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Guidance for Transportation Project Management

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Summary

Transportation project management, for all modes of transportation, is under extreme budgetary, political, and community pressure to contain costs and improve efficiency in the delivery of projects “on time and on budget.” In order to meet these twin goals, transportation agencies must employ dynamic project management tools. The successful planning, design and implementation of transportation projects needs to meet various performance metrics depending on each stakeholder’s perspective. Thus, the general terms of “on time” and “on budget” can mean different things to the users and to their clients—whether public or private. (For example, a change order might be viewed by the designer as within the timeframe and an acceptable extension of costs; a client might view the same change order as outside both time and budget). It is essential that project management take these different perspectives into account.

The purpose of this guidebook is to provide a toolbox that offers detailed project management subject areas and innovative practices that can be applied to achieve a higher level of project success. This guidebook has been developed to assist project managers who work for Department of Transportation (DOT) agencies or other public transportation agencies, whether they are DOT/agency employees or consultants working for the DOT/agency. Most DOT agencies have a project manual for each of the following phases of a project: planning, design, and construction. The guidebook has been developed to complement the agencies’ project manuals, not replace them. After researching numerous DOT websites and project manuals, the common milestones for the planning, design, and construction phases for transportation projects were compiled and made into a generic outline for each of the phases. The outline concentrates on those steps that are essential to a public agency project within the three phases of planning, design, and construction. The guidebook offers tools to better improve the agency’s process or to offer some suggestions to those that may be looking for a more innovative way to manage a project.

Chapter 1. Introduction

The Industry Problem

The recently completed NCHRP Project 20-24, *Comparing State DOTs Construction Project Cost and Schedule Performance*, reviewed the performance of 26,500 projects in 20 states over the most recent five year period. The review was simple and basically asked two questions:

- Was the project delivered at or below the contract award price (bid amount)?
- Was the project delivered on the expected schedule?

The results showed that in nearly 50% of the cases the projects were not delivered on time or on budget. More striking is that for the projects over \$5 million dollars in construction cost, less than 20% were on or under budget and only 35% were delivered on time.

A wide variety of factors can cause a project schedule or budget to slip and most project managers feel that the reasons are out of their control. Some of the most common reasons include difficulty in obtaining the rights of way, utility conflicts, underground conditions, environmental and political issues, design problems, lack of accountability, inadequate protocols, and lack of coordination between phases of project development. Many, if not all of these can be mitigated through the use of effective project management protocols and procedures. Issues that can cause delays such as the right of way or utilities can be avoided by early and consistent coordination with the department within the agencies responsible for these functions from the beginning of the project. Developing an understanding of their processes will help with the coordination process. It is all about fully managing a project as a whole as well as during the individual phases; the big picture must be kept in sight through the duration of the project.

Guidebook Development

This guidebook was developed under NCHRP Project 20-69, "Guidance for Transportation Project Management". The objective of developing the guidebook was to create a project-management guidance document including a toolbox of effective practices for application on transportation projects. The guidance document was to identify expected benefits from strengthened project management techniques, both in terms of success of transportation projects and in increased effectiveness of organizational strategies, staff development, and process resources. Areas to be covered in the document included: Organizational Context and Strategies including agency organization (and culture), project organization, project managers, matrix management, centralized versus decentralized management approaches; Project Management Systems including critical path methodologies, project-scheduling tools, cost estimation approaches, software tools, progress reporting, and project control; Project Management and Managerial Skills-managerial development training, technical expertise, career paths, skill sets, and management support; Project Management Methods and Processes such as risk management, cost estimation, reporting and communications, project control, management software tools, and scheduling applications; Project/Program Administration including delivery methods, contracting methods, financing methods, accountability and decision making, cost and project control, management of multiple projects within constrained resources; stakeholder involvement including political and policy issues: public and stakeholder communications, management of inputs, agreements, and commitments; and coordination with other departmental processes (e.g., planning, programming, operations, maintenance).

The guidebook is intended to be a manual and toolbox for DOT project managers during the planning, design, and construction phases of a project. The objectives of this project are two-fold:

- I. The development of a Project Management Guidance Document and accompanying toolbox of effectual practices for use by Departments of Transportation to improve effective management of agency transportation projects through the development of project management training programs.
- II. The provision of benefits to Departments of Transportation in terms of strengthened project management leading to successful transportation projects, robust organizational structures, staff development, and management processes.

The research for this guidebook was prepared throughout three tasks or phases, the first being a comprehensive review of literature and current practices relative to transportation project management. The information was gathered from an extensive literature search; interviews with four different project management experts from public, private, and non-transportation organizations; and a nationwide survey of public and private transportation project managers.

The second phase involved a separate survey and research that identified both well-established and innovative practices in project management used on transportation projects and projects outside of the transportation field. The team used an electronic survey that was distributed to 75 transportation officials involved with project management activities. An on-line questionnaire was created and distributed. Following the survey, the team selected targets of innovation, creativity and/or unique practices and tools for additional review by Internet, telephone, and face-to-face interviews. Attention was focused on those organizations that have accomplished positive results in project management. Each agency was asked to complete a survey to explain the reason for the practice or tool selection, the extent to which the practice or tool has contributed to desirable results and benefits, problems that may still exist despite use of the practice or tool, and other ongoing or planned modifications. The survey was also sent to managers and their clients to obtain a 360 degree view of factual results and process perceptions of project management efficiency, effectiveness, and efficacy. To ensure the project team obtained as accurate and relevant fact-finding as possible, the snowball technique was used with the selected agencies in an effort to identify other sources of information on project management. This technique required us to ask each contact to identify any other contact that they believe have relevant information. The snowball process stopped when no additional, new references were identified.

The third phase of the development was a compilation of the results of the surveys and literature from the proven and innovative practices for the management of a variety of transportation projects. The strengths and limitations for various projects, as they relate to various project characteristics and organizational structures were evaluated.

Various State Departments of Transportation's manuals and procedures were also researched for commonality, best practices, tips, and lessons learned.

Guidebook Organization

The guidebook consists of four Chapters: Introduction, Project Management Overview, Universal Elements, and Project Management by Phase. The Project Management Overview section is a basic overview of project manager traits and principals for effective project management. Universal Elements includes topics that are beneficial to all phases of Project Management. Project Management by Phase goes through topics and milestones that are specific to the planning, design, or construction phase. Within each section of the guidebook, the phases are broken out in detail and will include the steps that are important and/or milestones for a DOT project. A short description of the topic is given and tools are offered to compliment the topic.

At the end of each chapter there is a matrix that references specific tools that pertain to that particular topic. The tool or multiple tools associated with the section includes a Reading Room, an Applied Resources section, available

Software, and Websites. The initiative behind the tools is to offer project managers ideas, assistance, and proven methods that can support them with their projects and may perhaps result in them becoming better project managers.

Located throughout the text there will be best practices that are also in the form of tips and lessons learned that will be identified by the Best Practice symbol indicated below. Also within the various toolboxes, if an item indicates a tip, best practice or a lesson learned it will have the symbol in front.



Best Practices

Description of Tools

There is an icon that represents each of the available tools. Throughout the text the icon will be present if that tool is available for that topic. The icons are hyperlinked and are able to be clicked on to take the reader directly to that particular tool for the topic.

Reading Room



The Reading Room contains an annotated Bibliography that offers a variety of suggested readings and case studies from various sources. The suggested readings can be in the form of publications or articles that are located on the internet. The case studies offer previous case studies in project management that have been documented in the transportation field and other industries.

Applied Resources



The Applied Resources section offers a variety of hands on tools for completing the project management tasks. Included are checklists, process flowcharts, samples, spreadsheets, computational methods, and charts that can be filled in or just utilized as a guide and forms.

Software



In the software toolbox there is a chart of useful software that could assist project managers for particular tasks. The chart is set up by general project management software programs across the top and useful information along the side such as what is included in the program, the learning curve, the cost and number of users per account. Listed within the appendix there are other software programs listed for individual topics including others that are for general project management.

The NCHRP/TRB does not endorse any software products; however we are offering suggestions of useful products identified from our research.

Websites



The web based tool includes links to websites that go into great detail regarding the topic. There are entire websites devoted to project management as well as other sites that may only have an article attached as a suggested reading. Along with the web link there is a short description of what each site offers for ease of use.

The website appendix will also include some tools that have downloadable forms, checklists, templates and other resources that can be not only read, but also utilized. These sites are indicated by a toolbox icon.



Utilization of the Guide

To utilize the guidebook effectively the project manager will have his or her own department/agency/state project manuals with them and will be using this guidebook as a companion to the department's manual. The project manager will need to look over the manual and familiarize themselves with it before delving in. It is suggested that the project manager read the project management overview section first. This section offers tips and tools and also includes information that will be relevant to all phases of a project, thus useful to all project managers. The project manager can also reference the sections relevant to their phase of the project and the tools that pertain to the tasks associated with the topics. These tools have been selected based on the milestones that a DOT project manager will need to meet as well as the requirements that have been placed upon the public agency as a result of the state and federal regulations.

A disc that contains the entire document including the hyperlinks will accompany the hard copy of the guidebook. Since access to a computer is not always possible, the guidebook has been set up so that in addition to selecting an icon that is at the beginning of each topic to go to the tool the reader can also look in the back of the chapter for the tools matrix associated with each topic. The tools available for each section will be noted in a matrix at the end of the chapter and then included in an appendix. The matrices have the list of appendices across the top and the list of tasks within that chapter listed on the left side. The matrices include the page numbers within the appropriate appendix that each tool is represented on. The reader can look up the task and go to the right to see which tools are available for their topic. This will refer the reader to the pages in the appendix they will be looking for. If access to the disc is available, the reader can also click on the page numbers and will be directed to the beginning of the appropriate section. The chapters and tasks will follow the order of the Table of Contents. If the referenced tool associated with the chapter topic has a tool, it will be shown under the appropriate chapter task and tool.

For example, if a project manager is looking for a tool associated with conducting meetings, according to the outline, "conducting meetings" is in Chapter Two- Project Management Overview as a sub category for Effective Leadership. The project manager will look at the end of Chapter Two for the matrix associated with the Project Management Overview section. In the matrix Conducting Meetings will be listed in the left column with the tools listed across the top of the matrix. The matrix will show the page number and appendix of where the tools can be found. The chart is hyperlinked to direct the reader directly to the beginning of the section that they are interested in.

This guidebook will offer an array of tools that were selected specifically for the topics covered. The number of tools per topic will vary depending on the content. Some topics will have more tools than others because there is more information to pull from. There is a plethora of information available and this guidebook only represents a sample of the most useful types of tools. It is anticipated that the user will continue researching additional information within the types of tools selected for this guidebook as project management needs change.

Chapter 2. Project Management Overview

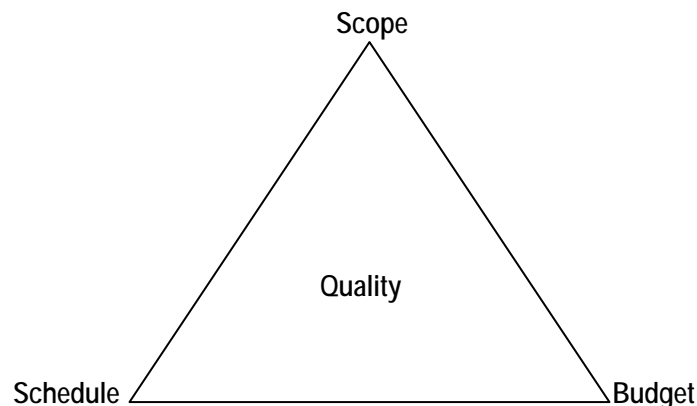


Basics of Project Management Summary



Let us begin the discussion of project management with a definition. There are numerous definitions for the term "Project Management" most of which involve the planning, organization and controlling of an effort with a defined outcome, specific resources and a required schedule. Frank Stasiowski, FAIA founder and CEO of PSMJ Resources defines project management as "The art and science of guiding all of the stakeholders through a series of changes that we call a 'project'. While a departure from the traditional definition, the Stasiowski definition introduces a fundamental fact and that is, *projects change as they evolve from notion to delivery.*

Fundamental to an understanding of what project management is, is an understanding of the interrelationship between scope, schedule and budget. These three elements form the sides of a triangle and as in any triangular relationship a change in any element will result in a change in the other two sides. Considering that project management involves change management a change in the scope will impact budget and probably schedule. A reduced budget will impact scope and possibly impact schedule. A reduced delivery timeline may result in increased cost and possibly scope changes.



The definition of a successful transportation project management effort would be:

- The scope, schedule and budget are in balance (remember the triangular relationship).
- Quality meets established standards and public expectations.
- No unresolved project issues, for example unresolved construction claims.

The characteristics of a successful project management process and environment are:

- An organizational culture of project management including:
 - Top management support of the project management process and the individual project manager
 - A formal process for project management within the agency that is developed by experienced project managers
 - Recognition that software is only a tool in the project manager's toolbox
 - Regular project status review meetings conducted and attended by senior management
 - Development of a culture within the organization to support the project manager and project management efforts including training and development protocols
 - A recognition that successful project management includes the collaborative effort of all disciplines involved in the project including the design disciplines, right of way, environmental permitting, utility coordination, intergovernmental relations, PIO, etc.

- Tools in place within the agency to assist the project manager including:
 - A financial reporting system that supports project management
 - Regular and consistent use of the project charter, project management plan, risk analysis and change management process
 - Adoption of simple software that the project manager uses and that can be rolled up into management reports by the project manager
- Effective change management including:
 - Recognition by all that change on a project is inevitable but must be both recognized and managed.
 - Recognition of the typical causes of change such as utilities, environmental permitting and related issues
 - A process established to recognize and deal with change
 - An effective outreach program to communicate the need and justification for the impacts of change including additional budget and schedule impacts
 - Review and change approval by top management
- A comprehensive project quality oversight system including
 - Frequent field reviews including a plan in hand review at the 70% completion level
 - Constructability reviews by experienced construction management personnel
 - Documentation of quality control (QC) processes during design including the red/yellow check of plans, calculations, and documentation that QC procedures have been followed
 - Operational reviews to assure adequate maintenance provisions
 - A "Ready for Construction Checklist" documenting that the project has been checked and reviewed and can be released
- An effective construction oversight/management program including:
 - Onsite oversight
 - Effective tracking of contractor communications including submittals, RFI's, shop drawings
 - Regular construction progress meetings with documentation
 - An effective partnering program

What is a Project Manager (PM)?



A capable PM is an effective leader who has an understanding of the goals and interests of the agency that is being represented. A PM has a thorough knowledge of the overall project process from project conception to closeout. A PM is able to plan, schedule, estimate and budget, monitor progress and performance of the project and team, and be able to take corrective action as required.¹

A team leader's competency in project management involves integrating comprehensive strategies, technological innovations, production engineering, and internal management. Leaders must be able to establish direction, form alliances, and motivate performance all the while optimizing time, cost, procurement, quality, communications, risk, scope, and human resources.

Traits of the Best PMs



There are many traits that make up a good project manager. There are the communication characteristics, the leadership aspect and of course the actual performance and accountability of the project manager. Depending on who is asked, a variety of characteristics will be offered to define a good project manager; however there are

¹ PSMJ Resources, Inc. (2004) *The Ultimate Project Management Manual*.

universal traits that everyone can agree makes a project manager successful. A project manager needs to be engaging, have focus, get the best out of their team, be flexible, and be resourceful to name a few. Some of these qualities come naturally to people and some are learned. It is important for a project manager to know what kind of traits they possess and what they need to work on by taking training classes, asking other project managers and peers and even your project team or past project teams.

Consistent Applications of PM Principles



As a project manager it is important to be consistent in the way you run a project. A good way to ensure project consistency is to develop a Project Charter and a Project Management Plan (PMP) for each project. With these documents in place it will help ensure that all of the crucial steps and key issues are identified. The charter states what is not included in the project's scope; the PMP only includes what is in the project and will be delivered to the public as part of this transportation improvement.



A best practice that many consultant firms use is the development of a Project Charter. The charter should be an early effort in the project initiation phase.

A Project Charter is a document written by the designated project manager, reviewed and approved by the project sponsor, who is a senior manager in the agency whose purpose is to formally authorize the project and provide the project manager with the authority to execute it.

The generic table of contents for a project charter would look like this:

<i>Table of Contents</i>	
■	Project identification (title, number)
■	Project mission, objectives and purpose
■	What is included, not included and unknown in the scope
■	Funding source(s) (if appropriate)
■	Identification of PM and other key personnel
■	Project limits & Location map
■	Permitting, ROW and Utilities
■	Key <i>scope</i> elements and deliverables
■	Project budget and schedule
■	Project partners and other stakeholders
■	Levels of authority
■	Key issues and <i>risk</i> elements
■	Other assumptions and constraints

Development of a charter is a time consuming but important activity. As in any effort of its type, the first time that a project manager develops a project charter; it will take considerably more time than it will to develop subsequent charters. Some fundamental considerations regarding charter development:

- It should be developed for the specific project. Avoid a "generic" charter for a "typical" project.
- It should be written by the project manager.
- It should have a sponsor – a member of the senior management team who will provide project oversight and who will provide support to the project manager.
- The charter is primarily a planning document; possible revisions during the planning phase may be needed with a final charter provided to the design team.

- It should be reviewed by key staff functions, for example environmental, right of way, utilities, etc. to assure that tasks unique to these disciplines are addressed in the initial scope development.
- Some initial recognition of risk elements should be addressed in order to be prepared for unknown or unexpected issues, such as environmental conditions, that might delay the project. The potential for these unknowns should be recognized in the charter.
- It should contain a budget contingency of 20 -25%.

As the project progresses through the planning phases and into design, a well developed and revised charter can be used as a transition document between the planning and design phase. Considering most state transportation agencies are organized with a planning, a design, and a construction division, the project manager can be expected to change as the project progresses through the three phases of delivery. It is imperative that the project goal and criteria remain consistent from phase to phase. Typically the plan assembly functions as a transition document between the design and construction phase. A well developed charter can be the transition document between the planning and design phases.

"The implication is that project management guidance documents will only benefit a program if the project leaders are totally committed to the chosen process and practices. Team members at every level of the project need to understand the process and perform in accordance with the established priorities and routines." ²

The Project Management Plan

It is recommended that a project management plan be developed for each project. This will identify the approach that the project team is going to take in order to bring the project to fruition. The careful and proper development of the plan and the execution of the plan will help the project run more smoothly.

A PMP is a highly developed extension of the project charter that contains these eight elements:

1. Project goals and objectives (*from the Project Charter*)
2. Scope (Work Breakdown Structure)
3. Schedule
4. Financial plan (Budget including contingency)
5. Team organization, responsibilities and communication plan (RACI)
6. Quality definition and plan
7. Risk analysis and contingency plan
8. Change management process

Note that items 1 through 4 can be derived directly from the project charter. The Project Management Plan (PMP) is developed from the charter and should support the charter's objectives.



Developing a Work Breakdown Structure (WBS)

The task of developing a WBS is fundamental to project planning. The process of dividing a project into its individual components is used as a basis for establishing the project budget, as a basis for negotiation and as a basis for monitoring project design progress and finally a basis for paying the consultant team if applicable. This entails dividing the project into its subordinate tasks and subtasks until the project is broken down into easily manageable elements each of which can be scheduled and budgeted and individually monitored as a discrete project deliverable, a mini project within the whole project. The fundamental value in managing a project in this fashion is that it is easier to track individual activities than a fully integrated whole.

Each of the tasks can be separately scheduled and budgeted. Each can be tracked as progress is made. If a task is delayed, the cause of the delay can be analyzed and corrective action taken before the entire project is jeopardized.

² Virginia Department of Transportation- the Dashboard Program

Note that each task above has a deliverable associated with it that when completed can be recognized as a completed task. This is how an effective work breakdown structure is developed.

Some considerations in developing the WBS:

- Always use scope elements, never accounting elements (Scope elements are deliverable-based and accounting elements are activity-based)
- Use deliverable based elements whenever possible
- Use the same WBS for scope, schedule and budget
- Use a WBS for both in-house and consultant designed projects
- Include project management as a discrete task
- When changes occur, revise your WBS, your schedule and your budget.
- Keep the dollar value of the tasks small enough so that if a task goes over budget the whole project is not jeopardized but large enough so that you don't become a time sheet cop

Whenever possible, base your WBS on deliverables.

Effective Leadership



An effective leader is more than one who gets the job done. A leader has many traits such as being a good communicator, knows how to build effective teams, gives and receives feedback effectively, listens, manages time well, is a visionary, is innovated, has integrity, and is a problem solver, just to name a few. As a project manager it is imperative that you are a good leader. Your team will respect you more if you have positive leadership traits and thus in turn will get more accomplished on your projects in a timelier manner. For example, if the project manager is not a good communicator, the team may be hesitant to approach the project manager if they have a question and try to figure it out on their own and it takes them twice as long as it would have if they had felt comfortable approaching the project manager. Examples like this cost the project money and time, because it took longer to complete that task.



As a project manager it is important that you know your leadership style and what you need to improve on and how you are viewed by your team as a leader. An effective way to improve on leadership skills is to take a 360 degree leadership assessment test. The assessments give you feedback from all areas, including your peers. The assessment is taken by yourself and a few of your peers and supervisors that are rating you on the same thing that you rated yourself on. The results are compared as well so that you can see if you are in line with what others think of you, as far as your competency. This is a great way to see what your leadership style is, what you need to improve on, and offers suggestions and training topics to help in the areas where you may have scored low and need improvement in.

Motivating the Team



Keeping the team motivated can be challenging at times. It is up to the project manager to keep their team excited about the project and focused on it. As the project manager it is also your job to recognize if your team is in need of motivation or is struggling on the project, as well keeping the team informed and praising work that has been well done. In the toolbox there are numerous tools that offer teambuilding tips and practices including motivating your team and effective leadership skills.

Conducting Meetings



As everyone knows a meeting can either be very productive or a waste of everyone's time. It is important as the project manager that you can decipher between a meeting that is needed and a meeting that can be avoided because there is another way to achieve your objective. Consider the purpose of the meeting and what is the preferred outcome, will a meeting accomplish the desired outcome? A meeting held should be a meeting that is worthy of the attendees time. There are many tips and guidelines for successful meetings in the toolbox.



As the project manager, you are responsible for the budget. Before inviting the entire project team to a meeting, think about the objective of the meeting and who is required to be there. Having a team member attend who does not need to be there costs the project money. Team members who are not invited to the meeting should still be sent a copy of the meeting minutes to keep them informed.



When giving an important presentation many agencies and private sector firms hold a mock meeting to run through the presentation, verbally work out any equipment and display malfunctions, and to have questions asked that pertain to the project presentation that may be asked at the meeting. Have a sheet for presentation feedback from the individuals at the mock meeting; this practice prepares the project team and refines the presentation for the actual meeting.

Crisis Management



Every project manager wants to avoid a crisis and the best way to do that is to monitor all aspects of your project carefully. There is a chance that the crisis can be avoided if the project manager takes his or her time and fully thinks out a plan of action (see section on Risk Management Plans), follows the agency's project manual, has good communication with the project team, and provides adequate time in the schedule for the processes that could potentially cause delays, such as right of way acquisitions or environmental clearances.

If the crisis is unavoidable the project manager must then be able to manage it. It is the responsibility of the project manager to find a solution to the crisis. The project manager should be able to assess the situation quickly using their intuition and knowledge of the field, involve the key players, plan how to act and develop alternatives based on the assumptions of the crisis, be proactive and be able to communicate and execute the plan effectively.



To possibly avoid a crisis in schedule and/or budget, build extra time and money into the project for all environmental and right of way activities. There may be an unforeseen issue such as the need for additional right of way or more intensive mitigation needed that can quickly throw a project off schedule and budget.

Communication



Like every other part of effective project management whether planning, design or construction management, good communication is not difficult nor should it be complex. The purpose of any communication is to exchange thoughts, information and ideas between two parties. Communication can be conveyed either orally or in writing. The multiple purposes of communications are to verify, clarify, direct, document or make a request to or from contractor, owner and/or designer. Communications between the project delivery team should be documented in some form of written

communication and recipients should sign off that they agree. Effective communication may be the most important trait of a successful project manager.



Follow up in writing takes little time but too often key players rely on their memories because of a conception that putting it in writing takes too much time. Thus misunderstandings lead to disagreements which lead to delays, rework and claims. Communication is the most effective method of claims avoidance.

Guiding Principles for Developing Effective Project Managers



Being an effective project manager requires skills and traits that are both inherent and learned as discussed in the traits of the best project managers section. However the values that a project manager has and how they are put to use are those principle factors that tend to shine through as a leader and make managers not only well liked, but effective.

Dr. Audrey J. Murrell, Ph.D, gave a presentation to the Project Management Institute in November 2005 on the 7 Principles of Effective Project Management³. In her presentation the principles are things that are a bit more intricate and involve a lot more of a person's self and personality than organization skills or the ability to follow a schedule. The 7 principles in her presentation are:

- Power and influence are NOT the same thing
- Influence is about understanding the process of social exchange (networking and agenda setting)
- Effective project managers balance technical and relationship skills
- Effective project managers build strong networks
- Effective project managers are skilled at agenda building
- Effective project managers are skilled at issue selling
- Effective project managers use power and influence ethically

Succession Planning



Succession planning is the process of identifying and preparing appropriate employees through mentoring, training and job rotation, to eventually replace the higher level employees within an agency when they retire or change positions. Every project should have a project manager and an assistant project manager (APM). Having an assistant is part of succession planning and will help ease the transition if the project manager leaves the project and will help train the assistant in project management. (The APM should not expect to be the PM if a change occurs, but the succession planning will help prepare them for it.)



Whether you have an assistant or other subordinates working for you as team members, offer them the opportunity to grow within their positions by delegating to them. Overall it will be helping both the PM and subordinates out professionally, the PM will be able to work on more senior level tasks and the subordinates will be learning another aspect of the project. Tools for delegation are available in Appendix I.

³ Her presentation on the 7 principles and the characteristics of each is located on the web at http://www.pittsburghpmi.org/documents/meetings/presentations/7_Principles_of_Effective_Project_Management.ppt#266,1,7 Principles of Effective Project Management

Project Management Training



Competency in project management involves integrating comprehensive strategies, technological innovations, production engineering, coordination between disciplines, internal management, and the ability to sell a project to the public. With emphasis on the technical and contextual aspects of the project process, the important standard is leadership that is committed to the team, the project, and the public. Individual project managers can and often do perform well in spite of sometimes difficult and non-supportive environments, the organization can go far in developing project manager skills, supporting the project manager efforts and in assuring that the project delivery objectives of the agency are met.

Although experience is acknowledged as the biggest difference maker, basic academic preparation and training in such areas as technical, managerial, financial, information technology, and legal matters are also seen as fundamental to project management success. There is always room for improvement whether you are a new project manager or have twenty years of experience. A lot of things have changed over the years from technology to a more culturally diverse working environment. It is important to keep up with the new challenges that the work place presents and know how to deal with modern day obstacles of project and people management.

If an agency-specific project management training program is not available, look for individual training classes that offer the following type of information or opportunities:

Personal Growth

- Professionalism classes that focus on business etiquette, proper business attire, body language, nonverbal communication and overall appropriate business behavior
- Time management to learn how to manage multiple priorities and make the most of your time
- Delegation to learn how to effectively allocate work assignments to your team
- Effective communication skills courses that teach how to manage interpersonal communication on the job verbally and written
- Personality testing and training

Professional Growth

- Job skill oriented classes such as an advanced spreadsheet class, effective presentations skills, meeting and facilitation skills, procurement regulations, coaching, budget management, business writing, problem-solving, conflict resolution, and influencing people, to name a few
- An overview of the entire agency and how projects proceed from initiation through to completion
- A position rotation opportunity may be available that allows individuals to work within other divisions of the agency and learn another aspect of the project delivery
- Communication skills are exceptionally important to the project manager; participation in Toastmasters or similar programs can greatly assist in developing good oral communication skills



Community colleges also offer continuing education classes that deal with project management and common issues in the work place. Be resourceful in your training and think outside of the box, there are numerous commercially available training courses that may meet your needs. If the agency does not offer training on a specific topic that there is a proven need for, suggest it.



A project management training program should reflect the agency's mission statement. An agency's reputation is only as good as the projects it produces, it is beneficial that an agency or organization teaches its project managers how to put their values and mission into action.

Many agencies and consultants enroll an employee into a training program when he or she becomes an assistant project manager or when the employee is able to take on more responsibility. Project managers that have not yet had the training or need refresher courses should also be enrolled in the program or at least in specific courses. An effective training program will cross train individuals who are candidates for a project manager track within the agency, whether agency employees or consultants that will represent the agency as the project manager. Cross training will benefit assistant project managers by giving them insight on the inner workings of the other phases of their projects and the steps involved. This insight will make the project managers a more valuable asset to the agency by making them more marketable within the agency, and will also prepare them for upper management positions within their division or another within the overall organization. Assistant project managers should complete this training program while actually working on projects – this will allow him or her to integrate techniques from the training into the daily work of the project. Training and skills learned tend to be more effective when they can be put to use relatively quickly.

CHAPTER TWO- PROJECT MANAGEMENT OVERVIEW	Applied Resources Appendix I	Reading Room Appendix II	Software Appendix III	Websites Appendix IV
Chapter Two- Project Management Overview	Page Numbers	Page Numbers	Page Numbers	Page Numbers
Project Management Overview	AI-1	AII-1	AIII-1	AIV-3
Basics of Project Management Summary	AI-1	AII-3	AIII-1	AIV-3
What is a Project Manager (PM)				AIV-3
Traits of the Best Project Managers		AII-4		AIV-3
Consistent Applications of PM Principles	AI-2	AII-6		AIV-4
Effective Leadership	AI-10	AII-8		AIV-4
Motivating the Team	AI-10			AIV-5
Conducting Meetings	AI-10	AII-11	AIII-2	AIV-5
Crisis Management	AI-13	AII-11	AIII-2	AIV-5
Communication	AI-14	AII-11		AIV-5
Guiding Principles for Developing Effective Project Managers	AI-15	AII-12		AIV-6
Succession Planning	AI-15		AIII-2	AIV-6
Project Management Training		AII-13		AIV-6

Chapter 3. Universal Elements

Project Startup for All Phases

Successful Conduct of Kick-off Meetings



The kick-off meeting is one of the most important meetings that a project manager will hold. A kick-off meeting that is well planned and gets the team on board is one that will set the tone for a successful project and project team. It is important that all project managers and key members of the project team from planning through to design are involved in the kick off meeting.

Team Coordination Between All Phases



Throughout the life of the project the planning and design project managers will be in constant coordination. The team will have many divisions and participants, however not all of them will be involved through to the end of the project. As the project develops and moves forward, team members will change along with the phase that the project is in. The project managers on the other hand will be involved with the project team and responsible for the coordination between team members and divisions until the project is completed or at least finished with their phase of the project and it has been officially closed out or handed off to the next phase of the project.



"Information Sharing: project management success is resource/information dependent."⁴

A key to successful team coordination throughout is information sharing. All aspects of a project will affect each other either directly or indirectly; therefore it is important that the project team be kept in the loop with what the other divisions are doing. This can be as simple as at the team meetings going over what has been done since the last meeting or having each division prepare a summary sheet on progress and issues that have occurred. By doing this simple exercise it may avoid issues or delays that could come up later if a team member did not have the needed information. Remember it is a project team, work together as a team and the project will reflect the continuity of the team.

Consultant Selection and Negotiations (when applicable)



Consultant Selection

Much has been written about consultant selection and virtually every public agency including state departments of transportation have well established and documented protocols prescribing the process. Most agencies have adopted some variation of the Brooks Act which promotes a qualifications based selection process that, typically, does not include price consideration as a factor. An NCHRP study (29-06) Consultants for DOT Preconstruction Engineering Work looks at the process in several states and identifies certain "best practices".

Putting the states individual processes aside and returning to the fundamentals of what is trying to be accomplished, that of selecting that consultant team that will deliver a cost effective design, on time with minimal involvement of agency staff. In selecting the consultant three interrelated factors need to be considered.

⁴ Department of Defense; U.S. Air Force Logistics.

1. **Cost:** The cost is not the cost of providing the design services but the ultimate cost of the constructed project. Does the consultant have a proven, documentable record of delivering a constructible project that is close to the engineer's estimate and with minimal construction change orders? What is the percentage of construction change orders that can be attributed to design shortcomings? Note that no design is ever perfect; the goal is to have less than 2% of the construction cost growth from bid to final delivery be design quality related.
2. **Competence:** The selected firm must show that they are competent and have the specific relevant experience to accomplish the work. While seemingly obvious, it is often easy for an agency to select a firm that may not have that competence. For example, a structural design firm might be very competent in the design of new bridges but may not have the experience or expertise to inspect and rehabilitate an old historic bridge.
3. **Capacity:** The firm must demonstrate that they have the capacity to do the work in the office that is proposed. This can be accomplished by asking the firms under consideration for a backlog curve which will show the staff hours of work currently in the office projected over a twelve month period. This same data should be requested to demonstrate the availability of key staff members proposed for the project.

Typically these three factors are evaluated by the selecting agency by following a seven step approach to consultant selection including:

1. Development of a selection committee
2. Publicly announced request for statements of qualifications and interest in the project
3. Development of a short list
4. Request For Technical Proposals (RFP) from the shortlisted firms
5. Review of the proposals
6. Interviews with the shortlisted firms
7. Selection of the top ranked firm



A well-worded RFP requiring specific and verifiable information is essential to making an informed selection of a qualified consultant. Although each agency has a unique consultant procurement procedure, here are some tips and suggestions for the proposal content:

1. Always require the consultant's proposal to answer specific questions, for example:
 - a. "List three projects for which the scope of work was comparable to this project that were completed by your firm in the past five years and identify your engineer's estimate, the bid price and the final delivered price for each."
 - b. "Identify the team members proposed for this project and list their relevant experience and identify their participation in the three projects listed above."
 - c. Provide a copy of your firm's quality control plan.
2. Require a backlog curve in the response to the technical proposal phase of the procurement process.
3. Require an availability curve for key individuals (project manager, project engineer, etc.) in the response to the technical proposal phase of the procurement process.
4. Identify references and contact information so that the references can be verified.
5. Require a statement of accuracy of the information in the proposal signed by an officer of the company.



Do not ask for cost related information including an estimate of staff hours or other cost data at the proposal stage of the project. Level of effort and cost data can only be determined during the negotiation phase of the procurement effort when the full scope has been determined.

Often, agencies will conduct interviews of firms that have been "short-listed." While conventional practice has been to invite the short listed firms to meet with the selection committee in the agency's office and to make a formal presentation, it is often better to require the selection committee to visit with the consultants in their office. While this will take more time from the selection committee, the committee can often better evaluate the consultant

qualifications including cost, competence and capacity by visiting the consultant on their home turf. While in the consultant's office, the selection committee should evaluate the following:

- Does the firm have the staff identified in the proposal?
- Does the firm have the equipment and assets to do the job (computers, software and related tools)?

Developing the Consultant's Cost/Fee



Once a scope and level of effort is agreed upon, the consultant will add billing rates to the agreed upon hours and add other direct costs (ODC's), this should determine a fair price for the work to be done. Some important pointers in accomplishing this are:

- Whenever possible, tasks should be deliverable-based and not activity-based. For example, "Prepare a topographic map" is a deliverable, when the map is completed, it can be seen and held. On the other hand, "Topographic mapping" is an activity that may or may not result in a tangible product.
- It is probable that the consultant's task list may vary from the agencies. This is normal because the consultant may know things about the project that the agency doesn't and the agency may have an insight that the consultant cannot have. Thus, an initial step would be to agree on the work to be done. (Obviously, if the consultant misses a task, the agency would be well advised to inform the consultant).
- It is easier and less emotional to negotiate level of effort rather than cost. Cost will come in when scope and level of effort are agreed upon.
- The agency should compare the consultant's billing rates with those of other comparable firms. While rates will vary with salaries and overhead they should be comparable between firms doing similar work in the same region.
- It is reasonable to ask the consultant for financial information such as recently audited overhead rate and salary data before negotiations begin.
- Salary and overhead are usually not negotiable, profit is.

This approach is known as "Bottom up" negotiation. What often occurs, however, is that the agency has a limited fixed budget for the consultant's work. In this case, where the consultant needs to deliver a project within a limited budget typically less than desired, "Top down" development of the budget is used. In this model, the achievable budget is used to develop a total level of effort for the project (simply divide by the consultants billing rate after deducting direct costs and reserving a contingency). From this level of effort (total number of hours available) tasks are assigned and task budgets developed. In this case, compromises must be made in the work scope to fit within the limits of the budget.

We now have two methods of developing a budget with the consultant: Bottom up and top down. In the real world a combination of the two is a typical method of negotiating where the consultant develops a budget, the agency deems it too costly and so an examination of the work scope and level of effort to achieve each task ensues. Normally agreement is reached fairly quickly using this method.

There are other methods of developing a budget; the most common is the "Unit Cost Method." In this case, historic data and experience provides a basis for estimating what it should cost to accomplish a particular design activity. Note that while unit cost method provides an easy method to determine what something should cost, there is no way that unit cost can take into consideration the uniqueness of a particular project or work site.

A common method of unit cost in the transportation field is percent of construction. If we have an estimated construction cost, the cost of design should be roughly 10 to 12 percent of construction. Again, this is a rule of thumb only.

A final method of determining budget for negotiation with the consultant is to estimate the level of effort over the duration of the project. In other words if a consultant can be expected to have a five person team working full time on our project for six months the total level of effort would be:

$$5 \text{ persons} \times 6 \text{ months} \times 173 \text{ hours per month} = 5190 \text{ hours}$$

Of the four methods described, this is the least accurate in most cases and should only be used as a final back check. This method can only be effectively used when we are asking for a constant level of effort over a prescribed time. For example, construction oversight consisting of a three person crew (resident engineer, inspector, clerk of the works) for nine-month construction duration becomes an easy calculation.

Consultant Negotiations

Once the consultant has been selected, contract negotiations begin. Ideally, this is an opportunity to begin the team building process with the consultant. The consultant is “an extension of staff” and it only makes sense to use this opportunity to build the relationship. Unfortunately, in too many instances, negotiations are viewed as a “win – lose” game where there will be a winner or a loser and we want always to be on the winning side. Some key points to remember in consultant negotiations are:

- Base the negotiations on the work to be done.
- Achieve a fair price for the work.
- Strive for a win-win agreement.
- Use the negotiations to build a relationship of trust.

Using these fundamental precepts both the agency and the consultant should develop a detailed scope of work including a WBS (as discussed in Traits of the Best PMs). This needs to be both comprehensive and in sufficient detail so that all of the tasks to be accomplished are listed and the tasks are small enough so that if an error is made in determining the level of effort to accomplish one task, it will not seriously jeopardize the total project budget. Hours to accomplish each task are then assigned, the tasks summed and a total to accomplish the project determined. Once both parties have completed the WBS, the tasks and level of effort can be compared and discussed (negotiated).



Some final thoughts on consultant negotiations:

- Negotiations are not a sporting event. You are there to arrive at a fair price based on a clearly developed and understood scope of work. There should be no winners and losers.
- The negotiations should serve to strengthen the relationship between consultant and client.
- Send staff to the negotiations who are empowered to reach an agreement and who will be taking part in the design process. Insist that the consultant do the same.
- Base the negotiations on a mutually developed scope of work and work breakdown structure. Reach an agreement on what is to be done before discussions of what it takes to do the work and long before costs are discussed.
- Always use more than one method of developing the project budget. Usually bottom up and top down are used with unit cost as a check. (See Developing the Budget for more information on bottom up and top down)
- Clarify what is expected from the consultant, for example, do not put “Attend meetings,” specify how many meetings they are expected to attend.

Scheduling Techniques to Ensure Adequate Time & Quality



There are numerous scheduling techniques the most common being bar charts or critical path scheduling and there are many proprietary software programs out there that are useful tools in the preparation and maintenance of a project schedule. In spite of the numerous software programs on the market and the tremendous power that many of these have, the act of developing a schedule is an extremely valuable tool for the project manager to think through the sequencing of the project.

What are the characteristics of a good schedule?

- Kept on a calendar basis, not a work day or hour basis
- Easily communicated and easy to read and understand
- Easy to update and modify as changes occur
- Shows task interrelationships – the proper sequencing of the job
- Includes review and correction time
- Allows for some slippage in some activities
- Is graphically presented so that interpretation is intuitive

There are several common mistakes that are made when developing the schedule:

- Not allowing for internal review and changes
- Starting tasks before prerequisites are complete and delivered
- Failure to consider staff availability, remember, people take vacations – the schedule can be helpful in planning vacations and in planning around them
- Excessive complexity – the schedule becomes so complex that everyone just ignores it
- Forgetting to include all of the project delivery activities such as right of way acquisition, utility coordination, public meetings, time for environmental clearances, etc.



Virginia's Department of Transportation (VDOT) implemented the Dashboard Program which resulted in significant time and budget performance improvements. The Dashboard program originally used the visual concept of a traffic signal to show projects that were on time and on budget- or behind in those measures. (The Dashboard now looks more like an automobile dashboard and performance measures have been extended beyond project management.)

- A green light on the signal indicated the project was on track.
- A yellow light indicated the project was at risk of falling behind schedule and needed immediate attention to get it back in the green.
- A red light meant the project was behind schedule and needed executive level attention to get it back on track.

VDOT focused their attention on the projects in the yellow zone, which is the critical time to address problems so projects returned to the green zone. Previously, each project's status was available only by going to several complex databases. The Dashboard is one common information source that is used by all levels of VDOT. The Dashboard monitors project advertisement schedules and relevant costs for bidding, project budgets, schedules, and work orders. It combines data from various VDOT computer systems and rates the project's status according to the red, yellow, and green colors of the traffic signal. The Dashboard program is credited for raising VDOT's on time, on budget performance significantly over a two year period and has won praise from transportation decision-makers and

the media alike. A distinct advantage of the Dashboard visualization is that decision-makers can tell at a glance what the project status is at any point in time.

Milestone & Bar Charts



The Bar Chart or Gantt chart method of tracking progress is a graphical representation of the original schedule versus the actual progress. The standard bar chart is a good choice for small projects, it is easy to set up and update, however it does not show the relationship between the different activities. Using the Gantt chart for tracking milestones can either be simple or complex, depending on what is trying to be shown. A milestone chart typically will indicate the end of a phase or when a major deliverable is due and can show all of the project activities on one chart. Milestone charts are also easy to read, understand, and update which makes them a good scheduling tool for all types of projects from simple to complex. A milestone chart can show the relationship between the different activities or it can be as easy as having a spreadsheet with the name of the milestone and the date it is due.

Critical Path Method



The Critical Path Method analyzes what activities or milestones have the least amount of scheduling flexibility then predicts project duration schedule based on all activities that fall in the critical path. The items that fall in the critical path are the ones that need to be done on time in order for the project to be completed on time.

Managing Project Budget



The project budget is one of the most important things as a project manager that you will need to manage. A key point to budget management is to know which activities control the budget and to keep track of those activities.



Controlling the Schedule and Budget Using Earned Value

Schedule and budget during the planning and design processes can be controlled by using a tool called “earned value”. Earned value⁵ integrates scope, schedule and budget necessary for effective project management. At inception of the project, a projected expenditure curve is developed based on the project’s budget and schedule. Each month, the accomplished deliverables (work tasks) delineated in the work breakdown structure are measured (plotted) against the baseline. This provides the project manager with the status of the project schedule and budget. It also provides the data for paying a consultant for work accomplished. This method allows the project manager to quickly identify any problems on a regular basis and prevents “last minute surprises.” It also ensures that the agency pays for what is delivered rather than time that has passed; thus, reducing the probability of major budget over-runs.

At the start of a project the design team develops a work breakdown structure, identifies the cost associated with each activity and when each activity is anticipated to begin and end. This is summed by period (see Table 1) then plotted on a curve which becomes a projected progress curve (Figure 1). Note that the Y axis on the left and right of the curve reflect progress differently, the left vertical axis is expressed in dollars and the right axis is in percent complete.

⁵ A more comprehensive discussion of earned value can be found in PSMJ’s *Ultimate Project Management Manual, Chapter 17, “Monitoring and Controlling the Project”*

Projected Expenditures

Task Description	Budget (\$)	Start Date	Finish Date	Unit Cost (\$/mo)	2001												Totals
					31-Jan	28-Feb	31-Mar	30-Apr	31-May	30-Jun	31-Jul	31-Aug	30-Sep	31-Oct	30-Nov	31-Dec	
A. Develop Background	\$13,140	1/1	6/30	\$2,190	\$2,190	\$2,190	\$2,190	\$2,190	\$2,190	\$2,190							\$13,140
B. Conduct Case Study																	\$0
1. Select Case Study Study	\$2,920	3/1	3/30	\$2,920			\$2,920										\$2,920
2. Prepare Briefing Documents	\$2,960	1/1	3/30	\$987	\$987	\$987	\$986										\$2,960
3. Develop Data Mgmt Plan	\$7,650	1/1	3/30	\$2,550	\$2,550	\$2,550											\$7,650
4. Visit Case Study Sites	\$19,700	4/1	9/30	\$3,283			\$3,283	\$3,283	\$3,283	\$3,283	\$3,283	\$3,285					\$19,700
5. Analyze Waste Samples	\$17,500	6/1	11/30	\$2,917					\$2,917	\$2,917	\$2,917	\$2,917	\$2,917	\$2,915			\$17,500
C. Evaluate Costs for Case Studies																	\$0
1. Develop Cost Models	\$8,060	1/1	6/30	\$1,343	\$1,343	\$1,343	\$1,343	\$1,343	\$1,343	\$1,345							\$8,060
2. Perform Preliminary Design	\$10,860	6/1	11/30	\$1,810						\$1,810	\$1,810	\$1,810	\$1,810	\$1,810	\$1,810		\$10,860
3. Estimate Costs	\$8,820	7/1	12/30	\$1,470						\$1,470	\$1,470	\$1,470	\$1,470	\$1,470	\$1,470	\$1,470	\$8,820
D. Evaluate Potential for Trtrrt	\$4,420	1/1	12/30	\$368	\$368	\$368	\$368	\$368	\$368	\$368	\$368	\$368	\$368	\$368	\$368	\$372	\$4,420
E. Assess Cost Impacts	\$5,260	11/1	12/28	\$2,630											\$2,630	\$2,630	\$5,260
F. Evaluate Cost Impact Models	\$6,240	11/1	11/30	\$6,240											\$6,240		\$6,240
G. Project Reporting																	\$0
1. Topical Reports																	\$0
a. Background Data	\$8,940	7/1	8/30	\$4,470						\$4,470	\$4,470						\$8,940
b. Case Study Site Visits	\$8,940	10/1	11/30	\$4,470								\$4,470	\$4,470				\$8,940
c. Waste Sampling	\$8,940	11/1	12/30	\$4,470									\$4,470	\$4,470			\$8,940
2. Draft Report	\$18,100	10/1	11/30	\$9,050									\$9,050	\$9,050			\$18,100
3. Final Report	\$7,940	11/1	12/30	\$3,970										\$3,970	\$3,970		\$7,940
H. Project Management	\$13,400	1/1	12/30	\$1,117	\$1,117	\$1,117	\$1,117	\$1,117	\$1,117	\$1,117	\$1,117	\$1,117	\$1,117	\$1,117	\$1,113		\$13,400
Total Monthly Cost					\$8,555	\$8,555	\$11,474	\$8,301	\$8,301	\$13,030	\$15,435	\$15,435	\$10,967	\$21,202	\$38,510	\$14,025	
Projected Cumulative \$					\$8,555	\$17,110	\$28,584	\$36,885	\$45,186	\$58,216	\$73,651	\$89,086	\$100,053	\$121,255	\$159,765	\$173,790	\$173,790

Table 1. Projected Expenditures

Projected Progress Curve

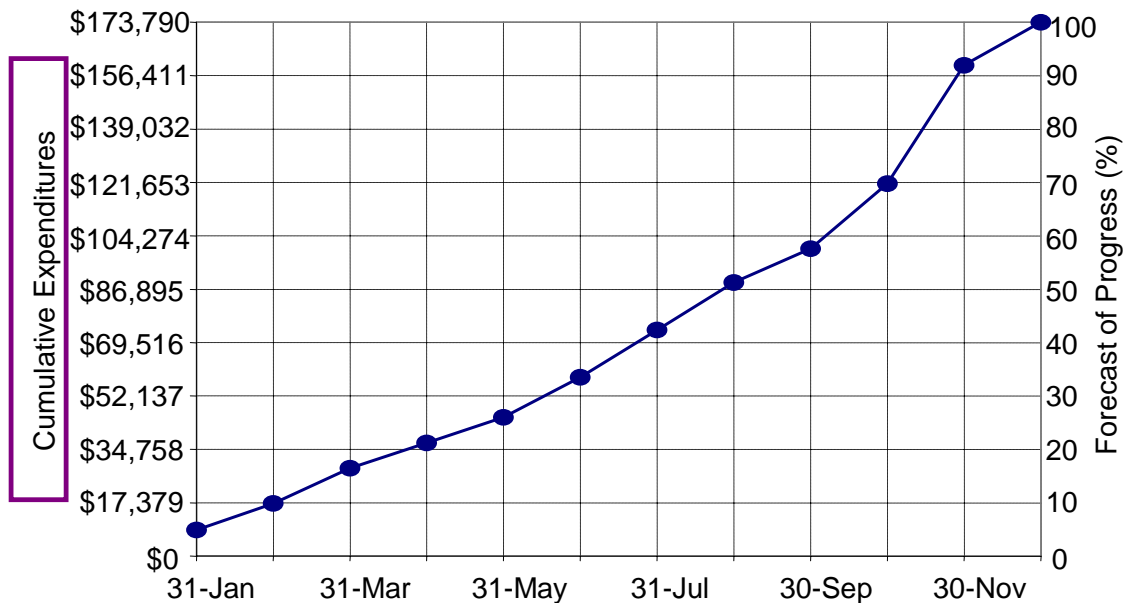


Figure 1. Projected Progress Curve

Progress on the project is then measured by estimating the percent complete for each task on the work breakdown structure, the value of the task is multiplied by the percent complete. All of the values thus earned are added to develop the cumulative percent complete for the project. These are then plotted on the progress curve as shown below.

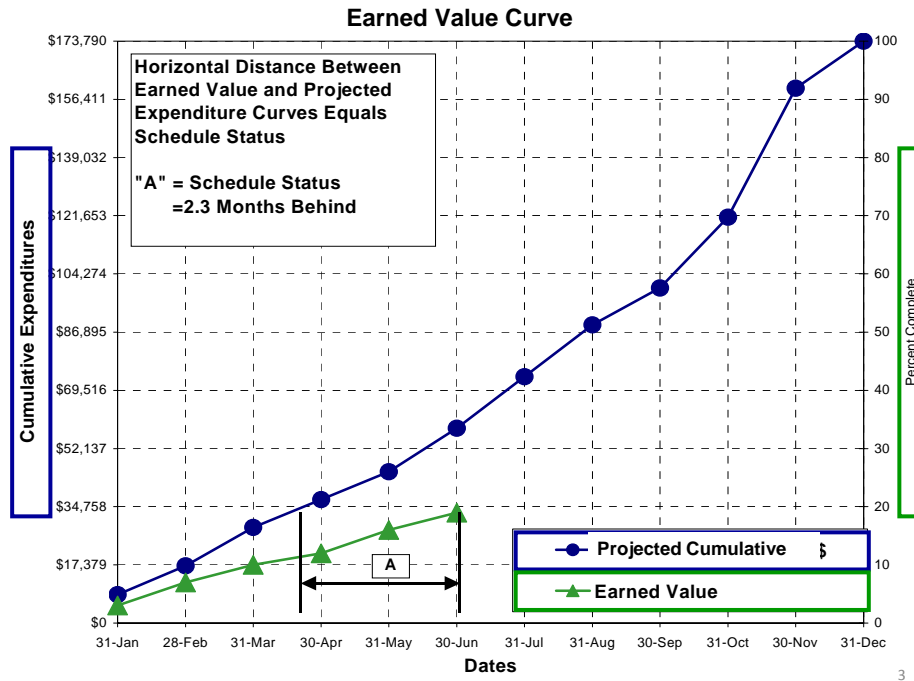


Figure 2. Earned Value Curve

Monitoring progress every period (typically monthly) using earned value is a best practice in common use in consulting engineering firms. While the accuracy of the report is a direct function of the accuracy of the estimates of progress on each of the tasks, by keeping the tasks relatively small (<\$10,000 each) the impact of an incorrect estimate is reduced. Note also that progress estimates on tasks that are complete or that have not yet been started are accurate so when the sum of all of the tasks is completed, the inaccuracies will balance out and a reasonable approximation of progress can be determined.

For internal projects the earned value curve will consist of three lines with separate calculations: Projected Progress (the blue line on the curve prepared at the outset of the project and part of the project management plan); Actual Progress Comparison (our earned value curve in green which is the best estimate of the our progress); and Cost to Date (red line and shows us our costs accrued. These three must be compared to determine budget and schedule status.

Tracking Consultant and Contractor Invoices

Tracking invoices is one of the best ways to keep the budget and progress of the project in check. The invoices will track the time spent on the project, the work that has been completed to date, the money spent, and the amount left in the contract for that consultant or contractor. Tracking consultant invoices that are based on earned value is a highly effective method of monitoring project progress.

Managing Project Quality



The quality of a project is a reflection of the agency, as the project manager it is a reflection on you as well. It is the job of the project manager to ensure that all products meet agency, state, and federal standards. Although required, meeting the standards is not the only measure of project quality that needs to be considered. Delivering a quality project requires that the project be set up properly from the start, including selecting the appropriate project team, timely reviews, realistic schedule and budget, and consistent coordination to name a few of the dynamics involved. There are many things that a project manager can do to help ensure a quality project. Putting competent people in the right positions, delegation, and managing project quality throughout the project are some key efforts towards a quality project. Additional considerations when managing the project are to get verbal commitments in writing, make sure the current specifications are being used and keep in touch with the project team to stay on top of any emerging issues. Issues can be detected through the reviews, quality assurance, and quality control checks. See below for more information on these topics. It is imperative that the project manager enforce and follow the quality assurance program that has been put into place. It is almost a follow the leader situation, if the project manager is not enforcing the quality assurance and quality controls, why should the team bother following them?



Constructability Reviews

"A constructability review is an independent review of the plans and specifications to ensure that the construction drawings and specifications are adequate from a contractor's point of view." ⁶ The constructability review is a method to assist in reviewing the project from the beginning at the planning phase all the way through to construction. The number of reviews will depend on the complexity of the project. The reviews primarily take place during the 30% design phase and can be internal with the project team and external with the contractors. The reviews "should be to minimize or eliminate potential change orders and schedule delays during construction by ensuring that the construction documents are fully coordinated, complete and buildable."⁷

In addition to the reviews held during the pre-construction phase, a good practice is to have a review at the end of project construction with the contractor and team to review the project and discuss what could have been better to improve future projects. This meeting is also a good time to evaluate the project objectives and if they were achieved and if not, why? In certain transportation projects it may be difficult to determine if the objectives have been achieved right away. For example, it is obvious that the road was widened and currently the level of service has improved, but will it provide the level of service that it was designed to for the anticipated amount of years?

Keep in mind that the public will be the end user of the project and managing quality is also making sure that the public is getting what they want. The public will have many opportunities to view the project concept prior to construction. It is important that the end user be satisfied with the project, take their opinions, comments and questions into consideration when designing and constructing the project.

⁶ Owen, D. (2004). *Performing a Constructability Review*. Retrieved November 13, 2008, from <http://www.donaldowen.com/constructability>

⁷ McDowall, Dr. (April 2008). *Constructability* (IPENZ Practice Note 13). Retrieved November 13, 2008, from http://www.ipenz.org.nz/ipenz/forms/pdfs/PN13_Constructability.pdf



Common mistakes/oversights that agencies make:

1. Failure to develop a list of required contractor submittals by date: In too many cases the contractor is not directed to submit certain items for agency/designer approval. The contractor then makes up his own list and submits it on his timeline. The agency then is forced into reacting to the contractor often without the review resources alerted and prepared to conduct the review on the requested schedule. A far better approach is to develop a list of required submittals, shop drawings and the like, ask the contractors to provide submittal dates and schedule and program the review so that the construction is not delayed.
2. Failure to conduct timely reviews or provide timely information: Along with establishing a submittal schedule agencies too often fail to manage the review process so that dates are met or they are not able to respond in a timely fashion to contractor requests for information. As a result, work continues on the job and rework becomes necessary.
3. Establishing an arbitrary completion date: Agencies and designers will, sometimes, establish a construction completion date that is not reasonable given site conditions, weather, material availability and the project complexity. Part of the design process should be the independent development of a reasonable construction schedule which will in turn establish an achievable delivery date. The corollary to this is that contractors should not bid a project that is not deliverable within the schedule established.
4. Issuing inadequate or out of date plans: This happens too often in both public and private project delivery. Plans are assembled "on the cheap" using the lowest cost provider or they receive inadequate review or they are not properly checked or (quite often) they are not field checked or they are allowed to languish on the shelf until they become stale and field conditions change. **Plans must be checked in the field within thirty days prior to issuing the invitation to bid.** Agencies are advised not to cut corners during the design process by trying to cut the design costs.
5. Inadequate field investigation: Agencies will often attempt to "save" design dollars by reducing the number and extent of items such as soil borings. Adequate underground investigation and close inspection of field conditions can often avoid expensive field change orders due to changed site conditions.
6. Insisting on unnecessary as-built drawings: Ideally the plans should reflect what is built in the field. Agencies need as-builts to confirm information contained in the plan assembly. Insist on detailed as-builts only for features that are hidden such as underground utilities, foundations and the like or for details that are changed in the field, i.e., material or equipment substitution.
7. Failure to adequately document directions to the contractor: Many discussions are conducted between agency/designer and contractor often in the field to resolve field issues or to provide needed information or direction. These discussions must be documented in writing to confirm or to clarify the verbal discussion. Too often, in the haste to get on with the project, this needed documentation is overlooked and forgotten about and becomes a subject of claims by the contractor as the project is in the closeout process. In today's construction environment, the issue of documentation is further complicated by e-mail. Many interchanges between contractor and the designer/agency are through e-mail and it is often difficult to sort out after the fact what separates a direction to the contractor with an interchange or discussion of information. Discuss in depth but document the instruction.



"The implication is that project management guidance documents will only benefit a program if the project leaders are totally committed to the chosen process and practices. Team members at every level of the project need to understand the process and perform in accordance with the established priorities and routines."⁸

⁸ Virginia Department of Transportation- the Dashboard Program

Quality Assurance (QA)



Quality Assurance is a method for the evaluation of the quality of products and/or services provided and will include a detailed review of the project including problem identification and corrective actions. It is expected that all necessary precautions have been taken to complete the project to specifications and state and/or federal standards. Oregon DOT stated it well in saying that the objective of QA is the continual improvement of the total delivery process to enhance quality, productivity, and customer satisfaction.

Quality Control (QC)



Quality Control focuses on the individual tasks of a project to ensure that each part is done properly to avoid problems later in the process. Each agency should have a quality control plan and process that each project must go through prior to authorization to take the project to the next level. As a project manager it is your responsibility to make sure that your team is following the QA/QC program that your agency has implemented and verify that the consultant's work is checked thoroughly as well. Do not assume that the consultant does not make mistakes, it happens and it will fall back on you as the project manager if something slips through the cracks on the reviews.



Develop a Quality Control plan for consistent and accurate reviews among projects. It is also recommended to have a QA/QC checklist that needs to be signed off on before going to the next step. This could be a process for each step of a project, having the work checked and reviewed numerous times before being signed off on.

Ensuring the Performance of Consultants



Consultants are doing more work for public agencies than ever before. The consultants can be on or off site and although it is easier to monitor their day to day performance when they are on site, it is also necessary to monitor them off site. Monitoring however does not mean we have to know what they do every hour. To monitor the consultant's work, agencies should request progress sheets, have regularly scheduled project meetings, and ask for invoices regularly.



Consultants expect to be rated and they want to do the best job possible so they can win more work from the agencies. An excellent way to track a consultant's work throughout the project is to keep a notebook and make notes on their performance, both good and bad. Everyone tends to get busy and forget what happened months before, by taking notes over the life of the project it will make it easier to fill out the rating sheets and performance evaluations. It is important to fill them out as accurately as possible so that they know what they need to improve upon and the agency will know what they liked or disliked about the consultant for future contracts.

Managing Risks & Creating a Risk Management Plan



All projects are susceptible to future events that may threaten and ultimately hinder the outcome, these are known as risks. It is imperative that these risks be identified at the beginning of a project in a risk management plan. A well developed risk management plan outlines the possible risks and how the team intends to deal with them if they occur. The plan is also the guide to managing the risks. To manage risks effectively the plan should be reviewed on a regular basis, this will remind the project manager of the items that need to be watched and how they are to be dealt with. The plan should also be updated as project risks change, some things will no longer be a risk and other risks may emerge as the project progresses.

There are many things to consider when developing the risk management plan. Think about the project and what could possibly cause a problem with the project being completed as planned. What is the likelihood of the issues actually happening and if they do happen, what will be the plan of action to correct them as expeditiously as possible? Of course it is preferred that the issue never arises; another part of the plan should be what can be done to actually reduce the chance of the issue actually surfacing.

A risk management plan should be compiled by the team, not only the project manager. The list of risks can be very comprehensive and it is better to think of too much than not enough and have something unexpected throw the project off.



A project can be put at risk by numerous factors both from internal and external sources. To determine what those risks are have a brainstorming session with the project team to identify them. It is a good practice to rank the factor by the likelihood of it occurring and the impact that it could have on the overall project. Monitoring the potential project risks as the project progresses may help minimize the risk early on and minimize the impact.

Managing Critical Path Items



Universally, projects experience claims, cost overruns and delays from one or more of five difficult to control causes:

1. Inability to get required permits on time
2. Political or acceptance issues including agreements with other political sub-divisions
3. Inability to get right of way
4. Inability to get utilities relocated on time
5. Unforeseen site conditions

Unlike design issues, the five causes cited above are difficult to manage and control because they are often outside of the transportation agency's direct control. Utilities and permits are managed and controlled by utility companies, permits by regulatory agencies. Public acquisition of rights of way are governed by an array of laws and procedures, recent highly publicized law suits have favored private property rights although transportation is recognized as a primary public interest. Political issues – politics being described as “the Art of the Possible” are sometimes driven by highly vocal special interests that simply do not want that transportation improvement constructed in their community, “NIMBY” (Not In My Back Yard) or “BANANA,” (Build Absolutely Nothing Approximately Near Anything) or the “CONE” Association (Citizens Opposed to Nearly Everything). Unforeseen or differing site conditions from what was classified during bidding can drive project costs up significantly. The site could materially differ than what the soil borings indicated and can result in additional man hours and equipment. Another unforeseen condition could be an underground tank that may or may not contain hazardous materials and the removal of that tank. Project barriers found onsite during construction will most certainly cause construction delays along with the increase of costs and hopefully not result in law suits from the contractor.

Although each of the five causes are different in nature and must be dealt with differently, they all have a single common denominator – they all take time and will delay a project unless the time that it takes to deal with these issues are factored into the project schedule and the responsibilities and resources needed are included in the project management plan. These causes need to be dealt with upfront and as early as possible. Let us consider the time needed for these activities and compare the necessary time with the time needed for design.



Recognize early in the project delivery process that permitting, public acceptance, utilities, and right of way acquisitions are time consuming matters but absolutely essential for successful project delivery. The following tips suggest effective strategies for managing these activities:

- Strengthen the project planning phase with a work scope to include initiation of the right of way acquisition process, identification of utilities to be relocated, initiation of the permit and environmental clearance program and completion of the public/political project acceptance phase of the project. This means that the project planning phase will take project delivery through about 30% design, far enough along to set the alignment and determine the right of way footprint, complete utility identification, identification and initiation of the permitting process and public, community and agency outreach appropriate to garner support for the project, or conversely, kill or modify the project early enough in the project delivery process that extensive irreplaceable resources are not lost on the effort. See the discussion on the project charter.
- Assign single points of contact within your agency to deal with the environmental and utility coordination activities. The same individual(s) dealing with their counterparts in the other agencies will develop personal relationships that are essential for establishing trust between the transportation agency and a utility company or regulating agency.
- Charge the staff assigned to utility coordination and obtaining permits to understand the motivators and processes of the other agencies. Their role is to act as a liaison helping to bridge between our transportation agency and the permitting/utility agency.
- Include the right of way staff, the utility staff and the permitting staff as recognized members of the project delivery team and include their input into monthly progress reports and require their participation in monthly project status meetings. These coordinators are expected to follow up with the agencies in question and track the status of the permit process.
- Consider hiring consultants with a proven track record in obtaining permits and utility coordination.
- Make a point of over communicating with the public and affected political subdivisions.

Typical durations of project delivery tasks are noted below, it is suggested that you put these activities on your critical list and monitor the progress as you monitor the design.

- Design: 12 to 18 months (start to bid award)
- Permits: 6 to 12 months
- Utilities: 4 to 6 months
- R-O-W: 6 to 12 months
- Agreements: 6 to 9 months

Agency Coordination Delays



Coordination delays are to be expected, but hopefully avoided. The best way to avoid delays is to keep in contact with the agencies and departments that are notorious for the delays. Consider the possible delays when making the schedule and build the review times into the schedule. Some delays are going to be unavoidable since the agencies are also over worked and understaffed.

Political Delays



All projects will have someone in the political realm involved for or against. Political delays can occur at any time, if there is an upcoming election and the project is controversial then your project may experience a longer delay than anticipated. Another way a project can be delayed is if it is a smaller or less significant project and a project with a high political profile is getting a lot of attention and pressure to get finished, the smaller project could be put on hold.

Political delays can be more drastic such as with a reduction in available funding from the highway trust fund. The reduction of funds available to states could mean a temporary delay or the project may be put on hold indefinitely if it is not an urgent need.



If it is an election year or you know of other projects that may impact your project due to the political ramifications, add this item to your risk management plan as a potential risk to the schedule. By adding it to the plan it will be an item to be watched and monitored.

Right of Way



A large number of projects will include the use or acquisition of Right of Way. The Right of Way process is time consuming and should be given adequate time in the schedule to account for delays. The coordination will be extensive and the entire process is expected to take over one year from appraisals to property access, longer if the owner is not a willing seller. The Real Estate division will be the key coordinator during this process and should be included in the kick off meeting and other relevant meetings as needed.

Utilities



As with Right of Way, the coordination will be extensive. Dealing with corporations can be a tedious process and coordination should begin early on in the project. Each state and agency will have its own process of utility coordination. The Real Estate division and/or the agency's local utility coordinator will be the main source of contact during this process.

Some items that will need to be done during the utility permitting process include (these items may be done by the PM, the Real Estate division or the Utility Coordinator)⁹:

- Review right-of-way plans and deed descriptions prepared by consultants and in-house design projects
- Provide coordination and technical assistance to the appropriate office for new right-of-way acquisitions
- Maintain right-of-way records
- Coordinate utility relocations and accommodations on highway construction projects
- Review all utility permits
- Provide coordination and technical assistance to the Attorney General's office for appropriation cases of new right-of-way acquisitions

⁹ Ohio Department of Transportation <http://www.dot.state.oh.us/districts/D03/Production/Pages/RealEstate.aspx>

Project Change Management



Inherent in the project delivery process is the recognition and management of change. As noted earlier, Frank Stasiowski, founder and CEO of PSMJ Resources defines project management as change management. The trick is to recognize change early and to deal with it.

Let us consider typical causes of change. Changes can be loosely grouped into four broad categories:

- **Changes in Project Scope:** In this instance we are discussing the scope of what is to be constructed in the project. These are additions, deletions or modifications to the initial concept of the scope of the project. For example, assume that we wish to widen eight miles of freeway between two interchanges from four to six lanes (three in each direction). As we go through the planning phases of the project it becomes evident that an intermediate new interchange is required. The decision must be made whether to add the interchange, postpone the interchange for a subsequent project or to make provisions for a future interchange by modifying the geometry, perhaps acquiring additional right of way, relocating utilities not only out of the way of the current widening project but out of a future interchange project as well, etc.
- **Scope Creep:** Scope creep can cause major project cost overruns and is not a favored result of project management. Scope creep is a consequence of multiple changes in scope and can be due to a number of factors. The main cause of scope creep is that the scope was not properly defined at the beginning of the project along with the requirements to bring the project to fruition. All too often as a project develops the realization that something was not considered in the scope, but is needed causes the project's scope to grow to now include those additional goods and services. A well written scope of work and the close management of tasks throughout the project can help in evading scope creep. One way to avoid scope creep is to break the project tasks out similar to mini projects to be able to keep an overall view of the project in manageable sections. Manage the project with good communication and change control, as a project manager knowing your project is the best position to be in.
- **Changes in Conditions:** These are changes that occur although no increased scope of the end product occurs, additional work must be done. Typical of these kinds of condition caused changes are perhaps discoveries made in the geotechnical investigation that will require additional treatment of the soils conditions or more expensive excavation techniques. A common cause of these changes is environmental mitigation requirements that could not be reasonably anticipated. Similarly, code and practice changes occur that can cause a redo of the design.
- **Design Changes:** It is ideal to avoid design changes at all costs, but design is a discovery process and during the design activity some changes may occur with the alignment due to unforeseen circumstances.
- **Add-on by a partner:** Though not common with freeway projects, from time to time, public projects are completed in partnership with other agencies or even private interests. These agencies have interests and needs that differ from the transportation focus. These non-transportation agencies may be willing to fund additional features to further their own objectives. For example, assume that our hypothetical freeway widening requires modification of the roadway drainage system. An adjacent storm water management agency requests additional channel capacity which if accomplished in partnership will preclude spending additional taxpayer's dollars for a parallel channel. They are willing to fund the difference in cost and provide technical input. This represents an add-on by a partner.

It has been determined that change is inevitable and now we need to learn to recognize change and develop a protocol for dealing with it. Every project starts with an identified mission or goal, (*improve the level of service from D*

to B), and an array of assumptions (*no new right of way will be required, existing roadway drainage is adequate to handle the additional paved area*). The mission statement and the assumptions form the basis of a project charter and a work breakdown structure which are discussed subsequently. Thus it can be recognized that a change has occurred when:

- The work breakdown structure must be added to or modified or
- The original project assumptions are no longer valid

In either case, the work breakdown structure, project budget and schedule must be changed to accommodate the change. This will require a change to the project charter, a modification to the budget and possibly a change to the program. The project manager must then go back to the approval and funding sources for a change to the allocated resources. This in and of itself provides a check and balance and an effective review of the necessity for the change. Some agencies have formalized this process into a structured **Project Change Control Board**, consisting of senior managers, program managers, project control personnel, budget analysts and other experts who will formally evaluate the cause and need for the change and modify the project charter accordingly.



Managing project change:

- Have the client clearly define the objective, not the solution.
- Start every project with a charter and a project management plan.
- Track every project every month with a project status update that addresses change.
- Develop a formal process for dealing with change and the aftermath of budget and schedule impacts.
- Identify the leading causes for change within your agency and develop a plan to deal with them as early in the project delivery process as feasible.
- Make every project delivery a three step process; planning, design, construction.
- Make risk management and change awareness part of the planning process.

Preparing for Project Closeout



Closing a project out involves a lot of preparation. The best way to prepare for close out is to keep in mind the necessary items needed and as the items become available put them in a file, eventually most items will be readily available when needed for the closeout. Depending on the agency's requirements, the type of project, and how the project was funded, the close out report may include all or some of the following items (there may be other items required, refer to your agency's policy):

- Appropriate manuals
- Completed punch lists
- Copies of all contractor invoices and proof of payment
- Certificate of occupancy
- Final acceptance
- Lien releases
- Retainage release process
- Financial status report
- Final request for payment
- Final progress report
- Invention disclosure
- Federally-owned property report

Project Closeout



Typically one thinks of project closeout as taking place after the project has been evaluated, constructed, inspected, all invoices received, and the ribbon has been cut. Project closeout can occur after each phase, such as planning before it is transferred to the next phase, as well as at the end of a project. Each phase of the project should be closed out since the funding for each phase could be coming from different sources, there may not be money in the next phase and the project will be shelved, or just as routine close out one phase before starting or transferring it to the next.

Project closeout is also a time for the team to reflect on the project to discuss lessons learned, and compare the initial objectives of the project and what was actually delivered, this will answer the question “Did we accomplish what we set out to accomplish?”

Project Audits



A project audit can occur anytime during the project, at the end or both. The audit can be internal or external (federal) and can be extensive. It is encouraged that all files are kept well organized; this will help both you and the auditor get through the process expeditiously. Audits can be done on the project itself, the budget or why things were done the way they were. Internal audits can be related to consultant tasks and how the prices of those tasks were developed; it is recommended that notes are taken and kept on the development process.

CHAPTER THREE- UNIVERSAL ELEMENTS	Applied Resources Appendix I	Reading Room - Appendix II	Software Appendix III	Websites Appendix IV
Universal Elements	Page Numbers	Page Numbers	Page Numbers	Page Numbers
Project Startup for All Phases	AI-16	AII-17		AIV-7
Successful Conduct of Kick-off Meetings	AI-16			AIV-7
Team Coordination Between all Phases	AI-20	AII-17		AIV-7
Consultant Selection and Negotiations	AI-21	AII-19		AIV-7
Developing the Consultant's Cost/Fee				AIV-7
Scheduling Techniques to Ensure Adequate Time & Quality	AI-22	AII-19	AIII-2	AIV-7
Milestone & Bar Charts	AI-22	AII-21	AIII-3	AIV-7
Critical Path Method	AI-23		AIII-3	AIV-8
Managing Project Budget		AII-21	AIII-3	
Tracking Consultant and Contractor Invoices				
Managing Project Quality		AII-24		AIV-8
Quality Assurance		AII-26		AIV-9
Quality Control	AI-24	AII-27		AIV-9
Ensuring the Performance of Consultants		AII-28		AIV-9
Managing Risks and Creating a Risk Management Plan	AI-25	AII-28		AIV-9
Managing Critical Path Items	AI-27	AII-37		AIV-10
Agency Coordination Delays		AII-37		AIV-10
Political Delays		AII-37		
Right of Way				AIV-10
Utilities	AI-27			AIV-10
Project Change Management	AI-28	AII-38	AIII-3	AIV-10
Preparing for Project Closeout	AI-31			AIV-11
Project Closeout	AI-32	AII-39		AIV-11
Project Audits				AIV-11

Chapter 4. Project Management by Phase

Planning Phase



There are many facets to the planning phase of a project starting with setting the purpose and need of the project, establishing the objective, and coordination with local and state officials along with the agencies help determine the transportation priorities in the state. This section of the guidebook focuses on the coordination aspect of the phase, after the consultants have been brought in, the schedule has been determined, and the funding has been made available for the planning phase of the project.

The majority of the public and agency coordination occurs during the planning phase of a project. The planning phase is also where you may run into delays, especially with the environmental agencies. This guide will offer tools in this area that will assist in the coordination such as sample letters, streamlining tips, environmental forms, and websites to name a few.

Internal and External Agency Coordination



A project will go through many stages of public and agency involvement throughout its life; therefore it is imperative to involve the agencies and the public early on in the planning process. Their early participation will ensure a better project that meets the needs and wants of the community, and can help potentially avoid conflict further along in project development. Coordination will be occurring throughout the entire project and it is important for the project manager to coordinate with his or her team as well as the agencies regularly in order for the project to move smoothly and without delay. The constant coordination efforts will pay off if an impediment occurs, it will be caught early enough that it may not hinder the schedule or budget too much.

External influences such as the regulatory and resource agencies, local governmental agencies, and the public will have an impact on all state or federally funded transportation projects. The majority of contact with these external influences will occur during the project's planning phase. Transportation projects using state and/or federal funding must meet certain requirements that are taken seriously and can have severe repercussions on the project if they are not met. Each state will have its own policies, but the federal regulations are the same for all states using federal money for transportation projects. As the project manager it is crucial to the project that you are familiar with both the state and federal guidelines when using any amount of their funding for your project.

Internal coordination is the key to the external coordination. The project team should meet regularly to discuss the project and keep it on track for delivery of the final environmental document in order to officially pass the project along to the design phase. Throughout the planning phase the project team will be coordinating and meeting numerous times with the agencies and the public and it is important for your project that the team to be on point and aware of all of the possible environmental implications of the project. The environmental impacts include natural, such as species, wetland and forest impacts; and also included in environmental are the historic, archaeological, socio-economic, community, hazardous materials, and air and noise impacts to name a few.

Inter-Agency Review (IAR) Meetings/Coordination



Some states have the advantage of IAR meetings. These meetings usually occur at certain milestones throughout the planning process, and depending on the impacts involved and the public opposition and implications the amount of meetings may increase. The IAR meetings give the opportunity to formally introduce the project to the regulatory agencies, allow them to ask questions for all of the agencies to hear, and be involved throughout the planning process. Due to geographic location it is possible that the agency does not have these formal meetings, and may use another method of coordinating with the regulatory agencies, such as quarterly reviews. These reviews are a convenient way to present the project collectively to those who need to sign off on it.

Typically the agencies will meet early on in the process, such as during a purpose and need field meeting. This will be the first introduction of the project and gives the agencies the opportunity to walk the study area and take note of the environment. There is preparation by the project team that needs to be done during this phase, including the formal letters to the agencies inviting them, setting the agenda, finding a meeting location close to the study area, arranging for transportation if needed, mapping, etc. Assistance with these items as well as others related to the planning phase can be found in the toolbox.



If you have a field meeting, it is important that as many agencies attend as possible, this may avoid future setbacks due to lack of knowledge of the study area that they are expected to be familiar with and give approval on.

Agency Concurrences at Milestones



Throughout the planning process the regulatory agencies will obtain an update on the project and be asked on their concurrence to move forward to the next step. There are commenting and concurring agencies, the concurring agencies will need to concur or concede before the project can move forward.

The milestone points and documents that will need the agencies' concurrence are as follows (this may vary state to state by title or order, also this list is not comprehensive from all states, but rather a list of commonalities found among a sampling of DOTs nationwide).

- Purpose & Need
- Alternates Retained for Detailed Study/ preferred alignments- At this point the preferred alignments have been narrowed down and a description of all alignments and what was dropped and kept and the rationale behind it.
- Draft Environmental Impact Statement
- Environmental Significance Determination- FHWA only
- Record of Decision- FHWA
- Access Point Decision report- FHWA

National Environmental Policy Act (NEPA) & Other State and Federal Regulations & Streamlining Processes



Natural environmental and socio-economic inventories will be done early on in the planning process and are only the beginning of the NEPA process. The early inventories will identify the features that an alignment may impact. After the alternates retained for detailed study have been identified the project will go into a full NEPA study.

The NEPA process is extensive and is required. The following information was taken from the Federal Highway Administration's website (www.fhwa.dot.gov), which offers a plethora of information on the requirements of NEPA. NEPA requires, to the fullest extent possible, that the policies, regulations, and laws of the Federal Government be interpreted and administered in accordance with its environmental protection goals. NEPA also requires Federal agencies to use an interdisciplinary approach in planning and decision making for any action that adversely impacts the environment.

NEPA requires examination and avoidance of potential impacts to the social and natural environment when considering approval of proposed transportation projects. In addition to evaluating the potential environmental effects, we must also take into account the transportation needs of the public in reaching a decision that is in the best overall public interest. The FHWA NEPA project development process is an approach to balanced transportation decision making that takes into account the potential impacts on the human and natural environment and the public's need for safe and efficient transportation.

It is FHWA's policy that (23 CFR § 771.105):

- To the fullest extent possible, all environmental investigations, reviews, and consultations be coordinated as a single process, and compliance with all applicable environmental requirements be reflected in the environmental document required by this regulation.
- Alternative courses of action be evaluated and decisions be made in the best overall public interest based upon a balanced consideration of the need for safe and efficient transportation; of the social, economic, and environmental impacts of the proposed transportation improvement; and of national, state, and local environmental protection goals.
- Public involvement and a systematic interdisciplinary approach are essential parts of the development process for proposed actions.
- Measures necessary to mitigate adverse impacts be incorporated into the action.

Public Involvement



One of the requirements of NEPA is extensive public involvement. Public involvement is the actual informing of the public about the project (i.e. newspaper ads and letters) as well as opportunities for the public to speak about the project and ask questions (focus group and public meetings). Public involvement needs to be addressed throughout the project and a Public Involvement Plan will need to be developed and updated as the project develops. There are many opportunities for public involvement in the planning phase and some in the design phase. Some projects will have more public involvement than others depending on community impacts and the nature of the project. Public involvement encompasses everything from a mailing explaining the project in the study area, project newsletters, a newspaper announcement, focus group and stakeholder meetings, to more formal involvement such as the public meetings and hearings.



Planning with proactive public involvement is the primary element in defining context and is the cornerstone to developing Context Sensitive Solution (CSS). The survey discussion with the Utah DOT representative was to obtain views regarding their survey input about Context Sensitive Solutions (CSS). The official being interviewed reported that Utah DOT began the use of CSS after a presentation at the 1998 Thinking Beyond the Pavement Conference. The Director and Deputy Director of the DOT have been the primary champions of the concept and they've succeeded in developing buy-in to the principles of the vision from agency personnel at all levels. As a result of their leadership, CSS is not viewed as a special program or method of doing project management. Rather, CSS has become the norm for the department as a means of making sure projects create environmental improvements other than the installation of pavement. By making the additional contributions to the community environment, agency outcomes have been recognized for a high level of success in reaching projects goals and building collaborations.

The use of CSS has fostered increased trust between the DOT, stakeholders and other state agencies. As a result of these improved relationships, there have been increases in state funding for transportation projects. One of the CSS methods used to improve contractor performance is the use of incentives. An example of this process is the practice of making \$100,000 available to contractors who work well with community leaders to keep them informed about the projects. The funds are awarded incrementally based upon feedback from block captains about the contractors' pre-project, mid-project and post-project performance. Visualization is also a critical part of the CSS process as a means of addressing stakeholder concerns by communicating design options through visual depictions.

Beyond simply addressing the requirements mentioned above, a CSS approach works to ensure that each activity finds the best balance between the three CSS principles:

- Meet Transportation Needs
- Be a Community Asset
- Fit the Natural and Built Environment

Other states reported to be utilizing CSS include Minnesota, New Jersey and Maryland.

Public Involvement Plan (PIP)



"The ultimate goal of the PIP is to allow the public opportunities throughout the process to influence the decisions."¹⁰

It is imperative that the Public Involvement Plan be established at the beginning of the project. As a state agency, the public is our customer and every effort should be made to get them on board with the project and on our side as early as possible. Having the public on our side will in turn make the project manager's job easier and may minimize risks that could potentially derail a project. The plan should outline and summarize the outreach efforts to involve the public and agencies during the development of the project and should include a description of the proposed outreach efforts to each. The plan needs to reflect the communities and businesses that are present in the project area, as well as adjacent communities which are also consumers of the resources within the project area. When developing the plan, each stage of the project should be taken into consideration and who will need to be informed for each of those phases. Although the PIP is done during the planning phase due to NEPA requirements, the design project manager should be involved in developing the plan as well.

¹⁰ http://www.dot.state.fl.us/emo/pubs/public_involvement/Chap%206%20Public%20Involvement%20Plan.pdf
Florida Department of Transportation Public Involvement Plan

Informing and Involving Elected Officials



Elected officials usually are aware of the possibility of the project coming to their jurisdiction, whether they have already voiced their opinion for or against. The DOT should be making the elected officials aware that the project is definitely being looked at seriously prior to the public announcement. The elected officials need to have that edge and be prepared to answer their constituents when asked about the project. A formal letter from the head of the agency should be mailed explaining the project, a brief overview of the process, and the date that the public will be made aware of the project.

Involvement Customers (Stakeholders, Community, Business Owners)



By involving the community stakeholders early on in the process, their voices will be heard about what they would like to see in the project. This exercise will help in the long run with planning and design, by getting the community feedback early on it may curb delays and opposition and earn their trust.

A separate mailing describing the project and details should be sent to those that will be directly affected by the project. The size and impacts of the project will determine if a focus group will be needed for the project. The focus group could be made up of residents, community association members, public officials, or business owners to name a few.



Know your mailing list audience, if it is an Environmental Justice community that primarily speaks another language, have the newsletters in both English and the primary foreign language in the area. At the public meetings make sure that there is a translator available so the community can effectively voice their opinion and ask questions. Before looking into companies to translate, ask people within the agency or the consultant team if they can translate. Also include the advertisements in the minority papers that are in the area.



If the project is large or high-profile it is suggested that a project website be set up. By posting the latest information online, it may deter people from calling to ask questions, thus saving the project manager time.



Agencies have sent out mass emails to their employees asking if they speak a foreign language fluently or know sign language, the names are kept in a database for future use of translating or assisting those that call in to ask a question to the agency.

Draft & Final Environmental Document



There are many levels of environmental documentation that will require the approval of the FHWA and the regulatory agencies prior to the project moving forward. The draft and final environmental documents are a key point in any project. The document will assure that the agency took all possible measures to avoid as many environmental and community impacts as possible and how the agency plans on mitigating for the impacts that were unavoidable.

Once the draft document has been approved by FHWA and the public the final document must be signed off on by FHWA before the project can move forward. The document will include items such as the project location, description, Purpose and Need of the project, project history, existing environmental conditions, descriptions of the alternates and reasons why they were retained or dropped, environmental impacts, mitigation strategies, avoidance and minimization efforts, stewardship and enhancement opportunities, graphics, and agency coordination and comments.

Design Phase



The design phase project manager will be involved from the beginning of the project and will be assisting in meetings and reviews until funding for the design activities and Preliminary Engineering (PE) has been obligated. Once funding has been obligated the PE phase can start and the project manager will form a project team and begin design activities. During the design process the project will go through many stages from Preliminary Investigation (PI) to awarding the contract. Depending on the type of project it is (i.e. bridge, highway, etc.) will determine what milestones and activities will be involved. The activities involved during the design process will require extensive communication and coordination with other divisions within your agency as well as with outside agencies.

All projects must meet the design standards not only for state and local requirements, but also the federal requirements. The designs will need to meet the current FHWA, American Association of State and Highway Transportation Officials (AASHTO), and the Geometric design standards.

Each agency will need to go through the basic steps and activities during the design phase of a project. The names and time-frames of these activities may vary state to state.

Design Activities



Preliminary Engineering



The PE phase of a project includes the PI (30%), the semi-final review (60-65%), final review (90-95%), and Plans Specifications & Estimates (PS& E) (100%). These percent complete numbers will vary between agencies.

Pre-P.I. and P.I.

The P.I. activities should be given time in the schedule to include coordination with many of the internal departments of the agency. The pre-P.I. phase involves preliminary information gathering of surveys, field work, geotechnical data, environmental, mapping, traffic control, hydraulics, and bridge. The plans will be developed and ready for the P.I. phase. The P.I. phase will prepare and assemble the plans for delivery for reviews. The plans will be reviewed and comments given back to the project manager for changes.

Semi-final Reviews



Typically the semi-final reviews occur between 60-65% design. At this point the plans have been reviewed and changes will be made. Now that the project has been designed the right of way and utility impacts are known and the utility coordination and right of way acquisition process can begin.

Final Review

The final review takes place when the drawings are at 90-95% complete. At this point the utility information and right of way have all been cleared and the design will be given a final look at by the agencies involved including state, local, and federal governments. The plans are gone through page by page and the agencies have the opportunity to ask any questions that they may have on the final design plans. The comments and questions should be noted and discussed during the meeting. Utility relocations should be finalized and scheduled preferably prior to submitting the Plans Specifications and Estimates (PS&E) package (see below). Be prepared to distribute the final review plans to all members of the review team at least one month in advance of the meeting to allow them time to review and be prepared to discuss their comments.

Plans Specifications & Estimates



After the final review all of the comments from the final review will be addressed and the design will be brought up to 100% complete, also known as the Plans, Specifications, and Estimates stage. In most instances a PS&E checklist will be needed prior to the project going to advertisement. The checklist will help ensure that all everything has been completed and checked off on, including items such as the permits, right of way, and reviews.

Agreements Process



The agreement process usually takes place prior to the semi-final review. Each project should have an agreement or multiple agreements depending on how many other agencies or parties that they will be working with. To protect the agency and to make all aspects of the project clear, each agency or company (i.e. utility) will need a separate legal agreement for their portion of the project. The agreements will cover things such as the details on the construction and maintenance of the project. The agreement also goes into the details of contracting requirements, funding, reimbursement, and payments.

The process of creating an agreement can be lengthy due to the reviews and comments that will come from both parties. The agreement will be created most likely by a third party team within your agency. It is important that the agreements team has all of the necessary information on the project in order for them to be able to draft the most accurate agreement possible. By giving them the information needed up front it will save everyone time later on in the process. After the agreement is drafted the review process internally will occur along with edits prior to sending it to the other party for their review and comments. It is possible that a meeting may need to be held to reconcile any disagreements on the drafted document. After all parties are in agreement the signature process occurs there will be numerous sets of original documents for signature, one for each party.



As the project manager you may be responsible for keeping the original agreement, it is recommended that a separate filing system be set up for original agreements and that a copy is made of the signed agreement and put in the project file. Numerous people may be accessing the project files over the life of the project and having the original in another file will avoid any misplacing of it.

Permits & Final Approvals



During the design phase there are numerous permits and approvals that must be obtained. After the environmental documentation and the all of the utilities and right of way have been cleared and the final design has been approved, at that point all of the final permits should be given before proceeding to the advertisement activities.

Releasing Projects for Construction

Most agencies have a structured process for releasing projects for construction. This is a final review and sign off by senior agency management attesting that indeed the project is ready to go to construction. Ideally, the agency will have developed a checklist signed off by the project manager to verify that certain key features or activities of the project have been accomplished. While project delivery issues may vary from agency to agency and in different parts of the country, most pre-construction checklists should contain the following verifications:

- There has been a constructability review by someone experienced in construction
- The plans and specifications have been checked and corrections made as appropriate
- The plans have been checked in the field within the previous thirty days and that the field conditions have not appreciably changed from the design assumptions
- All permits (including environmental) have been received
- Sufficient right of way including temporary construction easements have been obtained
- Utilities have been relocated
- Inter-agency agreements are in place
- There is continuing political acceptance for the project
- The potential need for additional public information activities has been considered and resolved

Advertisement



A project is advertised in order to get an array of companies to bid on the materials and/or services needed for completion of a project and to do it as cost efficiently as possible. Prior to the project going to advertisement there are steps that need to be taken internally that will vary from agency and project. Usually the project is placed on an agency advertisement schedule when the funds are approved and allocated for the construction portion. Each agency or at least state has guidelines that must be followed for preparation of an advertisement or bid package such as the duration of the ad, what day of the week a project needs to be advertised on, and in which newspapers. It is suggested that the agency's manual be consulted for the applicable guidelines for advertisement.

Bid Opening



The bid opening is the event that begins the real project and the moment of truth in the cost estimating process. Until bid opening, projected costs and the engineers estimate provided the only basis for the agency to program financial resources and to reserve funds for this need. Now we have a contractor who has proposed to construct this project for a certain dollar amount. Funds can now be set aside with some degree of certainty that the project can be delivered at or near a fixed amount.

Yet until the project is finally delivered and accepted, there still needs to be some contingency reserved for changes during the construction process. How much? A good number would be 5% of the bid amount assuming that the plan assembly is good and that there are no natural disasters that would substantially increase the cost.

Before determining the amount of project contingency, analyze the bids. The bid spread, i.e. the cost spread between the three closest bidders should be less than 15%. Hopefully the low bidder is the lowest of the three closest. **Bid spread is the single best indicator of the quality of the plan assembly.** A bid spread around 15% with the low bidder in the mix warrants a contingency of about 5% of the low bid. If the bid spread is larger than 15% or if the low bidder is outside of the three lowest bids consider increasing the contingency reserve accordingly.

As the bids are reviewed compare unit prices between bidders and the engineer's estimate and review the low bid for missing items or unreasonably low or high unit prices. While local procurement laws and codes will prescribe a method for dealing with bids that may be deemed non-responsive, if the unit prices are not comparable between the bidders, be prepared for a change request sometime during the construction process. For example if the low bidder has an unusually high number for the unit price of structural concrete, the summary of quantities in the plan assembly might be low, thus the contractor may request a change because of changed quantities.

Awarding the Contract



The contract should be awarded to the lowest responsive responsible bidder assuming the proposal is acceptable. The bid proposals should all be checked for accuracy and that all forms in the proposal have been executed. A proposal can be rejected if not submitted properly and all bids can be rejected if they come in much higher than anticipated.

Redline Revisions



Change is inevitable and this is true with design as well. It is important that the proposed changes known as redline revisions are noted on the final design plans. The changes must be approved and made before the project is advertised. Each agency has a process for such revisions and should be noted in the state manual.

Construction Phase



There are essential elements in providing effective construction oversight and management:

1. Contractor education
2. Contractor communication
3. Tracking construction progress

Contractor Education



The education phase typically occurs prior to the start of construction, often pre-bid and prior to a contractual relationship existing between agency and constructor. This is an effort to share information so that the constructor can better understand agency procedures, project conditions, expected challenges and other general information with which to put the project and the agency in a broad context. The education process is not intended to be directive in nature; rather it is intended to be an informative presentation of agency issues and concerns that may occur

outside of contract documents. Perhaps the most typical examples of these educational efforts are the pre-bid meeting and the pre-construction conference.

Pre-Bid Meeting

The purpose of the pre-bid meeting is to educate and inform potential bidders prior to bid tender regarding the scope of the project and any unique conditions on the project, its location and characteristics which might impact their bid. Potential risk factors are presented and the general scope of the project discussed by both agency and designer. Pre-bid meetings should be held thirty days prior to bid date at or near the construction site if feasible. On complex projects pre-bid meetings can be made mandatory so that all potential bidders get the same information.

Participants at the Pre-Bid Meeting should include the:

- Agency or representative
- Designer of record and specialists as appropriate
- Potential contractors and sub-contractors
- Others as designated by the agency (i.e.: an interested and active representative of a citizens group or a local elected official)

Minutes are recorded including all questions that may come from potential bidders and disseminated to all. The minutes of the pre-bid meeting become a matter of record on the project.

Contractor Communication



A pre-construction conference is beneficial to both the agency and the contractors. The purpose of the meeting is to review the project in more detail than was possible during the pre-bid meeting, to establish the project communication process, to review the respective responsibilities of owner, designer and contractor and to review the conditions unique to the project including public safety and maintenance of operations during construction. The Pre-construction conference is best held at or proximate to the construction site.

Pre-construction conferences typically include the following participants:

- Agency or representative
- Designer of record
- Agency's field representative
- Other representatives as designated by the agency
- General Contractor
- Contractor's job superintendent
- Key sub contractors as appropriate

Tracking Construction Progress



There are many effective ways to track the construction progress for a project, meetings are the most effective. Weekly construction meetings are an excellent way to track the construction progress of your project. The weekly construction meeting is the structured forum between agencies representatives, designer and constructor and is used to track progress, discuss the inevitable construction issues, coordinate activities and determine status of submittals, Requests for Information (RFI's) and other contractor generated correspondence.



Weekly Project Management meeting tips:

The weekly meeting should:

- Be highly structured with action minutes, and responsibilities and due date assigned as appropriate.
- The meeting should always be at the same place, on the same day of the week and at the same time for the duration of the project.
- Have a leader who should be responsible for assuring that minutes are taken and distributed within 24 hours (one day) of the meeting.
- The leader should allow for time for opinions and ideas to be expressed but should keep the meeting on track and bring the meeting back into focus if and when discussions become tangential to the subject.
- In some cases, discussions will ensue that, while important, do not involve many of the participants. In this case, the leader should table the discussion for a subsequent specific meeting to go over the specific matter in detail.

Fundamental rules for the weekly meetings:

- Start the meeting on time, end it on time (approximately one hour)
- Prepare a standard agenda
- Keep it focused
- Take detailed discussions off-line
- Participants come prepared and all participate

Meeting minutes should be prepared promptly, but allow participants a period of time (usually until the next meeting) to correct/comment on the minutes before they become a matter of the project record.



Minutes of weekly construction meetings become a legal document and can be the basis for claims or conversely can be used as a claims defense.



Often a contractor will have a “burning issue” at a meeting, the smart construction manager will get with the construction superintendent before the meeting to determine if there are any “burning issues.” If so, they should be dealt with at the start of the meeting regardless of when new business is scheduled for discussion on the agenda.

Participants:

- Agencies representatives including resident engineer, inspector, etc
- Design representative (as appropriate)
- Construction superintendent
- Key subcontractors (as their work approaches)
- Other contractor representatives as needed (estimator, etc)
- Key stakeholders and others as appropriate (PIO, etc.)

Request for Information (RFI) Management



RFI's are generally initiated by the contractor to obtain clarification on the plan assembly. It is a form of written communication used to document questions and to provide a written record of the response. While there is no prescriptive format for an RFI, the request should clearly indicate that it is an RFI, the date submitted, a clear statement of the question referring to the pertinent portions of the plan assembly as appropriate and the date that a response is needed. Note that "ASAP" is not a date. While RFI's are contractor driven, the project manager/agency has the right to expect the following:

- The contractor has become familiar with the contract documents and that this query is not simply a reflection on the fact that the contractor has not read the plans and specifications.
- The date that a response is needed can be verified by reference to the schedule.
- There is a reasonable time for the response.
- The question does not direct the contractor towards a specific construction process or technique. Unless otherwise specified in the contract documents, the contractor's means and methods are his to choose and manage. Agencies/designers have no business directing the contractor how to do something even if the contractor asks.

RFI's are legitimate questions by the contractor. However in the often claims laden environment of public construction, RFI's become weapons. Less than scrupulous contractors barrage the project with RFI's of questionable validity, the project manager/agency fails to manage or respond appropriately, RFI's pile up, work continues, rework builds and a basis for claims is established. Thus RFI's must be managed. Some strategies for managing RFI's are as follows:

- Establish at the outset a procedure for accepting legitimate RFI's. This should be on the agenda for the preconstruction meeting. The owner should clearly state that while legitimate RFI's will be responded to, the contractor is expected to read the plan assembly.
- Track RFI progress through a formal document tracking system similar to the system used for tracking submittals with due dates and responsibilities assigned.
- Track progress by making RFI status a topic at weekly construction meetings and by following up with the responsible individual.

Change and Claims Management



Nothing will erode public confidence in an agency more effectively than construction cost growth. While there is insufficient data among the many constructing agencies, anecdotally it seems that growth is often 10 to 13 percent of the bid price (here we are defining construction cost growth as the percentage of difference between bid price and final delivered price not originally programmed amount or the engineer's estimate). On a major project, anything over 5% of manageable cost growth is excessive and should be avoided. In order to better define what is "manageable" and what is not the general causes of cost growth must be considered. Generally speaking they can be grouped into five broad categories:

1. Changes in scope: Usually caused by inadequate scope development, inadequate design sometimes caused by code or other environmental changes. Scope changes are typically manageable.
2. Changed conditions: These are often delay changes caused by weather, strikes, and items that could not be typically foreseen or managed.

3. Design Changes: These include design errors, changes in materials or equipment requested by the agency to facilitate operations or maintenance, changes warranted by improved technology and related. These changes are manageable.
4. Add-on by outside agencies: These include items that another agency desires to be included for reasons tangential to the original project. For example highway drainage to be expanded to include offsite storm runoff. These are not considered manageable if the other agency agrees to compensate the primary agency for the increased cost.
5. "Other" costs: these include costs that are not identified in the above four. Often this can result in a negative number because of value engineering and other cost reduction activities.

These causes of construction cost growth can be effectively managed to keep the unplanned growth less than a target of 5% by care in the project delivery process including:

- Effective design project management including a comprehensive quality control program.
- Realistic project programming and budgeting.
- Assuring that utilities, right of way and permit matters are handled before construction is initiated.
- Effective community and political outreach throughout the project delivery process.
- An effective construction communications program with follow up and appropriate documentation.
- A defined and prescriptive method of managing changes when they occur.

A request for change should be initiated by the contractor outlining the reason for the change, a description of the work involved, a discussion of costs including a cost breakdown, schedule impacts of the change, the date that it became evident that a change was needed and, if appropriate, a presentation of alternative solutions.

Change orders need to be dealt with quickly lest a delay causes other project cost impacts or the change becomes the basis for a claim. While each change request must be evaluated on its own merits some standard approaches are suggested:

- Require the contractor to separate the new work from the existing contract so that the agency is not charged again for work in the base bid.
- Check requests for time extensions against the contractor's critical path schedule, often a change is not on the critical path and has no impact on the overall schedule.
- Close out the change as soon as the costs can be recognized; avoid hanging on to open changes until project closeout.

Where changes might be expected, bid unit prices so that extensive negotiations with the contractor might be avoided. (For example, consider a roadway project involving a normal amount of excavation and a differing amount of rock excavation at a higher cost. By bidding unit prices, the negotiations for adjusted quantities can be facilitated).

Construction Completion



After the construction activity is complete the project will need to be closed out. There are numerous things to tie up prior to a project being completely finished. The project will need to have all final reports completed and approved, certifications such as the "As Built" certification submitted, and the contractor will need to be terminated. Each agency will have certain requirements depending on the type of construction project.

CHAPTER FOUR- PROJECT MANAGEMENT BY PHASE	Applied Resources Appendix I	Reading Room - Appendix II	Software Appendix III	Websites Appendix IV
	Page Numbers	Page Numbers	Page Numbers	Page Numbers
Project Management by Phase		AII-40	N/A	AIV-12
Planning Phase		AII-40	N/A	AIV-12
Internal and External Agency Coordination	AI-37	AII-40	N/A	AIV-12
Inter-Agency Review (IAR) Meetings	AI-40		N/A	AIV-12
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Public Involvement Plan	AI-67	AII-41	N/A	AIV-18
Informing and Involving Elected Officials	AI-68		N/A	AIV-18
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Draft & Final Environmental Document			N/A	AIV-18
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Design Phase		AII-43	N/A	AIV-18
Design Activities	AI-82	AII-44	N/A	AIV-18
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Bid Opening	AI-85	AII-44	N/A	AIV-19
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Redline Revisions		AII-46	N/A	AIV-20

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Contractor Communication	AI-87		N/A	AIV-21
Tracking Construction Progress		AII-48	N/A	AIV-21
Request for Information (RFI) Management			N/A	AIV-21
Change and Claims Management			N/A	AIV-21
Construction Complete			N/A	AIV-21

Appendix I

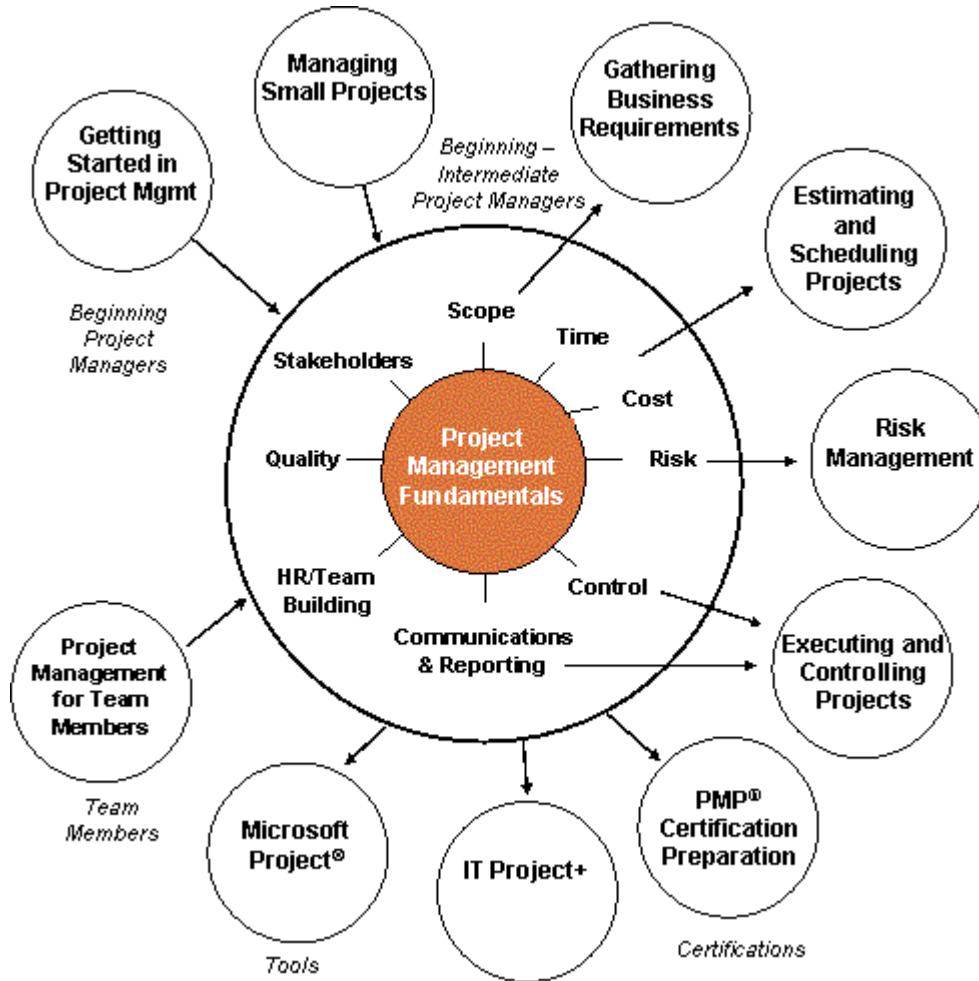
Applied Resources

This section offers a variety of hands on tools for completing the project management tasks. Included are checklists, process flowcharts, samples, spreadsheets, computational methods, and charts that can be filled in or just utilized as a guide and forms.

Some samples have been filled in as an example of the type of information that could be included or to show how things could be done. Please take into consideration that some of the information on the samples will need to be changed to fit your project's phase and details.

Chapter 2- Project Management Overview

Basics of Project Management Summary



<http://www.watermarklearning.com/projectManagementRoadmap.html>

Consistent Applications of the PM Principles

The Project Management Plan

The following offers sample checklists and outlines for a Project Management Plan.

The following PMP checklist was taken from the Center for Disease Control website (www.cdc.gov), which offers numerous checklists, guides, and templates on an array of project management topics.

Project Management Plan Checklist	
	Has an executive summary of the approved Project Charter been provided in the PMP along with updates that may have occurred after approval?
	Has a scope management plan been defined, outlined, and documented as part of the PMP, or a reference to where it is located included in the PMP?
	Has a change control management process been defined, outlined, and documented as part of the PMP, or a reference to where it is located included in the PMP?
	Has a training plan (for the project team) been defined, outlined, and documented as part of the PMP, or a reference to where it is located included in the PMP?
	Has a schedule/time management plan been defined, outlined, and documented as part of the PMP, or a reference to where it is located included in the PMP?
	Have project milestones been defined, outlined, and documented as part of the PMP, or a reference to where they are located included in the PMP?
	Has the project's work breakdown structure been included as part of the PMP, or a reference to where it is located included in the PMP?
	Has the project's schedule been included as part of the PMP, or a reference to where it is located included in the PMP?
	Has a cost/budget management plan been defined, outlined, and documented as part of the PMP, or a reference to where it is located included in the PMP?
	Has a quality management plan been defined, outlined, and documented as part of the PMP, or a reference to where it is located included in the PMP?
	Has a human resource management plan been defined, outlined, and documented as part of the PMP, or a reference to where it is located included in the PMP?
	Has a communication management plan been defined, outlined, and documented as part of the PMP, or a reference to where it is located included in the PMP?
	Has a communication matrix been included as part of the PMP, or a reference to where it is located included in the PMP?
	Has a risk management plan been defined, outlined, and documented as part of the PMP, or a reference to where it is located included in the PMP?
	Has a procurement management plan been defined, outlined, and documented as part of the PMP, or a reference to where it is located included in the PMP?
	Has compliance related planning been defined, outlined, and documented as part of the PMP, or a reference to where it is located included in the PMP?

 (Sample Source: PSMJ Resources)

Project Charter

for

Project

Project Number: TXXX

Version 1.1

February 6, 2007



(Sample Source: PSMJ Resources)
Project Charter

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(Sample Source: PSMJ Resources)
Project Charter

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(Sample Source: PSMJ Resources)
Project Charter

1. Introduction

1.1. Project Charter Purpose

The purpose of a Project Charter is:

- To initiate a project;
- To provide an understanding of the project, the reason it is being conducted, its justification; provide guidance on completion; and,
- To establish the general scope of the work to be accomplished early on in the project initiation phase.

The Project Charter will be reviewed and approved by the Project Sponsor prior to the project planning phase.

Instructions for completing the project charter are in blue italics. This and all other instructions in blue should be deleted upon completing the draft prior to printing the charter.

1.2. Project Overview

Project Name: *Official name of the project with roads listed west to east, south to north in that order to conform to standard naming conventions.*

Short Name: *Official 30 character name of the project used in the financial system and county budget documents.*

Project Number: *TXXX Fill in the number assigned to the project.*

Starting termini: *Describe starting termini using general terms, i.e. "West of the 99th Ave intersection at the start of the taper to widen the intersection."*

Ending Termini: *Same with the ending termini, "West of the Deer Valley Rd and 109th Ave intersection at the end of the existing pavement."*

Project Length: *In miles to nearest tenth mile.*

Lane Miles: *Estimate number of lane miles and assumed improvement. "12.4 lanes miles (assumes 4-lane arterial)."*

Current Conditions: *Discuss current conditions to include known development.*

Project Map: (Attached)

2. Project Overview and Scope

2.1. Project Objective

The objective of the project is to:

- Objective 1, *List each major objective to be accomplished by the project team. "Complete Design Concept Report"*
- Objective 2



(Sample Source: PSMJ Resources)
Project Charter

2.2. Scope

The scope of the project includes the activities listed below.

- ; *List each major task to be completed. For a DCR this includes any associated engineering studies, environmental clearance and right-of-way requirements identification as a minimum.*
- ;
- ; and
- .

The scope of the project does *not* include:

- ; *Identify what specifically is not to be included such as realignment of intersections or purchase of right-of-way. Delete sentence if not needed.*
- ; or
- .

The following areas of scope are uncertain or have not been fully defined.

- ; *Identify what specifically is uncertain and requires study such as realignment of intersections, noise walls or purchase of right-of-way. Delete sentence if not needed.*
- ; and
- .

2.3. Major Deliverables

The major deliverables from this project are:

- ; *List each deliverable "Design Concept Report"*
- ; and
- Briefing to management of recommended solution. *Mandatory deliverable of every study.*

2.4. Project Justification

Justification: *Describe the justification for the project. For safety project use "High accident rate" or "Meets signal warrants"*

Current Score and Benefit Cost: *Provide scoring data used to select project. " The project scored 80 making it the 4th ranking project with a benefit cost ratio of 30.5 making it a very sound project."*



(Sample Source: PSMJ Resources)
Project Charter

2.5. Estimated Project Cost

The estimated total cost for the project is \$*x,xxx,xxx* *Fill in number and table*

Item	Estimate	Inflated Cost (5yr)
Construction	<i>*16,558,387</i>	<i>*19,137,316</i>
Construction Management	<i>*1,990,606</i>	<i>*2,296,478</i>
Design	<i>*2,488,258</i>	<i>*2,870,597</i>
Right-of-way	<i>*1,090,000</i>	<i>*1,257,487</i>
Utility Relocation	<i>*84,000</i>	<i>*96,906</i>
MCDOT Administration	<i>*1,990,606</i>	<i>*2,296,478</i>
Total	<i>*24,232,000</i>	<i>*27,955,000</i>

**Replace with your numbers*

3. Program Guidance

3.1. Project Sponsor

The project sponsor is the Project Management and Construction Division Manager. *Project sponsor will always be a division manager or the department director. For planning studies the Planning Division Manager is the sponsor.*

3.2. Desired Completion Date

Describe when the project is desired to be completed. If a firm completion date is necessary provide that date and have the project delivery team confirm that the date can be met or, if not, the likelihood of meeting that date and the risks involved. Always include direction to have project team provide an achievable completion date if the date given cannot be met.

3.3. Budget

Provide the amount of funding budgeted for the project and when the funding is available. Provide direction to the team when they are to start the project if funding is not available immediately. Indicate source of other funding and if availability affects project.

3.4. Key Issues

List key issues or concerns such as drainage, traffic volume, other projects, environmental concerns, permits required, etc.

3.5. Other Guidance

Provide direction on known partnership interest and who has been contacted. Discuss the amount of public involvement expected. List and groups who will be project stakeholders. Identify Board of Supervisor interest, etc.

3.6. Other Available Information

List any Candidate Assessment Reports, corridor studies or other information available.



(Sample Source: PSMJ Resources)
Project Charter

Project Charter Acceptance

Prepared by:

Type name and title here

Date

Program Review:

Date

Sponsor Approval:

Date

Project Manager Acceptance:

Type name of assigned PM, Project Manager

Date

Note: A final signed copies of the project charter will be provided to the Program Office, Customers and Director.

Effective Leadership

www.leadership-tools.com is a site that offers free leadership tools. In order to access the free tools you must register for free. Once registered you will automatically receive the monthly newsletter on leadership tools in your inbox and have immediate access to the tools.

Motivating the Team

This list of tips for motivating the team is a compilation of many sources.

- Keep the team involved in the project
- Hold regular team meetings to keep the team in the loop
- Set challenging, but attainable goals
- Manage poor performance
- Believe in your team
- Positive reinforcement

Conducting Meetings

Effective Meeting Checklist

Before The Meeting

- The meeting must be left with (a decision, commitment, ideas, consensus, etc.)
- The ways to address each topic (discussion, brainstorming, planning, etc.)
- People to be present at the meeting to accomplish objective.
- The meeting is held in order to increase comfort and reduce influence.
- Issues or topics of the meeting are clear to all in attendance.
- Everyone knows what decisions or actions are to be taken.
- Hidden agendas are dealt with.
- Meeting's objectives are reasonable, given available time and resources.
- The agenda is made clear by the meeting organizer.
- Participants are told of the meeting sufficiently in advance.
- All necessary materials are distributed sufficiently in advance to allow review.
- The time of the meeting is convenient.
- People are reminded in advance by card or phone of date, time, and purpose of meeting.
- Printed agenda is provided for each member.
- Meeting room is reserved.
- There is much time for set-up.
- Additional space for your catered functions is reserved.
- Move-out schedule once the meeting is complete.

At The Meeting

- Arrive early enough to prep the meeting room and yourself.
- Start the meeting on time.
- Confirm that everyone received and understood the agenda and is prepared to work.
- Introduce the first agenda topic and indicate the preferred way of addressing it.
- Alert the meeting members when agenda items are within 2 to 5 minutes of their allotted time.
- Use a concerns flipchart to capture unfinished business.
- Summarize & confirm conclusions and commitments.
- Thank participants.
- Take notes.

After The Meeting

- Complete a short, clear summary of the meeting.
- Distribute the meeting summary to every participant.
- Begin and complete all of the actions committed to during the meeting.
- Follow up with any meeting participant who made a commitment.
- Express thanks to any participants who added superior levels of value to your meeting.
- Probe any participants who were unusually quiet or who expressed reservations with topics or outcomes.
- Mail out notes or action lists as appropriate.

Material Resources

- Meeting worksheets (action plans or barrier & solution worksheets)
- List of members with phone numbers and addresses for any new members present
- Name tags for large meetings of new groups
- Overhead Projector, PowerPoint Projector
- Directional signage
- Laptop Computer
- Flip Charts
- Paper, Notepads, Pens
- Board, Chalk/Markers
- Parking stickers
- Registration table, Head table, Table tents
- Podium with microphone
- Food and beverage requirements (breakfast, lunch, reception, dinner)
- Coffee/refreshments for breaks

Source: <http://www.todolistsoft.com/solutions/checklist/meeting-checklist.php>

Facilitation of the Meeting

In order for meetings to run smoothly the facilitator should be neutral to avoid any conflict. A good practice to have in regularly scheduled meetings is to have team members take turns being the facilitator. Some tips for the facilitation of a smooth meeting include:

- Be fair to those who were on time for the meeting and start the meeting on time.
- Introductions if necessary
- Review the Agenda with the group
- Keep focused on the agenda items. If there is a topic that comes up and not everyone needs to be involved in the discussion, table the topic and discuss after the meeting or at another time.
- For each of the agenda items, state the issue and ask the team for their views.
- Seek compromise and make decisions
- Give everyone a chance to speak
- If someone gets off topic, steer them back or ask to discuss at another time
- Set ground rules at the first meeting if it is a reoccurring project meeting or give a quick overview of rules as an agenda item, especially for larger meetings

Examples of ground rules include:

- No Rank
- Everyone participates
- Listen to what others are saying
- Keep an open mind
- Agree if it makes sense
- Disagree or ask questions if it does not make sense
- Have Fun
- One person speaks at a time
- Select the scribe
- Turn off cell phones and Blackberries

Presentation Feedback Forms

As mentioned earlier it is a good idea to hold a mock meeting for all major presentations. It is a best practice to have a checklist or evaluation form of sorts at these meetings to get feedback on the presentation so the team knows what areas of the presentation need to be improved upon for the actual meeting or presentation. If your agency does not practice this or does not have a standard form for feedback you as the project manager can create one. Some items that could be used (depending on the nature of the project) are listed below. The list can be added to and set up to meet your needs. The form could have yes/no/NA after each question and have room for comments. It should list who gave the presentation, the name of the project and the purpose of the meeting. This form is given to the presenters after it has been filled out by the mock meeting attendants. Another option that could be added to the form is to have the form given out to the supervisors at the actual meeting to see if the project team did what was asked and afterwards given to the team.

- Was the team prepared to give the presentation?
- Did the team coordinate their roles in the meeting prior to the mock?
- Were the comments given at the mock presentation addressed in the real presentation?
- Was the presentation focused on the topic at hand?
- Did the project team answer questions knowledgeably?
- Did the project team demonstrate a strong knowledge of the project?
- Did the visual aides work properly?
- Were the presentation materials appropriate for the meeting?
- Were the visual aides large enough to see from all seats?
- Were the visual aides actually useful to the meeting?
- Were the handouts helpful?
- What could make the presentation better?
- Was the presentation clear and easy to follow?
- Did the presentation leave enough time for questions?
- Did the project team look and act professional?

Crisis Management

Here are tactics for emergency problem solving:

<i>Keep blame at bay</i>	Blame and problem solving do not mix. If you survive the emergency, there will be time for accountability. If you don't survive, finding fault probably won't matter much.
<i>Don't play "I told you so"</i>	I-told-you-so is a kind of reverse blaming — it's designed to prove the faultlessness of the person making the claim. It isn't problem solving, and it pushes people's buttons.
<i>Evaluate solutions on their merits</i>	In normal times, the credibility of the originator or originators of a proposal influences how we evaluate that proposal. In emergencies, the workability of a proposal is far more important than the status of its originator
<i>Act decisively and immediately</i>	In emergencies, the tumble of events takes on a character so distinctive that I call it the "emergency snowball." Because we lack the resource margins that usually permit us to leave problems unresolved, we must act decisively. Delaying action entails risk.
<i>Accept your place in the hierarchy</i>	During the emergency, improving or defending your status within the team interferes with its ability to function as a unit with a single shared goal. Accept your place for now, however unjust you feel it might be. The emergency itself might provide the justice you seek.
<i>Honor your interdependence</i>	If you accept a responsibility or make a commitment to the team, honor the team's expectations. Unless you make every effort to report a deviation beforehand, doing something different from what you promised can seriously complicate the emergency.
<i>Hear people out</i>	In a true emergency, you'll almost certainly have occasion to listen to fractured, unclear or disjointed descriptions of new problems or other bad news. Listen patiently. Save your questions for the end of the report.

Source: <http://www.time-management-basics.com/time-management-ktd-crisis-management.shtml>

Source: <http://www.chacocanyon.com/pointlookout/050112.shtml>

Communication

Communication guidelines:

Awareness

- Base communication strategies on stakeholder needs and feedback.
- Ensure that communication is shared in a timely manner.

Content

- Advocate open, honest, face-to-face, two-way communication.
- Create an environment where project team members and other stakeholders can constructively challenge behavior and ideas.

Context

- Remember that communication is two-way. Listen as well as deliver the message.
- Involve senior management when appropriate.

Communication flow

- Coordinate communication with project milestone events, activities, and results.
- Include key stakeholders in developing an interest-based conflict management process.

Effectiveness

- Conduct regular assessments of the communication plan and process.
- Communication must focus on the customer.

Format and media

- Take advantage of existing communication vehicles and opportunities.

Source: Caltrans Project Communication Handbook First Edition 2/14/03

Guiding Principles for Developing Effective Project Managers

Succession Planning

A Delegation Checklist

- Select the right person for the job.
- Provide all the available information.
- Ask what additional information might be required.
- Present or locate all relevant background information.
- Define the project budget (hours and expenses) and level of effort.
- Clearly define the product you expect.
- Agree on an approach.
- Always give a deadline for completion.
- Agree on a level of effort.
- Check progress regularly.
- Establish appropriate control mechanisms.
- Do not allow a person to give work to you that is unfinished.
- Expect the product to be 30 percent different and 10 percent wrong.
- Be willing to modify assignments that fall behind schedule.
- Encourage discussion of problems.
- Create an environment in which work gets done, even when you're not there.
- Encourage team members to think in terms of solutions to problems.
- Give credit. Take blame.

Source: PSMJ Resources, Inc. The Ultimate Project Management Manual.

Chapter 3- Universal Elements

Project Startup for All Phases

Successful Conduct of Kick-off Meetings

Sample Project Kickoff Meeting Agendas

Sample #1

Name of Project
Date & Time of Meeting
Meeting Location

- Background and Project Vision
Introductions, including each person's stake/interest in the project
 - Project Timeline, Staffing, and Budget
 - Risk roundtable - each person states what he/she perceives as the greatest risk to the project.
 - Project communication - meeting schedule, status reports, etc.
 - Summary - open issues and takeaways
-

Sample #2

Name of Project
Date & Time of Meeting
Meeting Location

- Introductions
 - Project Review
 - Roles and responsibilities
 - Project approach and overall timeline
 - Questions
 - Recap/summary/ next steps
-

Sample Kick-off Meeting Checklists

Sample #1

Prior to the Meeting:

- List of participants (keep numbers in line with meeting's purpose).
- Were the attendees of the Kick-off meeting decided on at the Pre-meeting
- Who needs to attend the meeting?
- Who needs to receive a copy of the Meeting Minutes?
- Have team members been contacted about their participation on the project?
- Have the Managers of the team members agreed to allow their participation?
- Prepare the Kick-off meeting Agenda with time frames.
- What is the purpose of the meeting?
- Was the Kick-off meeting discussed at the Pre-meeting?
- Were the topic leaders decided at the Pre-meeting?
 - If so, is the presenter or discussion leader for each topic listed on the agenda?
- Is there a time allotment noted for each topic?
- Prepare any Handouts for the Meeting.
- Have you made copies of the Kick-off meeting Agenda for each attendee?
- Is there any information that needs to be distributed prior to the meeting and discussed at the meeting?
- Schedule Facilities (seating, temperature, audio-visual equipment).
- Is the room big enough to hold all of the meeting participants?
- Is there a need for audio-visual equipment?
- Is the room, where the meeting will be held, available during the desired meeting time?
- Are there alternate meeting facilities that can be used?

Scheduling the Meeting:

- Schedule the meeting at least 5 days in advance.
- When scheduling the meeting, include a copy of the agenda for the meeting.
- When scheduling the meeting, include the room where the meeting will be held.
- When scheduling a meeting with outside vendors, send an e-mail stating there will be a meeting, the agenda for the meeting as well as the administrative details such as when and where it will be. Ask those invited to accept or decline the meeting. Provide directions to the meeting.
- Ask participants requesting an agenda item to contact you no less than two days before the meeting with their request and the amount of time they will need to present it.

After the Meeting:

- Have the minutes been written up? Within 2 business days of the meeting?
 - Have copies of the minutes been distributed to each meeting participant?
 - Have copies of the minutes been distributed to the people listed in the Project Team, Project Sponsor, and Project Communications fields on the Project Profile?
-

Source: http://www1.umn.edu/pmo/docs/Kick-off_Meeting_Agenda_&_Checklist.doc

Sample #2

PROJECT KICKOFF CHECKLIST	
Project Name:	_____
Client Name:	_____
Project Manager:	_____
Kickoff Meeting: __ / __ / __	Signed Contract Rec'd: __ / __ / __
<input type="checkbox"/>	Has the signed contract been received?
<input type="checkbox"/>	Does the signed contract differ from proposal phase information? Do we need more insight from marketing or senior management?
<input type="checkbox"/>	Are job numbers assigned?
<input type="checkbox"/>	Are task budgets (work hours) assigned and understood by each team member?
<input type="checkbox"/>	Is the entire project or only a portion of the project authorized?
<input type="checkbox"/>	Are key members of the project team (internal and external) known?
<input type="checkbox"/>	Is there a written project management plan including schedule, budget, and special client expectations?
<input type="checkbox"/>	Are communication procedures established for client progress reports (meetings, transmittals, phone calls)?
<input type="checkbox"/>	Has any client-supplied project information been identified and received?
<input type="checkbox"/>	Are there unique client requirements for technical project work in terms of form or content?
<input type="checkbox"/>	Are client satisfaction checkpoints, interdisciplinary, plan review checkpoints, and probable construction cost estimates scheduled (15, 30, 60, 90 percent)?
<input type="checkbox"/>	Are all significant constraints in terms of schedule, budget, and information needs clearly identified?
<input type="checkbox"/>	Is all third party information identified and scheduled for delivery?
<input type="checkbox"/>	Are there any unresolved technical issues, agency coordination, or information confirmations that need to be resolved prior to kickoff?
<input type="checkbox"/>	Have all discipline managers and consultants confirmed their scope of work, schedule, and budget for their work tasks?

PROJECT KICKOFF CHECKLIST <i>(continued)</i>	
<input type="checkbox"/>	Are contract change procedures clear? Including verbal authorization prior to written confirmation?
<input type="checkbox"/>	Will the client require special invoicing preparation?
<input type="checkbox"/>	Is there a written quality control plan for this project?
<input type="checkbox"/>	Will a constructability review be required (15, 30, 60 percent)?
<input type="checkbox"/>	Is a site visit scheduled for key staff?
<input type="checkbox"/>	Has a schedule of drawings been prepared? Are drafting standards for this work clearly identified?
<input type="checkbox"/>	Are design checklists and computational procedures specified for this work?
<input type="checkbox"/>	Is the drawing index and filing system established?
<input type="checkbox"/>	Will part of/or the entire project be done using computer design tools?
<input type="checkbox"/>	Are project file organization standards known? Is the project file set up?
<input type="checkbox"/>	Will this project require project management and/or project design peer review? Is it scheduled with the reviewers identified by name?
<input type="checkbox"/>	Has the project manager initiated steps to form a personal relationship with the client? Is the client kickoff meeting scheduled? When?
<input type="checkbox"/>	Independent of the project team, is someone assigned to follow up with the client for satisfaction throughout this work process?
Remarks _____	

Checklist prepared by: _____ Date: __ / __ / __	
Checklist reviewed by: _____ Date: __ / __ / __	

Source: PSMJ Resources, Inc. *The Ultimate Project Management Manual*

Team Coordination Between all Phases

Who should be at the project team meetings? Depending on the type and size of the project will depend on who will actually be a part of the project team. Here is a list of possible project team members and departments that will be involved in the majority of DOT projects. Not all of these divisions will be at the kick off meeting, but eventually throughout the project development, design, and construction the project team involvement will increase with new members and others will not be needed to attend anymore. The meetings will involve members of the appropriate divisions during the appropriate phases; refer to your agency's project manuals for team member participation.

- Project Planning Project Manager
- Planning Engineer
- Environmental Specialists- will be overseeing the NEPA process and the environmental documentation, environmental permitting and coordination with the ACOE, wetland delineations, etc.
- Regional Planner- the Regional Planner will be in charge of the Purpose and Need at the beginning of the project.
- Travel Forecaster specialist- will be responsible for obtaining the traffic data for the project study area.
- Public Involvement Specialist-If your agency has a group dedicated for this purpose, they will be assisting with the public newsletters, setting up the locations for the public meetings and hearings, and will be helping with the mailing lists.
- Agreements Coordinator- The Agreements coordinator will act as the liaison for the agreements that are needed between the local agencies, the utility companies, and right of way issues, to name a few.
- Bike/Pedestrian coordinator- If your state requires sidewalks and bike paths to be included in your project, the coordinator will assist in coordination of this portion of the design.
- Access Management coordinator-
- Highway Design Engineer- is involved from the beginning of the project.
- Hydraulics Engineer
- Utilities Liaison
- Access permitting
- Plats and Survey
- Bridge Design Engineer
- Remedial Design Engineer
- District specialist such as the traffic engineer, utility engineer, right-of-way chief, maintenance engineer
- Traffic safety, traffic development and support
- Landscape Architect
- Construction Inspection division
- Real Estate division of your agency
- Geotechnical explorations and pavement division
- Other outside agencies such as:
 - FHWA
 - Federal Transit Administration
 - Other state agencies that may have an interest in the project, especially if it crosses or impacts their authority
 - Local Planning Organization
 - City or County planning and Public Works departments

Consultant Selection and Negotiations

Tips for the Consultant Interview Process

During the interview, the project manager (not the principal) should be the primary speaker. Limit the graphic presentation. Allow maps if necessary – no PowerPoint or fancy models. These, ultimately, cost you money and do not focus on the project team. As part of the interview, the selection committee should ask questions or observe to answer the following types of questions:

- What projects are you most proud of and why?
- What challenges do you see on this project that you are under consideration for and how have you handled similar challenges on previous projects?
- Describe your quality control program and how will you provide assurances to us, the client, that your program will be followed?
- How do you deal with a project that is in trouble?
- How do you prepare your cost estimates? Compare these with the low bids on some recent projects.
- Who does your constructability reviews?
- Please show us a project management plan for a project on which you are presently working.

Other questions that may be pertinent to the project under consideration should also be considered. Note that the above typical questions are focused on the design phase of the project the planning and construction phases should have different types of questions because of the different characteristics of the phases.



After the interview and the evaluation of proposals, the committee gets together discusses the relative merits of each of the firms under consideration and makes its selection. Some best practices for the selection process are:

- Develop and use a standard form on which committee members can either rank or assign points to each of the firms as they are evaluated on the various consideration factors.
- Gather and keep for a period of time the entire field notes from each of the members of the selection committee. (They can provide a contemporaneous record of the selection in the event that the selection is challenged.)
- Debrief the selected firm and the unsuccessful firms outlining specifically why the firm that was selected was selected. When debriefing the unselected firm do not imply that the firm was not qualified. Once the firm was shortlisted, it is expected that they are qualified. At the same time, to state that the winning firm was better qualified is certainly acceptable. What we are trying to do when debriefing is to encourage a cadre of qualified consultants to continue to compete for work with the agency.

A Simple Checklist for Hiring Consultants

- What would they contribute: would they offer a new skill or new way of doing things?
- What are your expectations: are the consultants really expected to provide reassurance and confidence in what staff is currently doing?
- Of the several sources, from where should consultants be chosen?
 - Private firms?
 - Universities?
 - Other projects?
 - Other local experts?
 - International experts?

Increasing Cost --->
- Do they speak your language? An advantage but not a necessity?
- Should they have previous experience locally? If they are expected to contribute to details, yes. They need not - and perhaps should not - have local experience if they are expected to bring new, innovative ideas, unencumbered by the accepted way of doing things.
- Are they willing to work with a local counterpart?
- Are the consultants willing to train local staff so that they can continue to benefit from their input?
- What type of consultant do you want? Technical consultants are often less appropriate at imaginative, general solutions but can respond better to given situations. Conversely, non-technical consultants can provide more imaginative, general solutions that do not require a specific solution.

Source: <http://web.mit.edu/urbanupgrading/upgrading/issues-tools/tools/hiring-consultants.html>

Scheduling Techniques to Ensure Adequate Time & Quality

Milestone & Bar Charts

The following is an example from Wisconsin DOT of major milestones used to ensure adequate time and quality of a project.

Major Milestones Checklist

Date:

- | | |
|--------------------------|---|
| <input type="checkbox"/> | <i>Project Definition Complete/Purpose & Need</i> |
| <input type="checkbox"/> | <i>Begin Preliminary Engineering</i> |
| <input type="checkbox"/> | <i>Environmental Documentation Complete</i> |
| <input type="checkbox"/> | <i>Right of Way Certification</i> |
| <input type="checkbox"/> | <i>Advertisement (Ad date)</i> |
| <input type="checkbox"/> | <i>Bid Opening</i> |
| <input type="checkbox"/> | <i>Award</i> |
| <input type="checkbox"/> | <i>Execution</i> |
| <input type="checkbox"/> | <i>Construction Start</i> |
| <input type="checkbox"/> | <i>Operationally Complete (Open to Traffic)</i> |
| <input type="checkbox"/> | <i>Final Contract Completion</i> |

Source: Washington State Department of Transportation Project Management Online Guide
http://www.wsdot.wa.gov/Projects/ProjectMgmt/OnLine_Guide/Tools/Initiate_Align_Worksheet.doc

Critical Path Method**Contract Time and Schedule Checklist Items**

The following is a list of items to review the completeness of the construction schedule:

- Reviews/Submittals
- Are there critical Submittals? What time is needed?
- Are there critical testing periods and how long?
- Are there critical review times and how long?
- What are the assigned calendars for submittals & review times?
- What are the logical connections between review activities and contractor's actual work?
- Procurement activities
- Time for reviewing false-work plans, shop drawings, positioning plans, mix designs, etc.
- Permits
- Are permits required?
- Time to obtain necessary permits?
- Specific Activity Requirements
- Additional time for obtaining specialty items or materials with long-lead requirements (i.e. Traffic Signal Equipment)
- Curing time and waiting periods between successive paving courses or between concrete operations
- Embankment settlement periods or embankment surcharges.
- Coordination with utilities
- False-work & shoring activities
- Punch-list and cleanup activities
- Material/Product Testing and Delays
- Government Furnished Material request?
- Trial shafts or piles
- Sample walls
- Time for fabrication of structural steel and other specialty items
- Staining, painting or other samples needing approvals
- Construction Limitations and Requirements
- Haul characteristics
- Type of earthwork (sliver cuts, benching)
- Work area restrictions
- Equipment congestion
- Allowable bad weather days
- Material availability
- Labor shortages and resource loading
- Traffic Volumes
- Traffic Staging events (closures, detours, etc)
- Critical interface activities (utilities, RR, etc.)
- Restrictions for nighttime and weekend operations
- Conflicting operations of adjacent projects, both public and private
- Are the NTP and Project Closeout activities shown?
- Project Commitments
- Environmental Commitments
- Winter season clearing, grubbing, grading restrictions in FP
- Noise restrictions

- SWPPP
- Seasonal limitations for certain activities
- Project Calendar Requirements
- Work week (5-day, 7-day weeks)
- Holidays
- Other non-working times
- Does the final schedule include/show:
 - Critical Path?
 - NTP date and completion date
 - Entire work scope, all activities in plans and specs?
 - Construction Staging and Mobilization?
 - Realistic duration of individual activities?
 - Maximum 20-day duration for any one activity? If longer, add phases for the activity.
 - Activities have at least one predecessor and 1 successor, except for first and last activity?
 - No negative lag for activities?
- Project Duration, Interim Milestones, Black-out dates, Contract work Days

Source: CFL Guidelines for Developing Critical Path Method Schedules, October 2006

Quality Control

QUALITY CONTROL PLAN			
Date:			
Job #:			
Project:			
Element	Target Date	Actual Date	Responsible Party
Project vision established			
Project drivers established			
Detailed task outline			
Kickoff meeting			
Project management plan			
Principal review of all docs			
Client sponsor consulted on critical decisions			
Client status reports			
Client review			
Constructability review			
Operability/Maintainability review			
Consultant coordination			
Agency review			
Client satisfaction			

Source: PSMJ Resources, Inc. The Ultimate Project Management Manual

Managing Risks and Creating a Risk Management Plan

Risk Management Processes and Outputs From – CAL TRAN Risk Management Handbook pdf

Process	Output(s) (deliverables)
Risk management planning	Risk Management Plan (RMP)
Risk identification	Risk Register (Register)
Qualitative risk analysis	Risk Register (updates) Prioritized list of risks classified as high, moderate, or low.
Quantitative risk analysis	Quantitative Risk Analysis Reports Numerical analysis of the project's likelihood of achieving its overall objectives (Risk Register updates)
Risk response planning	1- Risk Register (updates) 2- Project Management Plan (updates) 3- Project Risk Management Plan (updates) 4- Risk-related contractual agreements The outcome may result in one or more of the following: residual risks, secondary risks, change control, contingency reserve (amounts of time or budget needed).
Risk monitoring and control	Risk Register (updates) The outcome may result in workaround plans, corrective actions, programming change request (PCR), and updates to risk identification checklists for future projects

Threat Impact Evaluations
From – Cal Tran Risk Management Handbook

Evaluating Impact of a Threat on Major Project Objectives						
Impact	Very Low	Low	Moderate	High	Very High	
OBJECTIVE	Time	Insignificant Schedule Slippage	Delivery Plan milestone delay within quarter	Delivery Plan milestone delay of one quarter	Delivery Plan milestone delay of more than 1 quarter	Delivery Plan milestone delay outside fiscal year
	Cost	Insignificant Cost Increase	<5% Cost Increase	5-10% Cost Increase	10-20% Cost Increase	>20% Cost Increase
	Scope	Scope decrease is barely noticeable	Changes in project limits or features with <5% Cost Increase	Changes in project limits or features with 5-10% Cost Increase	Sponsor does not agree that Scope meets the purpose and need	Scope does not meet purpose and need
	Quality	Quality degradation barely noticeable	No safety issues, C, O, M deficiencies approved by project team	No safety issues, C, O, M deficiencies require District management approval	Quality may be made acceptable through mitigation or agreement (i.e. Fact Sheet)	Quality does not meet one or all of the following Safety, C, O, & M

Legend: C – Constructability, O – Operability, M – Maintainability

Evaluating Impact of an OPPORTUNITY on Major Project Objectives						
Impact	Very Low	Low	Moderate	High	Very High	
OBJECTIVE	Time	Insignificant Schedule Improvement	Delivery Plan milestone does not improve but float is added	Delivery Plan milestone improves but still within the quarter	Delivery Plan milestone improves by 1 quarter.	Delivery Plan milestone improved by more than one quarter
	Cost	Insignificant Cost reduction	<1% Cost Decrease	1% - 3% Cost Decrease	3%-5% Cost Decrease	>5% Cost Decrease
	Scope	Scope effect is not noticeable	Improves chances to achieve project limits or features with cost increases of 10% or more	Improves chances to achieve project limits or features with cost increases of 5%-10%	Improves chances to achieve project limits or features with cost increases of 2%-5%	Improves chances to achieve project limits or features with cost increases of < 2%
	Quality	No quality improvement noticeable	C, O, M improvement noticeable by project team	C, O, M improvement can be seen and measured	Quality improvement can be claimed for the project	Quality improvement is "best in class"

Legend: C – Constructability, O – Operability, M – Maintainability

Managing Critical Path Items

Utilities

Coordination for utility identification and verification requires extensive coordination. Minnesota DOT has a section on their website that offers templates for each step of utility coordination. An example is below, more can be found at <http://www.dot.state.mn.us/utility/design&construction/index.html>.

Sample Utility Coordination Letter

Dear **Mr./Ms. Contact**:

On **Date**, your offices were contacted by Gopher State One Call, ticket number # [REDACTED], about the above-referenced Minnesota Department of Transportation (Mn/DOT) construction project. As of this writing, Mn/DOT has not received any of the information requested from your office regarding your facilities. This letter outlines instructions regarding location and design work to help you comply with our request. For your reference, a copy of the general layout of the proposed construction area is enclosed.

Mn/DOT requests that you follow the instructions below regarding location work and provide us with any necessary information for all your existing facilities within the proposed construction area, in accordance with Minnesota Statutes, section 216D.04, subdivision 1a:

1. Show the approximate location of all your facilities, including facilities that have been placed out of service. You may provide maps or diagrams of the facilities, or you may locate a utility facility within the proposed construction area. Please call me at [REDACTED] if you will be providing actual field location information.
2. Indicate the size and type of each facility (for example, "6-inch cast iron pipe").
3. Indicate voltage of all electrical power lines.

Mn/DOT requests that you complete this location work by **Date**. Failure to perform the work by the time indicated would place your company in violation of Minnesota Statutes, section 216D.04, subdivision 1a, "Plans for Excavation." In such a situation, Mn/DOT would contact the Commissioner of Pipeline Safety regarding violation proceedings, as identified within Minnesota Statutes, section 216D.

If you have any questions or comments regarding the plans for the above-referenced project, please contact me at [REDACTED].

Sincerely,

Project Manager

Enclosure

cc:

Consultant - if involved
Utilities Engineer, MS 678

Project Change Management

The following figures present a sample from New York State's Project Change Request Form.

Figure 3-6 New York State Project Change Request

New York State Project Change Request	
PROJECT IDENTIFICATION	
Project Name:	_____
Project Manager:	_____
<i>Enter the Project Name. Identify the assigned Project Manager.</i>	
CHANGE REQUEST INFORMATION	
Request Date:	_____
Requested By:	_____ Agency: _____
Description of Change:	
Scope Impact:	
Schedule Impact:	
Quality Impact:	
Cost Impact:	

Figure 3-6 (Continued)

New York State Project Change Request	
<p><i>This form is likely to pass through several hands. The person who is requesting the change will initiate the form, entering the Change Request Date and his or her Name and Agency. This person should then include a detailed description of the change being requested in the Description area. (If more space is required for a thorough justification, attach additional documentation to this form.)</i></p> <p><i>The designated Reviewer (usually a subject matter expert) should then analyze the request being made, and communicate to the Project Manager the estimated impact to the project. The Project Manager will include this information on this form, along with his/her estimate of the cost and schedule impact. When completed, this form should describe the impact to the quadruple constraints, CSSQ.</i></p> <p><i>Once the impact has been documented, this form is presented to the appropriate approvers.</i></p>	
REVIEWER INFORMATION	
Reviewer Name: _____	Role: _____
Recommended Action: Approve: <input type="checkbox"/> Reject: <input type="checkbox"/>	
Reviewer Comments:	
Date: _____	
<p><i>Provide the above information for each individual designated as a Reviewer for the change request. The Reviewer should include his/her recommendation for Approval or Rejection of the request, any comments, and the date reviewed. If the Recommended Action is to reject the change request, the reviewer must explain the reason.</i></p>	

Preparing for Project Closeout

Final Project Completion Checklist & Forms

- Complete all close-out procedures identified in the construction contract documents.
- Receive notification of construction completion and list of items to be completed or corrected from the construction subcontractors.
- Inspect the project for substantial completion. Perform the punch list walk-through with the client and subcontractors. Ensure that all subcontractors perform their own walk-through as appropriate.
- Receive and verify the subcontractor's written notice that all work has been completed.
- When the project is substantially complete, and when required by the contract, prepare a Certificate of Substantial Completion. Obtain the owner's and subcontractor's written acceptance and approval.
- Make a final inspection with the owner to verify that all punch-list items have been corrected.
- Notify authorities requiring inspection before allowing occupancy.
- Obtain an Occupancy Permit, if required. Obtain the owner's and contractor's written acceptance and approval.
- Ensure that the owner and operator assume all responsibilities for insurance, security, maintenance, damages, and utilities after the certificate of substantial completion is issued.
- Obtain copies of the following as appropriate from equipment suppliers and the subcontractors:
 - Guarantees and warranties on equipment
 - Certificates of inspection
 - Maintenance schedules
 - Operating instructions
 - Spare parts or parts listing
 - Record drawings
 - Bonds
- Ensure all operating and maintenance manuals have been turned over to the owner.
- Coordinate any required training.
- Coordinate startup of all systems in accordance with testing schedules.
- Receive the subcontractors' final application for payment, along with:
 - Release of liens
 - Consent of surety, if any
 - Affidavits indicating all bills have been paid to suppliers and subcontractors
 - Independent inspection report, when required by lending institution
- Issue the final Certificate for Payment when all work is acceptable.
- Provide client and operator with list of manufacturers and specifications of all equipment, accessories, etc., for ordering maintenance contracts and spare parts.
- Assemble record drawings as required by the specifications.
- Verify that all testing reports, certificates of inspection, bonds, etc., have been submitted to the owner for permanent files.
- Assemble, analyze, and file complete records for construction and professional services.
- If defects are identified during the one-year period after substantial completion, seek authorization from the owner, as an additional service if possible, to investigate and make recommendations on their resolution.
- Prior to expiration of the one-year period, obtain owner's authorization (as an additional service if possible) to conduct a final, thorough inspection to determine if any final warranty action is required by the subcontractor to remedy known problems.

Source: PSMJ Resources, Inc. *The Ultimate Project Management Manual*

Project Closeout

The following present samples of a project closeout plan and form.

PROJECT CLOSEOUT PLAN			
Date:			
Job #:			
Project:			
Element	Resource	Completed	Responsible Party
Close Contracts			
Clear Deficiency List			
Confirm Completion			
Issue Completion Letter			
Release Holdbacks			
Issue Final Payment Certificate			
Turnover Docs to Owner			
Calcs			
Bid Sets			
Construction Sets			
Operating Manuals			
Shop Drawings			
Testing & Balancing Certification			
Archive Project Files			
Prepare Final CAD Issue			
Review/Cleanup/Archive Files			
Burn Electronic Files to CD			
Complete Financial Closeout			
Clear WIP			
Send Final Invoice			
Clear A/R			
Close Job Number			
Marketing Closeout			
Conduct Formal Project Review/Interview with Client			
Write Project Description for Marketing Files			
Arrange for Project Photos			
Get Client Testimonial Letter			
Update Resumes			

PROJECT CLOSEOUT PLAN <i>(continued)</i>			
Date:			
Job #:			
Project:			
Element	Resource	Completed	Responsible Party
Compare Plan vs. Actual			
Net Yield			
Staff Hours			
Schedule			
Quality			
Expenses			
Contingencies			
Compare Project Definition vs. Actual			
Costs			
Planning			
Schedule			
Scope of Work			
Project Organization			
Suitability of staff			
Interdepartment Cooperation			
Interoffice Cooperation			
Continuity of Assignment			
Availability of Staff			
Estimating			
Original Estimate with Actual			
Reasons for the Difference			
Assess Estimating Performance on Change Orders			
Planning			
Compare Original Plan with Final Performance			
Reasons for Differences			
Assess Planning Performance on Change Orders			

PROJECT CLOSEOUT FORM		
Project Name:		
Project Location:		
Project Number:	Project Manager:	
Client:		
Project Description:		
Total Contract Amount:	Overhead Rate Used:	
Method of Contract:		
Total Amount Invoiced: \$ _____	Profit: \$ _____	
Design Schedule:		
Construction Completed: ___/___/___	Construction Cost: \$ _____	
Subconsultants:		
Civil:		
Structural:		
Mechanical:		
Electrical:		
Geotechnical:		
Other: (attach list)		
Attach separate sheet with list of drawings, including:		
Sheet title	Sheet number	Sheet scale
Total Sheets:		
Total Sheets Without Standard Details:		

PROJECT CLOSEOUT PLAN (continued)			
Date:			
Job #:			
Project:			
Element	Resource	Completed	Responsible Party
Communication			
Was Team Communication Good?			
Was Corporate Communication Good?			
What Methods Were Used?			
Extras			
Identify Project Extras			
What Was the Source of Each Extra?			
Did We Make Profit on Extras?			
Client Satisfaction			
Project Manager's Opinion			
Client Sponsor's Opinion			
Client's Opinion			
Discuss Client's Opinion with Team			
Plan for Client Follow-up			
Partner/Sub Agreements			
Was There Value to Having Partners?			
Was Our Contractual Agreement Satisfactory?			
Would You Want This Partner Again?			
Project Successes			
What Were They?			
Were They Recognized?			
Project Failures			
What Were They?			
Were They Recognized?			
Client			
Contractual Relationship			
Would We Want This Client Again?			

PROJECT CLOSETOUT FORM <i>(continued)</i>		
Total Professional Hours:		
Gross Professional Hours Per Sheet:		
Total Technical Hours:		
Gross Technical Hours Per Sheet:		
Total Hours:		
Gross Total Hours Per Sheet:		
Computer Software Used:		
Copy of last project progress report attached? Y () N () N/A ()		
Marketing project description written? Y () N () N/A ()		
Copy of final report in library? Y () N () N/A ()		
Photos given to marketing? Y () N () N/A ()		
CAD drawings archived? Y () N () N/A ()		
CAD drawings accurate? Y () N () N/A ()		
Plans/files/disks sent to archives? Y () N () N/A ()		
Project worthy of an article? Y () N () N/A ()		
Project worthy of an award? Y () N () N/A ()		
Remarks: (attach extra sheet if necessary)		

Source: PSMJ Resources, Inc. *The Ultimate Project Management Manual*

Chapter 4- Project Management by Phase

Internal and External Agency Coordination

A sample Communications Plan from Washington State DOT is presented below.

Communication Plan
 <Insert Project Name>
 <Insert Project MP Limits>
 Project Manager: <Insert name here>
 <Date>

The communication plan for the project is broken into two sub-areas, Internal and External Communication, and is presented below in tabular form. Both sub-areas acknowledge that the project partners cannot realize their vision nor can the project delivery team attain our mission without a sufficient, timely and accurate flow of information. The items addressed below identify what the item is, who is the primary contact, how the information moves and when it happens. We also recognize that effective communication demands effective listening and viewing project decisions from our customer's perspective.

In order to assure successful delivery of this project, it will be necessary for the project delivery team to accurately inform each other of their needs, updates and timelines. Minutes from meetings listed below will be electronically routed to affected groups as appropriate.

External Communication

Timely and meaningful exchange of information external to the project team is critical to secure a positive commitment from stakeholders and the general public. As indicated in the table, that flow may be written or oral, formal or informal.

WHAT	WHO	HOW	WHEN
With Stakeholders			
Identify stakeholders			
Conduct local agency briefings			
What future work is anticipated or planned by local agencies?			
With the Public			
Public Involvement (PI)			
Project website			
DOT contact with public			

Internal Communication

Effective internal communication is open, honest, continuous and efficient. The table below addresses communication between and among the teams as well as communication protocols.

WHAT	WHO	HOW	WHEN
Communicate project progress to senior management			
Communication among all teams.			
Distribute & maintain schedule Base Schedule Date:			
Create an organizational chart that identifies Team Structure			
Set guidelines			
Clarify chain of command guidelines with other agencies and contractors			
Set protocols			
Team member Communication			
How do project teams & resource agencies communicate?			
Communication between P/M Team and Production/Supervision Team			
Define internal (DOT) communication roles and responsibilities			
Facilitate distribution of information on other relevant agency projects to all production team members			
Communication between P/M Team and Consultant or Contractor			
At technical/field level			
At admin/regional level			

Source: Washington State Department of Transportation Project Management Online Guide

http://www.wsdot.wa.gov/Projects/ProjectMgmt/OnLine_Guide/Phase_Guides/Construction/CN_Plan_the_Work/CN_Plan_Communication.htm

Errata Sheet

An Errata sheet is a good way to track comments, questions, and change requests on documents and at meetings. The errata sheet can serve as part of the project documentation, just like meeting minutes. Pass out the errata sheet with the revised version of the document when giving to agencies for concurrence so they can see that their comments were addressed and where to find the change.

For meetings, the errata sheet can serve to address questions that could not be answered at the time of the meeting. After the errata sheet is prepared it can either be passed out at the next meeting or attached as part of the meeting minutes.

Below are some sample formats that could be used. An errata sheet should have the original problem and how it was corrected or why it was not, and if desired the name of the agency or person that had the comment. All comments should be addressed, whether they are changed or not.

Document Errata Sheet Sample

Document: Draft Environmental Impact Statement Errata Sheet

Date: September 5, 2007

Agency	Original Section & Page Number	New Section & Page Number	Comment	Response
Department of Natural Resources	Sect. 5 Pg 3	Sect 5 Pgs 3-4	Document does not indicate where the mitigation for the 2 acres of forest will be located.	The location of the forest mitigation will be along US 50 two miles NE of the project site. The location description and map have been included in the document.

Meeting Errata Sheet Sample

Meeting: IAR Meeting – Preferred Alternate Date of Meeting: August 1, 2007

Date: September 5, 2007

Agency	Comment/Question	Response
USFWS	If Alternate 2 has less stream impacts, why are you choosing Alternate 3 as the preferred?	Alternate 2 will displace 11 families in an EJ community and 4 businesses and will impact a school, causing a 4(f). While Alternate 2 has less stream impacts, the overall environmental impacts are greater than Alternate 3

Inter-Agency Review (IAR) Meetings/Coordination

Samples of a letter to agencies confirming a field review meeting and agenda are presented below.

Sample Field Review Meeting Letter

Date

Name

Transportation Program Manager

U.S. Army Corps of Engineers

Local District Office & Address

RE: Project No. _____, Project Name, County, Maryland

Dear :

The purpose of this letter is to confirm that an Interagency Field Review has been scheduled for the **Project on Date**. This field review is being held to familiarize agency personnel with the project and to seek agency input regarding development of alternatives and environmental issues. The field review will consist of a visual overview of the study area conditions and associated environmental resources. No wetland boundary delineation requiring soil probes or testing would be included as a part of at this field review at this time.

All those receiving a copy of this letter or their representative are requested to attend the field review. Participants are requested to meet at **Time at Location** (see attached map).

If you have any questions, please contact the Project Manager, **PM Name Number** or the Environmental Manager, **EM Name at Number**.

Very truly yours,

Insert signature block

Enclosures

(Send to appropriate people at the following agencies, do not forget to include the local Office of Planning representative and Department of Public Works, and others that your agency may require.)

cc: Historical Trust
Department of the Environment
Department of Natural Resources
Federal Highway Administration
National Park Service
Environmental Protection Agency
US Fish & Wildlife Service

Sample Agenda for an Inter-Agency Field Review

Office Meeting & Field Review
Youngstown Road and US 1
August 28, 2008

Office Meeting (9:00-10:00)

- Introductions
- Project Description
- Describe any potential environmental, community, archeological and historical impacts
- Questions
- Directions to location where meeting in field

Field Meeting (10:00-1:00)

- Gather at site
- Walk entire study area pointing out the potential impacts and resources
- Question/Answer
- Disperse

Allow time for agency questions and photographs.

National Environmental Policy Act (NEPA) & Other State and Federal Regulations & Streamlining Processes

Environmental Document Preparation and Review Tool

Project Name: _____ Local Assistance SHS
 DIST-CO-RTE-PM: _____ EA: _____
 Federal-Aid No.: _____
 Document Type: Routine EA Complex EA EIS IS EIR Draft Final
 Name of Document Preparer or Oversight Coordinator: _____
 Consultant-Prepared Consultant : _____ Name: _____

Page No. in ED	Check if content is:		Major Required Content Per Annotated Outline
	Included	Not applicable	
	<input type="checkbox"/>	<input type="checkbox"/>	Cover Sheet
	<input type="checkbox"/>	<input type="checkbox"/>	Follows annotated outline format
	<input type="checkbox"/>	<input type="checkbox"/>	Includes 23 U.S.C. 327 assignment language
	<input type="checkbox"/>	<input type="checkbox"/>	General Information About This Document (not required for Final ED)
	<input type="checkbox"/>	<input type="checkbox"/>	Title Sheet
	<input type="checkbox"/>	<input type="checkbox"/>	Title including cooperating agencies
	<input type="checkbox"/>	<input type="checkbox"/>	Legal citations, including 49 USC 303 for Section 4(f), if applicable
	<input type="checkbox"/>	<input type="checkbox"/>	Signature blocks and contacts
	<input type="checkbox"/>	<input type="checkbox"/>	Abstract (only required for EIS)
	<input type="checkbox"/>	<input type="checkbox"/>	Due date for comments
	<input type="checkbox"/>	<input type="checkbox"/>	FONSI (for Final ED and only if applicable)
	<input type="checkbox"/>	<input type="checkbox"/>	[Proposed (insert for Draft ED)] Mitigated Negative Declaration or Negative Declaration (as applicable)
	<input type="checkbox"/>	<input type="checkbox"/>	Summary (optional for IS and EA, but required for EIR and EIS)
	<input type="checkbox"/>	<input type="checkbox"/>	Include 23 U.S.C. 327 assignment language
	<input type="checkbox"/>	<input type="checkbox"/>	Summary table
	<input type="checkbox"/>	<input type="checkbox"/>	Table of Contents
	<input type="checkbox"/>	<input type="checkbox"/>	List of tables and figures
	<input type="checkbox"/>	<input type="checkbox"/>	Proposed Project
	<input type="checkbox"/>	<input type="checkbox"/>	Introduction
	<input type="checkbox"/>	<input type="checkbox"/>	Brief introduction including appropriate figures
	<input type="checkbox"/>	<input type="checkbox"/>	Purpose and Need
	<input type="checkbox"/>	<input type="checkbox"/>	Purpose statements (recommend bulleted list)
	<input type="checkbox"/>	<input type="checkbox"/>	Need statements using categories provided in annotated outline
	<input type="checkbox"/>	<input type="checkbox"/>	Project has independent utility and logical termini?
	<input type="checkbox"/>	<input type="checkbox"/>	Project Description
	<input type="checkbox"/>	<input type="checkbox"/>	Brief restatement of purpose and need
	<input type="checkbox"/>	<input type="checkbox"/>	Alternatives
	<input type="checkbox"/>	<input type="checkbox"/>	Discussion of build alternatives (Note: For IS/ EA, one or more are required. For EIR/EIS, a reasonable range is required.)
	<input type="checkbox"/>	<input type="checkbox"/>	Common design features of build alternatives
	<input type="checkbox"/>	<input type="checkbox"/>	Unique features of build alternatives
	<input type="checkbox"/>	<input type="checkbox"/>	TSM and TDM alternatives
	<input type="checkbox"/>	<input type="checkbox"/>	Estimated cost information
	<input type="checkbox"/>	<input type="checkbox"/>	No-build alternative

Page No. in ED	Check if content is:		Major Required Content Per Annotated Outline
	Included	Not applicable	
	<input type="checkbox"/>	<input type="checkbox"/>	Alternatives comparison matrix (recommended but not required)
	<input type="checkbox"/>	<input type="checkbox"/>	Identification of preferred alternative (required for Final ED)
	<input type="checkbox"/>	<input type="checkbox"/>	Locally preferred alternative, if one has been identified
	<input type="checkbox"/>	<input type="checkbox"/>	Summary of final decision making process
	<input type="checkbox"/>	<input type="checkbox"/>	Alternatives Considered But Eliminated From Further Discussion. For Final ED, Alternatives Considered but Eliminated from Further Discussion Prior to Draft Environmental Document
	<input type="checkbox"/>	<input type="checkbox"/>	Permits and Approvals Needed
	<input type="checkbox"/>	<input type="checkbox"/>	Affected Environment, Environmental Consequences, and Avoidance, Minimization and/or Mitigation Measures
	<input type="checkbox"/>	<input type="checkbox"/>	List of environmental topic areas considered but determined to not be relevant
	<input type="checkbox"/>	<input type="checkbox"/>	List of environmental issues with no potential for adverse impacts
	<input type="checkbox"/>	<input type="checkbox"/>	Human Environment
	<input type="checkbox"/>	<input type="checkbox"/>	Land Use
	<input type="checkbox"/>	<input type="checkbox"/>	Existing and future land uses
	<input type="checkbox"/>	<input type="checkbox"/>	Development trends in project vicinity
	<input type="checkbox"/>	<input type="checkbox"/>	Map of existing and planned land uses
	<input type="checkbox"/>	<input type="checkbox"/>	Describe existing and planned land uses
	<input type="checkbox"/>	<input type="checkbox"/>	Describe avoidance, minimization and mitigation measures for each alternative
	<input type="checkbox"/>	<input type="checkbox"/>	Consistency with Relevant State, Regional, and Local Plans and Programs
	<input type="checkbox"/>	<input type="checkbox"/>	Transportation plans and programs
	<input type="checkbox"/>	<input type="checkbox"/>	Regional growth plans
	<input type="checkbox"/>	<input type="checkbox"/>	Habitat conservation plans
	<input type="checkbox"/>	<input type="checkbox"/>	General and community plans
	<input type="checkbox"/>	<input type="checkbox"/>	Specific development proposals
	<input type="checkbox"/>	<input type="checkbox"/>	Coastal zone management programs
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Location of project within coastal zone
	<input type="checkbox"/>	<input type="checkbox"/>	Impacts within coastal zone and measures to avoid, minimize, and/or mitigate
	<input type="checkbox"/>	<input type="checkbox"/>	Wild and Scenic River designation
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Describe river and impacts to river
	<input type="checkbox"/>	<input type="checkbox"/>	Coordination efforts to date
	<input type="checkbox"/>	<input type="checkbox"/>	Parks and Recreational Facilities
	<input type="checkbox"/>	<input type="checkbox"/>	Describe parks/recreational facilities in project vicinity; include maps
	<input type="checkbox"/>	<input type="checkbox"/>	Describe impacts related to parks and recreational facilities
	<input type="checkbox"/>	<input type="checkbox"/>	Summarize “use” of Section 4(f) properties and refer to Appendix B
	<input type="checkbox"/>	<input type="checkbox"/>	Section 4(f) de minimis use finding, if applicable
	<input type="checkbox"/>	<input type="checkbox"/>	Describe use; why the use is de minimis; public notice process; any avoidance, mitigation and enhancement measures needed to make de minimis finding; and written concurrence from official with jurisdiction
	<input type="checkbox"/>	<input type="checkbox"/>	Growth
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Document steps and results of “first cut screening”
	<input type="checkbox"/>	<input type="checkbox"/>	If further analysis needed, document “right-sizing” and growth-related effects of each alternative, including the no-build, on resources of concern
	<input type="checkbox"/>	<input type="checkbox"/>	Describe avoidance, minimization and mitigation measures for each alternative
	<input type="checkbox"/>	<input type="checkbox"/>	Farmlands/Timberlands
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Describe farmlands/timberlands in area; include Williamson Act properties
	<input type="checkbox"/>	<input type="checkbox"/>	Map of farmlands and timberlands

Page No. in ED	Check if content is:		Major Required Content Per Annotated Outline
	Included	Not applicable	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Describe impacts of each alternative on farmland/ timberland ; include the farmland conversion impact rating from AD-1006; include form in appendix
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Description of and impacts related to Williamson Act contract lands and/or Timber Production Zones under the California Timberland Productivity Act
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Describe avoidance, minimization and/or mitigation measures
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community Impacts
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community Character and Cohesion
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Describe the community profile: setting, demographics, neighborhoods, activity centers, economy
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Discuss indicators related to community cohesion
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Describe impacts to community character and cohesiveness
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Describe avoidance, minimization and/or mitigation measures
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Relocations
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Describe study area with a particular focus on areas with right-of-way acquisitions
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	List proposed partial and full residential and business acquisitions; include table
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Discuss availability of safe and sanitary replacement housing and/or comparable lease or land for impacted businesses
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Environmental Justice
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Identify minority or low-income populations (if any) and means used to identify them
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If none, insert boilerplate conclusion: project not subject to E.O. 12898
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If yes, describe impacts to EJ populations with focus on disproportionately high and adverse impacts
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If no disproportionately high and adverse impacts, insert boilerplate conclusion per outline
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If there are disproportionately high and adverse impacts, discuss all measures to avoid, minimize and/or mitigate
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Utilities/Emergency Services
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Describe utility systems (water, gas, sewer, electric power and telecommunication) that could be affected by project
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Describe law enforcement, fire and other emergency services that could be affected
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Describe both short-term and long-term impacts to utilities and emergency services
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If utility relocations are proposed, describe impacts related to those relocations either in this section or other applicable sections
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Discuss measures to avoid, minimize and/or mitigate impacts to utilities and emergency services
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Traffic and Transportation/Pedestrian and Bicycle Facilities
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Describe existing traffic circulation
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Describe design-year (at least 20 years out) traffic circulation for each alternative, including the no-build
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Discuss measures to avoid, minimize and/or mitigate traffic impacts
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Describe pedestrian and bicycle facilities in project area
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Discuss project compliance with ADA
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Discuss construction-related impacts to traffic and pedestrian/bicycle facilities, including the Traffic Management Plan
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Discuss measures to avoid, minimize and/or mitigate impacts to pedestrian and bike facilities
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Visual/Aesthetics
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Describe sensitive visual resources in project area and whether project has the potential to

Page No. in ED	Check if content is:		Major Required Content Per Annotated Outline
	Included	Not applicable	
			affect an officially designated scenic highway
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss viewer groups and sensitivity
	<input type="checkbox"/>	<input type="checkbox"/>	Include before and after visual simulations
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss impacts to visual resources and viewer response for each alternative
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss proposed context-sensitive solutions
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss measures to avoid, minimize and/or mitigate impacts to visual resources
	<input type="checkbox"/>	<input type="checkbox"/>	Cultural Resources
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Describe the area of potential effects (APE)
	<input type="checkbox"/>	<input type="checkbox"/>	Describe studies conducted and methodologies
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss cultural resources found within the APE, but do not disclose locations
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss significance (NRHP eligibility) of each evaluated cultural resource and coordination with SHPO, as applicable
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss avoidance, minimization, and/or mitigation measures and coordination with SHPO, as applicable
	<input type="checkbox"/>	<input type="checkbox"/>	For Final ED, discuss and include MOA if project would result in finding of adverse effect
	<input type="checkbox"/>	<input type="checkbox"/>	Include boilerplate on discovery of cultural materials/human remains during construction
	<input type="checkbox"/>	<input type="checkbox"/>	Summarize "use" of Section 4(f) historic properties and refer to Appendix B
	<input type="checkbox"/>	<input type="checkbox"/>	Section 4(f) de minimis use finding, if applicable
	<input type="checkbox"/>	<input type="checkbox"/>	Describe use; why the use is de minimis; any avoidance, mitigation and enhancement measures needed to make de minimis finding; and Section 106 PA documentation sent to SHPO
	<input type="checkbox"/>	<input type="checkbox"/>	Physical Environment
	<input type="checkbox"/>	<input type="checkbox"/>	Hydrology and Floodplain
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Describe floodplains in project area, including natural and beneficial values
	<input type="checkbox"/>	<input type="checkbox"/>	Map of base 100-year floodplain, if available
	<input type="checkbox"/>	<input type="checkbox"/>	Describe how each alternative would impact floodplain, including whether the alternative would have a significant encroachment
	<input type="checkbox"/>	<input type="checkbox"/>	If there is a significant encroachment, discuss coordination with/concurrence from FHWA TE
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss coordination with water resources and floodplain management agencies
	<input type="checkbox"/>	<input type="checkbox"/>	For Final ED, include the only practicable alternative finding, if required
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss measures to avoid, minimize and/or mitigate hydrology/floodplain impacts
	<input type="checkbox"/>	<input type="checkbox"/>	Water Quality and Storm Water Runoff
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Describe watersheds and receiving waters potentially affected
	<input type="checkbox"/>	<input type="checkbox"/>	Describe impacts related to water quality
	<input type="checkbox"/>	<input type="checkbox"/>	Refer to applicable BMPs from Storm Water Management Plan and Statewide Permit
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss measures to avoid, minimize and/or mitigate water quality/storm water impacts
	<input type="checkbox"/>	<input type="checkbox"/>	Geology/Soils/Seismic/Topography
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Describe site geology and subsurface conditions
	<input type="checkbox"/>	<input type="checkbox"/>	Describe impacts to geologic landforms as well as effects of geology and seismic hazards on the project design/structures
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss avoidance, minimization and/or mitigation measures for geology
	<input type="checkbox"/>	<input type="checkbox"/>	Paleontology
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss potential for occurrence of paleontological resources (do not disclose exact location)
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss impacts related to potential for unearthing or disturbing paleontological resources

Page No. in ED	Check if content is:		Major Required Content Per Annotated Outline
	Included	Not applicable	
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss avoidance, minimization and/or mitigation measures
	<input type="checkbox"/>	<input type="checkbox"/>	Hazardous Waste/Materials
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Summarize findings of Initial Site Assessment for each alternative and, if applicable, the Preliminary Site Investigation
	<input type="checkbox"/>	<input type="checkbox"/>	Summarize coordination with regulatory agencies
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss avoidance, minimization and/or mitigation measures, including the costs
	<input type="checkbox"/>	<input type="checkbox"/>	Justify avoiding or not avoiding hazardous materials; justify postponing or dispensing of further investigations
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss required provisions to handle hazardous materials during project implementation
	<input type="checkbox"/>	<input type="checkbox"/>	Air Quality
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Describe existing climatic and meteorological conditions
	<input type="checkbox"/>	<input type="checkbox"/>	Include map of receptor sites and monitoring stations
	<input type="checkbox"/>	<input type="checkbox"/>	Regional conformity: Include applicable boilerplate conformity statement per regional conformity flowchart (design, cost, and scope consistent with RTP and TIP)
	<input type="checkbox"/>	<input type="checkbox"/>	Project-level conformity
	<input type="checkbox"/>	<input type="checkbox"/>	Provide attainment status for each criteria pollutant
	<input type="checkbox"/>	<input type="checkbox"/>	If project area is in non-attainment or maintenance for CO, discuss hot-spot analysis for CO
	<input type="checkbox"/>	<input type="checkbox"/>	If project area is in non-attainment or maintenance for PM2.5 or PM10, summarize the qualitative analysis for particulate matter
	<input type="checkbox"/>	<input type="checkbox"/>	For PM2.5 and PM10 analyses, document results of Interagency Consultation and Public Involvement
	<input type="checkbox"/>	<input type="checkbox"/>	Include FHWA air quality conformity determination; place letter in appendix
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss construction-related impacts
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss potential for naturally occurring asbestos and structural asbestos
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss potential for mobile source air toxics (MSATs) and provide analysis in accordance with FHWA Interim Guidance on Addressing MSATs (February 3, 2006)
	<input type="checkbox"/>	<input type="checkbox"/>	Noise (and vibration if applicable)
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	23 CFR 772 analysis, for each alternative:
	<input type="checkbox"/>	<input type="checkbox"/>	Describe land uses and sensitive receptors, include map with locations
	<input type="checkbox"/>	<input type="checkbox"/>	Provide existing and future noise levels, including tables
	<input type="checkbox"/>	<input type="checkbox"/>	For each receptor, state whether there is a noise impact that requires consideration of abatement [substantial increase (12 dBA or greater) or approach or exceed NAC]
	<input type="checkbox"/>	<input type="checkbox"/>	Describe consideration of noise abatement, if required, and show on map
	<input type="checkbox"/>	<input type="checkbox"/>	For proposed abatement, discuss whether noise abatement reasonable and feasible
	<input type="checkbox"/>	<input type="checkbox"/>	Include boilerplate statement regarding abatement and final design
	<input type="checkbox"/>	<input type="checkbox"/>	CEQA noise analysis (place here for IS/EA; for EIR/EIS, include in CEQA-only chapter)
	<input type="checkbox"/>	<input type="checkbox"/>	Energy (mandatory for EIRs and EISs)
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss project's potential impacts on energy consumption and for energy conservation
	<input type="checkbox"/>	<input type="checkbox"/>	Biological Environment
	<input type="checkbox"/>	<input type="checkbox"/>	Natural Communities
	<input type="checkbox"/>	<input type="checkbox"/>	Boilerplate introductory language
	<input type="checkbox"/>	<input type="checkbox"/>	Describe impacts related to each community/habitat type (non-FESA/non-wetland), including habitat fragmentation, fish passage, and wildlife corridors
	<input type="checkbox"/>	<input type="checkbox"/>	Describe any regional conservation plans, such as HCPs or MSCPs
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss avoidance, minimization and/or mitigation measures for natural communities
	<input type="checkbox"/>	<input type="checkbox"/>	Wetlands and Other Waters

Page No. in ED	Check if content is:		Major Required Content Per Annotated Outline
	Included	Not applicable	
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Describe waters/wetlands in the project area, including functions and values
	<input type="checkbox"/>	<input type="checkbox"/>	Include quantification of impacts to waters/wetlands under each alternative, including table
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss impacts on function and value of waters/wetlands
	<input type="checkbox"/>	<input type="checkbox"/>	Map of waters/wetlands to be impacted by each alternative
	<input type="checkbox"/>	<input type="checkbox"/>	Summarize, in a table, impacts on wetlands and waters by drainage and impact type
	<input type="checkbox"/>	<input type="checkbox"/>	Document consideration of wetland avoidance alternative
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss all practicable measures to minimize harm to waters/wetlands
	<input type="checkbox"/>	<input type="checkbox"/>	Document agency coordination, including the NEPA/404 integration process (include copies of correspondence)
	<input type="checkbox"/>	<input type="checkbox"/>	For Final ED, include under a separate subheading an “Only Practicable Finding”, which references E.O. 11990; explain why there are no practicable avoidance alternatives; discuss inclusion of all practicable measures to minimize harm; and include boilerplate language for conclusion
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss the Least Environmentally Damaging Practicable Alternative and rationale for its identification
	<input type="checkbox"/>	<input type="checkbox"/>	Plant Species
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Describe impacts related to special-status plant species (non-T&E species)
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss avoidance, minimization and/or mitigation measures
	<input type="checkbox"/>	<input type="checkbox"/>	Animal Species
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Identify special-status species (non-T&E species) and impacts to those species, including MMPA and coordination
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss avoidance, minimization and/or mitigation measures
	<input type="checkbox"/>	<input type="checkbox"/>	Threatened and Endangered Species
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Describe threatened and endangered species and critical habitat in project area
	<input type="checkbox"/>	<input type="checkbox"/>	Include current species list from USFWS and, as applicable, NMFS
	<input type="checkbox"/>	<input type="checkbox"/>	Summarize Section 7 consultation to date (include copies of correspondence, concurrence letters and biological opinion/Essential Fish Habitat) (Note: For Final ED, BO or equivalent must be issued prior to approval of ED.)
	<input type="checkbox"/>	<input type="checkbox"/>	Summarize incidental take permit under California Fish and Game Code
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss avoidance, minimization and/or mitigation measures
	<input type="checkbox"/>	<input type="checkbox"/>	Invasive Species
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Describe impacts related to invasive species in project area
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss avoidance, minimization and/or mitigation measures
	<input type="checkbox"/>	<input type="checkbox"/>	Relationship Between Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity (for EISs only)
	<input type="checkbox"/>	<input type="checkbox"/>	Irreversible and Irretrievable Commitment of Resources (for EISs only)
	<input type="checkbox"/>	<input type="checkbox"/>	Construction Impacts (Optional Placement)
	<input type="checkbox"/>	<input type="checkbox"/>	Cumulative Impacts (Optional Placement)
	<input type="checkbox"/>	<input type="checkbox"/>	Regulatory setting
	<input type="checkbox"/>	<input type="checkbox"/>	Identify resources to consider and the resource study area for each resource
	<input type="checkbox"/>	<input type="checkbox"/>	Describe current health and historical context of each resource
	<input type="checkbox"/>	<input type="checkbox"/>	Reference project-related direct and indirect impacts on each resource
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss other current and reasonably foreseeable future actions and their impacts for each resource
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss avoidance, minimization and/or mitigation for cumulative impacts within CT/FHWA control; consider recommending measures for actions by others
	<input type="checkbox"/>	<input type="checkbox"/>	California Environmental Quality Act (CEQA) Evaluation

Page No. in ED	Check if content is:		Major Required Content Per Annotated Outline
	Included	Not applicable	
	<input type="checkbox"/>	<input type="checkbox"/>	Include boilerplate on determining significance under CEQA
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss Significance of Impacts
	<input type="checkbox"/>	<input type="checkbox"/>	Include subheadings for and discussion of effects that are 1) less than significant, 2) significant, and 3) significant and unavoidable. Include a discussion of CEQA noise analysis under appropriate significance heading.
	<input type="checkbox"/>	<input type="checkbox"/>	Climate Change
	<input type="checkbox"/>	<input type="checkbox"/>	Include boilerplate language and applicable analysis
	<input type="checkbox"/>	<input type="checkbox"/>	Comments and Coordination
	<input type="checkbox"/>	<input type="checkbox"/>	Boilerplate introduction
	<input type="checkbox"/>	<input type="checkbox"/>	As applicable, discuss Section 6002 review process coordination, involvement and collaboration
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss the scoping process including notices and meetings
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss consultation and coordination with public agencies
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss public participation, including meetings, hearings, and workshops
	<input type="checkbox"/>	<input type="checkbox"/>	Include responses to substantive comments received on Draft ED and at public hearings
	<input type="checkbox"/>	<input type="checkbox"/>	For Major Projects (over \$500 M), Draft Project Management Plan submitted to FHWA (Note: must be submitted prior to approval of Final ED)
	<input type="checkbox"/>	<input type="checkbox"/>	List of Preparers
	<input type="checkbox"/>	<input type="checkbox"/>	Distribution List
	<input type="checkbox"/>	<input type="checkbox"/>	Appendix A: CEQA Checklist
	<input type="checkbox"/>	<input type="checkbox"/>	Appendix B: Section 4(f) Evaluation
	<input type="checkbox"/>	<input type="checkbox"/>	Include 23 U.S.C. 327 assignment language
	<input type="checkbox"/>	<input type="checkbox"/>	Introduction
	<input type="checkbox"/>	<input type="checkbox"/>	Describe proposed project and alternatives; cross-reference discussion in ED
	<input type="checkbox"/>	<input type="checkbox"/>	Describe Section 4(f) properties
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss impacts to 4(f) properties and nature of “use”
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss avoidance alternatives, including details on whether they are prudent and feasible
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss inclusion of all measures to minimize harm
	<input type="checkbox"/>	<input type="checkbox"/>	Document coordination with agencies with jurisdiction of 4(f) resources
	<input type="checkbox"/>	<input type="checkbox"/>	Include least harm analysis and appropriate boilerplate concluding statements
	<input type="checkbox"/>	<input type="checkbox"/>	Discuss other park, recreational facilities, wildlife refuges, and historic properties evaluated relative to Section 4(f)
	<input type="checkbox"/>	<input type="checkbox"/>	Include copies of correspondence with agencies with jurisdiction of 4(f) resources
	<input type="checkbox"/>	<input type="checkbox"/>	Appendix C: Title VI Policy Statement
	<input type="checkbox"/>	<input type="checkbox"/>	Appendix D: Summary of Relocation Benefits (if applicable)
	<input type="checkbox"/>	<input type="checkbox"/>	Appendix E: Glossary of Technical Terms (optional)
	<input type="checkbox"/>	<input type="checkbox"/>	Appendix F: Minimization and/or Mitigation Summary (Note: ECR must be prepared prior to approval of Final ED)
	<input type="checkbox"/>	<input type="checkbox"/>	Appendix G: List of Acronyms (optional)

Items not mandated for Draft ED but required for approval of Final ED.

CEQA requirement.

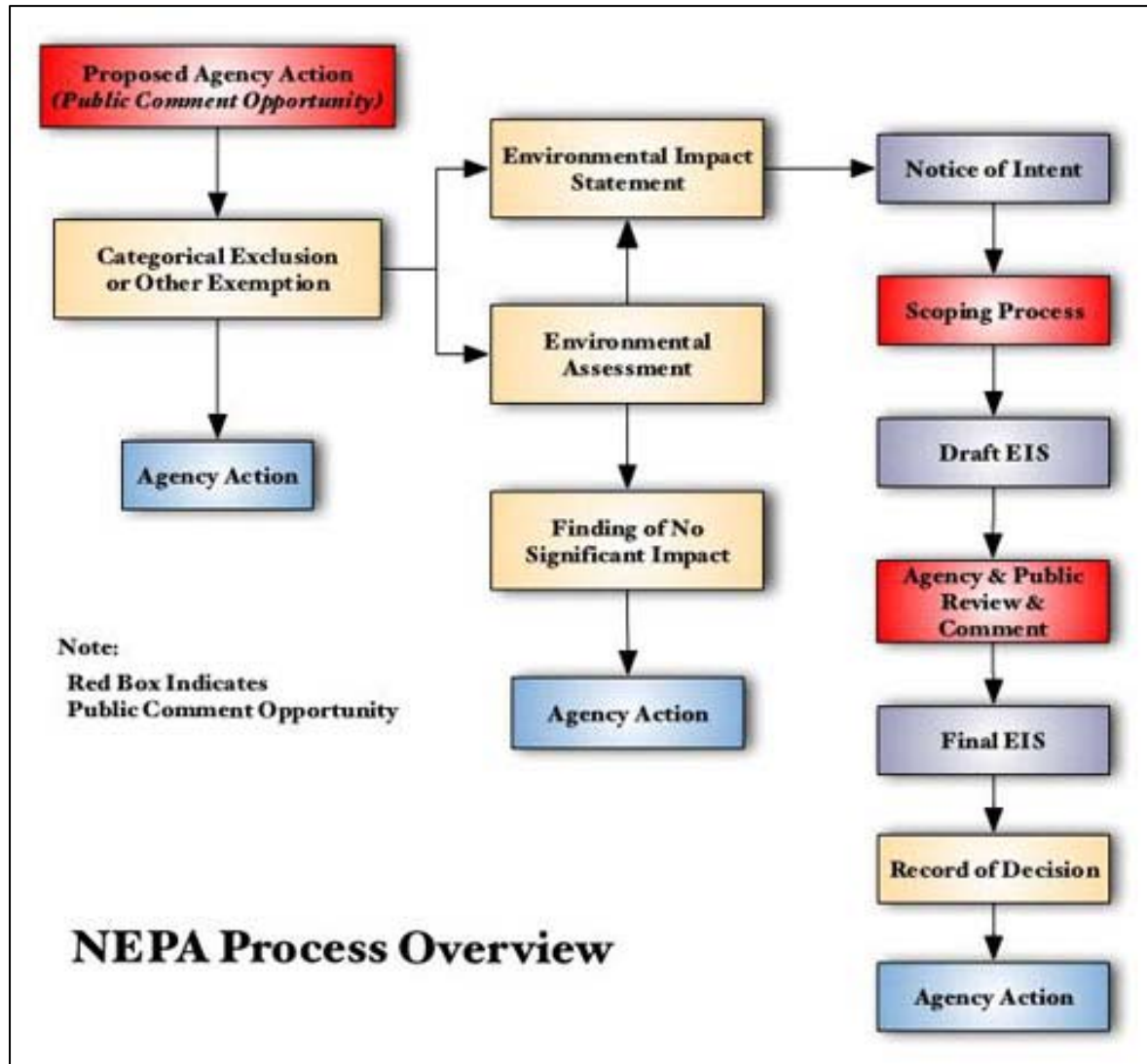
Prepared by:

Name

Signature

Date

Source : http://www.dot.ca.gov/ser/vol1/sec6/ch38nepa/ED_Checklist.doc



Source: http://www.delalbright.com/access/nepa_chart.htm

Section 4(f) Checklist

The attached section 4(f) checklist was developed by Dan Harris (FHWA, San Francisco). It includes the items he looks for when reviewing section 4(f) evaluations, and is based on 2 CFR 771.15, the FHWA Technical Advisory T 6640.8A, the FHWA Guidebook Section 24, and project experience.

Comments and suggestions regarding the checklist are encouraged; please send them to Dan Harris via the internet or FHWA email. The checklist has been in use for some time; however, it is a working document subject to change and improvement.

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May 1997

Draft Section 4(f) Evaluation

General

- Is the section 4(f) evaluation contained in a separate section, chapter, or appendix?
 - For EIS's, is the environmental document entitled Draft Environmental Impact Statement and Section 4(f) Evaluation@ on the EIS title page?
 - For EA's, is it entitled Draft Environmental Assessment and Section 4(f) Evaluation?
- Does the title page include the citation: Submitted Pursuant to 42 U.S.C. 42(2)(c) and 49 U.S.C. 0?
- Does the introduction to the section 4(f) evaluation include the following boiler plate description of section 4(f):

Section 4(f) of the Department of Transportation Act of 1966, codified in Federal law at 49 U.S.C. '0, declares that A[i]t is the policy of the United States Government that special effort should be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites.

Section 4(f) specifies that A[t]he Secretary [of Transportation] may approve a transportation program or project . . . requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or land of an historic site of national, State, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, area, refuge, or site) only if:

- (1) there is no prudent and feasible alternative to using that land; and
- (2) the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use.

Section 4(f) further requires consultation with the Department of the Interior and, as appropriate, the involved offices of the Departments of Agriculture and Housing and Urban Development in developing transportation projects and programs which use lands protected by section 4(f).

- Is a section 4(f) listed in the EIS index with correct page numbers?

Proposed Action

Are the proposed project and the project purpose and need briefly described with the corresponding EIS/EA text discussions properly referenced for additional information?

Description of Section 4(f) Property(ies)

Does the description of each section 4(f) resource which would be used by any alternative include all of the applicable information outlined in Attachment A?

Impacts on the Section 4(f) Property(ies)

- Does the impact evaluation discussion address the following impacts on each section 4(f) property for each alternative?
 - The amount of land to be used?
 - The facilities, functions, and/or activities affected?
 - Accessibility?
 - Visual?
 - Noise?
 - Vegetation?
 - Wildlife?
 - Air quality?
 - Water quality?
- If there is not an impact in one of the above areas, does the evaluation state such with adequate supportive information?
- Does the evaluation include an impact summary table when:
 - (1) more than one section 4(f) property is involved and
 - (2) such a table would be useful in comparing the various impacts of the alternatives?

Alternatives

- Does the section 4(f) evaluation of alternatives identify and summarize the alternatives addressed in the EIS/EA and include specific references to those discussions?

Detailed discussions of alternatives in an EIS/EA do not need to be repeated in the section 4(f) portion of the document if they are identified and summarized with specific references to the EIS/EA discussions of alternatives.
- Do both the section 4(f) evaluation and the EIS/EA discussion of alternatives include the same location alternatives?
- Are location alternatives and site-specific design variations which avoid section 4(f) property(ies) identified and evaluated?

- Does the section 4(f) evaluation of alternatives include at least one build alternative which avoids each and all section 4(f) resources or does it explain why there are not any such avoidance alternatives with adequate supportive information?

Measures to Minimize Harm

- Are all possible measures which are available to minimize the impacts to the section 4(f) property(ies) discussed?
Detailed discussions of mitigation measures in the EIS/EA may be referenced and appropriately summarized rather than repeated.
- If the section 4(f) property includes lands or facilities developed under section 6(f) of the Land and Water Conservation Fund Act, does the mitigation discussion address the section 6(f) requirements? See Attachment C.

Other Park, Recreational Facilities, Wildlife Refuges, and Historic Properties Evaluated Relative to the Requirements of Section 4(f)

- This section evaluates other park, recreational facilities, wildlife refuges, and historic sites in the project vicinity that do not involve a section 4(f) use.
- It needs to include the information outlined in Attachment B. This discussion is necessary to explain why some resources or facilities are not protected by provisions of section 4(f) and to document that any proximity impacts to section 4(f) resources do not result in a constructive use.

Coordination

- Does the summary discussion of preliminary coordination with the public official having jurisdiction over the section 4(f) resource address the following:
 - Avoidance alternatives,
 - Impacts to the property,
 - Measures to minimize harm, and
 - Where necessary, the significance and primary use of the property?
- If section 6(f) lands are involved, does the summary discussion include preliminary coordination with the National Park Service Region Office?

Final Section 4(f) Evaluation

- Is the information contained in the draft section 4(f) evaluation included in the final evaluation with appropriate revisions to reflect comments received on the draft document and any changed conditions, new information, or project refinements?
- Does the final evaluation provide the basis for concluding that there are no feasible and prudent alternatives to the use of section 4(f) land(s)?
 - The supporting information must demonstrate that there are unique problems or unusual factors involved in the use of alternatives that avoid these properties or that the cost, social, economic, and environmental impacts, or community disruption resulting from such alternatives reach extraordinary magnitudes 2 CFR '771.15(a)(2).*
- Does the final evaluation provide the basis for concluding that the preferred alternative includes all possible planning to minimize harm to the section 4(f) property(ies)?
- Does the final evaluation demonstrate that the preferred alternative is the feasible and prudent alternative with the least harm on the section 4(f) resources after considering mitigation?
- Does the ACoordination Section@ summarize the formal section 4(f) coordination with the Department of the Interior and, as appropriate, the involved offices of the Departments of Agriculture (usually the Forest Service) and Housing and Urban Development?
- Are copies of the section 4(f) comments included in the final evaluation, or if contained in the Draft EIS Comment and Response Section, are they accurately referenced?
- Have each of the section 4(f) comments received a full and adequate response?
 - Where new alternatives or modifications to existing alternatives are identified and will not be given further consideration, the basis for dismissing the alternatives/modifications needs to be provided and supported by factual information.*
- Where section 6(f) land is involved, is the National Park Service's position on the land transfer summarized in the text and documented with a copy of an NPS letter?
- Does the final section 4(f) evaluation conclude with the following statement?
 - Based upon the above considerations, there is no feasible and prudent alternative to the use of land from the [name(s) of the section 4(f) property(ies)] and the proposed action includes all possible planning to minimize harm to the [names(s) of the section 4(f) property(ies)] resulting from such use.*

EIS/EA's Without a Section 4(f) Use

All EIS's (and EA's only if appropriate) need to include a subsection/subchapter within the Environmental Consequences section/chapter entitled:

Park, Recreational Facilities, Wildlife Refuges, and Historic Properties
Evaluated Relative to the Requirements of Section 4(f)

that addresses the information outlined in Attachment B.

This discussion is necessary to explain why some resources or facilities are not protected by provisions of section 4(f) and to document that any proximity impacts to section 4(f) resources do not result in a constructive use.

Description of Section 4(f) Property(ies)

- A detailed map or drawing of sufficient scale to identify the relationship of the alternatives to the section 4(f) property.
 - Size of the section 4(f) property (hectares or square meters (with acres or square feet following parenthesis)).
 - Location of the section 4(f) property (maps or other exhibits such as photographs and/or sketches).
 - Ownership (e.g., private, city, county, State, Federal agency).
 - Type of section 4(f) property (e.g., park, recreation, historic).
 - Available activities or function of the property (e.g., ball playing, swimming, golfing).
 - Description and location of all existing and planned facilities (e.g., ball diamonds, tennis courts).
 - Type of access to the property (e.g., pedestrian, vehicular).
 - Usage of the section 4(f) resource (e.g., approximate number of users/visitors).
 - Relationship to other similarly used lands in the vicinity.
 - Applicable clauses affecting the ownership, such as lease, easement, covenants, restrictions, or conditions, including forfeiture.
 - Unusual characteristics of the section 4(f) property that either reduce or enhance the value of all or part of the property (e.g., flooding problems, terrain conditions, or other features).
 - If the section 4(f) property includes lands or facilities developed under section 6(f) of the Land and Water Conservation Fund Act, the description of the section 4(f) resource will need to indicate such. See Attachment C.
-

**Park, Recreational Facilities, Wildlife Refuges,
and Historic Properties
Evaluated Relative to the Requirements of Section 4(f)**

This section evaluates parks, recreational facilities, wildlife refuges, and historic sites in the project vicinity that do not involve a use of section 4(f) land. It describes each resource and then either:

- (1) explains why it is not protected by section 4(f), or
- (2) demonstrates that the proximity impacts do not rise to a level that substantially impairs the activities, features, or attributes that qualified the resource for protection under section 4(f).

All archaeological and historic sites within the section 106 area of potential effect (APE) and all public and private parks, recreational facilities, and wildlife refuges within approximately 0.8 km (one-half mile) of any of the project alternatives should be included. It is usually unlikely that such resources would be affected at greater distances; however, if there is an issue or question whether they would be affected, they should also be included.

Does the introduction to this discussion include:

a listing of the parks, recreational facilities, wildlife refuges, and historic properties being addressed in this section?

if a section 4(f) resource type (i.e., a park, recreational facility, wildlife refuge, or historic property) does not exist in the project vicinity, does the discussion state such?

the following statement, edited as appropriate for the types of resources involved:

The purpose of this discussion is to address section 4(f) requirements relative to other park, recreational facilities, wildlife refuges, and historical properties in the project vicinity. As indicated below, none of the alternatives under consideration result in a section 4(f) use of these other park, recreational, wildlife refuges, or historical resources. The discussion of each resource either documents (1) why the resource is not protected by the provisions of section 4(f) or (2) if it is protected by section 4(f), why none of the alternatives under consideration cause a section 4(f) use by (a) permanently incorporating land into the project, (b) by temporarily occupying land that is adverse to the preservationist purposes of section 4(f), or (c) by constructively using land from the resource.

Does the description of **each** resource include:

all of the applicable information outlined in Attachment A?

Documentation of whether it is or is not protected by the provisions of section 4(f)?

For each of the resources protected by section 4(f), does the impact evaluation:

address the following for **each** alternative:

the facilities, functions, and/or activities potentially affected?

accessibility?

visual?

noise?

vegetation?

wildlife?
air quality?
water quality?

conclude, based on the above discussion, whether any of the alternatives under consideration would cause a section 4(f) use?

If there is not an impact in one of the above areas, does the evaluation state such with adequate supportive information?

Concluding discussions of section 4(f) **must not use** phrases such as *A* therefore, section 4(f) does not apply. *@* Section 4(f) is applicable to all US Department of Transportation actions.

Rather, use:

Therefore, the provisions of section 4(f) are not triggered,
Therefore, the provisions of section 4(f) do not come into play,

or

The proposed project [*<preferred alternative= for final evaluations*] will not cause a constructive use of [*name of section 4(f) resource*] because the proximity impacts will not substantially impair the protected activities, features, or attributes of [*type of resource, e.g., park, historic site, future park*].

Section 6(f)

Section 6(f) of the Land and Water Conservation Fund Act directs the Department of the Interior (National Park Service) to assure that replacement lands of equal value, location, and usefulness are provided as conditions to their approval of the section 6(f) land conversion. Therefore, where a section 6(f) land conversion is proposed, replacement land will be necessary. Regardless of the mitigation proposed, the draft and final section 4(f) evaluations need to document the National Park Service's position on the section 6(f) land transfer.

Environmental Review Process Checklist

This checklist has been developed as a tool for use by the FHWA Division Offices and State DOTs to assist them in assuring that the essential aspects of the SAFETEA-LU environmental review process have been completed.

Checklist

	YES	NO
(1) FHWA has received project initiation letter from State prior to start of NEPA.	<input type="checkbox"/>	<input type="checkbox"/>
(2) Copy of Project Initiation Letter has been placed in official project file.	<input type="checkbox"/>	<input type="checkbox"/>
(3) Participating agencies and cooperating agencies have been identified. (3a) Notification letters on Participating and Cooperating agency status have been sent to identified agencies and placed in official project file.	<input type="checkbox"/>	<input type="checkbox"/>
(4) Lead/Joint lead agency status has been determined and documented.	<input type="checkbox"/>	<input type="checkbox"/>
(5) Coordination plan has been developed with consultation of participating agencies and placed in official project file.	<input type="checkbox"/>	<input type="checkbox"/>
(6) Schedule for the environmental review process has been developed through consultation with participating agencies and placed in official project file.	<input type="checkbox"/>	<input type="checkbox"/>
(7) Opportunity for involvement of participating agencies and the public on purpose and need has occurred and details of involvement documented in official project file.	<input type="checkbox"/>	<input type="checkbox"/>
(8) Opportunity for involvement of participating agencies and the public for range of alternatives has occurred and details of involvement documented in official project file.	<input type="checkbox"/>	<input type="checkbox"/>
(9) Appropriate methodology to be used and level of detail required in analysis has been determined in collaboration with participating agencies and documented in official project file.	<input type="checkbox"/>	<input type="checkbox"/>
(10) Optional -		
• Has a Higher Level of detail for the preferred alternative been developed?	<input type="checkbox"/>	<input type="checkbox"/>
• Was SOL notice published in FR? Has a copy been placed in the official project file?	<input type="checkbox"/>	<input type="checkbox"/>
• (a) Has there been consultation with FHWA legal staff? Has consultation been documented in official project file?	<input type="checkbox"/>	<input type="checkbox"/>
• (b) Has a copy of the notice been included in the project file?	<input type="checkbox"/>	<input type="checkbox"/>

Source: http://www.environment.fhwa.dot.gov/strmlng/sec602_checklist.asp

**Frequently Asked Questions Regarding Environmental Studies
(This sheet can accompany the Invasive Property Owners letters.)**

1. Why is this environmental analysis being conducted?
Answer: This project is currently a planning study. Planning studies require field assessments to properly identify the environmental features on properties within the project study area. SHA is examining several alternates within the study area and there is no selected alternate at this time.

2. How soon will construction of the project begin?
Answer: This project is funded only for the project planning phase. Once the project planning phase is complete, the project would be a candidate for the funding of future phases including engineering design, right-of-way, and construction.

3. Do I need to be at home when someone needs to enter my property?
Answer: No. However, if you have any special concerns or items you want to coordinate with us (i.e. dogs/pets, known underground utilities, etc.), please contact us at the telephone number indicated in the letter.

4. Will anyone need to enter my home or other structures on my property?
Answer: No.

5. During what time frame will the field assessments be done?
Answer: Representatives may appear for up to one year from the date indicated in the letter. Prior to beginning their assessments, the representatives will knock on the door of any occupied structures on a property.

6. How will I be able to identify the persons completing the field assessments?
Answer: AGENCY personnel are required to carry official photo identification. Often, consultants to AGENCY carry out the assessments. If there is ever any concern about the identification of a representative, please call AGENCY at the telephone number indicated in the letter.

7. How long will the environmental assessment on my property take and what will be done?
Answer: Air and noise analyses take approximately 24 hours and require only the temporary placement of a noise meter on the property. The evaluation of potential historic structures may usually be accomplished in one day. This evaluation may require photographs of structures. Archeological investigations may require digging a one square foot test pit. All soil will be returned to its proper place. Initial site assessments of potential hazardous material simply require photographs. Wetland identification is usually accomplished in two separate visits. The first visit would be conducted by a consultant representing AGENCY who may place markers. The second wetland identification visit would include a small group (5-10 people) representing AGENCY and various environmental regulatory agencies. Each visit may require the use of a hand-held auger to sample soil as far as five feet beneath the surface. All soil will be properly returned.

8. Does the letter mean that someone will definitely be entering my property?
Answer: No. Letters were sent to everyone in the immediate area of the proposed alternates. It is possible that no one will enter your property.

Samples of Letters to Agencies

Date
Name
State Historic Preservation Officer
Historical Trust
Address

Subject: Project name and location

Dear _____,

The (Agency) is proposing to (Insert project name and location) (see Attachment). The (Insert description of the current conditions of the site or project, this letter is going to the Historical Trust, they will require details for example: existing bridge has an approximately 66-foot width with a 55-foot wide clear roadway. There is a 4'-6" wide sidewalk on each side of the bridge. Concrete parapets with a single strand metal railing are also on each side of the bridge. The bridge has two simply supported spans (48'-0"±, 48'-0"±) composed of (Grade 36) rolled steel beams with a non-composite reinforced concrete deck. The superstructure has a 30 degree skew and is supported on one reinforced concrete pier and reinforced concrete abutments. The substructure is supported on steel H piles. The bridge was originally constructed in 1954 and in 1967 the bridge was widened approximately 34 feet on the west side of the existing bridge. The original design was for an HS-20 live load capacity and the bridge is currently load posted with silhouette signs for 15 tons, 19 tons, and 34 tons for the H15, MD Type 3, and MD Type 3S2 vehicles, respectively.)

The proposed project will (insert DETAILED description of the new project)

A few historic sites are located in the vicinity of the proposed project area (see Attachment- show plans or map with locations of the historic properties in relation to the project site). (List the historic sites in the vicinity if any and if you have a NHRP number associated with it, please list). (If your project area has been previously looked at, name who looked at it and what the findings are and if they were published or not). Given the scale of the proposed project and the distance of the project from historic resources, (either no effects upon historic resources including historic structures and archeological sites are anticipated or you will be impacting). (If not impacting)The project will involve minimal ground disturbance and will not visually intrude on the surrounding environment, setting or landscape. (If impacting- list the types of impacts to each property and include plan sheets as well as the location map).

Your concurrence in the determination of no impact upon historic properties or resources is respectfully requested. (Or if there is an impacts ask for input on the properties/resources and possible mitigation measures.)

Thank you for your time and consideration. I look forward to hearing from you in the near future.

Sample of Letter to the Department of Natural Resources

This same letter can be used for (a) anadromous finfish and (b) threatened or endangered species with a different closing paragraph. The letters must be sent separately to the appropriate divisions as indicated with the (a) and (b).

Date

Name

Department of Natural Resources

(a) Environmental Review Unit

(b) Wildlife and Heritage Division

Address

Subject: Project Name

Dear,

The (AGENCY) is proposing to (list project and location)(see Attachment-location site map).

The proposed project (insert detailed description of what the proposed project will entail)

(a) We request any information concerning the presence of anadromous finfish or other fish that may occur in the construction areas. Thank you for your time and consideration. I look forward to hearing from you in the near future.

(b) We request any information concerning threatened or endangered species and unique habitat that may occur in the construction areas. Thank you for your time and consideration. I look forward to hearing from you in the near future.

Sincerely,

California Department of Transportation has a template for a Coordination Plan. The direct link is http://www2.dot.ca.gov/hq/env/emo/files/6002_coordination_plan_template.doc to fill it in online with directions. Below is the template.

Coordination Plan Template

Section 1. Lead/Cooperating/Participating Agencies

1.1 List of Agencies, Roles, and Responsibilities

List all the agencies involved in the SAFETEA-LU Section 6002 process for the project and their associated roles and responsibilities.

Agency Name	Role	Responsibilities
Federal Highway Administration	Lead Agency	Manage 6002 process; prepare EIS; provide opportunity for public & participating/cooperating agency involvement
Caltrans	Co-lead Agency	Manage 6002 process; prepare EIS; provide opportunity for public & participating/cooperating agency involvement
Army Corps of Engineers	Cooperating Agency Participating Agency	Section 404 permit jurisdiction Provide comments on purpose and need & range of alternatives

1.2 Agency Contact Information

Specify contact information for each agency.

Agency	Contact Person/Title	Phone	E-mail
Federal Highway Administration	Fred E. Role S. California Team Leader	(916) 555-1212	fredrole@fhwa.dot.gov
Caltrans	Cal T. Rans Environmental Br. Chief	(916) 555-2121	Cal.rans@dot.ca.gov

Section 2. Coordination Points and Responsibilities

2.1 Coordination Points, Information Requirements and Responsibilities

List key coordination points, including which agency is responsible for activities during that coordination point. Specify the information required at each coordination point and who is responsible for transmitting that information.

Coordination Point	Information “In”	Agency Responsible	Information “Out”	Agency Responsible
Notice of Intent to Adopt	Send participating agencies a copy of the NOI; publish notice in newspaper; invite agencies and public to public scoping meeting	FHWA Caltrans	Comments on NOI	ACOE USFWS
Purpose and Need	Provide participating agencies and public with draft purpose and need statement via letters; solicit comments; hold scoping meeting	FHWA Caltrans	Comments on Purpose and Need	
Range of Alternatives	Provide participating agencies and public with information regarding alternatives being considered via letters; solicit comments; hold scoping meeting	FHWA Caltrans		
Collaboration on impact assessment methodologies				
Socioeconomic and environmental impacts	Identification of resources located within project area & general location of alternatives	FHWA Caltrans	Identification of any issues that could substantially delay permit approval	ACOE USFWS
Circulation of DEIS				
I.D. Preferred Alternative				
Circulation of FEIS				
Issue ROD				
Issue Section 404 Permit				

Section 3. Project Schedule

Schedule should include key milestones and decision-making deadlines for each agency approval. You can use the following table format or develop a Gantt chart.

Coordination Point	Anticipated Date of Information "In"	Agency Responsible	Anticipated Date of Information "Out"	Agency Responsible
Notice of Intent to Adopt	January 2006	FHWA Caltrans	February 2006 (30 days after transmittal)	ACOE USFWS
Purpose and Need		FHWA Caltrans		
Range of Alternatives		FHWA Caltrans		
Collaboration on impact assessment methodologies				
Socioeconomic and environmental impacts		FHWA Caltrans		ACOE USFWS
Circulation of DEIS				
I.D. Preferred Alternative				
Circulation of FEIS				
Issue ROD				
Issue Section 404 Permit				

Section 4. Revision History

Identify changes to the Coordination Plan. Note: If a schedule was included in the original coordination plan and it is the item that requires modification, concurrence on the schedule change is required only if the schedule is being shortened and then only from cooperating agencies, not all participating agencies.

Version	Date	Name	Description

Section 5. Other Information (Use only as needed)

Public Involvement Plan

A number of items can be included in the PIP some of which are as follows along with some tips for the actual meeting or mailings:

- Project initiation advertisements in local newspapers- make sure the minority newspapers are contacted as well
- A bulk mailing to the project study area residences and businesses that include invasive and non-invasive property owners- to determine the study area develop a list of project stakeholders (residents, business owners, advocacy groups, environmental justice populations, churches, public institutions, elected officials, etc.
- Alternates Public Meeting and/or Workshop
- Public Hearing
- Informational Meetings- optional meetings mainly needed if there has been an elapse in time since the team has last met with them before the Alternates Public Meeting/Workshop
- Focus Group Meetings- not all projects will have a focus group. Coordinate early if it is decided that one will be needed in order to establish membership. A suggested number of focus group meetings is between 6-12 to discuss strategies, alternates under consideration and the impacts, as well as the alternate that has been chosen and the mitigation associated with it.
- Correspondence and/or meetings with Environmental Justice communities (minority and low income)
- Correspondence and/or meetings with Section 106 consulting parties (historic)
- Informal meetings with the communities to establish community profiles
- Informal meetings with communities or individuals
- Developer meetings
- Written responses to correspondence and telephone requests for information

Materials that may be needed at the public meetings include:

- Display maps
- Visual materials
- Project fact sheets
- Models and graphic renderings
- Potential impacts to right of way, subdivisions, and other properties

Source: Maryland State Highway Administration's Project Planning Manual

Informing and Involving Elected Officials

SAMPLE LETTER #1
Elected Official & Agency Invitation

Date

Re:

To:

Arrangements have been made for a meeting to be held on date , at time , in room , building , at address . The purpose of this meeting is to discuss (*insert meeting purpose and project description including the limits.*) This meeting is being held prior to formal initiation of studies. Legislators, supervisors, councilmen, and representatives of interested local, State and Federal agencies and civic groups are being invited to attend.

Within 30 days following the meeting, it is requested that you furnish comments or concurrence as to (1) study objectives, (2) organization, (3) the time schedule for the study, (4) the study limits, and (5) whether or not an advisory committee is to be used during the study, as well as any other comments that you may wish to make. It is also requested at this time that you furnish any information on the location of historic properties that may be in the project vicinity and potentially affected by the proposal.

We cordially invite you to attend and participate in this meeting. It is hoped that the early involvement of all interested parties will enhance the effectiveness of cooperative planning. Individuals who need auxiliary aids for communication in order to participate in the meeting are invited to make their needs and preferences known to the Project Manager for this proposed project at (phone number) or TDD phone number (TDD phone number).

Sincerely,

Possible site locations for public hearings, workshops, and other meetings- keep the size of the meeting in mind when choosing a location.

- Community Centers
- Schools
- Church halls
- Senior Centers
- Recreation Centers
- Library
- State and local government facilities
 - Universities
 - agency training rooms
 - agency conference rooms
 - Government office building

When holding a field visit, preferably have an indoor meeting prior to the field visit. If you must meet outside consider a park and ride within close proximity of the site or look for a place that everyone can gather safely and hear what the project team has to say regarding the project.

Involvement Customers (Stakeholders, Community, and Business Owners)

Public Workshop Meeting Notice Sample Letter

The (Insert Agency Name) invites interested persons to attend an Informational Public Workshop regarding the (Insert project name) Project Planning Study. The project involves studying (insert description of project including boundaries)

WHAT: The Informational Workshop will acquaint the public with the progress of the study to date and present the (Insert stage of project that the workshop is being held for). Display areas will be set up explaining (insert the description of displays, for example-the Purpose and Need for the project, alternatives, typical sections, potential environmental impacts, and related projects). Project representatives will be available to discuss the project issues, answer questions, and record your comments. No formal presentation will be given. Feel free to arrive at any time and walk through at your own pace.

WHEN: Insert Date and Time

WHERE: Insert Site Location
Address of site location

CONTACT: (Insert Project Manager's Name), Project Manager
Insert Project Manager's email address
Phone Number or toll-free Number
(Insert local relay for blind or hearing impaired information here- name and phone number)

Anyone needing special assistance to participate, please contact the Project Manager by (Insert date two weeks before the meeting)

Please mark your calendars and plan to attend!
Source: Maryland State Highway Administration

Sample Newsletter

(Insert Project Name)

INFORMATIONAL NEWSLETTER – Insert Date

This is the newsletter for the (Insert project name) Project Planning Study sponsored by the (Insert Agency) and the Federal Highway Administration (FHWA). The purpose of this newsletter is to update/introduce to you the project, provide information on the project's purpose, issues and concerns regarding the project's delay, and upcoming events as we move towards completion of (Insert Agency) project planning process.

I. PUBLIC MEETING – (Date)

- An informal public workshop has been scheduled for *(date)*. The workshop will provide displays and handouts outlining the study, including preliminary alternatives, requirements of the National Environmental Policy Act (NEPA) process, key issues, etc. Representatives of the project study team will be on hand to discuss the project, update the status of the project and address your issues and concerns. Please mark your calendars to attend!

WHEN: *(DATE)*
 (Time)

WHERE: *(LOCATION)*
 Address of location

II. ABOUT THE STUDY

(Insert facts about the study- an example is below from a MD State Highway Administration planning project)

- The project is included in the Maryland Consolidated Transportation Program and is funded only for Project Planning phase.
- Both US Route 1 and MD Route 201 experience significant traffic congestion during morning, mid-day and evening travel periods. The goal of this project is to relieve traffic congestion, support planned economic development, improve vehicular, transit, bicycle and pedestrian safety.
- Numerous socio-economic, cultural and natural environmental resources constraints have been identified within the study area by the project study team. Issues identified include stream crossings, floodplains, wetlands, forested areas, rare and endangered species, parklands, historic structures, archeological resources, hazardous waste, land use, public services, and community facilities.
- The area can be considered multi-modal, with services provided by MTA, WMATA and MARC Train.

III. BACKGROUND INFORMATION

- For over a decade, the State Highway Administration has received complaints of growing congestion on US 1 and MD 201. The project has been placed on hold twice, most recently as October of 2002, due to issues regarding other related projects.
- Initial studies analyzed widening along US 1, as well as extending MD 201 over the railroad and US 1 through Ammendale Business Park. These studies identified a number of environmental issues and community concerns.
- The Alternative Public Meeting was held on September 20, 1994.

- The project team has updated the projected traffic volume data through the year 2035, determined the Level of Service (LOS) for all intersections along the US 1, incorporated traffic data from area projects such as the Intercounty Connector (ICC), I-95 Contee Road

IV. CURRENT ACTIVITIES

- The project study team has established several highway conceptual improvements to address the transportation needs of the corridor. The alternatives selected for detailed study include:
 - *Alternative 1 - No-build*
 - *Alternative 2 – TSM/TDM (Options #1, 2)*
 - *Alternative 3 – Widening US 1 to Six Lanes*
 - *Alternative 4 – MD 201/Virginia Manor Road Extension (Options # 1, 2, 3, 4)*
 - *Alternative 6 Modified – “Ladder Alternative” (Option #1 - 6 Lane US 1, Option #2 – 6 Lane US 1, Option #3 – 4 Lane US 1, Option #4 – 4 Lane US 1)*
 - *Alternative 7 Modified – “Combination Alternative” (Options #1, 2, 3, 4)*

V. PROJECT SCHEDULE

- Public Hearing –
- Signed Final Environmental Impact Statement –
- Record of Decision –

VI. CONTACTS

For more information or to be placed on the project mailing list, please contact:

(Insert Project Manager's Name), Project Manager
Agency
Agency Address
Project Manager's Phone Number
Email:

In addition, an overview of this project and other (Agency) projects, including upcoming activities can be found on the (Agency's) website at (project or agency web address)

Sample Fact Sheet Template for the Chosen Alternate

(Insert Project Name) PUBLIC INFORMATION MEETING
Date – Time Frame
Location

- (1) A combined location/design insert type of meeting was held for the project on date at location to insert purpose of meeting
- (2) Insert the level of environmental documentation

FHWA has determined that the selected alternate was insert Alternate that was chosen. This was signed by FHWA on date.

(Insert Chosen Alternate Number) Right-of-Way Requirements:

- # of Displacements (total take)

Right of Way required in acres:

- # of acres – Residential
- # of acres – Commercial
- # of acres – Wetlands
- # of acres – Parkland

Stream Crossing: (Insert name of stream and type of crossing box culvert, bridge, etc.)

- (3) (Insert if any type of engineering study, such as value engineering, where it was performed and the dates)

List the results of the study

- (4) List any other public involvement type meetings that were held, the location and the dates include the purpose of the meeting and anything resulting from the meeting.

- (5)

Project Schedule:

Advertisement -

Project Completion -

NOISE: If a noise study was performed and results

Sample Public Notice for a Joint Location/Design Public Hearing

PUBLIC NOTICE

*INSERT AGENCY
AND
INSERT APPROPRIATE REGULATORY AGENCY IF APPLICABLE*

WILL CONDUCT A
JOINT LOCATION/DESIGN PUBLIC HEARING

for the

INSERT PROJECT NAME

LIMITS OF PROJECT
IN
NAME OF COUNTY/TOWNSHIP/ETC.

on

DATE

TIME- Maps/Displays Available

TIME- Presentation/Testimony

at the

LOCATION
ADDRESS OF LOCATION

The purpose of the INSERT PROJECT NAME is to DESCRIBE THE PURPOSE OF THE PROJECT

Insert Project Limits Location Map

Name of Agency, in coordination with the Federal Highway Administration (FHWA), is conducting a *name the type of project; include the project limits and brief description of the project.*

The purpose of this Location/Design Public Hearing is to afford all interested persons the opportunity to present their views regarding the proposed location and general design of the project, including associated social, economic, cultural, and natural environmental effects for both the build and no-build alternatives. Forms for written comment will be available at the meeting.

Beginning at *time of meeting*, mapping depicting the project alternatives will be available for public viewing (*or list displays and information that will be presented at the meeting/hearing*). Representatives of *list agencies that will be present* will be available to record your comments and discuss points of interest with you.

A formal presentation beginning at *insert time*. and lasting approximately (*insert approximate time of presentation*) *Include details of what the presentation will cover.* This presentation will be followed by the receipt of public testimony.

Individuals and representatives of organizations who desire to be heard or want to be placed on the project planning mailing list may submit a request to *list appropriate contact(s), address, phone number, and email address*.

Written statements and other exhibits in lieu of, or in addition to, an oral presentation at the Public Hearing may also be submitted to *contact name* until **insert date give enough time to include them in the transcript** in order to be included in the Public Hearing Transcript. If you received a copy of this notice in the mail, you are currently enrolled on the project mailing list. Those persons enrolled will be kept informed of the project development and the opportunity for public involvement as the study progresses.

Requests to be placed on the speakers' list for this Public Hearing should be received no later than **(insert a date approximately 10 days before the meeting)** Elected officials will be given the opportunity to speak before those on the speakers' list. After the elected officials, the speakers will be called in the order in which their requests were received. Attendees at the Public Hearing who desire to speak may do so after those on the previously established list. If a large number of speakers enroll, a limitation of the time allotted to each speaker may be necessary. Brochures and forms for written comments will be available at this Public Hearing.

Beginning on **insert date approximately 30 days before the public meeting**, the Draft Environmental Assessment/Section 4(f) Evaluation (EA/4f) describing the study will be available for inspection and copying at the following locations during normal business hours:

Insert name of locations that the document will be available for viewing.

Address and phone number of the location

(If your project has the presence of wetlands or other source of water below is possible language to use) Agency has identified Waters of the United States, including jurisdictional wetlands, which are regulated by Section 404 of the Clean Water Act. This Public Hearing provides the opportunity to present views, opinions and information which will be considered by the Corps in evaluating a Department of the Army permit. All comments received will become part of the formal project record. Copies of any written statements expressing concern for aquatic resources may be submitted to *insert local Army Corp of Engineers contact information and date that they will be receiving comments until*.

The EA/4f serves as an application for a Corps permit pursuant to Section 404 of the Clean Water Act (33 USC 1344). Coordination with the *local* Department of the Environment also ensures that the document satisfies the alternatives analysis requirements of the State's wetland permit review. Application for the State permit will be made subsequent to the alternative selection process.

The decision to issue the Section 404 Permit will be based on an evaluation of the probable impacts including the direct, secondary and cumulative impacts of the proposed project on the public interest. This decision will reflect the national concern for the protection and utilization of important resources. The benefits which may reasonably be expected to accrue from the proposed project must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposed project will be considered, including the cumulative effects. Among these factors are conservation, economics, aesthetics, general environmental concerns, wetlands, cultural values, fish and wildlife values, flood hazards, floodplain values, land use, navigational concerns, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production and, in general, the needs and welfare of the people.

The Corps is soliciting comments from the public; federal, state and local agencies and officials; Native American Tribes, and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any

comments received will be considered by the Corps to determine whether to issue, modify, condition or deny a permit for this proposal. To make this decision, Public Hearing comments regarding the assessment of impacts to endangered species, historic properties, water quality, general environmental effects and other public interest factors listed above are taken into account.

The project is required to obtain water quality certification from the *local Department of the Environment (DE)* in accordance with Section 401 of the Clean Water Act. Water quality certification is requested from the DE by way of this public notice. Any written comments concerning the work described above which relate to water quality certification should be sent to *Local contact* for the Department of the Environment, Wetlands and Waterways Program, *Address*. The Section 401 certifying agency has a statutory limit of one year to make its decision.

The applicant must obtain any state or local government permits which may be required.

The evaluation of the impact of the work described above on the public interest will include an application of the guidelines promulgated by the Administrator, US Environmental Protection Agency, under authority of Section 404 of the Clean Water Act.

The preliminary review of this application indicates that the proposed work will have no effect on federally listed species or their critical habitat pursuant to Section 7 of the Endangered Species Act, as amended. As the evaluation of this application continues, additional information may become available which could modify this preliminary determination.

Describe any historic property impacts

HEARING-IMPAIRED/NON-ENGLISH-SPEAKING PERSONS:

If anyone who is hearing impaired desires to attend this meeting, please notify *Project contact* at the above address in writing or teletype to *phone number* (Statewide toll free). Non-English-speaking persons who wish to attend should notify the same address or call *insert appropriate phone number* or toll free at *insert phone number*. All requests for an oral, sign-language or non-English-language interpreter must be received by **enter date ten days prior to the meeting/hearing**. To the extent that this is feasible and possible, an interpreter will be provided.

Sample of a Project Re-Initiation Public Notice

PUBLIC NOTICE
(INSERT AGENCY NAME)
HAS RE-INITIATED
PROJECT PLANNING
FOR THE
(INSERT PROJECT NAME)
(Insert project limits)
Insert project location (city, county, township, etc)

Insert a project location map clearly defining the project limits.

This study will develop and evaluate possible improvements to the *Insert project name, limits and location*. The project planning phase includes agency and public involvement, the review of all reasonable alternatives, including the No-Build Alternative, and an evaluation of social, economic and natural environmental impacts. It concludes with the receipt of location and design approvals if a build alternative is selected.

As a part of the public involvement activities, and consistent with Section 106 of the National Historic Preservation Act, comments are invited regarding historic properties in the project area, including standing structures and archeological resources.

Citizen involvement in the planning process is encouraged. Written comments and requests to be included on the project planning mailing list may be submitted by mail to *Insert Project Manager's Name*, Project Manager, *Insert Address*, or by calling *Phone Number* or toll-free at *Phone Number*, or by email at *Insert email address*. Those persons on the project planning mailing list will be kept informed of project developments and the opportunity for public involvement as the study progresses. Additional information on the project is provided on the *Agency* website at *Insert Agency or project website*.





US 1/MD 201 Project Planning Study



MARYLAND
201

PROJECT NEWSLETTER • SPRING 2008

SHA Revises Potential Alternatives, Schedules Public Workshop

SHA invites you to attend an Informational Workshop for the US 1/MD 201 Project Planning Study on May 15, 2008, at Beltsville Elementary School. Since the study was reinitiated in 2006, a review of the alternatives previously developed has been conducted. This review incorporates new traffic studies, area development plans, and an updated environmental inventory including past and present concerns of the environmental agencies. The results of that review and the refined alternatives will be presented at the Informational Workshop in an open-house forum at which attendees can conduct a self-paced review of project information and meet with SHA representatives. There will be no formal presentation.

Project Background

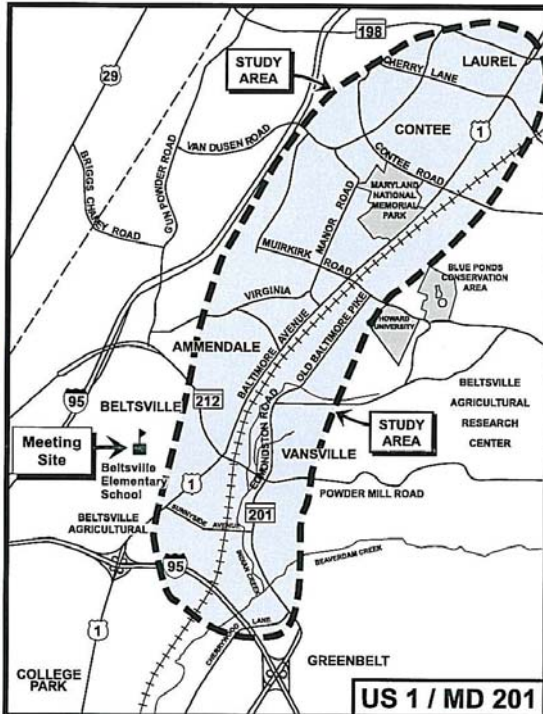
The US 1/MD 201 Project Planning Study, initiated in the early 1990s, will evaluate the feasibility of relieving congestion, improving safety, and enhancing mobility along the US 1 and MD 201 corridors, while preserving and enhancing the unique community and environmental characteristics of the study area. Preliminary alternatives were developed and presented at the first Alternates Public Workshop in 1994. As a result of issues that arose about logical termini and the need for further assessment of potential impacts, the project was placed on hold.

The study was reactivated in 1999, with MD 198 as the northern terminus. The refined alternatives were presented at a second Alternates Public Workshop held in 2000, where members of the community raised concerns about roadway widening and increased traffic.

When the project was reinitiated in January 2006, the project team was charged with reducing the number of preliminary alternatives/options and making them easier to understand. Following the May 2008 Informational Workshop, the State Highway Administration (SHA) will begin preparation of the Draft Environmental Impact Statement (DEIS).

Changes to the Project Planning Study

As a result of coordination efforts between SHA and the environmental agencies, alternatives for US 1/MD 201 have been simplified and reduced in number. Several alternatives and/or options involving major project area impacts have been eliminated, and others have been combined. Seven alternatives, including the No-Build Alternative, have been carried forward for detailed study. Maps and descriptions of these alternatives are provided in this newsletter.



Attend the Public Workshop!

WHAT: Informational Workshop
for US 1/MD 201 Project Planning Study

WHEN: Thursday, May 15, 2008
5:30 PM to 8:30 PM

WHERE: Beltsville Elementary School
(Gymnasium)
4300 Wicomico Avenue
Beltsville MD 20705

Alternatives Retained for Detailed Study

Alternative 1: No-Build

No major improvements are proposed under Alternative 1, the No-Build Alternative. Minor short-term improvements would occur as part of routine maintenance and safety operations. The No-Build Alternative does not address future traffic concerns or the purpose and need for the project. It serves as a baseline for comparing the impacts and benefits associated with the Build alternatives.

Alternative 2: Transportation System Management (TSM) Improvements

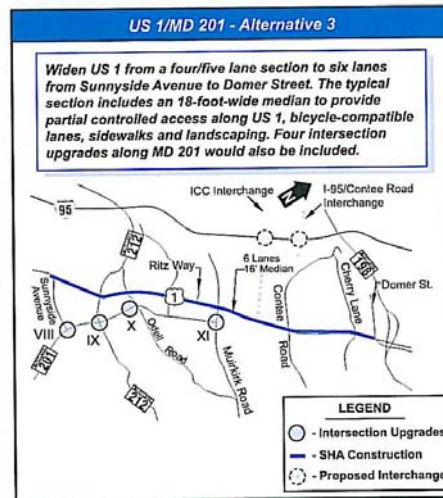
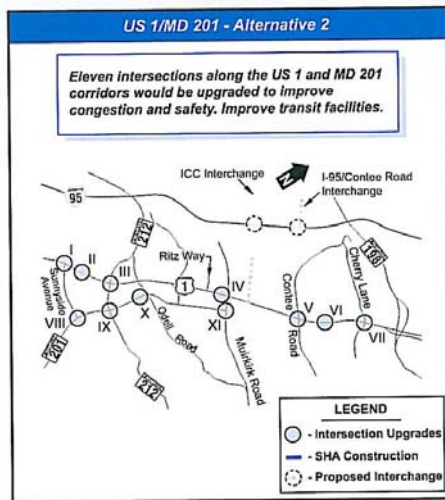
TSM improvements typically include additional turn lanes, traffic signals and/or changes in signal phasing, and intersection improvements not specifically listed as part of the other Build alternatives. Intersections considered for improvement along US 1 include Sunnyside Avenue, Rhode Island Avenue, MD 212 (Powder Mill Road), Muirkirk Meadows, Contee Road, Cypress Street, and Cherry Lane. Along MD 201 and Old Baltimore Pike, improvements would be made to intersections at Sunnyside Avenue, Powder Mill Road, Old Baltimore Pike, and Muirkirk Road. Other potential improvements to US 1 include adding a median and bicycle-compatible lanes where feasible, while maintaining existing roadway sections where increased width would cause significant impacts to adjacent businesses. The TSM alternative could be included in any of the other Build alternatives where appropriate.

Alternative 3: US 1 Widening

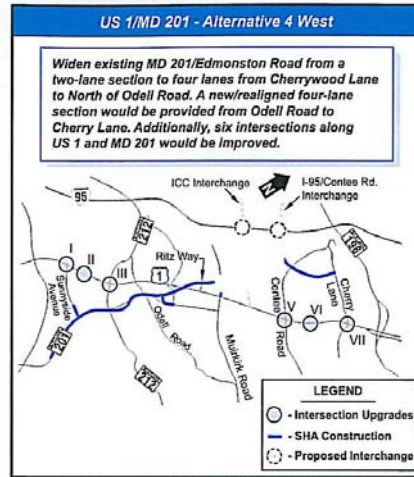
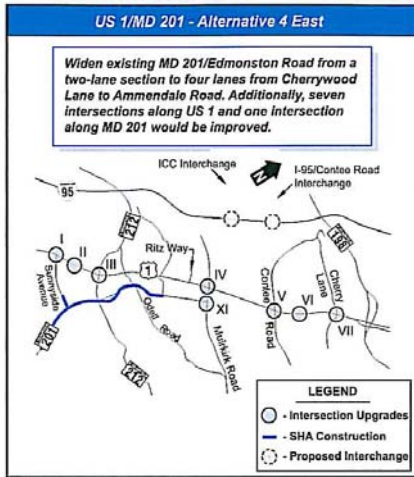
Alternative 3 would widen US 1 to six lanes from Sunnyside Avenue north to Domer Street, with an 18-foot-wide median and turn lanes at intersections. An outside lane would be widened to accommodate bicyclists, and sidewalks and landscaping would be included. This alternative also includes a western shift of the US 1 roadway to accommodate a potential third set of tracks along the CSX Railroad. Intersection improvements along MD 201 and Old Baltimore Pike at Sunnyside Avenue, Powder Mill Road, Edmonston Avenue, and Muirkirk Road would be incorporated into Alternative 3.

Alternative 4 East: MD 201

Alternative 4 East would widen/relocate MD 201 from Cherrywood Lane to north of Odell Road, then follow Old Baltimore Pike to Muirkirk Road. Widening of MD 201 begins at Ivy Lane, continues along existing MD 201 to Powder Mill Road, and curves east on new alignment just north of Powder Mill Road onto Beltsville Agricultural Research Center (BARC) property behind the community of Vansville. There it turns west, crossing MD 201 and Old Baltimore Pike, then runs parallel to MD 201 before merging into and continuing along Old Baltimore Pike to Muirkirk Road. The typical section for this widening/relocation includes four lanes with sidewalks, landscaping, a median, and a 16-foot-wide bicycle-compatible outside lane along MD 201 and Old Baltimore Pike.



Alternatives Retained for Detailed Study - Continued



Alternative 4 West: MD 201

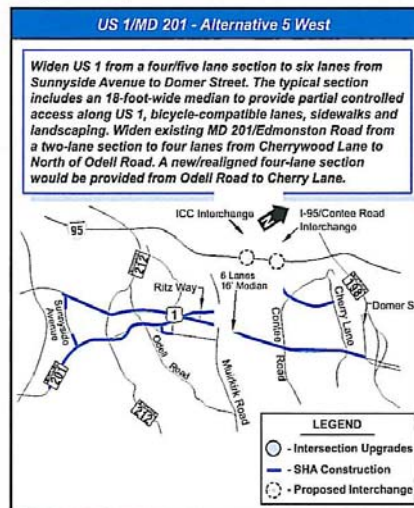
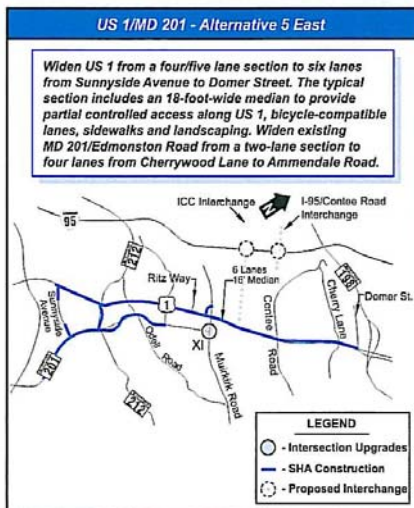
This alternative is the same as Alternative 4 East from Cherrywood Lane to north of Odell Road. From Odell Road, Alternative 4 West extends north, running parallel and east of Indian Creek on structure crossing over US 1 for a distance of 1,200 feet north of Ammendale Road. There it follows right-of-way reservation to the Virginia Manor Road/Ritz Way intersection, where it follows Virginia Manor Road through the proposed Intercounty Connector (ICC) interchange and turns west to connect with proposed relocated Contee Road. Alternative 4 West also includes the relocation and widening of Van Dusen Road from a T-intersection with relocated Contee Road north to Cherry Lane. The typical section for the widening/relocation of Virginia Manor Road and Van Dusen Road includes the same features described in the typical section for Alternative 4 East.

Alternative 5 East: US 1 and MD 201

Alternative 5 East is a combination of Alternative 4 East (four-lane widening of MD 201) and Alternative 3 (six-lane widening of US 1).

Alternative 5 West: US 1 and MD 201

Alternative 5 West is a combination of Alternative 4 West (four-lane widening and relocation of MD 201) and Alternative 3 (six-lane widening of US 1).



Public Involvement is Important


This meeting offers members of the public the opportunity to discuss their thoughts and concerns about the project and to provide oral or written comments. SHA will carefully review and consider public input and preferences expressed at the workshop. Following the workshop, SHA will accept comments and questions by telephone, email or mail. Additional information can be found on the SHA website at www.marylandroads.com. Please use the contact information provided below to address your remarks to the project team:

Ms. Kameel R. Holmes, Project Manager
Project Planning Division
Mail Stop C-301
Maryland State Highway Administration
707 N. Calvert Street
Baltimore MD 21202-0717
Telephone: (410) 545-8542
Toll-free within Maryland: 1-800-548-5026
Email: kholmes@sha.state.md.us

In addition to the Informational Public Workshop, the project team will be available to meet with various business, community, and homeowners groups as the project moves forward. Please feel free to contact us to set up a meeting.


Remaining Steps

- Evaluate public and agency comments from workshop and mailings – **Spring 2008**
- Refine and develop study alternatives – **Summer 2008**
- Prepare and circulate draft environmental document – **November 2008**
- Conduct Location/Design Public Hearing - **Spring 2009**
- Recommend a preferred alternative to SHA Administrator – **Summer 2009**
- If a Build alternative is selected, complete and distribute the final environmental document for selected alternative – **Winter 2009**
- Obtain Location and Design Approvals – **Spring 2010**

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Martin O'Malley, Governor
Anthony Brown, Lieutenant Governor
John D. Porcari, Secretary
Neil J. Pedersen, Administrator

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION
OFFICE OF PLANNING AND
PRELIMINARY ENGINEERING
P.O. BOX 717, MAIL STOP C-301
BALTIMORE, MD 21203-1717



Design Activities

Departments, agencies, and companies that require coordination through design:

- Bridge Design
- Highway Design
- Environmental Programs
- Real Estate
- Utilities
- Travel Forecasting
- Traffic and Safety
- Construction
- Plats and Surveys
- Planning
- Geotechnical
- Materials and Technology

Agreements Process

The following checklist format was taken from the MD SHA. These are items that the Agreements team may need in order to prepare the agreement necessary for the project.

Agreements Checklist

- Chief Engineer or Director's approval
- Dates for the following milestones
 - Advertisement
 - Bid Opening
 - Notice to Proceed
 - Estimated Completion Date
- Contract numbers for the state/local, FHWA, and the County/Town
- What is the justification for entering into this agreement with the other party?
- Contact information for the other parties, as well as title, phone number, and billing address.
- Description of the total project: Description of work under agreement, description by party
- Who designs? Have the other parties been advised of their cost of design? Design cost by party:
- Is there right-of-way required? Who is acquiring? Who is funding the acquisition? Who will own? Right of Way costs by party:
- Who advertises, administers the bid, and awards? Who constructs? Who funds the construction? Construction costs by party:
- Will utility relocation be necessary? Who relocates? Utility cost by party:
- Is there an Access Permit involved? Has it been applied for and/obtained? Permit Number?
- Have other parties been advised that their estimated cost must include Agency's direct salaries, payroll burden, and overhead?
- Have other parties been advised as the other as to the need to provide security for their funding obligations in a manner acceptable to the Agency?
- Have other parties been advised that they will participate in EWO's and delay claims that may be attributed to their portion of the work?
- Is there a possibility of transferring roads to other party (county, city, or town), if so, have the other parties agreed and what are the limits?
- Who will maintain the project once it is constructed?
- Are there other milestones what will govern the timeliness of this agreement or that should be placed in the agreement, other than the dates listed as the milestones? If yes, explain.
- Other information:
- Prepared by:
- Title: Office: Phone/email
- Project Contact in Design:

Source: Maryland State Highway Administration

Advertisement

This checklist was provided by the Maryland State Highway Administration. The items needed for approval to advertise a project will vary state to state and this is meant to be used as a general guide.

Sample Checklist for Approval to Advertise

Elements needed to obtain Approval to Advertise (ATA):

- 1) Plans and Specification ready to advertise.
 - a) Plans will provide detail drawings, location maps and required information needed to bid and construct the proposed project.
 - b) Specification or Invitation for Bid manual (IFB) will contain General Provision (GP), Term and Conditions (TC), Technical Requirement for construction and material, Bid Proposal Form and associated project information that will comply with COMAR, Agency and FHWA regulation.
- 2) Engineers Estimate
 - a) Estimate will be presented in a spread sheet format (columns and rows) and list the proposed construction elements, respective quantities, predicted bid unit price and total item cost and total project cost.
 - b) The Schedule of Prices (Bid) format located in the advertised IFB may differ from Engineer's Estimate format. If so, in addition to a detail engineer's estimate, Sponsor will provide the predicted bid price for each item noted in the Schedule of Prices (Bid) form with respective totals reflecting the bases of award and include all deduct, add alternate bid or contingent items.
- 3) Environment Permit Form:
- 4) Public awareness letter:
 - a) Public awareness letter that summarizes how, when and what is the majority public option for the proposed project. Recommend including copies of elected officials support for the project.
- 5) Final Review Report:
 - a) Develop and provide a Final Review Report that reflects meeting comments, recommendations and edits presented at Final Review meeting (recommend a question/action format, list of attendees and participants who delivered written comments but not attend). Participants and invitation to the Final Review meeting should include Agency and other vested entities with insight to the design, advertisement & award process, construction or future maintenance of the project. The meeting is commonly viewed as a peer review of the proposed design and a last opportunity to make comment/edit prior to submitting request for approval to advertise.
- 6) Right of Way Certification:
 - a) Sponsor will provide evidence of when and how the Right of Way or easement needed to construct the project was obtained. SHA will review documentation for compliance with FHWA Title 23 regulation and deliver the Right of Way Certification letter to FHWA for their approval.
- 7) FHWA approval of NEPA documentation:
- 8) Executed MOU
- 9) Concurrence of Traffic Control Plan:
- 10) Applicable documents & approvals such as Office of Bridge concurrence, specific to Sponsor's needs or unique to the project.
- 11) FORM 25C

Advertisement and Bid opening guidelines will comply with COMAR and FHWA regulations.

- a) A minimum 21 calendar day advertisement period listed in "eMarylandMarketPlace".
- b) Recommend additional advertisements in Newspapers with (1) primary circulation in a major metropolitan area such as "Baltimore Sun" in Baltimore or Washington Post; (2) a local circulation relative to the Sponsors geographic location and (3) a Minority Business Enterprise.

-
- c) Conduct a public opening of the sealed bid proposal.
 - d) Determine the lowest responsible responsive bidder and **prior** to contract award or NTP request concurrence in award (CIA).

Concurrence in Award (CIA) request will include the following elements:

- e) Both Minority Business Enterprise (MBE) forms (00C44 & 00C45) documenting contractor's proposed Affirmation Action Plan that meets or surpasses contract MBE % goal.
 - i) Minority Business Enterprise (MBE) goal shortfall will need the Contractor's written bona fide "Good Faith Effort", completed Form 00C46, Sponsor's review and acceptance of the effort prior to requesting SHA concurrence.
 - f) Experience and Equipment Form.
 - g) Copy of signed bid proposal, certified true and correct bid tabulation and bid analysis, Non-collusion affidavit, advertisement publication, and Bid Justification (if applicable).
 - h) Any request for an exception to contract requirements.
-

Bid Opening

Sample Agenda for the Pre-Bid Meeting

Agenda
Pre- Bid Meeting for Project XXX
Date, Time, Location

- Purpose and scope of the project
 - General conditions
 - Work hours
 - Laydown and staging areas
 - Maintenance of operations during construction
 - Safety of the public
 - Construction oversight
 - Payments to contractors
 - The bidding process
 - M/W/DBE requirements
 - Review of the plan assembly
 - Possible site visit
 - Questions from potential bidders
-

Pre-Construction Checklist should contain the following verifications:

- There has been a constructability review by someone experienced in construction.
- That the plans and specifications have been checked and corrections made as appropriate.
- That the plans have been checked in the field within the previous thirty days and that the field conditions have not appreciably changed from the design assumptions.
- That all permits (including environmental) have been received.
- That sufficient right of way including temporary construction easements have been obtained.
- That utilities have been relocated.
- That inter-agency agreements are in place
- That there is continuing political acceptance for the project.
- That the potential need for additional public information activities has been considered and resolved.

Contractor Education

Sample of Pre-Construction Meeting Agenda

Agenda
Pre- Construction Meeting for Project XXX
Date, Time, Location

- Introductions and definition of project responsibilities
- NTP date
- Schedule review
- Hours of operation
- Haul routes and staging areas
- Maintenance of traffic and operations
- Public safety and worker behavior
- Construction oversight and inspection
- Utility coordination
- Environmental protection
- M/W/DBE goals and expectations
- Project communications and submittal processes incl. emergency communications.
- Meeting schedules
- Change order process
- Project acceptance and closeout

Minutes are taken and provided to all participants and become part of the project record.

Contractor Communication

The following sample is for a weekly construction meeting. Weekly construction meetings helps keep the project on schedule and both parties aware of any issues that may come up prior to them becoming major issues and possibly delay the project.

Sample Agenda for a Weekly Construction Meeting

Agenda
Weekly Construction Meeting for Project XXX
Date, Time, Location

- "Hot items" (*often in construction, there are one or more "hot" items that need immediate resolution, cover these first before the rest of the agenda*)
- Comments/acceptance of last weeks meeting.
- Review of milestone dates
- Three week look ahead (Hint: compare this week's three week look ahead with last weeks!)
- RFI and submittal log and associated due dates
- Safety
- Utility coordination
- Issues/action items from last week's meeting
- New issues with responsibilities assigned
- Public outreach needs
- As built status
- Pay request status.

Qualifications of a good construction inspector:

- Technical capabilities: Obviously a construction inspector must have a knowledge of construction, its materials, processes and sequencing, scheduling. They must have studied in detail the plan assembly for the specific project. They must be familiar with the quality assurance procedures for the project.
- Communication skills: The construction inspector must not only possess the skill set necessary to communicate orally and in writing, he or she must want to communicate and should readily discuss matters with the contractor and owner/designer.
- Record keeping: The inspector must keep thorough and detailed records of conversations, field directives as well as maintain a thorough daily log which will provide the basis for the field record of construction. Thorough and detailed record keeping will be instrumental in avoiding claims.
- Be a team player: While the inspector represents the owner, he or she must respect the fact that they are an integral part of the project delivery team consisting of owner, designer, and constructor. The inspector must treat the contractor with respect and in turn demand the respect of the contractor.

Inspector's Field Report

While there are standard forms commercially available the inspector's daily field report should contain the following information:

- Project identification
- Date
- Number of pages in the report
- Weather and temperature including precipitation and cloud cover
- Description of the work in progress

- Listing of major items of equipment
 - Size and makeup of the contractor work force.
 - Verbal discussions with the contractor
 - Requests for project action including potential changes
 - Job site visitors
 - Accidents
 - Accident record
-

Appendix II

Reading Room

The Reading Room tool offers suggested readings, best practices, and case studies from various sources. The following summaries are samples of the annotated bibliography that is a description of project management process and procedures. These summaries offer contrasts and comparisons to the lessons learned from the expert interviews.

It should be noted that in order to access some of the full articles you will need to have a paid subscription to the periodical or may need to go to a university or departmental library that subscribes to the periodical to review. Some of the articles can be accessed directly through www.sciencedirect.com.

Chapter 2- Project Management Overview

General PM Overview

Maylor, Harvey. (2001). Beyond the Gantt chart: Project management moving on. *European Management Journal*, 19(1), 92-100.

Large-scale engineering projects have traditionally dominated the subject of project management. Today, however, project management has become a core business process for most organizations. This paper argues that the academic subject and many of the practices have lagged this change. Particular problems are identified with the role of strategy and planning, the units of assessment, the planning process itself and the body of knowledge of the subject. An alternative view of project management is proposed based on an integrative model and areas for further development are identified.

Blackburn, S. (2002). The project manager and the project-network. *International Journal of Project Management*, 20 (3), 199-204.

This paper draws on a qualitative study to increase understanding of what project managers do, and how project managers understand and talk about what they do. It includes insights from in-depth analysis of interviews with a nominal group of project managers. However, rather than use competence frameworks to bring out the network of relationships between the project manager and the multiple political, environmental and technological factors in any project, concepts from Actor-Network Theory are used to interpret the stories told by experienced project managers about their work and their use of project management techniques against the fluid and transient nature of projects. The paper shows how project management processes act as allies, enabling the project manager to interest and enroll team members and stakeholders and to mobilize the support of sponsors and other powerful players.

Ellis, R. D., & Lee, S.-H. (2006). Measuring Project Level Productivity on Transportation Projects. *Journal of Construction Engineering and Management*, 314-320.

This research study introduces the development of a method for measuring and analyzing the project level productivity (PLP) of all project activity over the life of the project. A key aspect of the measurement method was the development of a process to combine multiple simultaneous work activity productivity into a global productivity value for the project as a whole. Three case studies, including the collection of thousands of productivity values, were performed on highway construction projects to demonstrate the validity of the analysis method. Results indicate that productivity can be measured and analyzed at the project level based upon the field data construction operations.

Belout, Adnane. (1997). Effects of human resource management on project effectiveness and success: toward a new conceptual framework. *International Journal of Project Management*, 16 (1), 21-26.

Project management strategy research has focused on the effects of structure and planning operations (such as budgets, date completion and quality) on project success. In the past, projects have been managed as technical systems instead of behavioral systems. Relatively little attention has been paid to human resource factor. However, the Project Management Institute in its official definition of Project Management Body of Knowledge (P.M.B.O.K.) included human resource management as one of the six fundamental basic functions of project management. In this arena which lacks theoretical foundation, a relatively recent study made the situation even worse. Pinto and Prescott (1988) concluded that the Personnel factor; (independent variable) was the only factor in their research that was marginal for Project Success (dependent variable). This paper takes a critical look at this research and attempts to respond to their controversial findings. The main objective is to improve the thinking aspects and to highlight the validity of the measures used.

Buckle, P., & Thomas, J. (2003). Deconstructing project management: a gender analysis of project management guidelines. *International Journal of Project Management*, 21 (6), 433-441.

Strong isomorphic forces are at work in the emerging project management profession. (Isomorphic forces in this case refers to different genders in different organizations behave and think in similar fashion about project management skills). At the same time, competent project management practice is evolving and expanding to include both soft and hard skills. Contemporary gender scholarship purports that these different skill sets are founded on inherently gendered logic systems. Thus, questions regarding the role of masculine and feminine logic systems in project management become increasingly important. We deconstruct portions of one of the pre-eminent isomorphic forces at work today --the Project Management Body of Knowledge (PMBOK)--to initiate discussion on the ways in which gendered logic systems play a role in generally-accepted project management practice.

Chapman, C. (2006). Key points of contention in framing assumptions for risk and uncertainty management. *International Journal of Project Management*, 24 (4), 303-313.

This paper explores the relationship between 'common practice' as defined by a simple reading of PMBOK Chapter 11 and 'best practice' as approached (but not quite achieved) by two alternative guides (PRAM and RAMP) in terms of key points of contention in framing assumptions which everyone interested in project management as a whole ought to understand. An immediate purpose is helping readers to avoid some of the current confusion about the difference between 'common practice' and 'best practice'. A longer term goal is influencing the shape of future project risk management guides, to enhance them individually, and to make them easier to use collectively. 'Best practice' definition is itself contentious. Other authors are encouraged to debate the definition of 'best practice' and explore the position of other guides.

Hubler, P., & Meek, J. (2005). Sub-Regional transportation initiatives:

Implications for governance. *International Journal of Public Administration*, 28, 1081-1094.

This paper examines the role of selected institutional forms and formal initiatives (councils of governments and joint power authorities) as integrative functions among local governments of the metropolitan region. These sub-regional networks provide integrative functions and enjoy greater success in implementing regional projects than their regional counterparts. This paper draws lessons from different examples of initiatives in the Greater Los Angeles area. These associations may signal a shift to a governance paradigm where policy creation and implementation is less a product of top-down intentional design, as it is individual vision initiative, and leadership at the local levels.

Van Der Merwe, A. P. (2002). "Project management and business development: integrating strategy, structure, processes and projects." *International Journal of Project Management* 20(5): 401-411.

The classical school of business development supposed that rationality in structure and process were attained by a theory that defined one best way; of doing things. The theory was based on four pillars: division of labour, scalar and functional processes, structure, and span of control. Modern business development places more emphasis on strategy that aims to delight customers, processes that lead to the ultimate of efficiency and infinitely flat organisational structures to manage by projects. Organisational theory is rich in the research of strategic management with specific interest in analysis, objective setting and the effect of organisational structure. But strategies do not fail when they are being analysed or when the objectives are being set. They fail during implementation and, more particularly, due to the lack of proper project management. Equally, there are many publications on business processes, without any regard to the natural scientific explanation of process theory. Even though business process re-engineering is discussed in project management circles it remains a mystery as to how this interrelates with organisational theory. Abundant literature is available on the effect that the implementation of strategy has on organisational structure, but void on the interrelation of business processes and the role of project management in relation to strategy and structure. Particularly, on the integration and effect that strategy, structure, processes and projects have on one another. Of note is the fact that project management literature concentrates

exclusively on the PROJECT and there is little research done on MANAGEMENT as it applies to the general management of an organisation. This research analysed MANAGEMENT and PROJECT MANAGEMENT in an attempt to find the application and integration of strategy, structure, processes and projects in order to facilitate the development of a business.

<http://www.sciencedirect.com/science/article/B6V9V-45BVJ1M-7/2/1534b3ed81b06fad9a81253cb5b1cbc6>

Thiry, M. (2001). "Sensemaking in value management practice." International Journal of Project Management 19(2): 71-77.

Value management (VM) is used more and more in conjunction with programmes and projects, to define business objectives and identify the best ways to achieve them, by balancing stakeholder's needs and expectations with available resources. This paper will demonstrate why value practitioners, project and programme managers, as well as sponsors, need to acknowledge sensemaking and its contribution to people willingness to support or reject a change process. It will specifically discuss why this process is essential to the practice of VM and why the aim of VM workshops and VM studies needs to be reassessed to include sensemaking.

<http://www.sciencedirect.com/science/article/B6V9V-41V34XM-1/2/6bccacc5bb78ee255ad9c7d81dd9d7f0>

Thiry, M. (2004). "For DAD: a programme management life-cycle process." International Journal of Project Management 22(3): 245-252.

This paper intends to demonstrate the need for a specific programme rhetoric and life cycle, distinct from that of project management. Grounded in strategic concepts, rather than project concepts, and addressing strategic level stakeholders, both the rhetoric of programme management processes and its structures must reflect the complexity, iterative and changing nature of programmes, as well as address executives and senior management, which are its key stakeholders. Programmes display both high uncertainty and ambiguity and programme management phases must be structured in such a way that they address both. The author has chosen words to describe this programme life cycle that clearly establish its relationship with strategy; they are formulation; organisation; deployment; appraisal and dissolution. All these terms reflect a strategic, long-term endeavour, representative of programme's nature. The formulation and appraisal phases, especially are close to strategy development concepts, whilst the organisation and deployment phases insist on a systemic and learning view of management.

<http://www.sciencedirect.com/science/article/B6V9V-495671J-2/2/2e19ac398981897f405ca9ff579ee4cd>

Hubler, P., & Meek, J. (2005). Sub-Regional transportation initiatives:

Implications for governance. *International Journal of Public Administration*, 28, 1081-1094.

This paper examines the role of selected institutional forms and formal initiatives (councils of governments and joint power authorities) as integrative functions among local governments of the metropolitan region. These sub-regional networks provide integrative functions and enjoy greater success in implementing regional projects than their regional counterparts. This paper draws lessons from different examples of initiatives in the Greater Los Angeles area. These associations may signal a shift to a governance paradigm where policy creation and implementation is less a product of top-down intentional design, as it is individual vision initiative, and leadership at the local levels.

Basics of Project Management Summary

White, D. and J. Fortune (2002). "Current practice in project management -- an empirical study." International Journal of Project Management 20(1): 1-11.

This paper reports the findings of a survey designed to capture the real world experiences of people active in project management. The survey took the form of a questionnaire that was sent to 995 Project Managers and which achieved a response rate of 23.7%. Each respondent was asked to describe a recent project and

identify factors that were regarded as critical to that project's outcome. The extent to which the project gave rise to side-effects was explored and particular emphasis was placed on the use that had been made of any of the many project management methods, tools and techniques that are available. Respondents were also asked to judge the effectiveness of the methods, tools and techniques they had used and to report any limitations or drawbacks they had encountered. The results showed that most respondents used only a small number of methods, tools and techniques with project management software and Gantt charts being the most widely used aids. Almost half of the respondents reported drawbacks to the methods, tools and techniques they had employed. The criteria for judging project success most cited in the project management literature (on time; to budget; and to specification) were the criteria used by the respondents to judge their projects' success. However, two further criteria were reported as being of particular relevance. These were both concerned with the consequences of the project on the organisation involve. In contrast to the finding of many surveys of project success rates, a remarkably high proportion (41%) of the projects reported upon here were judged to be completely successful, though it should be noted that the judgments were made by Project Managers who had worked on the projects being judged.

<http://www.sciencedirect.com/science/article/B6V9V-449V0S0-1/2/a7309c5a4cbf9c65a49cfcf7143f053f>

Cooke-Davies, T., & Arzymanow, A. (2003). The maturity of project management in different industries: An investigation into variations between project management models. *International Journal of Project Management*, 21, 471-478.

This paper presents the results of an investigation into the nature and extent of variations between project management practices in six industries. The investigation had the practical purpose of supporting a group of pharmaceutical R&D organizations in their search for an optimum project management model. A total of 10 domains were identified using qualitative methods and these formed the basis for a program of 31 in-depth interviews with knowledgeable project management practitioners in 21 organizations drawn from the six industries. Each interview elicited a quantitative assessment of the practices relating to the domain, using pre-determined scales, and qualitative comments on the practices based on the experiences of the interviewee. Differences between companies and industries were found to exist in each domain. The most highly developed project management models (which might be said to equate to measure of project management maturity) were found in the Petrochemical and Defense industries, which on average scored highly on most dimensions. Other industries (Pharmaceutical R&D, Construction, Telecommunications, and Financial Services) displayed some interesting differences in different domains, but did not display the coherence or scores of the two leading industries.

Kasi PE, SE, CVS, Muthiah (2007). "Managing Transportation Projects with ASTM International Standards." ASTM International Standards Worldwide web article

This paper shows that the use of five ASTM International standards on building economics can pay big dividends in the planning and managing-to-cost of major transportation projects. Three examples are given: a billion-dollar reconstruction of an urban expressway, a complex bridge on an interstate expressway, and a successful proposal for the rehabilitation of a complex, 60-year-old viaduct in the heart of a large urban city. The first two projects won national recognition awards and in the third case study, the designers received a contract for their skill in cost management using ASTM International standards.

http://www.astm.org/SNEWS/NOVEMBER_2007/kasi_nov07.html

Traits of the Best PMs

Barber, E. (2004). "Benchmarking the management of projects: a review of current thinking." International Journal of Project Management 22(4): 301-307.

This paper discusses the strengths and weaknesses of benchmarking project management and the difficulties of analyzing the competencies and skills of project managers. Research has shown vast differences in the performance between leading companies and average companies in performing particular

activities. By benchmarking leading companies, many firms have experienced significant success in upgrading their organizational capabilities. This paper begins the process for benchmarking project managers in an endeavor to improve management performance of similar projects. As benchmarking can significantly improve the performance of managing companies, it is argued that by benchmarking project management significant improvements can be experienced in the performance of projects.

<http://www.sciencedirect.com/science/article/B6V9V-4B0P91M-2/2/beaa83a398b75bf8459c0ce49748d19e>

Dai, C. X. and W. G. Wells (2004). "An exploration of project management office features and their relationship to project performance." *International Journal of Project Management* 22(7): 523-532.

The advantages of project management have been well documented, but project failure rates still remain high. This suggests continued exploration of new process models and organization structures to nurture strong project performance. One important candidate for improvement in this ongoing journey is the project management office (PMO). This paper is based on a two-year empirical study that investigated the establishment and use of PMOs and the environmental conditions in which they operated. It also identified and assessed an array of PMO functions and services and their influence on reported project performance. The core results were generally favorable toward the utilization of such features, with project standards and methods showing the highest correlation to performance in each of the two distinct populations.

<http://www.sciencedirect.com/science/article/B6V9V-4CHRHGR-1/2/c6ce82c07dd47e28c9626381e38cd6ae>

Edum-Fotwe, F.T., & McCaffer, R. (2000). Developing project management competency: perspectives from the construction industry. *International Journal of Project Management*, 18, 111-124.

Project managers in today's construction industry are faced with a situation wherein the fundamental roles and functions they perform are witnessing a gradual shift in focus. To maintain their professional competency, practicing project managers in construction adapt to this changing industry environment by relying on knowledge and skills acquired through training and experience. The extent to which such training enables project managers to effectively adapt to changing demands have considerable relevance not only for the training of future project managers, but more importantly, the kind of management and general manpower development policies that construction organizations can adopt.

Wang, E., H.-W. Chou, et al. (2005). "The impacts of charismatic leadership style on team cohesiveness and overall performance during ERP implementation." *International Journal of Project Management* 23(3): 173-180.

Though several key enterprise resource planning (ERP) implementation factors, including top management commitment and support, change management, and consultants' support haven been broadly discussed in literature, other factors such as leadership style and team cohesiveness have recently received more attention in technical project implementation [Thite M. Leadership styles in information technology projects. *International Journal of Project Management* 2000:18:235-41; Jiang JJ, Klein G, Chenoun-Gee H. The relative influence of IS project implementation policies and project leadership on eventual outcomes. *Project Management Journal* 2001;32(3):49-55]. The charismatic leadership style has often been adopted by organizational leaders, primarily in Asian countries including Taiwan. The present study, based upon the team leadership theory proposed by Zaccaro, Rittman, and Marks [The sociology of religion [Transl. Ephraim Fischhoff]. Boston: Beacon Press; 1963], serves as an initial step towards understanding the impacts of charismatic leadership style on ERP implementation. Three-hundred companies listed in the "Top 500 of The Largest Corporations in Taiwan 2001," that have implemented ERP systems, were surveyed. The results confirm that leaders should demonstrate more charismatic behaviors to establish the ERP project team members' cohesiveness and, thus, improve team performance. The positive relationship between team cohesiveness and overall team performance was also statistically supported. Implications on future study are discussed.

<http://www.sciencedirect.com/science/article/B6V9V-4F14YTR-2/2/438bb085a77bbc1c121dd38b38caac02>

Zwikael, O., K. Shimizu, et al. (2005). "Cultural differences in project management capabilities: A field study." *International Journal of Project Management* 23(6): 454-462.

This paper presents a study on identifying differences in project management style, between two different cultures, the Japanese and the Israeli. Management styles were evaluated on the nine classical project management areas, as defined by PMBOK, and on the organizational support required for a proper project management infrastructure. A total of 425 project managers were involved in the study, out of which 337 were from Israel and 88 were from Japan. Significant cultural differences were found between the two countries. Israeli project managers are more focused on performing "Scope" and "Time" management processes, assisted by project management software, while formal "Communications" and "Cost" management are more frequently used by Japanese project managers. It was also found that Japanese organizations use clear and measurable success measures for each project, while project objectives in Israel are often quite foggy. Differences in efforts made by project managers and management of the organization on specific project processes are demonstrated and discussed in this paper. These differences are manifested by smaller costs and schedule overruns in Japanese organizations, while Israeli customers of local projects seem to obtain better technical performance at the end of the project. The Israeli customer, however, is much more impacted by superior technical performance and easily forgives cost and schedule overruns.

<http://www.sciencedirect.com/science/article/B6V9V-4G94HVM-1/2/5b51e590c4b304b7e8da1c78203fe478>

Consistent Application of PM Principles

Pender, S. (2001). Managing incomplete knowledge: Why risk management is not sufficient. *International Journal of Project Management*, 19 (2), 79-87.

The Project Management Institute's Guide to the Project Management Body of Knowledge (PMBOK) underpins many initiatives to improve project management practice. It is widely used for training and underpins the development of competency standards. Because of its fundamental importance, the PMBOK should be critically reviewed. This paper argues for an expansion of the PMBOK Guide's risk management knowledge area to include a wider perspective of incomplete knowledge. The PMBOK Guide deals with uncertainty through the traditional use of probability theory, however the underpinning assumptions of probability theory do not always apply in practice. Furthermore, probability-based risk management theory does not explain important aspects of observed project management practice. This paper discusses an expanded framework of incomplete knowledge, including: an expanded concept of uncertainty that acknowledges ignorance or surprise, where there is no prior knowledge of future states; imprecision arising from ambiguity (fuzziness) in project parameters and future states; and, human limitations in information processing.

Dai, C. X. and W. G. Wells (2004). "An exploration of project management office features and their relationship to project performance." *International Journal of Project Management* 22(7): 523-532.

The advantages of project management have been well documented, but project failure rates still remain high. This suggests continued exploration of new process models and organization structures to nurture strong project performance. One important candidate for improvement in this ongoing journey is the project management office (PMO). This paper is based on a two-year empirical study that investigated the establishment and use of PMOs and the environmental conditions in which they operated. It also identified and assessed an array of PMO functions and services and their influence on reported project performance. The core results were generally favorable toward the utilization of such features, with project standards and methods showing the highest correlation to performance in each of the two distinct populations.

<http://www.sciencedirect.com/science/article/B6V9V-4CHRHGR-1/2/c6ce82c07dd47e28c9626381e38cd6ae>

Hans, E. W., W. Herroelen, et al. (2005). "A hierarchical approach to multi-project planning under uncertainty." *Omega: The International Journal of Management Science*: 1-15.

We survey several viewpoints on the management of the planning complexity of multi-project organizations

under uncertainty. Based on these viewpoints we propose a positioning framework to distinguish between different types of project -driven organisations. This framework is meant to aid project management in the choice between the various existing planning approaches. Next we introduce a generic hierarchical project planning and control framework that serves to position planning methods for multi-project planning under uncertainty. We discuss various techniques for dealing with the uncertainty inherent to the different hierarchical stages in a multi-project organisation.

<http://www.sciencedirect.com/science/article/B6VC4-4HTCW69-1/2/c23e5c1e3c90255e4678c6d9979ea43b>

Hall, R. and P. Andriani (2003). "Managing knowledge associated with innovation." Journal of Business Research 56(2): 145-152.

This article reports the results of empirical work carried out in a project funded by the UK Government's Engineering and Physical Sciences Research Council (EPSRC). The project was concerned with operationalising knowledge management concepts in the context of interorganisational innovation. The companies that collaborated in this project were a major manufacturer of powered garden machinery and a major mobile telephone operator. The technique, which has been developed, operationalises the concepts of: tacit and explicit knowledge, radical and incremental innovation, and the five basic knowledge management processes: externalisation, dissemination, internalisation, socialisation, and discontinuous learning. The technique involves each participating party identifying the features that the successful innovation needs to possess. This is followed by the identification of the knowledge gaps that must be bridged if each feature is to be achieved. These knowledge gaps constitute the units of analysis. For each unit of analysis/knowledge gap, the size of the gap, and the nature of the required knowledge are estimated subjectively by each project team member. This allows both the identification of units which have high risk and the nature of the knowledge transformation processes, which need to be managed. The independently generated subjective perceptions are shared between the collaborating parties in a process of perceptual synthesis. At an operational level, the technique facilitates a productive dialogue between team members. At a managerial level, once a consensus regarding risk and vulnerability has been reached, improved project management becomes possible.

<http://www.sciencedirect.com/science/article/B6V7S-47S5NCS-9/2/9c9338b9a0dd84567a7849dd52e724a9>

Hecht, H. and D. A. Niemeier (2002). "Comparing transportation project development efficiencies: the California department of transportation and the California county sales tax agencies." Transport Policy 9: 347-356.

Finding time and cost efficiencies associated with preliminary and final design of transportation projects has become increasingly difficult. Major new complexities present interesting and challenging project management issues and many agencies have incrementally adapted project development process to improve inefficiencies. Yet our understanding of the project development process is limited and the incremental changes in the process have not resulted in major modification in the way in which transportation project development is approached for most agencies.

<http://www.sciencedirect.com/science/article/B6VGG-462BGTN-1/2/3cae18c84065245b9f07e8d851bf3210>

Milosevic, D. and P. Patanakul (2005). "Standardized project management may increase development projects success." International Journal of Project Management 23(3): 181-192.

Companies frequently opt to implement standardized project management (SPM), which can be defined as a standardized set of project management practices. These companies expect that such an approach will carry significant potential for improving project performance. To investigate this potential, we undertook an exploratory study into the impact of SPM on project performance in development projects in high-velocity industries. Our research started with the qualitative method using case study research to identify the major factors in SPM efforts on the organizational project management level (as opposed to the individual project level). Then, we developed hypotheses based on these factors and performed hypothesis testing to identify factors that impact project success. In addition, we conducted the follow-up interviews to enrich and refine our findings. Three major findings came out of this study. First, the variables of SPM tools, leadership skills, and process showed themselves to be of higher interest to standardization than the other independent variables because they may impact project success; second, these variables of higher interest are typically customized to fit the strategic purpose of the company; and third, companies tend to standardize project management practices only to a certain level.

<http://www.sciencedirect.com/science/article/B6V9V-4FC3RY4-1/2/0437b09538f1ee679fa91b319a7adf1e>

Shenhar, A. J. and D. Dvir (1996). "Toward a typological theory of project management." Research Policy 25(4): 607-632.

A traditional categorization of innovation as either incremental or radical has often been mentioned in the theoretical literature of innovation. A similar distinction has not become standard, however, in the project management literature and many publications on the management of projects tend to assume that all projects are fundamentally similar. In reality, however, projects exhibit considerable variation, and their specific management styles seem anything but universal. As a step towards the development of a project management theory, we present here a two-dimensional typology to define the wide spectrum of today's projects and their various management styles. Using a combination of qualitative and quantitative methods and two data sets, we identify a set of ideal types and real-world variants of these types. We show that the framework of this research can be subjected to quantitative modeling and rigorous empirical testing, and that it meets most of the criteria of a developed typological theory. Furthermore, such theory will particularly be useful in predicting the dependent variable -- i.e. project effectiveness.

<http://www.sciencedirect.com/science/article/B6V77-3VW8PW8-7/2/86c689522387c285e7f2a2a72a2ff7bc>

Effective Leadership

Clift, T. B. and M. B. Vandenbosch (1999). "Project Complexity and Efforts to Reduce Product Development Cycle Time." Journal of Business Research 45(2): 187-198.

One of the primary goals of new product development (NPD) teams is the reduction of development cycle time. To date, many companies continue to adhere to the structure and formality of standardized processes irrespective of the complexity of the development task at hand. Using a pattern-matching methodology, we selected 20 NPD projects for detailed study. The final sample was balanced on the basis of project complexity, cycle time, and company size. In-depth interviews conducted with the leaders of these projects highlighted several key differences in the approaches used to reduce cycle time in projects of varying complexity. The short-cycle simple projects in our sample tended to be run by autocratic leaders, who adhered to a well-defined product development process. In contrast, the short-cycle complex projects in our sample were run by leaders who used a more participative management style, used many external sources of information, and were less formal in their approach to NPD project management. The long-cycle project leaders in our sample were also more autocratic in their approach to project leadership, used less external sources of information, and generally adhered to the standardized, serial processing approach to NPD. Our findings indicate that short-cycle complex projects require a different type of management process than is evidenced in the literature. Managers of this type of project need to foster a short-cycle mentality among the

project team and the company product development organization. At the same time they must exercise caution to ensure that the decision-making process is not dominated by the mere desire to be quicker.

<http://www.sciencedirect.com/science/article/B6V7S-3WV9MS4-8/2/42248148b37fa48badc3ead038aef6c0>

Loo, R. (2003). "Assessing team climate in project teams." *International Journal of Project Management* 21(7): 511-517.

Team climate is an important factor in the pursuit of team effectiveness; however, the team climate concept has received limited attention in the project management field. This study helps to fill that gap by using Anderson and West's four-factor theory of team climate and their Team Climate Inventory [TCI: Anderson NR, West MA. The team climate inventory manual and users guide. Windsor (UK): Assessment Services for Employment, NFER-Nelson; 1994] with 44 four-person teams of management undergraduates conducting team research projects. Statistical results for the TCI's five scales and 15 subscales showed positive team climates in this sample at the two TCI administrations, Time 1 (week 3) and Time 2 (week 12) in the project life cycle. Results of the qualitative analyses of participant's written comments with the TCI complemented the statistical results and showed that participants had positive team experiences and, improved their team skills among other effects. Recommendations are presented for using the TCI in building teams, project management training, and project evaluations among other uses.

<http://www.sciencedirect.com/science/article/B6V9V-4871572-2/2/139ae1d3b9f0ed4c9c9519a8314a1c26>

Strang, K. D. Examining effective technology project leadership traits and behaviors. *Computers in Human Behavior*, Corrected Proof.

Effective project team leadership theory is explored from the perspective of leader traits, skills, roles, and behaviors. Existing leadership traits and behaviors are examined from organization science empirical studies, they are differentiated from management functions, and the gap between extant theory and the project management domain is highlighted through this research. Leadership principles are examined from actual organizational work settings, specifically dynamic projects, with a view to discovering what actually happens as compared with espoused theory. The underlying research question is whether these theories hold up and can be effectively integrated to the project management domain.

Thamhain, H. J. (2004). Linkages of project environment to performance: lessons for team leadership. *International Journal of Project Management*, 22 (7), 533-544.

This field study of 76 technology-based project teams examines the influences of the project environment on team performance. The results show that in spite of cultural differences among organizations a general agreement exist on the factors that drive team performance. One of the most striking finding is the large number of performance factors that is derived from the human side. Organizational components that satisfy personal and professional needs seem to have a strong effect on cooperation, commitment, risk management, and ultimately drive overall team performance.

Gabriel, E. (1997). "The lean approach to project management." *International Journal of Project Management* 15(4): 205-209.

The early work in project management introduced project-oriented systems and methodologies, previously lacking in the project direct participants. The emphasis inevitably was on centralised project teams owning the systems. The paper illustrates through case studies the developed concept of lean project management, which recognises that the system and philosophy is now better understood by participants, who themselves provide and contribute to the project control mechanisms. The project manager becomes an individual client-based leader of the project team, the source of decision making and the conduit for communication. The approach has been successful on complex public arts buildings over 10 years and could be of general application in a wide range of project management and management by project environments.

<http://www.sciencedirect.com/science/article/B6V9V-3SWY03S-2/2/91b8cbbab4b2cbe9b312f875a86f6225>

Green, G. C. (2004). "The impact of cognitive complexity on project leadership performance." Information and Software Technology 46(3): 165-172.

In today's complex development environments, the ability to integrate project components has been found to be a key responsibility for project leaders. This paper reports results of a preliminary experiment examining the importance of cognitive differentiation and integration (i.e. cognitive complexity) to project leadership performance. Results from this preliminary study show the importance of cognitive complexity to success in project leadership. Surprisingly, results suggest that leaders with lower levels of cognitive differentiation abilities (less information fragmentation) perform better on project definition tasks. Results also suggest that higher levels of cognitive integrative ability are associated with higher performance in project definition tasks. To this end, we suggest ways to improve complex thinking in project leaders. This study is important to IS managers responsible for identifying and training project leaders, and researchers seeking to understand factors important to successful project leadership.

<http://www.sciencedirect.com/science/article/B6V0B-49CT62N-3/2/e55727b2404360b5125046e018051587>

Blackburn, S. (2002). "The project manager and the project-network." International Journal of Project Management 20(3): 199-204.

This paper draws on a qualitative study to increase understanding of what project managers do, and how project managers understand and talk about what they do. It includes insights from in-depth analysis of interviews with a nominal group of project managers. However, rather than use competence frameworks to bring out the network of relationships between the project manager and the multiple political, environmental and technological factors in any project, concepts from Actor-Network Theory are used to interpret the stories told by experienced project managers about their work and their use of project management techniques against the fluid and transient nature of projects. The paper shows how project management processes act as allies, enabling the project manager to interest and enroll team members and stakeholders and to mobilize the support of sponsors and other powerful players.

<http://www.sciencedirect.com/science/article/B6V9V-44M1NH8-4/2/211f6eae63643c26057ed1df5e09e6b1>

Gallstedt, M. (2003). "Working conditions in projects: perceptions of stress and motivation among project team members and project managers." International Journal of Project Management 21(6): 449-455.

The emergence of temporary and democratic work forms characterizes work today and organizations to a great extent rely on individuals' performance. Workers' perceptions of working conditions are affected by two important factors: motivation and stress. Projects are motivating due to clear goals, but they are also often time pressured. Incidents like, for example, loss of resources, changing preferences or priorities, or project closure might provoke changes to the set goals, to which individuals have committed. This could obstruct effective goal fulfillment as well as create stress among the people involved. How do project managers and project team members perceive incidents that the typical project encounters? How do they cope with uncertainties the incidents bring about? The finding suggests that incidents cause changes over the project lifecycle, both of goals and of individuals' perceptions of tasks, conditions, and the situation. Different coping strategies are used to reduce uncertainty and stress.

http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V9V-488VXN4-B&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&_view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=317def534f1e83117dbb1333721d4c21.

Conducting Meetings

Michael Doyle & David Straus, *How to Make Meetings Work: The New Interaction Method*, Reprinted Edition, Berkley Publishing Group, 1993.

A classic in the field of meeting design and facilitation. This book was the first to describe many of the ideas which are now common practice.

Rilla, E., Paterson, C., Manton, L., Day, P. "Facilitation: The Road to Effective Meetings." *Journal of Extension* (2006): 44.2 April 2006

Abstract: Feeling frustrated with meetings that take a lot of time yet accomplish little? In California, a "team" of trained Extension professionals conducted Essential Facilitation (EF) workshops to expand this technique among 200 Extension professionals, faculty, and volunteers throughout California. Visit our Web site at <http://groups.ucanr.org/ANR_Leadership/> to read five case stories illustrating a wide range of scenarios where EF strategies make a difference in meeting effectiveness and how they benefit community efforts. Learn how the Interaction Associates model of meeting facilitation is rapidly becoming the method of choice for more productive and satisfying meetings with University of California Cooperative Extension staff. <http://www.joe.org/joe/2006april/tt5p.shtml>.

Crisis Management

Jedd, M. "Project Rescue." *PM Network* 01 Jan. 2006:1-10.

This article illustrates the use of metrics to assess projects that have run off-track and to develop solutions to resuscitate them. Methods used by a management consultant (David Koenig of Liberty Mutual) with a considerable number of project turn-around successes are highlighted in the article. Mr. Koenig uses three approaches: "micromanagement of the project plan, frugal budget management, and ruthless management of scope and quality".

<http://www.allbusiness.com/operations/3505171-1.html>

Soderholm, A. "Project management of unexpected events." *International Journal of Project Management*. 26(1): 80-86.

Unexpected events and environmental impact not planned for are common during project implementation. This article explores how unexpected events are dealt with in projects using qualitative case study data from four different cases. Results show four different approaches to deal with unexpected events: innovative action, applying detachment strategies, setting up intensive meeting schedules and negotiating project conditions are common approaches to deal with the unexpected events. The discussion shed new light on one common situation during project execution – i.e. dealing with unexpected events – that is not normally included in the best practice models of project management.

http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V9V-4R05JCV-1&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&_view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=6b6e23dad1cb615d4a0b3bb72ba4ea82.

Communication

Griffin, A. and Hauser, J. (1992). "Patterns of communication among marketing engineering and manufacturing—a comparison between two new product teams." *Management Science*. 38 (3): 360-373.

Models and scientific evidence suggest that firms are more successful at new-product development if there is greater communication among marketing, engineering, and manufacturing. This paper examines communication patterns for two matched product-development teams where the key difference between the groups is that one used a phase-review development process and the other used Quality Function Deployment (QFD), a product-development process adopted recently at over 100 United States and

Japanese firms. To our knowledge, this is the first head-to-head comparison of traditional U.S. product development processes with QFD.

Our data suggest that QFD enhances communication levels within the core team (marketing, engineering, manufacturing). QFD changes communication levels from “up-over-down” flows through management to more horizontal routes where core team members communicate directly with one another. On the other hand, the QFD team communicates less on planning information and less with members of the firm external to the team. If this paucity of external communication means that the team has the information through the team, it is a positive impact of QFD. If the result means that QFD induces team insularity, even when the team needs to reach out to external information sources, it is a cause for concern.

<http://www.jstor.org/pss/2632480>.

Johansen, J. (2004). “Project management communication: a systems approach.” Journal of Information Science. 30(1): 23-29.

This discussion analyzes and reviews verbal and non-verbal communication issues that have an impact on information resource project managers. The concepts are presented in a familiar information systems model framework showing open and closed-loop systems as well as a communication flow system. It provides theoretical underpinnings for project managers who strive to develop proactive management of the environmental influences surrounding them to shape a communications environment, rather than having to take a reactive stance to the multiple messages and barriers they encounter. Technology alone is insufficient to improve communication. Technology may be utilized to organize data into information, but information becomes communication only as it is interpreted by a person. Information resource project managers, who can expect to spend a large percentage of their time in communication activities, can develop communication skills as they increase their understanding that communication is interactive and manageable.

<http://jis.sagepub.com/cgi/content/abstract/30/1/23>.

Pinto, M.B. and Pinto, J.K. (2003). “Project team communication and cross-functional cooperation in new program development.” Journal of Product Innovation Management, 7(3): 200-212.

The importance of communication for the successful development of new projects, particularly within the R&D laboratory setting, has been well documented. Yet researchers have seldom examined the relationship between patterns of communication and cross-functional cooperation in the development and management of new programs. In this article Mary Beth and Jeffrey Pinto report on the results of a research study that assessed the relationship of two aspects of project team communication (formal versus informal modes and reason for communication) with the level of cross-functional cooperation actually achieved within a hospital project team charged with developing a new program. A total of 262 team members were surveyed from 72 hospital project teams. The results demonstrated that high cooperation teams differed from low cooperation teams both in terms of their increased use of informal methods for communication as well as their reasons for communicating. Finally, cross-functional cooperation was found to be a strong predictor of certain project outcomes.

<http://www3.interscience.wiley.com/journal/120713858/abstract?CRETRY=1&SRETRY=0>.

Guiding Principles for Developing Effective Project Managers

Clarke, A. (1999). “A practical use of key success factors to improve the effectiveness of project management.” International Journal of Project Management 17(3): 139-145. In a world where change is becoming increasingly important, tools such as project management, if used properly, can provide a useful way for organisations to manage that change effectively. Whilst there is a clear understanding of the need to achieve the required cost, time and quality objectives, surprisingly little is published on how these objectives can practically be met. Furthermore, many of the major issues and problems concerning project

management in practice can detract from the main objectives of the project. This paper aims to show how, by focusing on number of key success factors, such problems can be overcome or minimized. The problems addressed here are based on observations from an aerospace engineering company. However, they are typical of those seen in a variety of organisations that use project management for managing change.

http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V9V-3VKD1XW-1&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&_view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=db19422c0090696b8440c16f441a44fb.

Papalexandris, A., G. Ioannou, et al. (2004). "Implementing the Balanced Scorecard in Greece: a Software Firm's Experience." *Long Range Planning* 37(4): 351-366.

The Balanced Scorecard (BSC) is a relatively new approach to strategic management and performance measurement and control, which has generated substantial interest in the academic and industrial communities. This paper presents the experience from the implementation of a specific BSC model at a large software development company in Greece. The study illustrates and evaluates the main obstacles and shortcomings, as well as the critical success factors that characterise such BSC projects, while offering managerial insights and guidelines for similar implementations.

<http://www.sciencedirect.com/science/article/B6V6K-4DCKRVY-4/2/6ccfcca32733980bfc453acf9957a3fb>

Shenhar, A. J. and D. Dvir (1996). "Toward a typological theory of project management." *Research Policy* 25(4): 607-632.

A traditional categorization of innovation as either incremental or radical has often been mentioned in the theoretical literature of innovation. A similar distinction has not become standard, however, in the project management literature and many publications on the management of projects tend to assume that all projects are fundamentally similar. In reality, however, projects exhibit considerable variation, and their specific management styles seem anything but universal. As a step towards the development of a project management theory, we present here a two-dimensional typology to define the wide spectrum of today's projects and their various management styles. Using a combination of qualitative and quantitative methods and two data sets, we identify a set of ideal types and real-world variants of these types. We show that the framework of this research can be subjected to quantitative modeling and rigorous empirical testing, and that it meets most of the criteria of a developed typological theory. Furthermore, such theory will particularly be useful in predicting the dependent variable -- i.e. project effectiveness.

<http://www.sciencedirect.com/science/article/B6V77-3VW8PW8-7/2/86c689522387c285e7f2a2a72a2ff7bc>

Project Manager Training

Crawford, L. (2005). "Senior management perceptions of project management competence." *International Journal of Project Management* 23(1): 7-16.

As more organisations adopt project management approaches and the demand for project managers grows, there is increasing interest in the competence of project managers and in standards for development and assessment of project management competence. Project management standards are being used extensively throughout the world in training and development, professional certification programmes and corporate project management methodologies on the assumption that there is a positive relationship between standards and effective workplace performance. However, there has been no empirical research reported that supports or indeed questions this assumption. This paper reports on research that explores the relationship between performance against standards and the effectiveness of project management performance in the workplace, as perceived by senior managers. Results suggest that there is no statistically significant relationship between performance against the widely used standards in their entirety, and senior management perceptions of effectiveness of workplace performance. Results suggest different perceptions and expectations of project management competence between project managers and their supervisors, senior management.

<http://www.sciencedirect.com/science/article/B6V9V-4D636C6-4/2/b6479d1c140991c277782e9cfaff6ffb>

Atkinson, R. (1999). "Project management: cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria." International Journal of Project Management 17(6): 337-342.

This paper provides some thoughts about success criteria for IS-IT project management. Cost, time and quality (The Iron Triangle), over the last 50 years have become inextricably linked with measuring the success of project management. This is perhaps not surprising, since over the same period those criteria are usually included in the description of project management. Time and costs are at best, only guesses, calculated at a time when least is known about the project. Quality is a phenomenon; it is an emergent property of people's different attitudes and beliefs, which often change over the development life-cycle of a project. Why has project management been so reluctant to adopt other criteria in addition to the Iron Triangle, such as stakeholder benefits against which projects can be assessed? This paper proposes a new framework to consider success criteria, The Square Route.

<http://www.sciencedirect.com/science/article/B6V9V-3XD3JRK-3/2/d7e34d3590a4b85d111d6d69e0636264>

Belassi, W. and O. I. Tukul (1996). "A new framework for determining critical success/failure factors in projects." International Journal of Project Management 14(3): 141-151.

Only a few studies in the project management literature concentrate on the critical factors that affect project success or failure. Whereas many of these studies generate lists of critical success factors, each list varies in its scope and purpose. The success factors are usually listed as either very general factors or very specific factors affecting only a particular project. However, lacking a comprehensive list makes it difficult not only for project managers but also for researchers to evaluate projects based on these factors. In this study, we suggest a new scheme that classifies the critical factors, and describes the impacts of these factors on project performance. Emphasis is given to the grouping of success factors and explaining the interaction between them, rather than the identification of individual factors. An empirical study is conducted to test the practicality of using such a scheme. The statistical analyses of the results demonstrate the differences between the critical success factors identified in a previous study from literature and the factors identified with the use of our scheme. Many critical factors, such as factors related to project managers' performance, factors related to team members and environmental factors, became apparent with this study. The results are encouraging, in that practitioners support the use of this scheme for determining and analysing critical success factors and how systems respond to these factors.

<http://www.sciencedirect.com/science/article/B6V9V-3VW1S2D-3/2/6d7078ddd4be4123d16d089de41db40>

Fernandes, K. J., V. Raja, et al. (2005). "Portals as a knowledge repository and transfer tool--VIZCon case study." Technovation 25(11): 1281-1289.

Today's business domains are complex and require faster decisions, better allocation of resource and above all dictate the need to share knowledge both within and outside the domain. Managing dynamic projects in such a volatile business environment requires a structured approach. This paper is concerned with using portal technology as a means for storing and transferring knowledge. The paper demonstrates the use of portal technology, via a case study, to increase the overall project reactivity and achieve the objectives, namely to reduce time; improve decision-making, increase productivity and reliability. A portal developed to manage the VIZCon project is described using a novel framework. A five-step approach for developing an effective project management portal is presented with empirical evidence. Finally implementation issues and the limitations of the system are discussed.

<http://www.sciencedirect.com/science/article/B6V8B-4C2R32X-2/2/f5d2ed6956bc81021d593de439e18378>

Globerson, S. and A. Korman (2001). "The use of just-in-time training in a project environment." International Journal of Project Management 19(5): 279-285.

Around 40% of the knowledge acquired in training is lost after a break of 1 month, rising to 90% after 6 months. By providing training as needed, Just in Time Training (JIT-T) seeks to solve this problem. In other words, effort is not invested in training people in skills that they are not going to use in the very near future. The paper describes the use of the JIT-T approach in training project managers, working in a hi-tech

company. JIT-T was selected because the management felt that the conventional training was not effective enough. The more crucial project management areas were identified, and the training program was executed.

<http://www.sciencedirect.com/science/article/B6V9V-433PBK5-3/2/eed31fb98c5976dd2348a594fe7994bc>

Ramsay, D. A., & Boardman, J. T., et al. (1996). Reinforcing learning, using soft systemic frameworks. *International Journal of Project Management*, 14 (1), 31-36.

A medium-sized systems engineering company, resolved to enhance the project capability of its workforce. The first step was to change its organizational structure and create a projects group out of which all the projects would be managed. As part of this new strategic direction they decided to send key project staff on a training course to increase confidence and skills in project management. The course stimulated and inspired workers for a short period, but soon afterwards they resorted to their previous form. The company wanted to know why the course had failed and how the training could be given in a manner that would have lasting effects. It was found that there was great confusion about what the course had been about, which affected considerably the disposition of each delegate and created perceptions that were in fact detrimental to the learning. There was a definite need to convey, more clearly, what underlying learning message the company had for the course. All professional trainers acknowledge that a few days out of the workplace can only hope to achieve the sowing of a few seeds and a germinating of ideas. The intention is for a continuation of the learning back in the workplace as ideas are tried out and the concepts are matured and owned. Consequently, the communication and reinforcement of the basic message is paramount and if that message is not sufficiently well communicated it is easily lost in the business of the course itself.

Sense, A. J., & Antoni, M. (2003). Exploring the politics of project learning. *International Journal of Project Management*, 21 (7), 487-494.

Competitive advantage for project success will only be realized when project team members effectively access, absorb and apply the multiple learning opportunities that exist within and across projects and, manage the political dimension effectively. These items as individual entities are important project variables to be addressed. Both are also linked. In making a contribution to understanding this nexus, this paper combines and explores case study research findings from within a project and across projects from two countries, which illuminates some central agitators of politics impacting project learning. These revelations have implications for both practitioners and project management researchers.

Thiry, M. (2004). "How can the benefits of PM training programs be improved?" *International Journal of Project Management* 22(1): 13-18.

This paper exposes a number of shortcomings of project management (PM) training programs and puts forward propositions to avoid them. It is grounded in more than 25 years of personal experience with projects and 5 years of implementing PM training programs and draws on a recent research project and the conclusions obtained. The main conclusion of the research is that organizations implement PM training programs for two major reasons: in reaction to specific triggers, like customer feedback, or reduction of share value; or as part of a wide-ranging organizational change program, like a shift from functional to projectized structure. Two major conclusions come out of this study:(a) often strategic goals are not specifically identified as part of the project and;(b)when goals are identified; there are no clear measures of success associated directly to their achievement. Where both of these exist, organizations have either underestimated or simply not budgeted the required control processes as part of the resources cost. From this analysis, the paper suggests that organizations need to understand the justification for the training and define corresponding objectives and evaluation criteria.

<http://www.sciencedirect.com/science/article/B6V9V-495671J-4/2/2c3b7e4e81ff85adb797a4b4d30ecfc0>

Cooke-Davies, T., & Arzymanow, A. (2003). The maturity of project management in different industries: An investigation into variations between project management models. *International Journal of Project Management*, 21: 471-478.

Martin, A. (2000). "A simulation engine for custom project management education." International Journal of Project Management **18**(3): 201-213.

The Project Management Simulation Engine is a software environment for generating customised computer-based simulations that facilitate project management education from a management perspective. This paper first describes a particular implementation called Contract & Construct, which models a contract management approach in a large construction project. Experience of running the simulation is discussed, including an analysis of strategies adopted by players and their resulting performance. Then the paper briefly presents the underlying architecture of the engine, and shows how its database implementation can support the generation of customised simulations for different projects. The paper also shows how the simulation can be used as a research instrument into participant behaviour, and discusses extensions to the work.

<http://www.sciencedirect.com/science/article/B6V9V-3YMW43B-7/2/561cfd9d3dc8f2ed4b27391de1305f34>

Pfahl, D., M. Klemm, et al. (2001). "A CBT module with integrated simulation component for software project management education and training." Journal of Systems and Software **59**(3): 283-298.

Due to increasing demand for software project managers in industry, efforts are needed to develop the management -related knowledge and skills of the current and future software workforce. In particular, university education needs to provide to their computer science and software engineering (SE) students not only technology-related skills but in addition, a basic understanding of typical phenomena occurring in industrial (and academic) software projects. The objective of this paper is to present concepts of a computer-based training (CBT) module for student education in software project management. The single-learner CBT module can be run using standard web-browsers (e.g. Netscape). The simulation component of the CBT module is implemented using the system dynamics (SD) simulation modeling method. The paper presents the design of the simulation model and the training scenario offered by the existing CBT module prototype. Possibilities for empirical validation of the effectiveness of the CBT module in university education are described, results of a first controlled experiment are presented and discussed, and future extension of the CBT module towards collaborative learning environments are suggested.

<http://www.sciencedirect.com/science/article/B6V0N-44C84K6-7/2/57eb13c7610fc32fe2a44125c04b7207>

Chapter 3- Universal Elements

Project Startup for All Phases

Team Coordination Between all Phases

Cohen, S. G. and D. E. Bailey (1997). "What makes teams work: Group effectiveness research from the shop floor to the executive suite?" Journal of Management 23(3): 239-290.

In this article, we summarize and review the research on teams and groups in organization settings published from January 1990 to April 1996. The article focuses on studies in which the dependent variables are concerned with various dimensions of effectiveness. A heuristic framework illustrating recent trends in the literature depicts team effectiveness as a function of task, group, and organization design factors, environmental factors, internal processes, external processes, and group psychosocial traits. The review discusses four types of teams: work, parallel, project, and management. We review research findings for each type of team organized by the categories in our heuristic framework. The article concludes by comparing the variables studied for the different types of teams, highlighting the progress that has been made, suggesting what still needs to be done, summarizing key learnings from the last six years, and suggesting areas for further research.

<http://www.sciencedirect.com/science/article/B6W59-45HDDNS-14/2/ee732e390c32d58d802aa4a4f7d0a64e>

Fleming, Q. W. and J. M. Koppelman (1996). "Integrated project development teams: another fad ... or a permanent change." International Journal of Project Management 14(3): 163-168.

This paper candidly discusses both the positive and the negative aspects of an increasingly popular approach towards project management called integrated project development teams. The concept has been around for years and has gone by other names, most notably concurrent engineering, but at other times it is simply referred to as project teams. The use of teams has had wide acceptance in the US in both the private and government sectors. The attraction of the project teams' concept is quite straightforward: the distinct possibility of shortening the cycle time necessary to take a new product idea from its creator to the ultimate consumer, while maintaining or improving the quality of the final design. Whereas managements often understand the general nature of employing project teams, not all firms are willing to make the necessary commitments to make them work successfully. There are also certain drawbacks in the use of teams which not everyone discusses, or quite possibly understands.

<http://www.sciencedirect.com/science/article/B6V9V-3VW1S2D-5/2/a3c8379d43b2dd39d701193e578f5c48>

Sorel, T. "The Life Cycle Continuum."

A management structure that moves a megaproject along with seamless transitions between the project's phases can affect the final outcome and success.

<http://www.tfrc.gov/pubrds/04jul/04.htm>

Steyn, H. (2002). "Project management applications of the theory of constraints beyond critical chain scheduling." International Journal of Project Management 20(1): 75-80.

The application of the Theory of Constraints (TOC) is an approach that can be used to develop a variety of management techniques. As a result of the multi-disciplinary nature of project management a variety of different applications within project management are possible. The application of the TOC approach to project scheduling led to the development of the critical chain technique that has been the subject of discussions in literature. This paper explains why TOC was initially applied only to project scheduling. A second application of TOC is to manage resources shared by a number of concurrent projects. The basic principles of this second application are discussed in this paper. In addition to the above-mentioned two applications the TOC approach can also be applied to other areas of project management such as project

cost management and project risk management.

<http://www.sciencedirect.com/science/article/B6V9V-449V0S0-8/2/215545b4c56b2d75056025ad8a30b86b>

Genus, A. (1997). "Managing large-scale technology and inter-organizational relations: The case of the Channel Tunnel." *Research Policy* 26(2): 169-189.

This paper provides an analysis of the difficulties affecting the development of the Channel Tunnel fixed link. The study draws upon relevant concepts and concerns located in the disciplines of technology policy, decision theory and project management. It evaluates the inflexibility (and non-incrementality) of the Channel Tunnel project in terms of capital intensity, unit size, dependence upon specialized infrastructure and lead time. Hitherto, research has provided support for the hypothesis that technological projects characterized by the aforementioned factors will be unusually painful to develop, with adverse implications for their performance in operation. Studies of this type have analysed, amongst other subjects, the development of nuclear power and first generation North Sea oil fields: cases which contravene the prescriptions of incrementalism. Another aspect of the paper investigates the claim, also supported by previous research, that inflexible technology projects are promoted by centralized decision-making processes to the exclusion of legitimate stakeholders. A more flexible, incremental approach, on the other hand, would emphasize the mutual adjustment and coordination of various stakeholders. The theme of the paper referred to here relates to the implications of centralized decision making early in the life of large-scale projects for subsequent inter-organizational conflict and the lack of the partnering or mutual approach that is widely accepted as being a key factor in the effective management of such projects. The research benefits from interviews with key participants in the Channel Tunnel project as well as from a wealth of secondary data. Conclusions drawn refer to the whether the findings of the research support or refute the incremental thesis and whether more flexible alternative options were available to decision makers.

<http://www.sciencedirect.com/science/article/B6V77-3SX28W2-3/2/25358bac94b73eacef9e30ebb14852ee>

Evaristo, R. and P. C. van Fenema (1999). "A typology of project management: emergence and evolution of new forms." *International Journal of Project Management* 17(5): 275-281.

Traditionally, project management has focused on the management of projects on a single location either within one organization or among two or more organizations. Recently, however, emerging trends are changing the way projects are organized and managed, creating new challenges in project management research and practice. This paper has two objectives. First, it proposes a classification of project management types based on the number of projects and sites involved and investigate the consequences of such schema. Second, the evolution of projects across three levels is discussed.

<http://www.sciencedirect.com/science/article/B6V9V-3WH648K-2/2/543b8eff3b0dbdb968cee155ed907449>

Mahmoud-Jouini, S. B., C. Midler, et al. (2004). "Time-to-market vs. time-to-delivery: Managing speed in Engineering, Procurement and Construction projects." *International Journal of Project Management* 22(5): 359-367.

The time-to-market in NPD projects is a key factor in the competition between innovative firms. Research on concurrent engineering has shown that time can be managed as well as a delay and as a speed. Our concern in this paper is to study the time factor in the case of Engineering, Procurement and Construction (EPC) projects, where a customer initially contracts for a project from a contractor on the basis of specifications, budget and delay. Is time-to-delivery a key factor? Does its reduction represent a competitive advantage for the client and/or for the contractor in EPC projects? Is project speed a key variable to be managed, or does it result from other project parameters? We first define an analytical model to characterize a speed profile in EPC projects. We implement this model for six major construction projects developed by a large, international firm. A variety of speed profiles result. We conclude by showing the relevance of NPD project speed management in EPC projects.

<http://www.sciencedirect.com/science/article/B6V9V-4B428JW-3/2/0a897aa9b64424fb6f0152d376d48c7>

Consultant Selection and Negotiations

- Gransberg, D., H. Reynolds, et al. (1999). "Measuring Partnered Project Performance" Cost Engineering 41(10): 39. These authors present the results of a study of over 400 projects completed by the Texas Department of Transportation over 5 years. The objective was to compare the performance of construction projects on which formal partnering agreements had been executed with projects that had been complete without partnering and measure the benefits due to partnering. The data was collected on 20 different aspects, from cost and time growth to the amount of previous experience.
<https://www.aacei.org/bookstore/cgi-bin/shop.cgi?CustomerID=1110783241&page=litsearch.html>

Scheduling Techniques to Ensure Adequate Time & Quality

- Alsakini, W., K. Wikstrom, et al. (2004). "Proactive schedule management of industrial turnkey projects in developing countries." International Journal of Project Management 22(1): 75-85.

This paper presents the results of a study on the deviations that are encountered in power plant projects in developing countries, their effects and the key solutions for planning and steering of these projects. The study recommends a planning and scheduling system that is based on performing continuous detailed planning throughout project execution to incorporate the forthcoming events and react to their effects. When recommending such system the authors equally emphasize the need for the project management function itself to adapt to the changing industry environment in order to maintain its relevance for project delivery well into the future.

<http://www.sciencedirect.com/science/article/B6V9V-48B00BG-5/2/a369e1a4cc7e709939c0a036a9ad2e44>

- Clift, T. B. and M. B. Vandenbosch (1999). "Project Complexity and Efforts to Reduce Product Development Cycle Time." Journal of Business Research 45(2): 187-198.

One of the primary goals of new product development (NPD) teams is the reduction of development cycle time. To date, many companies continue to adhere to the structure and formality of standardized processes irrespective of the complexity of the development task at hand. Using a pattern-matching methodology, we selected 20 NPD projects for detailed study. The final sample was balanced on the basis of project complexity, cycle time, and company size. In-depth interviews conducted with the leaders of these projects highlighted several key differences in the approaches used to reduce cycle time in projects of varying complexity. The short-cycle simple projects in our sample tended to be run by autocratic leaders, who adhered to a well-defined product development process. In contrast, the short-cycle complex projects in our sample were run by leaders who used a more participative management style, used many external sources of information, and were less formal in their approach to NPD project management. The long-cycle project leaders in our sample were also more autocratic in their approach to project leadership, used less external sources of information, and generally adhered to the standardized, serial processing approach to NPD. Our findings indicate that short-cycle complex projects require a different type of management process than is evidenced in the literature. Managers of this type of project need to foster a short-cycle mentality among the project team and the company product development organization. At the same time they must exercise caution to ensure that the decision-making process is not dominated by the mere desire to be quicker.

<http://www.sciencedirect.com/science/article/B6V7S-3WV9MS4-8/2/42248148b37fa48badc3ead038aef6c0>

- Chu, X. and S. E. Polzin (1998). "Considering build-later for major transit investments." Transportation Research Part A: Policy and Practice 32(6): 393-405.

This paper uses a theoretical model of benefit-cost analysis to consider the timing of major transit investments. The model takes into account the net benefits of a project, the variation of net benefits with project age and investment timing, capital cost and its growth, and the discount rate. Three questions are examined: (1) when might build-later be evaluated? (2) how do changes in the discount rate and other parameters of an investment affect its optimal timing? and (3) how significantly do differences in the stream

of net benefits from an investment affect its optimal timing? The first two questions are examined analytically, and the last question is examined numerically. Implications are discussed with respect to planning for major transit investments.

<http://www.sciencedirect.com/science/article/B6VG7-3T88FM7-1/2/645e58562d24657868ee470abbae82d5>

El-Rayes, K., & Kandil, A. (2005). Time-cost-quality trade-off analysis for highway construction. *Journal of Construction Engineering and Management*, 131 (4), 477.

Many departments of transportation have recently started to utilize innovative contracting methods that provide new incentives for improving construction quality. These emerging contracts place an increasing pressure on decision makers in the construction industry to search for an optimal resource utilization plan that minimizes construction cost and time while maximizing its quality. This paper presents a multi-objective optimization model that supports decision makers in performing this challenging task.

Lee, S., & Pena-Mora, F., & Park, M. (2006). Dynamic planning and control methodology for strategic and operational construction project management. *Automation in Construction*, 15, 84-97.

This paper introduces the system's perspective of the dynamic planning and control methodology (DPM), aimed to support both the strategic and the operational aspect of project management. For this objective, a new modeling framework that integrates system dynamics and network-based tools is presented in this paper. The proposed framework adopts system dynamics as a core simulation engine for strategic project management and network-based tools as a wrap layer for operational project management. To implement the DPM framework, a web based system has been developed within a collaborative environment.

Srivastava, B., & Kambhampati, S., et al. (2001). Planning the project management way: Efficient planning by effective integration of causal and resource reasoning in RealPlan. *Artificial Intelligence*, 131 (1-2), 73-134.

In most real-world reasoning problems, planning and scheduling phases are loosely coupled. For example, in project planning, the user comes up with a task list and schedules it with a scheduling tool like Microsoft Project. One can view automated planning in a similar way in which there is an action selection phase where actions are selected and ordered to reach the desired goals and a resource allocation phase where enough resources are assigned to ensure the successful execution of the chosen actions. On the other hand, most existing automated planners studied in Artificial Intelligence do not exploit this loose-coupling and perform both action selection and resource assignment employing the same algorithm. The current work shows that the above strategy severely curtails the scale-up potential of existing state of the art planners which can be overcome by leveraging the loose coupling. Specifically, a novel planning framework called RealPlan is developed in which resource allocation is de-coupled from planning and is handled in a separate scheduling phase. The scheduling problem with discrete resources is represented as a Constraint Satisfaction Problem (CSP) problem, and the planner and scheduler interact either in a master-slave manner or in a peer-peer relationship.

Fernandes, K. J., V. Raja, et al. (2005). "Portals as a knowledge repository and transfer tool--VIZCon case study." *Technovation* 25(11): 1281-1289.

Today's business domains are complex and require faster decisions, better allocation of resource and above all dictate the need to share knowledge both within and outside the domain. Managing dynamic projects in such a volatile business environment requires a structured approach. This paper is concerned with using portal technology as a means for storing and transferring knowledge. The paper demonstrates the use of portal technology, via a case study, to increase the overall project reactivity and achieve the objectives, namely to reduce time, improve decision-making, increase productivity and reliability. A portal developed to manage the VIZCon project is described using a novel framework. A five-step approach for developing an effective project management portal is presented with empirical evidence. Finally implementation issues and the limitations of the system are discussed.

<http://www.sciencedirect.com/science/article/B6V8B-4C2R32X-2/2/f5d2ed6956bc81021d593de439e18378>

Zafra-Cabeza, A., M. A. Ridao, et al. (2004). "An algorithm for optimal scheduling and risk assessment of projects." Control Engineering Practice 12(10): 1329-1338.

This work presents a method for the optimal scheduling of projects in terms of time and cost. The technique uses a p-timed Petri net to describe the project tasks and the project risk assessment plan. Risks, their impacts and mitigations actions are taken into account. The algorithm determines the set of mitigation actions which optimize a function that considers project cost and completion time of the project.

<http://www.sciencedirect.com/science/article/B6V2H-4CCNRD7-3/2/f6dc67679e85f7560b3eec1036131e33>

Milestone Charts & Bar Charts

Maylor, H. (2001). "Beyond the Gantt chart: Project management moving on." European Management Journal 19(1): 92-100.

Large-scale engineering projects have traditionally dominated the subject of project management. Today, however, project management has become a core business process for most organisations. This paper argues that the academic subject and many of the practices have lagged this change. Particular problems are identified with the role of strategy and planning, the units of assessment, the planning process itself and the body of knowledge of the subject. An alternative view of project management is proposed based on an integrative model and areas for further development are identified.

<http://www.sciencedirect.com/science/article/B6V9T-429912W-B/2/32912bee31450f3fb3631e76af793169>

Managing Project Budget

The U.S. Department of Transportation has a statement on the Management of Cost Drivers on Federal-aid Highway Projects. This statement was made by The Honorable Kenneth M. Mead, Inspector General of the U.S. DOT to the Committee on Appropriations, Subcommittee on Transportation, Treasury and Independent Agencies US House of Representatives. The case study is a review of a number of successful projects, how they managed the projects and the results of those projects.

<http://www.oig.dot.gov/StreamFile?file=/data/pdfdocs/cc2003109.pdf>



Blythe, J. (2004). "The Road to Best Practices-Using Lessons Learned in Cost Management." Cost Engineering 46(11): 10.

<https://www.aacei.org/bookstore/cgi-bin/litsearch.pl?CustomerID=1110783241>

Chua, D. K. H., P. K. Loh, et al. (1997). "Neural networks for construction project success." Expert Systems with Applications 13(4): 317-328.

Being able to identify key attributes for successful project performance is of paramount importance to project agencies, contractors, and designers. Understanding these key factors can help in the efficient execution of a construction project. This paper identifies key project management attributes associated with achieving successful budget performance using a neural network approach. Neural network models were developed using field data comprising potential determinants of construction project success. Altogether eight key project management factors were identified: (1) number of organizational levels between the project manager and craft workers; (2) amount of detailed design completed at the start of construction; (3) number of control meetings during the construction phase; (4) number of budget updates; (5) implementation of a constructability program; (6) team turnover; (7) amount of money expended on controlling the project; (8) the project manager's technical experience. The final model, after sufficient training, can also be used as a predictive tool to forecast budget performance of a construction project. This approach allows the budget performance model to be built even though the functional interrelationships between inputs and output are not clearly defined. The model also performs reasonably well with incomplete information of the inputs.

<http://www.sciencedirect.com/science/article/B6V03-3SNYRVH-K/2/58bcf76ed61b570299311f8ef5fd6e4b>

Harbuck, R. (2001). "Parametric Estimating Methodology for Transit Project Planning." AACE International Transactions: PS21.

Transit project planning is a critical step in the development of transit capital improvements. The planning process focuses on a special transportation need, identifies alternative actions to address this need, and generates the information required to select an alternative for implementation. In the typical transit project planning effort, capital cost estimating plays an important role in the evaluation of alternative and ultimately in the selection of the "best" alternative option. The paper will present a parametric estimating methodology for preparing capital cost estimates that follow the general guidelines established by the US Federal Transit Administration (FTA).

<https://www.aacei.org/bookstore/cgi-bin/shop.cgi?CustomerID=1110783241&page=litsearch.html>

Lee, D. B. (2000). "Methods for evaluation of transportation projects in the USA." Transport Policy 7: 41-50.

"Projects", as the term is used here, are capital investments- from resurfacing streets to multi-billion dollar construction- that create transportation infrastructure. "Methods" are primarily benefit-cost analysis, although other frameworks have been, and still remain, in use. Most projects are contracted by public agencies and authorities, primarily at the state and local level, but the federal government is the dominant source of evaluation guidance because most transportation projects use some share of federal funds. Benefit-cost analysis (BCA of BC) is a decision framework for government agencies to use in considering the desirability of taking alternative actions, whether investment, operations or regulation. This survey describes the use of BCA by US transportation agencies, comparing theory, published guidance, and actual practice.

<http://www.sciencedirect.com/science/article/B6VGG-40X8F3J-7/2/b4374350658747d6c9b1bfe003f5533f>

Molenaar, K. (2005). "Programmatic cost risk analysis for highway megaprojects." Journal of construction engineering and management 131(3): 343.

Highway megaprojects (construction projects over \$100 million) are fraught with uncertainty. These projects have historically experienced increases in project costs from the time that the project is first proposed or programmed until the time that they are completed. Persistent cost underestimation reflects poorly on the industry in general but more specifically on engineers. Traditional methods take a deterministic, conservative approach to project cost estimating and then add a contingency factor that varies depending on the stage of project definition, experience, and other factors. This approach falls short, and no industry standard stochastic estimating practice is currently available. This paper presents a methodology developed by the Washington State Department of Transportation (WSDOT) for its Cost Estimating Validation Process. Nine case studies, with a mean cumulative value of over \$22 billion, are presented and analyzed. Programmatic risks are summarized as economic, environmental, third party, right-of-way, program management, geotechnical, design process, construction and other minor risks. WSDOT is successfully using the range cost output from this procedure to convey project costs to management and the public.

<http://ascelibrary.aip.org/getpdf/servlet/GetPDFServlet?filetype=pdf&id=JCEMD4000131000003000343000001&idtype=cvjps>

Nassar, K. M. (2005). "Evaluating cost overruns of asphalt paving project using statistical process control methods." Journal of construction engineering and management 131(11): 1173.

While some projects will experience changes to the contracted cost by deduction or additions, construction cost overruns are becoming a common problem in the construction industry. Steps need to be taken to minimize cost overrun through cost and quality control techniques. This paper presents a study conducted to evaluate construction cost overruns of asphalt paving operation performed by the Illinois Department of Transportation (IDOT). The main objective is to analyze the main causes of cost overruns and evaluate the amount of cost overrun of asphalt paving operations, using statistical process control (SPC) techniques.

Real data from projects in the year 2000 were collected from IDOT. These data contain cost information of 219 projects. The results indicate that the average cost overrun for the sample collected was 4% above the bid price. Reasons for cost overruns are analyzed and a Pareto chart and a cause and effect diagram are constructed. Individual and Moving Range (MR) control charts are developed and their interpretation and use are discussed. Furthermore, the benefits and limitations of using the individuals and MR chart in cost control application are printed out. It is recommended that SPC analysis be an integral part in managing and control ongoing project costs.

<http://ascelibrary.aip.org/getpdf/servlet/GetPDFServlet?filetype=pdf&id=JCEMD4000131000011001173000001&idtype=cvips>

Nightingale, P. (2000). "The product-process-organization relationship in complex development projects." Research Policy **29**: 913-930.

This paper provides a framework linking products to innovation processes in order to show how knowledge, technology and organization are all interrelated. These interactions create specific innovation management problems for companies developing complex, systemic capital goods. Firms can reduce development schedules and costs by efficiently allocating resources to reduce uncertainty about the implications of different design options. The paper proposes that technologies are constructed by following a set of interrelated problem solving tasks that constrain the range of possible innovation processes. This dynamic interaction between these interrelated tasks and the organization of specialized labor influences the success of problem solving (as does problem-solving technology) and consequently the number and extent of redesign feedback loops in the innovation process. These redesign feedback loops have implication for the schedule, cost and quality of the project. The more general framework is illustrated by a case study of product development in the aeroengine sector.

<http://www.sciencedirect.com/science/article/B6V77-417FB1C-8/2/c96c4a37b8db9abbd3a62c17d08b69e1>

Paul, A. and G. Gutierrez (2005). "Simple probability models for project contracting." European Journal of Operational Research **165**: 329-338.

There are two aspects to the process of price setting using sealed bids. The project owner is interested in deploying the contract mechanism that will secure reliable service at the cheapest cost. On the other hand, each contractor bidding for the project is interested in winning the contract but at a price that assures him a reasonable profit margin. We use a parsimonious stochastic model to compare and contrast some commonly used contracts from the point of view of the project owner. We show that if the bidders are risk neutral, a Fixed Price contract results in the smallest expected procurement cost for the project owner. We introduce and analyze Menu contracts and show that the expected price of a Menu contract lies in between the prices of the Fixed Price and Cost Plus contract for the same project. We analyze how risk aversion and collusion, which we model using concepts of stochastic dependence impacts the average winning bid price.

<http://www.sciencedirect.com/science/article/B6VCT-4CGN0CH-1/2/ad42db84059b84349c950c57ea61ec4c>

Reid, R. (2004). "Greasing the Skids: How Federal Lending Programs can move your Transportation Projects Forward." Government Finance Review: 40.

<http://www.gfoa.org/services/gfr/archives/2004/06/>

Seabrook, E. (2002). "Contract Administration on federally funded projects." AACE International Transactions **PM.12**: 121.

The Dallas-Fort Worth metroplex has had significant growth in the past few years and is in the process of planning many large projects that will be competing for federal funding. The projects range from \$1 million to \$3 billion, incorporation highways, airports, and transit projects. Many considerations are required when preparing contracts that include federal funding. From the initial applications to the actual contract wording, the proper statements are important to avoid jeopardizing the funding. The type of change control process used is critical to the approval process and will help in claims avoidance. This paper reviews US Federal Transportation Administration (FTA) guidelines for contract administration, focusing on contract changes

including delays, acceleration, liquidation damages, and overall claims management.

<https://www.aacei.org/bookstore/cgi-bin/litsearch.pl?CustomerID=80082180>

Sinnette, J. (2004). "Accounting for megaproject dollars: efforts are underway to help improve cost estimating for major highway projects." *Public Roads* 68(1): 40-47.

Tam, C. M. (1999). "Build-operate-transfer model for infrastructure developments in Asia: reasons for successes and failures." *International Journal of Project Management* 17(6): 377-382.

In recent years, there has been a growing trend for governments in the Southeast Asian region to allow private participation in some major public investments, especially for infrastructure projects. Many large infrastructure projects, such as expressways and power plants, are being constructed or have been operated by private firms under a procurement system called build-operate-transfer (BOT). Under the system the franchisee (project sponsor) is responsible for financing, construction, and operating a facility and he, in return, has been granted a right to generate revenue from the facility for a specific period. After the concession period, the facility will be transferred at no cost to the franchiser, who usually is the government. The major motivator for the BOT system is that the host government need not spend any public funding but still can provide a public facility to her people. Meanwhile, the franchisees can enjoy a high potential profit from a successful BOT project. Experience from Hong Kong has proven the benefits of the system. However, the system can be very risky potentially. The three transportation projects in Thailand, including the Second Expressway System, Don Muang Tollway and the Bangkok Elevated Transport System, have given investors a painful experience. Analyzing these successful and failing examples, this study has concluded the ingredients of a successful BOT project. They include an experienced, equitable and simple governing body and structure, an uncorrupted and honest political regime, an intact contractual agreement, a structured set of BOT regulations and legal system, large and reliable consortium and experienced construction organization and lastly, but most importantly, no intervention of politics.

<http://www.sciencedirect.com/science/article/B6V9V-3XD3JRK-8/2/89c395b31c259baf5b4aa4a7922ee09>

Managing Project Quality

Aggarwal, R. and Z. Rezaee (1996). "Total quality management for bridging the expectations gap in systems development." *International Journal of Project Management* 14(2): 115-120.

The expectations gap in systems development is the result of differences between the expectations of end users from computer systems and their actual performance. High expectations of users are caused by vendors' self-serving claims and the glitter of technology, while the low performance of computer systems is the result of inadequacies in systems development. Application of total quality management (TQM) concepts in systems development narrows this expectations gap by meeting users' requirements of functionality and budget constraints. This is achieved by involving users, senior managers and systems developers in systems development. The development process is streamlined with computer-aided software engineering (CASE) tools and project management techniques.

<http://www.sciencedirect.com/science/article/B6V9V-3VVVPP8-9/2/454ed0b8c252b276068facb5b190084f>

Papalexandris, A., G. Ioannou, et al. (2004). "Implementing the Balanced Scorecard in Greece: a Software Firm's Experience." *Long Range Planning* 37(4): 351-366.

The Balanced Scorecard (BSC) is a relatively new approach to strategic management and performance measurement and control, which has generated substantial interest in the academic and industrial communities. This paper presents the experience from the implementation of a specific BSC model at a large software development company in Greece. The study illustrates and evaluates the main obstacles and shortcomings, as well as the critical success factors that characterise such BSC projects, while offering managerial insights and guidelines for similar implementations.

<http://www.sciencedirect.com/science/article/B6V6K-4DCKRVY-4/2/6ccfcca32733980bfc453acf9957a3fb>

Pantazides, L. (2005). "Managing Quality on Transportation Mega Projects." ASQ World Conference on Quality and Improvement Proceedings 59: 289.

<http://qic.asq.org/per/search.pl?item=20336>

Minchin, R. E. and G. R. Smith (2005). "Quality-Based Contractor Rating Model for Qualification and Bidding Purposes." Journal of Management in Engineering: 38-43.

A quality contractor on every construction project would make project management simpler for Department of transportation (DOT) project engineers and strategic planning more accurate for DOT executives. A qualification model that includes the quality of a contractor's past work would be invaluable in assuring that each project had a quality contractor. Including the quality of past work in the bidding process would further help in this goal. Implementation of such a model for both its potential uses would require business process reengineering for the DOT in two important areas: qualification of contractors and contract award procedures. The research team has produced an innovative model, called the Quality-Based Performance Rating (QBPR) system. This model receives inputs from traditional subjective sources and integrates them with totally objective data input from the result of tests of the project's materials and workmanship, then uses these inputs to produce a score of each project that is further used by the system to generate an index for each contractor reflecting that contractor's quality of work over a specified time frame.

<http://ascelibrary.aip.org/getpdf/servlet/GetPDFServlet?filetype=pdf&id=JMENA000021000001000038000001&idtype=cvips>

El-Rayes, K. and A. Kandil (2005). "Time-cost-quality trade-off analysis for highway construction." Journal of construction engineering and management 131(4): 477.

Many departments of transportation have recently started to utilize innovative contracting methods that provide new incentives for improving construction quality. These emerging contracts place an increasing pressure on decision makers in the construction industry to search for an optimal resource utilization plan that minimizes construction cost and time while maximizing its quality. This paper presents a multiobjective optimization model that supports decision makers in performing this challenging task. The model is designed to transform the traditional two-dimensional time -cost tradeoff analysis to an advanced three-dimensional time -cost quality trade -off analysis. The model is developed as a multiobjective genetic algorithm to provide the capability of quantifying and considering quality in construction optimization. An application example is analyzed to illustrate the use of the model and demonstrate its capabilities in generating and visualizing optimal tradeoffs among construction time, cost, and quality.

<http://ascelibrary.aip.org/getpdf/servlet/GetPDFServlet?filetype=pdf&id=JCEMD4000131000004000477000001&idtype=cvips>

Zudor, I. and J. Homstrom (2005). "Solution framework proposal: taking effective control over the project delivery chain with automatic identification and agent-based solutions." Assembly Automation 25(1): 59.

The objective of this paper is to propose a solution framework for better project delivery control. Three emerging technologies that may offer practical solution are reviewed. These are automatic product identification, merge-in-transit (MIT), and agent based control systems. Combining project site level and shipment specific control makes it possible to implement MIT in the project delivery chain. This basic functionality of merging deliveries is needed to react to project delays, and improve scheduling project resources. Systems design and trials are needed for further development of the proposed solution framework. Organizations responsible for coordinating project deliveries need to think about the incentives and costs for logistics service providers, and other business partners to participate in MIT solutions. The proposed framework is based on an open identification scheme. This makes it possible for new project delivery partners and service providers to locate and start using the controlling software applications without prior notification and arrangement.

<http://www.emeraldinsight.com/Insight/viewContentItem.do?contentType=Article&contentId=1463465>

Akinsola, A. O., K. F. Potts, et al. (1997). "Identification and evaluation of factors influencing variations on building projects." International Journal of Project Management 15(4): 263-267.

This paper identifies and quantitatively examines factors influencing the magnitude and frequency of variations on building projects. The evaluation was based on the analysis of 46 completed building projects in the UK. The identified factors were classified into four main categories: client characteristics, project characteristics, project organization and environmental factors. The findings of the study suggest that there is a relationship between these factors and the magnitude and frequency of variations. Adequate attention given to these significant factors at pre- and post-tender stages of the project should reduce the effect of variations.

<http://www.sciencedirect.com/science/article/B6V9V-3SWY03S-9/2/0633c3407df060c3deadcb48b5696ccd>

Quality Assurance

Arditi, D. and Gunaydin, H. (1998). "Total quality management in the construction process." International Journal of Project Management 15(4): 235-243.

There is great potential for quality improvement in the construction process. A study of the literature and of surveys conducted in the USA indicated that management commitment to quality and to continuous quality improvement is very important; construction industry professionals are well aware of the importance of quality training; partnering agreements among the parties in the construction process constitute an important step in securing a high quality product; a feedback loop could upgrade the original quality standards used in the industry; the clarity of project scope and requirements as well as of drawings and specifications is a prerequisite for high process quality.

http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V9V-3SWY03S-6&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&_view=c&_version=1&_urlVersion=0&_userid=10&md5=a1dcc16c052b190d33560a0b60c75bcb.

Conroy, G. and H. Soltan (1998). "ConSERV, as a continual audit concept to provide traceability and accountability over the project life cycle." International Journal of Project Management 16(3): 185-197.

All major capital projects require some form of audit mechanism procedure and these are traditionally undertaken at strategic periods over the project life cycle typically, pre sanction, 30, 60 and 90%. In order to evaluate the status of a given project at any time during the life cycle, project specific data are required; these data require structured evaluation in accordance with the organization's audit procedures. The concurrent, simultaneous engineering resource view concept, ConSERV, is being designed to enable project specific data to be handled via a knowledge based system and thereby be continually analyzed, assessed and audited against project specific issues and organizational procedures. This paper outlines the benefits of using an on line self audit facility, built into an intelligent knowledge based project management system.

<http://www.sciencedirect.com/science/article/B6V9V-3SX7016-7/2/70d528c8a47fe043dec33e93fab7aeca>

Love, P., and Irani, Z. (2003). "A project management quality cost information system for the construction industry." Information & Management 40(7): 649-661.

A prototype Project Management Quality Cost System (PROMQACS) was developed to determine quality costs in construction projects. The structure and information requirements that are needed to provide a classification system of quality costs were identified and discussed. The developed system was tested and implemented in two case study construction projects to determine the information and management issues needed to develop PROMQACS into a software program. In addition, the system was used to determine the cost and causes of rework that occurred in the projects. It is suggested that project participants can use the information in PROMQACS to identify shortcomings in their project-related activities and therefore take the

appropriate action to improve their management practices in future projects. The benefits and limitations of PROMQACS are identified.

http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VD0-46WW6MW-1&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=e4a50f44fe9c2e4223462feac73feb52.

Kam, C.W. and Tang, S.L. (1997). "Development and implementation of quality assurance in public construction works in Singapore and Hong Kong." *International Journal of Quality & Reliability Management* 14(9): 909-928.

Quality assurance (QA) has been adopted by the public construction sectors in Asia since the introduction of ISO 9000 quality standards in 1987. The Governments of Singapore and Hong Kong have designed a series of quality infrastructure to promote, develop and improve the quality management system in the construction industry. Highlights the rapid development of quality systems in Singapore and Hong Kong, and the implementation of the construction quality assessment system (CONQUAS) in Singapore. Examines the performance assessment scoring system (PASS) in Hong Kong to assess the quality of building works. Discusses and compares the incentives for the construction sectors to achieve the ISO 9000 certification in both cities.

<http://www.emeraldinsight.com/10.1108/02656719710186830>.

Quality Control

Hillman Willis, T. and Willis, W.D. (1996). "A quality performance management system for industrial construction engineering projects." *International Journal of Quality & Reliability Management* 13(9): 38-48.

Engineering consulting firms involved in the design and construction of large-scale industrial plants attempt to find flaws as early as possible in the design process to avoid more costly deviation corrections later on, particularly during and after construction. Deviation corrections can be reduced by pursuing more diligent quality prevention and appraisal efforts. Quality performance management system (QPMS) is a cost evaluation programme designed to measure the prevention and appraisal effort and its impact on deviation corrections. Examines this system and details the quality improvement results for a multi-million dollar chemical plant project. Approximately 12 per cent of the total cost of design and construction was attributed to quality costs, a majority of which was categorized as various prevention and appraisal activities. Describes overall cost reductions and other benefits of QPMS.

<http://www.emeraldinsight.com/10.1108/02656719610150605>.

Meirovich, G. (2006). "Quality of design and quality of conformance: Contingency and synergistic approaches." *Total Quality Management & Business Excellence* 17(2): 205 – 219.

The distinction between design quality and conformance quality has not been systematically analysed in the literature. On the one hand, there is no sufficient distinction between these two elements in reference to many TQM themes, which are addressed too 'totally' in the sense that quality is taken as a whole, undivided phenomenon. On the other hand, quality of design and quality of conformance are referred to as separate, independently coexisting phenomena. This paper studies these two quality dimensions as opposite and conflicting sides of a paradox that complicates quality management. Conflict between design and conformance quality can be handled in two main ways. One is a contingency approach, whose purpose is to determine correct prioritization between the two dimensions and allocate resources accordingly. This paper focuses on contextual variables such as: stages of industry, product, and organizational life cycle; organizational technology; generic competitive strategy; international strategy; and level of uncertainty. The second possibility is to employ an integrative, or synergistic, approach, which is based on a win-win perspective that the improvement of one element can contribute to the improvement of another.

<http://www.informaworld.com/smpp/content~content=a741480898~db=all>.

Ensuring the Performance of Consultants

Ng, S. and Chow, L. (2004). "Framework for Evaluating the Performance of Engineering Consultants." Journal of Professional Issues in Engineering Education and Practice. 130(4): 280-288.

The evaluation of consultant's performance is crucial to the success of a consulting assignment especially when today's construction projects are becoming more sophisticated, large-scale, and risky. However, since individual clients have developed their own consultant's performance evaluation (CPE) procedures, the sharing of performance information, though desirable, may not be too meaningful as the results of evaluation could be inconsistent. There is a need to examine whether a unified framework can be derived for CPE. The aim of this paper is to improve the transparency and rigorousness of CPE through the establishment of an evaluating framework for gauging the performance of engineering consultants. In this paper, a comprehensive set of evaluation criteria is identified, and the significance of these criteria is discussed through an empirical survey.

[http://dx.doi.org/10.1061/\(ASCE\)1052-3928\(2004\)130:4\(280\)](http://dx.doi.org/10.1061/(ASCE)1052-3928(2004)130:4(280)).

Managing Project Risks & Creating a Risk Management Plan



Chapman, C. and S. Ward (2004). "Why risk efficiency is a key aspect of best practice projects." International Journal of Project Management 22(8): 619-632.

This paper explains what 'risk efficiency' means, why it is a key part of best practice project management, and why it may not be delivered by common practice as defined by some guidelines. This paper also explains how risk efficiency can be addressed operationally using comparative cumulative probability distributions (S-curves). Further, this paper explains why risk efficiency provides a foundation for a convincing business case for:- formal project risk management processes designed for corporate needs,- embracing the management of opportunities as well as threats,- measuring threats and opportunities to assist decision making,- developing a more effective risk taking culture,- taking more risk for more reward. The argument uses linked examples from four successful cases: the first use of a designed project risk management process by BP for offshore North Sea oil and gas projects, the first use of a designed process by National Power for combined cycle gas powered electricity generation, a culture change programme for IBM UK concerned with taking more risk to increase the rewards, and a due diligence assessment of project risk management for a railway infrastructure project. The concepts and tools described are relevant to any industry sector for projects of any size.

<http://www.sciencedirect.com/science/article/B6V9V-4CN9NMH-1/2/4977d877573d7821ed9744d82d5dea55>



Papalexandris, A., G. Ioannou, et al. (2005). "An Integrated Methodology for Putting the Balanced Scorecard into Action." European Management Journal 23(2): 214-227.

We develop a compact and integrated methodological framework for Balanced Scorecard (BSC) synthesis and implementation. The proposed methodology capitalizes on existing knowledge, while incorporating critical issues, grounded in our research and experience, which have not been systematically considered or documented in previous work. By identifying shortcomings and critical success factors from literature and experience, the methodology aims at overcoming certain serious predicaments faced by many implementations. The methodology embodies activities related to Project Management, Change Management, Risk Management, Quality Assurance and Information Technology, areas that contribute considerably to BSC implementation success.

<http://www.sciencedirect.com/science/article/B6V9T-4FY3P5W-7/2/675d7a2707177dcd6b645f2364c50df1>

Conroy, G. and H. Soltan (1998). "ConSERV, a project specific risk management concept." International Journal of

Project Management 16(6): 353-366.

Managing risk in design intensive multi-disciplinary capital projects presents unique problems for decision-makers within the project environment. Existing risk management tools tend to employ axiomatic software and as such do not provide any intelligent risk management capability or lead to better informed decision making processes. ConSERV is being developed as a comprehensive project management methodology able to extract project specific risk issues throughout the project life cycle and apply experiential knowledge by using a knowledge based systems to assist in the management of them. A visual representation of the project risks is obtained by employing a more practical non probabilistic approach. ConSERV will provide project managers with on line decision support, at key stages of the project to assist in the management and control of the project specific risks identified.

<http://www.sciencedirect.com/science/article/B6V9V-3TKVCYD-3/2/4d1d6849661a38086f37a5c69c7a5a35>

Kwak, Y. H. and K. S. LaPlace (2005). "Examining risk tolerance in project-driven organization." Technovation 25(6): 691-695.

Risk tolerance is often misunderstood or overlooked by project managers. The levels and perspectives of risk tolerance are dynamic throughout the life of the project. Risk tolerance has three different perspectives when you are involved in a project: firm, project manager, and stakeholder. The firm's risk tolerance varies according to the firm's financial stability and project diversification. A project manager's risk tolerance is affected by job security and corporate culture. The stakeholder's risk tolerance is influenced by project objective. Unfortunately, failures in communication between the stakeholder and project manager are quite common because there are few applicable tools available to support the process. The project success will depend on agreeable level of risk tolerance and support of compensation policies, corporate culture, performance reviews, and early risk management planning.

<http://www.sciencedirect.com/science/article/B6V8B-49PRGRG-4/2/59d80982a545df99d9268cf5d2b9ef5c>

Dillon, R., M. E. Pate'-Cornell, et al. (2005). "Optimal use of budget reserves to minimize technical and management failure risk during complex project development" IEEE Transactions on Engineering Management 52(3): 382-395.

Project managers are recognizing that adequate resource reserves are a critical success factor in a project development environment that is complex and uncertain. Yet, justifying the need for project reserves is still a challenge, is the optimal allocation of any available resources to minimize development uncertainties. This paper presents a multiperiod decision model designed to support the management of reserves considering the risk of failures including technical, managerial, i.e., exceeding budget and schedule, or strategic, i.e., meeting budget, schedule, and technical specifications but not achieving the full strategic value of the project. In this paper, we examine the trade offs among these risks and their implications for resource allocation during a project's development phase. This decision support model is referred to as Dynamic Advance Probabilistic Risk Analysis Model. It provides decision makers with a quantitative tool to allocate reserves (beyond the bare-bone minimum project costs). Among project reserves, technical reinforcements of the engineered system, and product enhancements, with the advantage of flexibility over time. The model yields first, coarse estimates of the value of deferring some commitments about the products' design until critical uncertainties are resolved and second, an estimate of the optimal amount to be invested in testing and reviews. We show that the greater the uncertainties at the onset of the development phase, the greater the value of this information.

<http://ieeexplore.ieee.org/iel5/17/31494/01468407.pdf?isnumber=31494&prod=JNL&arnumber=1468407&arSt=+382&ared=+395&arAuthor=Dillon%2C+R.L.%3B+Pate-Cornell%2C+M.E.%3B+Guikema%2C+S.D.>

Einstein, H. H. (2000). "Tunnels in Opalinus Clayshale -- A review of case histories and new developments." Tunneling and Underground Space Technology 15(1): 13-29.

Numerous tunnels have been built and new tunnels are planned in the Swiss Jura Mountains, and most of them intersect Opalinus Clayshale. This paper reviews several tunnel case histories which show that Opalinus Clayshale can be quite problematic by swelling during construction and also during operation, if

the invert cover is not strong enough and if water can penetrate into the shale. Modern testing methods and a newly developed behavioral model based on these tests are then presented. They clearly show that Opalinus Clayshale when unloaded as can occur around the tunnel perimeter swells which in turn can induce creep and even failure. Considering this behavior in design and construction will reduce swelling and creep. Modern, TBM-based tunnel construction which utilizes prefabricated liner elements satisfies these requirements. In addition, the paper describes project management procedures that allow one to include the risks associated with swelling when assessing and awarding bids.

<http://www.sciencedirect.com/science/article/B6V58-42KDGC4-3/2/6c1ca96a0284c89a72b01993e893ed3a>

Hall, R. and P. Andriani (2003). "Managing knowledge associated with innovation." Journal of Business Research 56(2): 145-152.

This article reports the results of empirical work carried out in a project funded by the UK Government's Engineering and Physical Sciences Research Council (EPSRC). The project was concerned with operationalising knowledge management concepts in the context of interorganisational innovation. The companies that collaborated in this project were a major manufacturer of powered garden machinery and a major mobile telephone operator. The technique, which has been developed, operationalises the concepts of: tacit and explicit knowledge, radical and incremental innovation, and the five basic knowledge management processes: externalisation, dissemination, internalisation, socialisation, and discontinuous learning. The technique involves each participating party identifying the features that the successful innovation needs to possess. This is followed by the identification of the knowledge gaps that must be bridged if each feature is to be achieved. These knowledge gaps constitute the units of analysis. For each unit of analysis/knowledge gap, the size of the gap, and the nature of the required knowledge are estimated subjectively by each project team member. This allows both the identification of units which have high risk and the nature of the knowledge transformation processes, which need to be managed. The independently generated subjective perceptions are shared between the collaborating parties in a process of perceptual synthesis. At an operational level, the technique facilitates a productive dialogue between team members. At a managerial level, once a consensus regarding risk and vulnerability has been reached, improved project management becomes possible.

<http://www.sciencedirect.com/science/article/B6V7S-47S5NCS-9/2/9c9338b9a0dd84567a7849dd52e724a9>

Isaacs, L. (2005). "In the trenches." The American City & County 120(9): 34.

http://americacityandcounty.com/mag/government_trenches/index.html

Jaafari, A. (2001). "Management of risks, uncertainties and opportunities on projects: time for a fundamental shift." International Journal of Project Management 19(2): 89-101.

This paper makes a case for a shift to strategy-based project management, a component of which is real time management of risks, uncertainties and opportunities using a life cycle project management approach. Risk analysis and management should not be viewed as a separate planning and response operation. Risk and opportunity management is a way of thinking and a philosophy that should permeate the entire spectrum of project activities. Shifting to business objectives and focusing on the whole of life risks/rewards are of paramount importance. Evaluation of risks must be based not only on delivering projects on time and within budget but also on crafting, developing and operating a long term business entity which can deliver the business objectives of the parties concerned while meeting or exceeding community expectations.

<http://www.sciencedirect.com/science/article/B6V9V-41V34XM-3/2/48636b376f343b03256002fb0400edad>

Kumar, V., B. Maheshwari, et al. (2003). "An investigation of critical management issues in ERP implementation: empirical evidence from Canadian organizations." Technovation 23(10): 793-807.

The study investigates critical management issues in Enterprise Resource Planning (ERP) implementation projects such as selection of ERP vendor, project manager, and implementation partners; constitution of project team; project planning, training, infrastructure development, on-going project management; quality assurance and stabilization of ERP. The innovation process study approach is taken and data is collected

from 20 organizations using a questionnaire and structured interviews. Although each adopting organization has a distinct set of objectives for its systems project, we found many similarities in motivations, concerns, and strategies across organizations. This study identifies many critical concerns in ERP project management.

<http://www.sciencedirect.com/science/article/B6V8B-45B65X0-1/2/47bfc80b083dc292f7a60c18e1e77e53>

Lampel, J. (2001). "Towards a holistic approach to strategic project management." International Journal of Project Management **19**(8): 433-435.

Large projects can have large consequences, not only for those who use them, but also for the organizations and institutions that build and finance them. When successful, large projects generate revenues and benefit society, but when they go wrong society suffers and the organizations and institutions that are in the business of large projects confront financial difficulties and potential damage to their reputation. Interest in improving the planning, design, and delivery of large projects is therefore long-standing.

<http://www.sciencedirect.com/science/article/B6V9V-442RD8G-1/2/4b73ef23f1eca48dc24e6eb083ba9c76>

Mahmoud-Jouini, S. B., C. Midler, et al. (2004). "Time-to-market vs. time-to-delivery: Managing speed in Engineering, Procurement and Construction projects." International Journal of Project Management **22**(5): 359-367.

The time-to-market in NPD projects is a key factor in the competition between innovative firms. Research on concurrent engineering has shown that time can be managed as well as a delay and as a speed. Our concern in this paper is to study the time factor in the case of Engineering, Procurement and Construction (EPC) projects, where a customer initially contracts for a project from a contractor on the basis of specifications, budget and delay. Is time-to-delivery a key factor? Does its reduction represent a competitive advantage for the client and/or for the contractor in EPC projects? Is project speed a key variable to be managed, or does it result from other project parameters? We first define an analytical model to characterize a speed profile in EPC projects. We implement this model for six major construction projects developed by a large, international firm. A variety of speed profiles result. We conclude by showing the relevance of NPD project speed management in EPC projects.

<http://www.sciencedirect.com/science/article/B6V9V-4B428JW-3/2/0a897aa9b64424fb60f0152d376d48c7>

Thomas, A., S. Kalidindi, et al. (2006). "Modeling and assessment of critical risks in BOT road projects." Construction Management and Economics **24**: 407-424.

[http://www.journalsonline.tandf.co.uk/\(uoffid55d1znt055b2jxggmo\)/app/home/contribution.asp?referrer=parent&backto=issue,7,9;journal,7,84;linkingpublicationresults,1:100154,1](http://www.journalsonline.tandf.co.uk/(uoffid55d1znt055b2jxggmo)/app/home/contribution.asp?referrer=parent&backto=issue,7,9;journal,7,84;linkingpublicationresults,1:100154,1)

Allen, J. (2005). "Risk Analysis in Transit Project." AACE International Transactions: R91.

<https://www.aacei.org/bookstore/cgi-bin/shop.cgi?CustomerID=1110783241&page=litsearch.html>

Akintoye, A. S. and M. J. MacLeod (1997). "Risk analysis and management in construction." International Journal of Project Management **15**(1): 31-38.

The paper describes, on the basis of a questionnaire survey of general contractors and project management practices, the construction industry's perception of risk associated with its activities and the extent to which the industry uses risk analysis and management techniques. It concludes that risk management is essential to construction activities in minimizing losses and enhancing profitability. Construction risk is generally perceived as events that influence project objectives of cost, time and quality. Risk analysis and management in construction depend mainly on intuition, judgment and experience. Formal risk analysis and management techniques are rarely used due to a lack of knowledge and to doubts on the suitability of these techniques for construction industry activities.

<http://www.sciencedirect.com/science/article/B6V9V-3T7F236-6/2/6bc3f26834724c3bd052bc9f935d5>

Ogunlana, S. O., K. Promkuntong, et al. (1996). "Construction delays in a fast-growing economy: Comparing

Thailand with other economies." *International Journal of Project Management* **14**(1): 37-45.

Construction delays impact the time and cost of projects. A survey of the delays experienced in highrise building construction projects in Bangkok, Thailand, was undertaken and the result compared with other studies of delays and overruns around the world to determine whether there are special problems that generate delays for construction in developing economies. Resource supply problems were by far the most acute problems of the Thai construction industry in the boom years. The results of the study support the view that construction industry problems in developing economies can be nested in three layers: (a) problems of shortages or inadequacies in industry infrastructure (mainly supply of resources); (b) problems caused by clients and consultants and (c) problems caused by contractor incompetence/inadequacies. Conclusions recommend the need for focused effort by economy managers and construction industry associations to provide the infrastructure needed for efficient project management. This study should be of interest to emerging economies in Europe and Indochina.

<http://www.sciencedirect.com/science/article/B6V9V-3VW1CFV-6/2/6c5824db474adc2fb8809d7b0de1b1c3>

Pinto, C. A., A. Arora, et al. (2006). "Challenges to Sustainable Risk Management: Case Example in Information Network Security." *Engineering Management Journal* **18**(1): 17.

This article contributes to more sustainable management of risk by describing frameworks for (1) valuation of avoided risks and (2) improving outsourced information security services. These contributions address the absence of a structure for rewarding successful risk management, the need for an ever-more accurate economic measure of risk, and the difficulty of transferring risks to contract-bound outsourcing entities. The manager can use these concepts to make more informed decisions in allocation resources to risk management activities. Challenges and lessons from two case studies are present: (1) application of risk-based ROI at Lawrence Berkley National Laboratory, and (2) information assurance outsourcing at the Navy Marine Corps Intranet.

<http://www.asem.org/publications/EMJ%20V18%20Articles.doc>

Quinet, E. (2000). "Evaluation methodologies of transportation projects in France." *Transport Policy* **7**: 27-34.

Cost-Benefit-Analysis (CBA) practices have oscillated between a strict application of economic theory, based on surplus analysis, and a rather loose use of multi-criteria analysis. Recently a new impulse has been given to project evaluation and CBA, relying on the strict principles of economic theory. This paper offers a short description of the institutional aspects of the transportation sector in France, a review of the principles of CBA as applied in France, and comments on specific issues such as the value of time, safety, regional development and environment. The conclusion discusses problems related to the institutional features of the transportation sector.

http://www.sciencedirect.com/science?_ob=MIimg&_imagekey=B6VGG-40X8F3J-5-1&_cdi=6038&_user=513551&_orig=browse&_coverDate=01%2F31%2F2000&_sk=999929998&view=c&wchp=dGLbVlb-zSkzV&md5=a00227c76120ce72555263639f99537a&ie=/sdarticle.pdf

Raz, T. and E. Michael (2001). "Use and benefits of tools for project risk management." *International Journal of Project Management* **19**(1): 9-17.

Risk management is one of the key project management processes. Numerous tools are available to support the various phases of the risk management process. We present the results of a study designed to identify the tools that are most widely used and those that are associated with successful project management in general, and with effective project risk management in particular. The study is based on a questionnaire administered to a sample of project managers from the software and high-tech industries. The response data was analyzed in order to find which tools are more likely to be used in those organizations that report better project management performance and in those that value the contribution of risk management processes.

<http://www.sciencedirect.com/science/article/B6V9V-41HHNG4-2/2/477958f34170494578a877016f6e57ec>

Sawacha, E., S. Naoum, et al. (1999). "Factors affecting safety performance on construction sites." International Journal of Project Management 17(5): 309-315.

The factors influencing safety on construction sites are discussed. The impacts of the historical, economical, psychological, technical, procedural, organizational and the environmental issues are considered in terms of how these factors are linked with the level of site safety. The historical factor is assessed by the background and characteristics of the individual, such as age and experience. The economic factor is determined by the monetary values which are associated with safety such as, hazard pay. The psychological factor is assessed by the safety behavior of fellow workers on site including supervisors. The technical and procedural factors are assessed by the provision of training and handling of safety equipment on site. The organizational and environmental factors are assessed by the type of policy that the management adapts to site safety. Information regarding these factors was correlated with accidents' records in a sample of 120 operatives. Results of the factor analysis suggest that variables related to the organization policy' are the most dominant group of factors influencing safety performance in the United Kingdom Construction Industry. The top five important issues found to be associated with site safety were: (1) management talk on safety; (2) provision of safety booklets; (3) provision of safety equipment; (4) providing safety environment and (5) appointing a trained safety representative on site.

<http://www.sciencedirect.com/science/article/B6V9V-3WH648K-6/2/f7c2e00071fc6bce7c270398b172da8c>

Scriba, T. and J. Seplow (2005). "Making Work Zones Work Better: The Final Rule on Work Zone Safety and Mobility." Institute of Transportation Engineers 75(4): 38.

To address issues associated with traffic, congestion and work zone safety, FHWA recently updated its regulation on traffic safety and mobility in work zones. The final rule will facilitate consideration of the broader safety and mobility impacts of work zones across project development stages and the implementation of strategies to manage these impacts during project delivery.

<http://www.issinet.com/bin/webdbc.dll/traffic/users/htx/&/ite/journal/results.htx>

Turner, P. R. (2003). "Interstate Bridge Replacement: Fast Track." AACE International Transactions.

<https://www.aacei.org/bookstore/cgi-bin/shop.cgi?CustomerID=1110783241&page=litsearch.html>

Valadares Tavares, L., J. Antunes Ferreira, et al. (2002). "A comparative morphologic analysis of benchmark sets of project networks." International Journal of Project Management 20(6): 475-485.

The performance of methods to manage projects depends heavily on the features of their project networks. This is particularly true for methods devoted to project scheduling, risk analysis and resources allocation. Therefore, a long line of research has been developed to generate benchmark sets of project networks and several sets have been proposed in the literature. Unfortunately, no comparative analyses of their features were published and hence serious doubts about the comparability of results using different benchmark sets can be raised. In this paper, a multi-dimensional taxonomy for the morphology of project networks is used and four benchmark sets are evaluated: Patterson collection of problems (Patterson JH. A comparison of exact approaches for solving the multiple constrained resource, project scheduling problem. *Management Science* 1984;30:854-867) and the sets produced by the generators due to Agrawal et al. Agrawal MK, Elmaghraby SE, Herroelen WS. DAGEN a generator of test sets for project activity nets. *European Journal of Operational Research* 1996;90:376-382, Kolisch et al. Kolisch R, Sprecher A, Drexel A. Characterization and generation of a general class of resource -- constrained project scheduling problems. *Management Science* 1995;41:1693-1703, Tavares LV. Advanced models in project management. Kluwer, 1999 and Tavares et al. Tavares LV, Antunes Ferreira JA, Coelho JS. The risk of delay of a project in terms of the morphology of its network. *European Journal of Operational Research* 1999;119:510-537. Original results about the lack of representativeness of these sets are obtained showing that misleading conclusions can be deduced. The last set is, by far, that one covering most extensively the morphologic space of instances which could be foreseen because the generation of networks is carried out in terms of a wider range of parameters. This conclusion is quite useful for project managers willing to assess alternative methods to

solve their problems based on project networks.

<http://www.sciencedirect.com/science/article/B6V9V-45HVT9D-7/2/cfd331392b293bf865db9650ad9aab64>

Zaghloul, R. and F. Hartman (2002). "Construction contracts: the cost of mistrust." International Journal of Project Management 21: 419-424.

Based on two independent surveys of Agencies, Consultants and Contractors across Canada, the assessed premium associated with the five most commonly used exculpatory clauses in construction is between 8 and 20% in a seller's markets. It should be obvious that trust and contracting methods are related and that this relationship is of vital importance to effective project management and contract administration. This paper presents some of the results of a survey conducted across the Canadian construction industry that identifies some opportunities for better risk allocation mechanism and contracting strategies that are based on a trust relationship between the contracting parties.

<http://www.sciencedirect.com/science/article/B6V9V-488VXN4-3/2/3309ad69b5ae4dff41a8369dad508b03>

Ghosh, S. and J. Jintanapakanont (2004). "Identifying and assessing the critical risk factors in an underground rail project in Thailand: a factor analysis approach." International Journal of Project Management 22(8): 633-643.

Large and complex infrastructure projects involve various risk factors and the successful implementation of such projects depends on effective management of the key risk factors. This paper reviews the literature to identify essential risk variables associated with infrastructure projects. Based on these risk variables, a survey is conducted to isolate and assess the critical risk factors for a mass rapid-transit underground rail project (Chaloem Ratchamongkhon Line), Thailand. Responses obtained within the project organization are evaluated using principal component analysis to understand the latent structure of the critical risk factors. The variables within the factors are tested to confirm the reliability and validity of the constructs. Finally, nine critical factors with 35 items are extracted after four iterations. Critical risk factors obtained through the factor analysis are assessed to gain better understanding of their importance and impact on project management. The research findings are supported by the perceptions of the senior management within the project organization, which are also discussed in the paper.

<http://www.sciencedirect.com/science/article/B6V9V-4CP69WR-1/2/1ccb3a0efaca91838699673e2f7ab2ab>

Pender, S. (2001). "Managing incomplete knowledge: Why risk management is not sufficient." International Journal of Project Management 19(2): 79-87.

The Project Management Institute's Guide to the Project Management Body of Knowledge (PMBOK) underpins many initiatives to improve project management practice. It is widely used for training and underpins the development of competency standards. Because of its fundamental importance, the PMBOK should be critically reviewed. These paper argues for an expansion of the PMBOK Guide's risk management knowledge area to include a wider perspective of incomplete knowledge. The PMBOK Guide deals with uncertainty through the traditional use of probability theory, however the underpinning assumptions of probability theory do not always apply in practice. Furthermore, probability-based risk management theory does not explain important aspects of observed project management practice. This paper discusses an expanded framework of incomplete knowledge, including: an expanded concept of uncertainty that acknowledges ignorance or surprise, where there is no prior knowledge of future states; imprecision arising from ambiguity (fuzziness) in project parameters and future states; and, human limitations in information processing. The paper shows the expanded framework explains observed project-management practice more thoroughly than the probability-based framework. The conclusion reached is that management of incomplete knowledge provides a better theoretical foundation for improving project management practice. To substantiate this, a promising new approach based on real options is also discussed.

<http://www.sciencedirect.com/science/article/B6V9V-41V34XM-2/2/1a61bc8eeb25197158492462f17d6f56>

Charoenngam, C. and C.-Y. Yeh (1999). "Contractual risk and liability sharing in hydropower construction." International Journal of Project Management 17(1): 29-37.

Construction activities are uncertain and dynamic, and associated risks are often permanent and complex in construction projects. In large-scale infrastructure projects, theoretically, risks and liabilities should be fairly shared among project participants through contractual arrangements. In order to prevent unexpected risks and thus disputes during construction, international contractors should pay close attention to local project characteristics and contract practices. This paper identifies typical construction risks and describes the comparison between FIDIC (Federation Internationale Des Ingenieurs Conseils) and the Taiwanese government Conditions of Contract for hydropower construction projects.

<http://www.sciencedirect.com/science/article/B6V9V-3V7B8VR-4/2/125c2274e8ae988b9616ba1b199a2eff>

Kumaraswamy, M. M. and X. Q. Zhang (2001). "Governmental role in BOT-led infrastructure development." International Journal of Project Management 19(4): 195-205.

BOT-type schemes are attracting increasing interest with the growing thrust towards privatizing infrastructure projects in both developing and developed countries. However, an intelligent allocation of risks is a prerequisite to success of this relatively new procurement route, amidst the many variables and unknowns in such long-term and more complex scenarios. Concerted efforts from both government and private sectors, as well as appropriate political, legal and economic environments are also essential. This paper identifies and discusses various issues that governments need to deal with, for the BOT mechanism to work smoothly. These issues are further illustrated by relevant examples from Hong Kong experience in evolving an effective BOT project management framework for transportation/tunnel projects.

<http://www.sciencedirect.com/science/article/B6V9V-42P527W-1/2/820e83d0d728b8b5cc07de198528411c>

Chapman, C. (2006). "Key points of contention in framing assumptions for risk and uncertainty management." International Journal of Project Management 24(4): 303-313.

This paper explores the relationship between 'common practice' as defined by a simple reading of PMBOK Chapter 11 and 'best practice' as approached (but not quite achieved) by two alternative guides (PRAM and RAMP) in terms of key points of contention in framing assumptions which everyone interested in project management as a whole ought to understand. An immediate purpose is helping readers to avoid some of the current confusion about the difference between 'common practice' and 'best practice'. A longer term goal is influencing the shape of future project risk management guides, to enhance them individually, and to make them easier to use collectively. 'Best practice' definition is itself contentious. Other authors are encouraged to debate the definition of 'best practice' and explore the position of other guides. The framing assumptions are considered in terms of basic concepts: 'probability', 'uncertainty', 'risk', 'optimisation' and 'opportunity'. A practical example of the implications is provided via analysis of the use of probability-impact (PI) matrices and associated PI indices (risk indices or scores). The use of PI indices is 'common practice', but it is a clear indication that 'best practice' is not being followed, for reasons clarified in this paper. A follow-on companion paper considers related generic process definition issues.

<http://www.sciencedirect.com/science/article/B6V9V-4JRM0HS-1/2/ae790a8dd82137de6b42ef7977d3d49c>

Barber, P., C. Tomkins, et al. (1999). "Decentralised site management--a case study." International Journal of Project Management 17(2): 113-120.

Where projects are complex, there may be a need for greater decentralisation of control in order to avoid the bureaucratic inefficiencies of central direction. Decentralisation does not, however, dispense with the need to co-ordinate activities. This paper shows how a major UK construction company successfully implemented a balance between cellular autonomy and overall project risk management in a major road project.

<http://www.sciencedirect.com/science/article/B6V9V-4B0P91M-2/2/beaa83a398b75bf8459c0ce49748d19e>

Chapman, R. J. (1998). "The effectiveness of working group risk identification and assessment techniques." International Journal of Project Management 16(6): 333-343.

It is commonly recognised that the risk identification and assessment sub stages of the overall process of project risk analysis and management have the largest impact on the accuracy of any construction risk assessment. To accomplish these stages requires the acquisition of judgments from the project 'core' team (principal designers). The way these judgments are collected is central to the value and effectiveness of the whole process. However there is a lack of real understanding of the merits and drawbacks of the available techniques. This paper adopts the model of determinates of group effectiveness offered by Charles Handy as a framework to evaluate the identification methods of brainstorming the nominal group technique and Delphi, all borrowed from outside of the construction industry. While brainstorming is the most frequently sited technique for risk identification, it is not a panacea and has severe limitations when compared to the nominal group technique.

<http://www.sciencedirect.com/science/article/B6V9V-3TKVCYD-1/2/0f9398e757ef5b12ae6476fb9a1ae94>

Chapman, R. J. (2001). "The controlling influences on effective risk identification and assessment for construction design management." International Journal of Project Management 19(3): 147-160.

Project risk management (PRM) can provide a decisive competitive advantage to building sponsors. For those sponsors who take risks consciously, anticipate adverse changes, protect themselves from unexpected events and gain expertise to price risk, gain a leading edge. However, the realisation of this commercial advantage on design-intensive multi-disciplinary capital projects hinges to a large extent on the approach to the initial identification of risk. The very way the identification process is conducted will have a direct influence on the contribution that risk analysis and management makes to the overall project management of construction projects. This paper examines the steps involved in conducting the identification and assessment process and how they may influence the effectiveness of risk analysis. A series of issues are examined in turn, which are considered to have a direct bearing on the quality of the identification and assessment process. By focusing on these issues, our understanding of the contribution that risk management makes to improving project performance may be enhanced.

<http://www.sciencedirect.com/science/article/B6V9V-4292H85-2/2/5ca6e866eb3f5754c049ec52f8124b99>

Conroy, G. and H. Soltan (1998). "ConSERV, a project specific risk management concept." International Journal of Project Management 16(6): 353-366.

Managing risk in design intensive multi-disciplinary capital projects presents unique problems for decision-makers within the project environment. Existing risk management tools tend to employ axiomatic software and as such do not provide any intelligent risk management capability or lead to better informed decision making processes. ConSERV is being developed as a comprehensive project management methodology able to extract project specific risk issues throughout the project life cycle and apply experiential knowledge by using knowledge based systems to assist in the management of them. A visual representation of the project risks is obtained by employing a more practical non probabilistic approach. ConSERV will provide project managers with on line decision support, at key stages of the project to assist in the management and control of the project specific risks identified.

<http://www.sciencedirect.com/science/article/B6V9V-3TKVCYD-3/2/4d1d6849661a38086f37a5c69c7a5a35>

Coppendale J., (1995), Manage Risk in Product and Process Development and Avoid Unpleasant Surprises. Engineering Management Journal, 5(1). There are many examples reported in the media of major engineering and development projects running late or exceeding their budget. Sometimes, the consequences have been so serious that they have threatened the future of the companies involved. Highly visible, high-profile projects do not, however, have a monopoly on failure. For every major project which hits the headlines, there are thousands of others which fail in less spectacular ways. The author describes PA Consulting Group's three step process for a structured approach to project development. These are: identify the risks, assess the likelihood and the impact of potential risks, and develop risk management plans.

Managing Critical Path Items

Abeid, J., E. Allouche, et al. (2003). "PHOTO-NET II: a computer-based monitoring system applied to project management." Automation in Construction 12(5): 603-616.

This paper describes the development and implementation of an automated real-time monitoring system for construction projects programmed in a Delphi environment. The system links time-lapse digital movies of construction activities, critical path method (CPM) and progress control techniques. It accepts digital images taken from multiple cameras, stores them in chronological order and links them to a database that contains schedule information. The digital pictures taken from up to four cameras are placed on a website from where a remote computer(s) can capture and store the pictures in the database. The system enables management staff at the contractor's and owner representatives' headquarters to follow developments at the construction site in real time. Additionally, time-lapse films of activities at the construction site taken by multiple cameras can be played back in synchrony with dynamic graphs showing planned versus actual schedules. PHOTO-NET II introduces a new concept in time-lapse photography that allows the user to manipulate the frame rate, enabling a reasonable playback time as well as the implementation of the technology for long-term construction projects using standard PCs.

<http://www.sciencedirect.com/science/article/B6V20-48YW29H-3/2/106f6deb0a21e8ff9d57dcf134679d43>

Agency Coordination Delays

The article located on the Surface Transportation Policy Partnership website discusses how the FHWA finds that it is lack of funding and local support are the source of delays and that environmental streamlining is not the answer.

<http://www.transact.org/library/decoder/streamliningdecoder3.pdf>

Political Delays

Pinto, J.K. (2000). "Understanding the role of politics in successful project management." International Journal of Project Management 18(2):85-91.

Successful project management is directly linked to the ability of project managers and other key players to understand the importance of organizational politics and how to make them work for project success. While most of us view politics with distaste, there is no denying that effective managers are often those who are willing and able to employ appropriate political tactics to further their project goals. This paper offers some thoughts on the role of politics in successful project management, identifying ways in which project managers can use politics in a positive and effective manner.

http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V9V-3YSXD28-2&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&_view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=58b2354886e29af4cefc566a043c8df6

Sense, A. (2003). "A model of the politics of project leader learning." International Journal of Project Management. 21(2): 107-114.

This article proposes and describes a model for understanding the political issues associated with and impacting upon, individual learning for project leaders, whilst they are leading an innovation project. The value in this model is that it provides a means of conceptualizing and reconciling the interplay of the political issues and the learning activity of the project leader, and, building a practical agenda for optimising the benefits of learning. The applied qualitative research supporting the model and conclusions was conducted with two project leaders involved in leading two large, separate, but interrelated projects within one Australian manufacturing operation over a period of 5 years.

http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V9V-45CN92W-3&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&_view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=fef41c203c0567c8bd52c36c00473876.

Wilemon, D. (2006). "Interpersonal Power, Managing Politics, & Project Team Alignment." Technology Management for the Global Future 5: 2244-2244.

In the last two decades impressive gains have been made in our knowledge of project management. Much of this advancement in understanding has focused on creating better tools to plan, organize, execute, and control projects. Three areas which have received less attention are how project managers gain support for their projects; how project managers manage change and resistance when managing their projects; and how project leaders create and manage "alignment" with their senior managers and key project sponsors. The major objectives of this presentation are to: 1) review what we know about how project leader gain and sustain support for their projects; 2) examine how project leaders can effectively deal with various stakeholders and other critical organizational members; and 3) discuss how project leaders and their teams maintain "positive alignment" with senior managers/sponsors.
http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=4077635.

Project Change Management

Williams, T. M. (2000). "Safety regulation changes during projects: the use of system dynamics to quantify the effects of change." International Journal of Project Management 18(1): 23-31.

Uncontrolled change can have an important effect on large design and development projects. Such effects are systemic and so are difficult to quantify. One particular source of change that can have a major effect is changes to safety regulations. The risk of such change needs to be recognised and quantified. This paper highlights this risk by describing two transport manufacturing projects that were evaluated post mortem as part of claims procedures. The types of effects caused are described, as are the issues involved in their quantification. Traditional tools were inadequate to quantify these effects. The use of System Dynamics is described to demonstrate the project dynamics, to model the inter-relationships between factors and to quantify their combined effect. This technique can be used for many areas of project modeling.
<http://www.sciencedirect.com/science/article/B6V9V-40Y4JMT-4/2/f58f4f33619af425f7798880cca1ed47>

McElroy, W. (1996). "Implementing strategic change through projects." International Journal of Project Management 14(6): 325-329.

Senior managers spend a lot of time and effort trying to change their organisations. All too often it turns out to be a waste of time. Somewhere along the way, the force behind their ideas and objectives drains away. This paper looks at what gets in the way of strategic change. It shows how using projects, programmes and the associated management processes can guarantee a greater level of success. This paper does not propose that project management is a simple solution. Indeed, this is one of the most commonly-cited reasons for failure of business process re-engineering initiatives.
<http://www.sciencedirect.com/science/article/B6V9V-3VWTBJS-2/2/04933e18341df9cdf82d4c137f1c33ab>

Tchokogue, A., C. Bareil, et al. (2005). "Key lessons from the implementation of an ERP at Pratt & Whitney Canada." International Journal of Production Economics 95(2): 151-163.

This article uses a case study approach to evince the lessons learned from a successful implementation of an ERP system. It points out some strategic, tactic and operational considerations inherent in an ERP implementation that are prerequisites to effective organizational transformation required by a system implementation such as SAP R/3. At the strategic level, top managers established a clear vision of the role of the ERP project in their business model, along with P&WC's strategic priority. They created a feeling of urgency, and precisely determined the scope and scale of the project. Top management then committed substantial resources by allocating sufficient human and financial resources and persevered in backing a structured and disciplined approach to implementation until completion of the project. At the tactical level, P&WC redesigned its organization with a view to increasing coherence and rigor, at an opportune time. It took on recognized technological partners that used a proven methodology that was meticulously applied.

The human aspect was given a preponderant role. Moreover, clear measurement indicators were used to assess progress. At the operational level, the Change Leadership and Knowledge Transfer teams played a crucial role in this process. The impact of the ERP system on employees was studied extensively and integrated in the action strategies. Change sessions were decentralized within business units. A massive training program was deployed using many of P&WC's own employees as instructors to ensure a better appropriation of the technology. The experience of Pratt & Whitney Canada (P&WC), a large aeronautics company, reconciles both the requirements of a large-scale project and the capacity of an organization to successfully meet the challenges associated with such an implementation. In particular, this experience demonstrates that success is conditional on adequate management of the complex context of an ERP implementation.

<http://www.sciencedirect.com/science/article/B6VF8-4BHVKM8-3/2/a217dd3412d4b134be3569914edc6db3>

Wu, C.-h., T.-y. Hsieh, et al. (2005). "Statistical analysis of causes for design change in highway construction on Taiwan." *International Journal of Project Management* 23(7): 554-563.

Design change exist in construction projects and often cause cost overrun or schedule delay. Change management is a key issue in project management. The first step of change management is change identification. It includes the recognition of potential change event conditions in the project and the clarification of change responsibilities. We conducted multiple-case studies using statistics analysis to identify change in highway project in Taiwan, to clarify the causes of construction change and to analyze the influence. The results show the differences in engineering properties among embankment roads, viaducts, and tunnels create differences in emphasis in investigating and managing geological concerns. The analysis furthermore indicates that, in order to prevent changes of design because of insufficiency of geologic survey, site-survey shall be enhanced in the feasibility analysis and planning design stages for future similar projects. The finding in the paper can be used as a reference for clients in forming their project procurement strategy.

<http://www.sciencedirect.com/science/article/B6V9V-4GYNYDN-1/2/4e6551d7f0b6f395db16cd0976ded175>

Project Closeout

Williams, T. (2003). "Learning from projects." *The Journal of the Operational Research Society*. 54(5): 443 -451.

The 'learning organization' is frequently emphasized in the literature and in practice, and this is particularly important for project-oriented organizations. However, experience tells us that organizations tend not to learn adequately from project experiences. This paper reviews some of the work seeking to model and explain the behavior of complex projects, which explains why lessons are difficult to learn from such projects-not the easy and obvious lessons but the lessons about complex non-intuitive project behaviors. From there it looks at why projects are frequently not reviewed, and seeks to offer practical proposals for carrying out reviews, using small models to enable lessons to be learned that provide understanding (rather than simply data), and distributing that learning around the organization.

<http://cat.inist.fr/?aModele=afficheN&cpsidt=14802158>.

Chapter 4- Project Management by Phase

Planning Phase

Dvir, D., T. Raz, et al. (2003). "An empirical analysis of the relationship between project planning and project success." *International Journal of Project Management* 21(2): 89-95.

This paper examines the relationship between project planning efforts and project success. Three planning aspects are considered (requirements definition, development of technical specifications, and project management processes and procedures), along with three perspectives on project success (end-user, project manager, and contracting office). The study is based on data from more than a hundred defense research and development projects (aimed at the development of weapon systems and support equipment) performed in Israel and includes an analysis of the statistical correlation between the two sets of variables. The findings suggest that project success is insensitive to the level of implementation of management processes and procedures, which are readily supported by modern computerized tools and project management training. On the other hand, project success is positively correlated with the investment in requirements definition and development of technical specifications.

<http://www.sciencedirect.com/science/article/B6V9V-454T709-3/2/883f17e60c383f22dab76f2032666704>

Internal and External Agency Coordination

Blackburn, S. (2002). The project manager and the project-network. *International Journal of Project Management*, 20 (3), 199-204.

This paper draws on a qualitative study to increase understanding of what project managers do, and how project managers understand and talk about what they do. It includes insights from in-depth analysis of interviews with a nominal group of project managers. However, rather than use competence frameworks to bring out the network of relationships between the project manager and the multiple political, environmental and technological factors in any project, concepts from Actor-Network Theory are used to interpret the stories told by experienced project managers about their work and their use of project management techniques against the fluid and transient nature of projects. The paper shows how project management processes act as allies, enabling the project manager to interest and enroll team members and stakeholders and to mobilize the support of sponsors and other powerful players.

Demeester, Michel. (1999). Cultural aspects of information technology implementation. *International Journal of Medical Informatics*, 56, 25-41.

Culture sets our values and norms. It is a way of thinking that determines our behaviors, decisions, actions and knowledge. Technology transfer and integration are basically the exchange of the knowledge, know-how and skills through which technology was created and on which its use depends. Culture is deeply rooted in ourselves. We are usually unaware of its influence on our professional activity. Cultures are diverse, and their encounter through technology exchange triggers conflicts that are expressed in objective terms. We need to detect and resolve those conflicts at the right level, i.e. at the cultural level instead of only focusing on the visible obstacles to the deployment of tele-matics applications. This paper summarizes the basic concepts on which we ground a practical approach to detecting and resolving culture-based conflicts in technology transfer and integration. It investigates the relation between cultural preferences and actions. Culture is translated and reduced to a seven dimensions framework. Cultural preferences influence the decision-making process that leads to tangible actions. The structure and dynamics of that process are described as a Change Governance Framework.

National Environmental Policy Act (NEPA) & Other State and Federal Regulations & Streamlining Processes

Shen, L. Y. and V. W. Y. Tam (2002). "Implementation of environmental management in the Hong Kong construction industry." International Journal of Project Management 20(7): 535-543.

The control of environmental impacts from construction has become a major issue to the public. Whilst the implementation of environmental management in construction has a direct contribution to environmental protection, it involves allocating a variety of resources for practicing various environmental management methods such as noise control, treatment of polluted water, waste recycling and reusing, and so on. The application of these methods leads to an increase in labour use, materials handling costs, which can limit their implementation. This paper provides a profile of environmental management in Hong Kong construction by identifying what contractors in Hong Kong consider to be the benefits of and barriers to the practice. The appropriateness of measures for mitigating the barrier effects is investigated. The paper provides empirical evidence of the benefits of and barriers to the process of increasing the implementation of environmental management among contractors in Hong Kong. It should help contractors to adjust their environmental management policy by efficient resources allocation within their companies.

<http://www.sciencedirect.com/science/article/B6V9V-45VD3NJ-6/2/88db8946413b0697f9cce5eccdc896ec>

Public Involvement Plan (PIP)

Tudor, M. (2001). "Route 40 Corridor Improvements: Transportation Planning in a Changing Public Involvement Arena." Institute of Transportation Engineers 71(5): 30.

This feature is another in the series that is being generated by the National Dialogue Transportation Operations being led by the U.S. Federal Highway Administration and the Institute of Transportation Engineers. National Dialogue activities to date have identified the need for transportation operation entities to be driven by system performance and customer service measures so that the existing transportation system's performance meets or exceeds customer's expectations. This feature demonstrates how one state department of transportation is engaging its customers as full partners in transportation planning and decision -making. It provides some of the lessons learned with the Route 40 Corridor Improvements Project, a public involvement process in Delaware that was based upon a consensus building approach to recommend 20 years of transportation improvements.

<http://www.issinet.com/bin/webdbc.dll/traffic/users/htx/&ite/journal/results.htx>

Bougromenko, V. (1999). "Defending local interests in project management: from team to decision making level." International Journal of Project Management 17(2): 131-135.

Projects, particularly transport ones, are evaluated by the public according to their prospective benefits not only to real users, but also to indirect ones. Such external profitability can be accounted on the basis of local changes-global response; methodology which can be fully implemented with the use of a specially designed Geogracom 4W expert system. Taking into consideration external effects proves a justification period to be 3.5-5 times shorter. This article shows how the methodology is applied with the system.

<http://www.sciencedirect.com/science/article/B6V9V-3VGH270-9/2/8f31c067e465c75405838285c3b8f8b6>

Bailey, K., et al. (2007). Transportation Research Record: Journal of the Transportation Research Board 1817: 50-57.

Public involvement in transportation infrastructure decision making is frequently mandated and is regarded as increasingly essential by a wide variety of stakeholders. The integration of advanced technologies, such as visualization, into this process is increasingly desired. However, public involvement processes often are regarded as problematic by many stakeholders and the state highway agencies charged with implementing them. Structured public involvement (SPI) is posited. SPI takes a systems approach toward the integration

of advanced technologies into public involvement forums. Because the goal of public involvement is to increase user satisfaction with both the process and the outcomes, the characteristics of advanced technologies and their capacities for gathering useful feedback in public forums must be evaluated. Visualization is put forth as an enabling technology within an SPI framework. The properties, capacities, and transportation-related uses of three visualization modes are evaluated, and their operational features are discussed. A case study dealing with highway improvement in central Kentucky reveals that three-dimensional renderings are significantly preferred to twodimensional and virtual reality modes; the case study also shows that visualization should complement, not replace, other performance information. The role of electronic scoring as an integral component of this SPI protocol is emphasized, resulting in fast assessment and free expression of views. Factors affecting the efficiency of visualization are analyzed, and recommendations are presented for implementing SPI protocols that rely on visualization. These include investigating participants' previous experience with visualization, incorporating iterative public involvement in finalizing design options, and ensuring that the technologies are compatible with the chosen public involvement process.

<http://trb.metapress.com/content/84177q7082r27516/>.

Landre, B.K. and Knuth, B.A. (1993). "The role of agency goals and local context in Great Lakes water resources public involvement programs." *Environmental Management*. 17(2): 153-165.

As complex social phenomena, public involvement processes are influenced by contextual factors. This study examined agency goals for public involvement and assessed the importance of local context in remedial action planning; a community-based water resources program aimed at the cleanup of the 42 most polluted locations in the Great Lakes Basin. Agency goals for public involvement in remedial action plans (RAPs) were agency-oriented and focused on public acceptance of the plan, support for implementation, and positive agency-public relations. Corresponding to these goals, citizen advisory committees were created in 75% of the RAP sites as a primary means for public input into the planning process. Factors that influenced the implementation of public involvement programs in remedial action planning included public orientation toward the remediation issue, local economic conditions, the interaction of diverse interests in the process, agency and process credibility, experience of local leadership, and jurisdictional complexity. A formative assessment of "community readiness" appeared critical to appropriate public involvement program design. Careful program design may also include citizen education and training components, thoughtful management of ongoing agency-public relations and conflict among disparate interests in the process, overcoming logistical difficulties that threaten program continuity, using local expertise and communication channels, and circumventing interjurisdictional complexities.

<http://www.springerlink.com/content/k1566xth2610p713/>.

McComas, K.A. (2006). "Theory and practice of public meetings." *Communication Theory*. 11(1): 36-55.

Public meetings are among the most commonly used, frequently criticized, yet least understood methods of public participation in community planning. Although systematic research on public meetings is sparse, a vast, if fragmented, amount of experiential knowledge exists, and that can form the basis for a working theory of why some public meetings work and others do not. Characteristics of successful public meetings can be generally grouped by whether they relate to the process or the outcomes of public participation. Although a relationship exists, extant research would suggest that successful processes do not always lead to successful outcomes; however, officials interviewed for this study tended to equate successful outcomes with successful processes. Officials' satisfaction with public meetings seemed to be more tied to outcomes, and most officials were only moderately satisfied with public meetings.

<http://www3.interscience.wiley.com/journal/118990107/abstract>.

Involvement Customers (Stakeholders, Community, Business Owners)

Wang, X. and J. Huang (2006). "The relationships between key stakeholders' project performance and project success: Perceptions of Chinese construction supervising engineers." International Journal of Project Management 24(3): 253-260.

Using a questionnaire to survey Chinese construction supervising engineers, this study concerns with the questions of how the engineers evaluate project success and to what extent key project stakeholders' performance correlates with project success. The results show that the engineers use "relation/guanxi" among the key stakeholders as the most important criterion of project success while using the golden-triangle criteria; the stakeholders' project performance positively correlates with each other; project agencies play the most important role in determining project success, and project management organizations' performance as the single point of project responsibility has significant correlations with project success criteria.

<http://www.sciencedirect.com/science/article/B6V9V-4HV74RW-1/2/65f8edca425f377cb20f51abc2a121e6>

Chinyio, E. A., P. O. Olomolaiye, et al. (1998). "An evaluation of the project needs of UK building clients." International Journal of Project Management 16(6): 385-391.

The investigation reported established a checklist of 50 different needs from which a client's specific requirements can be identified. The checklist comprises of 34 aspects of needs compiled from literature, and 16 others ascertained from an empirical investigation, through a questionnaire survey of 42 UK building clients. An evaluation of these needs indicated that 'functionality of buildings', 'timeliness of completion' and value for money' are the aspects of needs which at the moment are most frequently desired by clients. In quest of achieving optimal client satisfaction with building schemes, the generated checklist can be developed into a data bank which, can easily be used for verifying a client's project requirements.

<http://www.sciencedirect.com/science/article/B6V9V-3TKVCYD-6/2/4fc510eaf965a9f9ae7070a8f078e7ea>

Design Phase

Newcombe, R. (1996). "Empowering the construction project team." International Journal of Project Management 14(2): 75-80.

Theoretical concepts from the literature on organisational power are used to analyse project organizations in the construction industry which result from the adoption of different project management approaches. Two procurement paths, traditional and construction management are compared in terms of the power bases and processes used by the project manager. It is postulated that legitimate power is weak in both cases, resulting in a power gap between the power that is given under the contract and the power needed to ensure action. The power gap is bridged under the traditional system by a sophisticated system of exchange and reciprocity using a range of currencies which are valued by the parties. The more egalitarian atmosphere of the construction management project organization encourages the greater use of expertise and charisma as power bases to bridge the power gap, coupled with the modern management concept of empowerment of all the parties involved, especially the newly-named specialist trades contractors. The implications of this theory of power and procurement paths for clients, project managers, project teams and researchers is hypothesized.

<http://www.sciencedirect.com/science/article/B6V9V-3VVVPP8-3/2/2d22ae525c6a1a95b1633c7abd8cfd1b>

Coleman, D. J. and S. Li (1999). "Developing a groupware-based prototype to support geomatics production management." Computers, Environment and Urban Systems 23(4): 315-331.

Digital map and chart providers are under increasing pressure to bring their original and updated products to market in shorter time frames than ever before. As the contract production model has come to play an increasingly significant role in digital mapping and charting programs, workflow processes and production tasks have at least been extended, if not redefined. At the same time, through the refinement and

integration of groupware tools and Intranet/Extranet software, applications of computer-supported cooperative work have emerged in support of both project-driven research and corporate information management. The Geographical Engineering Group at University of New Brunswick has undertaken a program of research to: (1) investigate the applicability of groupware and database technologies to support collaborative geomatics production in networked environments; (2) develop Extranet-based prototypes; and (3) evaluate the effects of these prototypes on project management and organizational culture. A summary of the results from the preliminary works is presented in this paper. Focus has been placed on the collaboration prototype developed in terms of quality control inspection project in mapping and charting productions. The paper concludes with a discussion of key design and implementation issues.
<http://www.sciencedirect.com/science/article/B6V9K-3X8G5P2-7/2/d1d97cf014f2e1107b96621d7aa91930>

D'Angelo, J., S. Vanikar, et al. (2004). "Designing Tomorrow's Pavement." *Public Roads* 68(2): 16.

The new guide and software may become the national approach for creating and rehabilitating roadway surfaces.

<http://www.tfrc.gov/pubrds/04sep/03.htm>

Hecht, H. and D. A. Niemeier (2002). "Comparing transportation project development efficiencies: the California department of transportation and the California county sales tax agencies." *Transport Policy* 9: 347-356.

Finding time and cost efficiencies associated with preliminary and final design of transportation projects has become increasingly difficult. Major new complexities present interesting and challenging project management issues and many agencies have incrementally adapted project development process to improve inefficiencies. Yet our understanding of the project development process is limited and the incremental changes in the process have not resulted in major modification in the way in which transportation project development is approached for most agencies.

Design Activities

Meyer, Michael. (2005). Linking safety-conscious planning and context-sensitive solutions. *Institute of Transportation Engineers*, 75 (8), 18-23.

Safety-conscious planning and a context-sensitive solutions approach to project development have been introduced into transportation professional practice over the past 10 years. This feature suggests that the two can be mutually supportive and applied in ways that promote safety and other community values. Incorporating safety considerations and strategies into the transportation planning process includes consideration for safety-related capital projects and system operations strategies as well as for public education, enforcement and emergency response to incidents. The basic principles and guidelines that influence much of what happens in project development are founded on professional principles of safe design.

Bid Opening



Shr, J.-F., B. Ran, et al. (2004). "Method to determine minimum contract bid for AB I/D highway projects." *Journal of construction engineering and management* 130(4): 509.

More and more state highway agencies (SHAs) have begun to consider the value of time in highway construction. The "A (cost) + B (time cost) + I/D (incentive/disincentive)" bidding concept is designed to shorten the total contract time by allowing each contractor to bid the number of days in which the work can be accomplished, in addition to the traditional cost bid. I/D are not only used to provide an incentive to the contractor for earlier completion, but also to provide a disincentive for late completion of a project. Contractors are then presented with the problem of determining the best strategy of bid estimation, including construction cost, time cost, and incentive/disincentives. SHAs are also faced with the problem of placing a maximum and/or minimum on the time bid. To provide users a useful tool to estimate project time more

accurately using this advanced method, this study develops a quantified model of the price-time bidding contract. The functional relationship between the construction cost and time duration is developed based on data from the Florida Department of Transportation (FDOT). The contractor's construction cost "A" is then combined with the road user cost and incentive/disincentive to determine the optimum low bid price and time. This optimum can then be used by the SHA to set limits on the range of acceptable time bids. Finally, several projects completed by the FDOT will be used to illustrate the validity of this model.

<http://ascelibrary.aip.org/getpdf/servlet/GetPDFServlet?filetype=pdf&id=JCEMD4000130000004000509000001&idtype=cvips>

Chapman, C.B., et al. (2000). "Incorporating uncertainty in competitive bidding." International Journal of Project Management. 18(5): 337-347.

This paper describes a simple, transparent approach for developing competitive bids, based on an appreciation of cost uncertainty and estimates of the probability of winning with different levels of bid. The process offers an 'applied' approach which facilitates an iterative approach to bid development and appropriate consideration of important qualitative factors which are difficult to model. The process is illustrated with a case example which has been well received by practitioners as a teaching case. The focus of the paper is on the careful structuring of issues which lend themselves to quantification, and the facilitation of systematic consideration of issues which do not.

http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V9V-408KDCH-5&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&_view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=beba75c884b74a7b784b208c5cdc0c90

Xie, G., et al (2006). "Risk avoidance in bidding for software projects based on life cycle management theory." International Journal of Project Management. 24(6): 516-521.

This study explores how to integrate software project management risk into bidding risk, and makes use of life cycle management theory to study risk avoidance in bidding for software projects. The stages in the life cycle of software projects and main risk items are introduced. As many types of risk items exist in the bidding, we analyze the possible risk response measures for different risk categories and the measures' corresponding strength. Finally, we describe the basic methodology for dynamic risk avoidance in bidding for software projects based on life cycle management theory and give an example.

http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V9V-4JW7X0W-1&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&_view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=6be9132f59d7be7d0f4e84f999bd4465

Awarding the Contract

Broome, J. C. and R. W. Hayes (1997). "A comparison of the clarity of traditional construction contracts and of the New Engineering Contract." International Journal of Project Management 15(4): 255-261.

This paper discusses clarity and style of drafting in construction contracts based on research carried out by the Project and Construction Management Group at the University of Birmingham into the efficacy of the New Engineering Contract. One of the three principle objectives of the NEC was the achievement of greater clarity. The first section of the paper asks whether existing conditions of the contract achieve clarity, deduces that they do not and investigates why not. The second section reviews the original aims of the authors of the New Engineering Contract (NEC) before presenting the findings of research to date on whether the contract fulfils both the needs of the construction industry and the self-stated aims of the authors of the NEC. It then briefly considers some of the general legal criticisms of it and the changes made to the second edition of the Engineering and Construction Contract (ECC). This paper then outlines the benefits of clarity to effective project management and concludes that while ECC is not perfect it is a significant improvement on other forms of contracts in terms of clarity.

<http://www.sciencedirect.com/science/article/B6V9V-3SWY03S-8/2/8cffc6e6d05665fe49ac628cfac58302>

Shr, J. F. and W. T. Chen (2003). "A method to determine minimum contract bids for incentive highway projects." *International Journal of Project Management* 21(8): 601-615.

An increasing number of state highway agencies (SHAs) are using Incentive/Disincentive (I/D) bidding for highway construction. The I/D bidding concept is designed to shorten the total contract time by allowing the contractor to obtain incentives for early completion and pay disincentives for late completion of a project. Contractors are then presented with the problem of determining a better strategy to develop their bid estimate, including construction cost, construction time, and I/D. This research offers a quantifying model to determine an optimum low bid to submit for linear I/D and escalating I/D type projects. A functional relationship between the construction cost and time duration is developed from the Florida Department of Transportation (FDOT) projects. The equation is then combined with the I/D to determine the optimum low bid price and time. Finally, several projects completed by the FDOT will be utilized to illustrate the validity of this model.

<http://www.sciencedirect.com/science/article/B6V9V-487KKBX-3/2/d9f843943b7e1b54d2cd8cb0e38db196>

Zaghloul, R. and F. Hartman (2002). "Construction contracts: the cost of mistrust." *International Journal of Project Management* 21: 419-424.

Based on two independent surveys of Agencies, Consultants and Contractors across Canada, the assessed premium associated with the five most commonly used exculpatory clauses in construction is between 8 and 20% in a seller's markets. It should be obvious that trust and contracting methods are related and that this relationship is of vital importance to effective project management and contract administration. This paper presents some of the results of a survey conducted across the Canadian construction industry that identifies some opportunities for better risk allocation mechanism and contracting strategies that are based on a trust relationship between the contracting parties.

<http://www.sciencedirect.com/science/article/B6V9V-488VXN4-3/2/3309ad69b5ae4dff41a8369dad508b03>

Redline Revisions

Nassar, K., & Nassar, W., & Hegab, M.. (2005). Evaluating Cost Overruns of Asphalt Paving Projects Using Statistical Process Control Methods. *Journal of Construction Engineering and Management*, 1173-1178.

While some projects will experience changes to the contracted cost by deduction or additions, construction cost overruns are becoming a common problem in the construction industry. Steps need to be taken to minimize cost overrun through cost and quality control techniques. This paper presents a study conducted to evaluate construction cost overruns of asphalt paving operation performed by the Illinois Department of Transportation (IDOT). The main objective is to analyze the main causes of cost overruns and evaluate the amount of cost overrun of asphalt paving operations, using statistical process control (SPC) techniques. Real data from projects in the year 2000 were collected from IDOT. These data contain cost information of 219 projects. The results indicate that the average cost overrun for the sample collected was 4% above the bid price. Reasons for cost overruns are analyzed and a Pareto chart and a cause and effect diagram are constructed. Individual and Moving Range (MR) control charts are developed and their interpretation and use are discussed.

El-Rayes, K., & Kandil, A. (2005). Time-cost-quality trade-off analysis for highway construction. *Journal of Construction Engineering and Management*, 131 (4), 477.

Many departments of transportation have recently started to utilize innovative contracting methods that provide new incentives for improving construction quality. These emerging contracts place an increasing pressure on decision makers in the construction industry to search for an optimal resource utilization plan that minimizes construction cost and time while maximizing its quality. This paper presents a multi-objective optimization model that supports decision makers in performing this challenging task.

Lee, S., & Pena-Mora, F., & Park, M. (2006). Dynamic planning and control methodology for strategic and operational construction project management. *Automation in Construction*, 15, 84-97.

This paper introduces the system's perspective of the dynamic planning and control methodology (DPM), aimed to support both the strategic and the operational aspect of project management. For this objective, a new modeling framework that integrates system dynamics and network-based tools is presented in this paper. The proposed framework adopts system dynamics as a core simulation engine for strategic project management and network-based tools as a wrap layer for operational project management. To implement the DPM framework, a web based system has been developed within a collaborative environment.

Kwak, Y. H., & Watson, R. J. (2005). Conceptual estimating tool for technology-driven projects: exploring parametric estimating technique. *Technovation*, 25 (12), 1430-1436.

This paper examines a parametric estimating technique applied to technology-driven projects. Parametric cost estimating is a widely used approach for bidding on a contract, input into a cost benefit analysis, or as the pre-planning tool for project implementation. Extensive literature reviews suggest that effective parametric estimating methodology is becoming an essential tool for technology-driven organizations. The use of parametric estimating in budgeting, scheduling, and control of projects will enhance the ability of project management organizations to effectively and efficiently utilize valuable resources. The benefit of parametric estimating is its use as an estimating model for better determining potential resource requirements during the project pre-planning and conceptual phase.

Construction Phase



Hastak, M. (1998). "Advanced automation or conventional construction process?" *Automation in Construction* 7(4): 299-314.

The rapidly developing area of construction automation leads construction managers to critically evaluate the feasibility of replacing conventional construction processes by automated systems. This decision requires careful analysis of tangible and intangible factors such as need-based criteria, economic criteria, technological criteria, project specific criteria, and safety/risk criteria. This paper presents a decision making model and a decision support system (DSS) to assist construction managers in systematically evaluating whether to opt for a conventional construction process or an automated system for a given project. The proposed DSS, called AUTOCOP (Automation Option evaluation for Construction Processes), utilizes the Analytical Hierarchy Method (AHP) to analyze the tangible and the intangible set of criteria involved in the decision problem.

<http://www.sciencedirect.com/science/article/B6V20-3V5HW1S-5/2/032d26323695bb73e2f2dd75c8cc9686>

Newcombe, R. (1996). "Empowering the construction project team." *International Journal of Project Management* 14(2): 75-80.

Theoretical concepts from the literature on organisational power are used to analyse project organisations in the construction industry which result from the adoption of different project management approaches. Two procurement paths, traditional and construction management are compared in terms of the power bases and processes used by the project manager. It is postulated that legitimate power is weak in both cases, resulting in a power gap between the power that is given under the contract and the power needed to ensure action. The power gap is bridged under the traditional system by a sophisticated system of exchange and reciprocity using a range of currencies which are valued by the parties. The more egalitarian atmosphere of the construction management project organisation encourages the greater use of expertise and charisma as power bases to bridge the power gap, coupled with the modern management concept of empowerment of all the parties involved, especially the newly-named specialist trades contractors. The implications of this theory of power and procurement paths for clients, project managers, project teams and researchers is hypothesised.

<http://www.sciencedirect.com/science/article/B6V9V-3VVVPP8-3/2/2d22ae525c6a1a95b1633c7abd8cfd1b>

Tracking Construction Progress

Hendrickson, C., Tung, A. Project Management for Construction: Fundamental Concepts for Owners, Engineers, Architects and Builders. Pittsburgh, PA: Prentice Hall, 1998.

While this book is devoted to a particular viewpoint with respect to project management for construction, it is not solely intended for owners and their direct representatives. By understanding the entire process, all participants can respond more effectively to the owner's needs in their own work, in marketing their services, and in communicating with other participants. In addition, the specific techniques and tools discussed in this book (such as economic evaluation, scheduling, management information systems, etc.) can be readily applied to any portion of the process

<http://pmbook.ce.cmu.edu/index.html>

Yan, W., et al., (2006). "A strategy for integrating product conceptualization and bid preparation." The International Journal of Advanced Manufacturing Technology, 29(5-6): 616-628.

Collaboration with other members of the supply chain is one means by which small and medium sized enterprises (SMEs) can compete in today's global business environment. Thus, early stages of the new product development process involve both technical activities, e.g., product platform definition, and commercial activities, e.g., bidding for contracts. This paper introduces an integrated collaborative bidding and design system (CBDS) to help SMEs coordinate the two aspects. General sorting was employed for initial requirements acquisition and platform definition; while a self-organizing map (SOM) neural network was combined with a concurrent cost-schedule estimation strategy for refinement of design options and bid evaluation/preparation. A case study on cellular phone design was then applied for illustrating the proposed prototype system.

<http://www.springerlink.com/content/81j7213jg76428r6/>.

Appendix III

Software

In the software toolbox there is a list of useful commercial software and Project Management guides that could assist project managers for particular tasks. At the beginning of the Appendix there is a chart of overall project management software that our research found to be comprehensive to project management. Other software programs are listed in the appendix under the appropriate task.

The NCHRP/TRB cannot endorse any particular software, but we are offering suggestions of available products.

Chapter 2- Project Management Overview

Basics of Project Management Summary

Project Management Guides:

PMBOK (Project Management Body of Knowledge)

<http://www.pmi.org/Marketplace/Pages/Product/Detail.aspx?GMProduct=00100035801>

PRM

PRAM

MPMM (Project Management Methodology) <http://www.mppm.com>

General Project Management Software Programs

Lotus Domino <http://www-306.ibm.com/software/lotus/products/domino/>

This software is primarily for collaboration purposes, useful for projects with out-of-office work groups. It offers organizational features, RSS feeds, and integration with e-mail and office applications. Openness is a key feature, allowing connection to and communication with supporting programs and applications that a PM may use currently.

Mind Jet for Project Management http://www.mindjet.com/us/solutions/project_management/

This software features a brainstorming tool similar to that used in OpenMind. There are three versions of the software, but only one is a full project management package (Mindjet JCVGantt Pro3). Highly integrated with Microsoft programs.

Mercury Project Manager

Meridian Systems <http://www.meridiansystems.com/>

Real Microsoft Project <http://www.microsoft.com/sql/solutions/bi/projectreal.msp>

Suretrack Primavera <http://www.primavera.com/>

AEC Fast Track <http://www.aecsoft.com/products/fasttrack/default.asp>

RealPlan

IT Toolkit for Project Management http://www.ittoolkit.com/project_management.htm

Centric Software for Project Management <http://www.centricssoftware.com/>

Plan Trax

Optimizing Resources

Pareto Optimization

DAPRAM

RealPlan

Conserve

Earned Value Method <http://www.projectsart.co.uk/what-is-earned-value.html>

Parametric Estimation

Stochastic Aggregation Model (SAM)

Predict

ESTI

Sim-Utility

PE Handbook

Analysis and Evaluation Methods

Multi-Criteria Analysis <http://www.cifor.cgjar.org/acm/methods/mca.html>

Cost-Benefit Analysis http://www.mindtools.com/pages/article/newTED_08.htm

Effective Leadership

Conducting Meetings

http://www.cbtpplanet.com/Management/conducting_meetings_effective_meeting_communication.htm

K Alliance, formally Computer Based Training, has training software for effective meeting communication.

<http://www.meetingsense.com/>

This software system works with Outlook to organize meeting information, share relevant files, take notes and publish action items, easily improving the productivity of meetings, before and afterward. Other features include audio recording and secure data storage.

<http://www.wiredred.com/web-conferencing-technology/>

Several software systems that allow real-time web conferencing and PowerPoint Sharing can be downloaded here for a license fee. Another option is to use the hosted services for a monthly fee.

Crisis Management

Global AlertLink <http://www.globalalertlink.com/solutions/>

Guiding Principles for Developing Effective Project Managers

Succession Planning

Halogen Software offers software for succession planning and information on developing the team.

<http://www.halogensoftware.com/products/halogen-esuccession/>

Insala offers software suites for succession planning and leadership development.

<http://www.insala.com/products.asp>

Chapter 3- Universal Elements

Scheduling Techniques to Ensure Adequate Time & Quality

Project Scheduling Programs

Microsoft Excel <http://office.microsoft.com/en-us/excel/default.aspx>

Critical Resource Diagramming (CRD)

Microsoft Project <http://office.microsoft.com/en-us/project/default.aspx>

This has been rated the top project management software (Top Ten PM Software.com), primarily because it is capable of integrating with most other pm software. A review of this software and the nine others is available at <http://project-management-software-review.toptenreviews.com/>. For more information regarding Microsoft Project see the chart at the beginning of the appendix.

RealPlan

Decision Support Systems <http://dssresources.com/>

Artemis Project View <http://www.aisc.com/>

Sciforma Project Scheduler <http://www.sciforma.com/us/products/process/overview.jsp>

Misonet Construction Information Services- <http://www.misonet.com>

Task Scheduling

PERT <http://www.netmba.com/operations/project/pert/>

Milestone & Bar Charts

www.ganttchart.com

<http://ganttproject.biz/download.php>

Critical Path Method

<http://www.netmba.com/operations/project/cpm/>

The Kidasa Software, Inc. website offers professional examples of milestone charts for various activities that a project manager may encounter. The site sells Milestones Professional software on topics such as earned value, timelines, status and budget to name a few

www.kidasa.com

www.powerangle.com provides a CPM project scheduler and sometimes offers it for free.

Managing the Budget

Return on Investment (ROI)

<http://www.investopedia.com/terms/r/returnoninvestment.asp>

Net Present Value (NPV)

<http://www.investopedia.com/terms/n/npv.asp>

Internal Rate of Return (IRR)

<http://www.investopedia.com/terms/i/irr.asp>

Project Change Management

<http://www.cbtplanet.com/Management/change-management-suite-training-cbt.htm>

K Alliance, formally Computer Based Training has training software for Change Management

Appendix IV

Websites

The web based tool includes links to websites that go into great detail and whole sites devoted to project management as well as other sites that may only have an article attached as a suggested reading.



The toolbox icon indicates that the website has an applied resource tool such as a checklist or form that can be downloaded. This icon also will be noted in Appendix 1 Applied Resources to show that there is an available tool online. The number next to the toolbox icon coincides with the Applied Resources section for ease of reference.

There are certain websites such as California's DOT and the FHWA, which have an abundance of useful information for DOT project managers. These websites include information from numerous topics throughout this guidebook. It is recommended that you take time to explore these sites and bookmark them for future reference. These sites will be referenced throughout this section with a link directly to the topic.

Some states are smaller in program size and could use some additional guidance on how things are done or just looking for a faster way of doing something; it is suggested to look to your counterparts in the DOT world for assistance. The states with the larger programs, such as California could have what is needed on their website.

The Department of Transportation in California has one of the most comprehensive sites for DOT project managers. This site offers project manuals for planning, design, construction and other topics such as right of way and environmental. The site has manuals and guides for risk management to quality assurance and samples of letters and contract documents. The information can be found under the News tab and click on Manuals. Once on the manuals page other topics will be available for specific project phases. Keep in mind that each state does have their own state regulations that must be followed; California's site can be used as a guide and a tool to enhance your state's procedures. <http://www.dot.ca.gov/>

The Department of Transportation in Texas offers their project manuals online and has an abundance of useful information that can be downloaded. <http://www.txdot.gov>

The Department of Transportation in Minnesota also has a good amount of information including the Highway Project Development Process, A Project Manager's Guide. This document will have some topics specific to Minnesota, but mostly it provides guidance on the environmental documentation and reports on the federal level, and explains a multitude of topics that a DOT project manager may encounter, such as Environmental Justice and Agency involvement. This website is another great tool to assist project managers and offers ideas to those that wish to expand their areas of knowledge. <http://www.dot.state.mn.us>

The FHWA website provides insight on the important aspects of transportation projects, since most DOT projects need FHWA approval before moving forward. The website offers links to related sites and resources, guidance, policy information, an electronic reading room, toolkits, special topics articles, information on training, tips and tools, best practices, newsletters, and a NEPA knowledge exchange to name a few topics. The site will guide a project manager through the necessary steps and information needed to get a project approved. As a project manager you should familiarize yourself with FHWA's website; it is a valuable tool that will prove to be versatile for many projects. Throughout this section there will be many links to the FHWA website, the links have been broken down by relevance and each link is detailed on the topic it is referencing. <http://www.fhwa.dot.gov>

The Western Federal Lands Highway Division operates as part of the Federal Lands Highway Program in the Northwest. The website provides samples of forms for all phases of a project. The site offers right of way and utility information, along with other resources <http://www.wfl.fha.dot.gov/about/>

Outside of the DOT world, but still a government agency is the Center for Disease Control (CDC). This website is based on best practices and offers templates, guides, checklists, and process and practice guides on project management topics. Topics that are covered are the project charter, close out, PMP, change management, risk management, scheduling, and work breakdown structures to name a few. The CDC website is a great resource that should be considered when looking for project management information. <http://www2.cdc.gov/cdcup/>

Washington State DOT has an excellent power point presentation that can be viewed at <http://www.wsdot.wa.gov/Consulting/Forms/LAGManagingProjectDelivery.ppt> The presentation is a short course developed by the Design Office on Managing Project Delivery. The presentation provides a great overview of Managing Scope, Schedule and Budget, Quality, Change, and Project Closure to name a few topics and also offers flow charts and diagrams.

www.1000ventures.com is a site ranked highly for project management topics such as Effective Leadership, Change Management, and Asking Effective Questions. The site offers information and mini-courses on an array of topics such as leadership, change management, project management, quality management, communication, and people skills. The site also includes tips, quotes, and rules for individual growth as well as professional. The free information on the site is very informative and covers a lot of information on project management basics and other topics for personal and professional growth.

Chapter 2- Project Management Overview

Basics of Project Management Summary

The following websites offers articles and tips on the overall importance of project management, including discussions of scope, time, budget, and traits of successful project managers.

<http://management.about.com/cs/projectmanagement/a/PM101.htm>
<http://www.projectsmart.co.uk/simplified-project-management-process.html>
<http://www.brighthub.com/office/project-management/articles/1619.aspx>
<http://www.professional-pm.com/pmbasics.htm>

What is a Project Manager (PM)?

Wikipedia provides a broad definition of project managers: http://en.wikipedia.org/wiki/Project_manager

The following article outlines the Top 10 qualities of successful project managers:
<http://www.projectsmart.co.uk/top-10-qualities-project-manager.html>

Traits of the Best Project Managers

Project Management Course.com offers tips on successful project management, traits of a good PM, project management challenges, and other project management articles. <http://projectmanagementcourse.com/project-manager.html>

Tools on project management and other resources such as research, events, books, white papers, surveys, case studies, interviews and pod casts are available at www.projectsatwork.com.

Colorado's Governor's Office of Information Technology has an Enterprise Program Management Office (ePMO) and this office has created a website that was established to provide project management best practices, standard status reporting, templates, tools, and training to state agencies. The website can be found at <http://www.colorado.gov/cs/Satellite?c=Page&childpagename=OIT-New%2FOITLayout&cid=1167928259151&p=1167928259151&pagename=OITXWrapper>

Project management tips can be found at <http://www.johnkellett.co.uk/index.php/2007/08/14/100-rules-for-project-managers/> and <http://ezinearticles.com/?Tips-for-Project-Management-Success&id=826027>

The following websites offer articles on overall project management lessons.
<http://www.itslessons.its.dot.gov/its/benecost.nsf/LessonHome>

<http://www.fhwa.dot.gov/programadmin/mega/collaborative.cfm>

<http://ourmedia.org/node/325914>

<http://www.pkal.org/documents/Vol4LeadersLessonsLearned.cfm>

<http://www.industryweek.com/section.aspx?sectionid=9>

<http://www.leadershipandbusiness.com/>

<http://www.projectsmart.co.uk/lessons-from-the-perfect-science-hindsight.html>

<http://www.projectsmart.co.uk/best-practice.html>

<http://www.pmhut.com> is the project management hut website and it offers tips and articles on all aspects of project management and overall project information including change management, communications, project collaborations, ethics, and time management to name a few topics.

Sandhill.com offers an article on characteristics of both projects that had failed and that were successful in 2007 and why. http://www.sandhill.com/opinion/editorial_print.php?id=173

The American Management Association has a site <http://www.amanet.org> that has government solutions to project management; has and offers over 170 seminars on topics including management, leadership, communication, and time management. The site also boasts special events such as webcasts and webinars, conferences, and an abundance of free resources such as research, surveys, newsletters, online library and a thinker series that promotes thinking and team development.

The Free Management Library is a comprehensive resource for leadership and management topics. The site has training, suggested readings, links to peer groups and online groups, job banks and organizations and links that offer more resources. Individuals are permitted to upload content to the site as well. This website offers a lot of good, free information for the project management topics that are discussed in this manual. Most topics will be on the actual act of project management and the skills, rather than the DOT processes. <http://www.managementhelp.org/>

The Public Procurement Guides is a website from Cyprus, Greece that has a similar process to project development as the US. The site has an entire section on project development and the development of the plans such as risk plans and information on the executing and controlling processes. The site is a good reference with best practices, tools, and templates. <http://www.publicprocurementguides.treasury.gov.cy/OHS-EN/HTML/index.html>

Consistent Applications of Project Manager Principles

Smooth Projects.com is a project management software site that offers many articles on project management through a variety of topics. This direct link goes to project management principles.

http://www.smoothprojects.com/project_management/313-project-management-14-principles.html



The FHWA website offers a guide on putting together a Project Management Plan. The site explains what a PMP should include, the purpose of a PMP, and offers a PMP Checklist and guidance questions.

<http://www.fhwa.dot.gov/programadmin/mega/pmpguide.cfm>

Effective Leadership

The following website offers a plethora of information on leadership skills, including what makes an effective leader, qualities of leaders, and how to handle different types of situations.

[http://www1.agric.gov.ab.ca/\\$Department/deptdocs.nsf/all/agdex1334](http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/agdex1334)



www.leadership-tools.com is a site that offers free leadership tools. In order to access the free tools you must register at no cost.

www.argospress.com is a website that offers books on building an effective team and other leadership topics.

www.teambuildingtips.com is a website that has great tips for team motivation, team building, team management, change management, and leadership skills. The site also has a free team building e-news letter that will be sent to your inbox and an “Ask the Team Doctor” section that you can type in your question and they will respond to you with an answer.

Motivating the Team

This website offers tips and ideas on motivating employee performance.

<http://www.associatedcontent.com/article/27937/error?cat=3>

Conducting Meetings



The Free Management Library offers guides to conducting effective meetings as well as other useful samples such as meeting minutes and agendas.

<http://www.managementhelp.org/misc/mtqmgmnt.htm>



This website features several useful templates and tools to plan successful working groups and meetings.

http://www.facilitatingprojects.com/tools_templates.htm

This website features twelve templates and tools to help plan successful working groups and meetings.

Crisis Management

Point Lookout is a free weekly email newsletter of tips, insights and perspectives that help people in dynamic problem-solving organizations find better ways to work with each other. The following article on crisis management provides tips on emergency problem solving.

<http://www.chacocanyon.com/pointlookout/050112.shtml>

The Institute for Crisis Management website also offers tools and resources to minimize the disruption and financial impact of a sudden or smoldering crisis.

<http://www.crisisexperts.com/index.html>

The Time Management Basics website discusses a variety of information on time management, tips and articles.

This direct link discusses Crisis Management.

<http://www.time-management-basics.com/time-management-ktd-crisis-management.shtml>

Communication



The Project Smart website offers a template for a communication plan that can be downloaded as well as articles on communication. <http://www.projectsart.co.uk/communication-the-lifeblood-of-a-project.html>

www.1000ventures.com/business_guide/crosscuttings/communication_main.html

The Texas DOT has written a chapter about the communication and documentation process.

<ftp://ftp.dot.state.tx.us/pub/txdot-info/des/dgnguide/chapter1.pdf>

Guiding Principles for Developing Effective Project Managers

Succession Planning

The U.S. General Services Administration offers a guide on succession planning that includes the working groups findings, lessons learned, skills that are needed, and a planning guide.

http://www.gsa.gov/gsa/cm_attachments/GSA_DOCUMENT/UpdatedSPGuide_R25-ul-a_0Z5RDZ-i34K-pR.pdf

The US General Services Administration has www.gsa.gov/successionplanning

The following site offers software to assist in succession planning

http://www.halogensoftware.com/micro/esuccession/esuccession_sp.php

The following site is from the American Institute of Certified Public Accountants, and offers case studies and articles for preparing your current employees for more complex roles. Information is also provided on succession strategy, goal setting, and easing the transition process.

<http://pcps.aicpa.org/Resources/Succession+Planning/Succession+Practice+Continuation+Planning/>

The CIO website has an article on How to Succeed at Succession Planning.

http://www.cio.com/article/192851/How_To_Succeed_At_Succession_Planning?page=2

Project Management Training

An excellent tool for project management that will assist PMs in thoroughly guiding a project is located on California's Department of Transportation website. The Project Development Process is a web based module that goes through each phase of a project starting with project development through to the project closeout. The site offers a Project Development Procedures Manual as well with checklists for each phase of the project and quizzes on the procedures. The site also offers resource links for further research on related topics as well as the manuals for industry standards.

<http://www.dot.ca.gov/hq/oppd/pdp/index.htm>

The Training Camp website offers Project Management Program training courses.

<http://www.trainingcamp.com/usa/training/pmi/pmp/overview.aspx>

The On Projects webpage offers practical and professional advice, tools and templates for project teams. The site is a blog site that offers a lot of information for project teams regarding management, stakeholder information, communications plans and more.

<http://onprojects.net/>

Project management training articles and resources can be found at <http://www.wandelendecoach.info/>. This site has insight on project management in other industries as well as articles on general project management.

Washington State Department of Transportation website offers project management and delivery manuals for all phases of a project; the website is located at <http://www.wsdot.wa.gov/>.

Chapter 3- Universal Elements

Project Startup for All Phases

Successful Conduct of Kick-off Meetings

The TechRepublic website offers steps to conduct an effective project kickoff meeting as well as links to other articles. http://articles.techrepublic.com.com/5100-10878_11-1038766.html



The docstoc website offers professional documents available for download. <http://www.docstoc.com/docs/289658/Project-Initiation-Kick-off-Meeting-Agenda%5B2%5D>

Team Coordination Between All Phases

http://findarticles.com/p/articles/mi_m3724/is_1_68/ai_n6276612 BNET, business network has an article on the Transportation Industry and the management structure that moves a megaproject along with seamless transition between phases. BNET also has numerous articles on management and a business library for white papers and webcasts.

Consultant Selection and Negotiations

The University of Wisconsin-Extension has a learning store which has publications that can be viewed online or purchased for a small fee. This link is for hiring a Planning Consultant: A Guide to Preparing a Request for Proposals. The article is written for communities, but offers checklists and ideas of what to put in a RFP. <http://learningstore.uwex.edu/pdf/G3751.pdf>

Three guidelines for getting the most out of consultants can be found at http://articles.techrepublic.com.com/5100-10878_11-5706225.html.



Chillibreeze is a site that has an article on how to write an RFP and what should be included. http://www.chillibreeze.com/articles_various/write-a-RFP.asp

Developing the Consultant's Cost/Fee

An explanation of the bottom up budgeting approach is located at <http://www.wpmc.com/process.htm>

A comparison of the top-down and the bottom-up budgeting approaches are given at <http://www.oecd.org/dataoecd/49/36/37045279.ppt#265,11,Top-down & Bottom-up Compared>

Scheduling Techniques to Ensure Adequate Time & Quality

The Texas DOT has created a how to guide on Scheduling. <ftp://ftp.dot.state.tx.us/pub/txdot-info/des/dgnguide/chapter3.pdf>

Bar Chart

This website gives an explanation of project scheduling using Gantt charts. These bar charts are commonly used to schedule the phases or elements of a project and also display the relationships between tasks. <http://www.stellman-greene.com/aspm/content/view/18/38/>

Critical Path Method

www.netmba.com/operations/project/cpm/ has an explanation of the critical path method.



The California State University San Bernardino web site offers exercises and quizzes on the Critical Path Method

<http://ftp.csci.csusb.edu/dick/cs372/11ex.html>

Critical Path Method and Critical Chain Project Management are tools used for keeping projects on schedule. Umesh Dwivedi, a certified Project Management Professional, provides a summary of the two techniques, which is available at: <http://www.freewebs.com/umeshspace/PM/CriticalChainProjectManagement.pdf>.

Managing Project Quality



This site provides a checklist for managing project quality from a software development perspective. This checklist can be directly applied to other types of projects as well.

<http://it.toolbox.com/blogs/enterprise-solutions/managing-project-quality-checklist-8499>

Stacy Groff, American Society for the Advancement of Project Management co-founder and ProjectExperts President has written an article on Measuring and Managing Project Quality. The website also offers a multitude of project management articles, podcasts, book reviews, and educational opportunities through training.

<http://www.asapm.org/asapmag/articles/ManagingQuality.pdf>

Constructability Reviews



A sample agenda for a Constructability Review is located on the Oregon.gov website. The site also has information on value engineering, manuals, and other roadway engineering topics.

http://egov.oregon.gov/ODOT/HWY/ENGSERVICES/forms_home.shtml

The Institute of Professional Engineers New Zealand Incorporated offers practice notes in a variety of engineering topics; the one on constructability describes the meaning of constructability, when it should be done, barriers, objectives, and the process of the review. http://www.ipenz.org.nz/ipenz/forms/pdfs/PN13_Constructability.pdf

The Washington State Department of Transportation has a research report on their website titled "A Framework for the Constructability Review of Transportation Projects" <http://www.wsdot.wa.gov/Research/Reports/400/409.1.htm>

The FHWA website has the constructability review process listed as a best practice and gives the reason for adopting the best practice and the benefits for numerous states.

<http://ops.fhwa.dot.gov/wz/practices/best/crossref.asp?id=6&sortBy=O.OrganizationName>



Arizona DOT has a comprehensive constructability guide that includes checklists and maintenance considerations. <http://www.dot.state.az.us/Highways/ConstGrp/PDF/ConstructabilityGuide.pdf>

Quality Assurance

The Oregon DOT has a QA guidebook on their site that includes what a quality control plan is, a model to follow on how to implement, and information needed for each phase of a project.

http://www.oregon.gov/ODOT/HWY/QA/docs/qa_guidebook.pdf

The Federal Financial Institutions Examination Council has a list of quality assurance standards as well as risk management standards and other project management topics.

http://www.ffiec.gov/ffiecinfobase/booklets/d_a/04.html



Oregon DOT also has an excellent example of the checklists for QA/QC on an excel spreadsheet that could be tailored to your agency. The checklists span multiple phases and disciplines and include flowcharts that show points on where QA/QC reviews are needed. http://www.oregon.gov/ODOT/HWY/QA/docs/qa_guidebook.pdf , http://www.oregon.gov/ODOT/HWY/SEOPL/docs/guides/qa_checklist1.xls, and http://www.oregon.gov/ODOT/HWY/QA/docs/qa_checklist2.xls are the links to these samples.

This link to FHWA has information on training, laws, regulations, technical advisories and informational memorandums on Quality Assurance and Quality Control. <http://www.fhwa.dot.gov/construction/cqit/qa.cfm>

Quality Control

<http://www.bitpipe.com/tlist/Quality-Control.html> Bitpipe.com is a library of White Papers, Webcasts and Case Studies. The site offers product information, downloads, podcasts and research guides. The site also has a newsletter that you can pick the topics that you are interested in and you will receive notice when a new white paper, webcast or case studies that pertains to your particular interest is available on the website.

Ensuring the Performance of Consultants

This chapter written by Texas DOT discusses the evaluations of consultants.

<ftp://ftp.dot.state.tx.us/pub/txdot-info/des/dgnguide/chapter6.pdf>



The City of Mesa, AZ has a Consultant Performance Evaluation form and guidelines to filling it out on their website located at http://www.cityofmesa.org/engineering/pdf/Performance_Eval.pdf.

Managing Project Risks and Creating a Risk Management Plan

http://www.theirm.org/publications/documents/Risk_Management_Standard_030820.pdf

www.argospress.com is a site that provides books on risk management.



www.pmhut.com is a project management website that has articles and information on project risks, managing them and avoiding them and also offers templates for risk management.

<http://www.wikihow.com/Develop-a-Risk-Management-Plan> is a comprehensive site that has an article and tips on how to develop a risk management plan and includes a sample.

The Wikipedia article on risk management includes many aspects on the topic including the principles of risk management, potential risk treatments, avoidance, and implementation of a risk management plan.

http://en.wikipedia.org/wiki/Risk_management

Managing Critical Path Items

PM World Today is an electronic Global Project Management eJournal that offers free news journals. The site is comprised of case studies, featured papers, tips and techniques, PM research and education news and interesting projects. <http://www.peworldtoday.net/> is the direct link to the home page. The following link directs to an article that gives tips and techniques for managing delays and accelerations

<http://www.pmforum.org/library/tips/2007/PDFs/Posener-1-07.pdf>

Agency Coordination Delays

<http://www.fhwa.dot.gov/environment/title23.htm> offers interagency guidance.

Right of Way



The state of Maryland has a brochure that is meant for property owners to explain the process of acquiring right of way for transportation projects. The brochure is a good example of how the public can be informed.

http://www.i-95expresstolllanes.com/linked_files/rightofway.pdf

Utilities



The Western Federal Lands Highway Division of the FHWA offers numerous utility notification package forms available for download at http://www.wfl.fha.dot.gov/design/row/forms/utility_notification.htm.

This link to FHWA's Construction page has construction and maintenance fact sheets on avoiding utility delays.

<http://www.fhwa.dot.gov/construction/fs02048.cfm> and <http://www.fhwa.dot.gov/construction/cgit/utilities.cfm> has the laws, regulations, policy, guidance, and training.

Project Change Management

The following articles provide additional information on change control and outline possible impacts to project schedule and budget:

<http://www.epmbook.com/scope.htm>

<http://www.trimitra.com/articles/projectchangecontrol.html>

This particular article is on The Business Impact of Change Management. <http://gbr.pepperdine.edu/063/change.html>

The Pepperdine University Graziadio School of Business and Management offers a journal of relevant business information and analysis on multiple topics. The direct link to the journal is <http://gbr.pepperdine.edu/>

This link is to the TX DOT that discusses change management and the different kinds of changes that a project manager may experience including scope and budget changes. <ftp://ftp.dot.state.tx.us/pub/txdot-info/des/dqnguide/chapter5.pdf>



True Solutions, Inc. offers inexpensive templates for change control.

<http://www.truesolutions.com/catalog/project-management-templates/change-control-templates.html>

Preparing for Project Closeout



The Western Federal Lands Highway Division website has a checklist for project closeout.

http://www.wfl.fha.dot.gov/construction/cmr/documents/project_closeout_requirements.doc

Project Closeout

The FTA has a direct link to their library that offers an example on project close out. The site includes close out procedures and an explanation of the steps involved.

<http://www.fta.dot.gov/fta/library/admin/BPPM/ch10.html>



A project close out template can be found at the Center for Disease Control and Prevention website

http://www2.cdc.gov/cdcup/document_library/project_templates/CDC_UP_Project_Close_Out_Template.doc

Project Audits



This website link is a presentation on what to include in an audit, what key points to have in an audit.

http://uamp.wits.ac.za/sebs/downloads/2006/pmchapter_14_mcgrawhill_handouts.pdf

Chapter 4- Project Management by Phase

Planning Phase

Virginia DOT has a Project Development Concurrent Engineering Process diagram that is a good model to see where tasks fall into place within a project from the scoping team meeting to advertisement.

<http://www.virginiadot.org/projects/Resources/CE-Process.pdf>

The Surface Transportation Policy Partnership website is one that offers statistics for each state, reports, issue areas such as health and safety and the environment, articles and a library. The site has information on the TEA-21 process and other legislative information. <http://www.transact.org/>

This link provides data and analysis tools for transportation professionals to achieve stronger linkages between planning and the environment. <http://www.environment.fhwa.dot.gov/integ/resources.asp>

Internal and External Agency Coordination

Indianapolis Metropolitan Planning Organization produced a Policies & Procedures Manual in 2006 that may be a useful guide to managing the numerous agencies collaborating on projects.

<http://www.indympo.org/NR/rdonlyres/B6FDF517-8C2D-4821-8E64-D695FDC8C15C/0/MPOPolicyandProcedureManual2006.pdf>



The U.S. Environmental Protection Agency has the project process steps explained including charts that state which agencies are involved and the data needed for the step. This particular link is geared toward the Mid-Atlantic Transportation & Environmental Streamlining Framework Process.

<http://www.epa.gov/reg3esd1/nepa/mate/processsteps.htm>

The U.S. Department of Transportation website has information and tips on how to coordinate better and develop working groups to improve the environmental review process. The site also has case studies, news and press releases on topics such as streamlining and projects that are going through an accelerated review process.

<http://www.dot.gov/execorder/13274/workgroups/index.htm>

Interagency Review (IAR) Meetings

This link to FHWA provides information on the interagency consultation and the general requirements of the agencies. The site also lists the roles and responsibilities of each agency, requirements for conflict resolution and requirements for circulating documents. http://www.fhwa.dot.gov/environment/conformity/ref_guid/chap2.htm

Agency Concurrence at Milestones

This link to the FHWA website discusses the conflict resolution process that the state of Maryland is using when working with the regulatory agencies during concurrence points.

<http://www.environment.fhwa.dot.gov/strmlng/adrguide/adrappg.asp>

National Environmental Policy Act (NEPA) & Other State and Federal Regulations & Streamlining Processes

The following websites are great online resources for guidelines and streamlining practices to satisfy NEPA, state, and federal requirements. The FHWA's website offers a great deal of information and offers links to other sites that will help guide the reader through the NEPA process and other environmental state and federal regulations.

http://environment.fhwa.dot.gov/integ/case_oregon.asp is a case study for Collaborative Environmental and Transportation Agreement for Streamlining.

The Environmental Protection Agency has extensive guidance on the streamlining process located at <http://www.epa.gov/reg3esd1/nepa/mate/FinalMidRevised.pdf>.



This link to FHWA has examples of best practices in environmental stewardship. <http://www.fhwa.dot.gov/demdiv/bestpractices2.htm#EnvironmentalStewardship>

NEPA

The FHWA's Environmental Guidebook is an online resource that provides up-to-date information to accelerate the delivery of transportation projects.

<http://www.environment.fhwa.dot.gov/guidebook/index.asp>

The Council on Environmental Quality was established by Congress in 1969 as part of NEPA in an effort to ensure that federal agencies meet the requirements of NEPA.

<http://www.nepa.gov/nepa/nepanet.htm>

<http://ceq.hss.doe.gov/Nepa/regs/nepa/nepaegja.htm>

http://ceq.hss.doe.gov/ntf/Collaboration_in_NEPA_Oct_2007.pdf

<http://www.epa.gov/Compliance/nepa/>

<http://www.environment.fhwa.dot.gov/projdev/index.asp>



http://www.fhwa.dot.gov/cadiv/pre/nepa_ck.htm has a final NEPA checklist, this version is specific to California and is a guide and not all inclusive.

Federal Regulations and Orders

Each federal transportation agency has prepared guidance on the policies and procedures for compliance with NEPA.

Federal Aviation Administration-FAA

The Federal Aviation Administration (FAA) has adopted FAA Order 1050.1E, Environmental Impacts: Policies and Procedures and FAA Order 5050.4B, National Environmental Policy Act (NEPA) Implementing Instructions for Airport Projects to guide the implementation of NEPA for airport projects.

http://www.faa.gov/regulations_policies/orders_notices/media/all1050-1e.pdf

http://www.faa.gov/airports_airtraffic/airports/resources/publications/orders/environmental_5050_4/

Federal Highway Administration - FHWA

The Code of Federal Regulations, Title 23: Highways includes all of the federal regulations related to highway projects. The Federal Highway Administration (FHWA) utilizes CFR 23 throughout the life of a project.

http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?sid=0995652f35c29f4fda57b9b5351ffd0a&c=ecfr&tpl=/ecfrbrowse/Title23/23tab_02.tpl



This link to FHWA provides a checklist template that will assist in determining the type of project classification and the scope of the environmental document. The checklist is prepared at the beginning of project development and is expanded when new information becomes known throughout the study period. The list includes the agencies involved in the project and the name, title, address, and phone number of persons representing those agencies. <http://www.efl.fhwa.dot.gov/design/ae/WFLHD/Chapter1/forms-templates/ProjectScopeChecklistTemplate.doc>

The following websites offer guidance on the Environmental Review Process and streamlining.

<http://www.fhwa.dot.gov/hep/section6002/index.htm>
<http://www.environment.fhwa.dot.gov/strmlng/newsletters/feb02nl.asp>
http://www.environment.fhwa.dot.gov/strmlng/sec602_checklist.asp
<http://www.environment.fhwa.dot.gov/projdev/tdmpdo.asp>

Environmental documentation is crucial to any federally-funded construction project. The links below include discuss specific types of environmental documents. They provide descriptions of all of the different types of environmental documentation and the requirements for each. The site also lists information that should be included within each document.

<http://environment.fhwa.dot.gov/projdev/impTA6640.asp>
<http://www.environment.fhwa.dot.gov/guidebook/results.asp?selSub=91>

Federal Railroad Administration - FRA

The Federal Railroad Administration's [Procedures for Considering Environmental Impacts](#) guides the NEPA process for railroad projects.

<http://www.fra.dot.gov/Downloads/RRDev/FRAEnvProcedures.pdf>

Federal Transit Administration- FTA

The Federal Transit Administration offers [UMTA C 5620.1, Guidelines for Preparing Environmental Assessments](#).
http://www.fta.dot.gov/documents/UMTA_C_5620.1.pdf

Air Quality

There are numerous resources to ensure compliance with the Clean Air Act, as amended through 1990.

<http://www.epa.gov/air/criteria.html>

The Environmental Protection Agency's Green Book lists areas by county that are in Nonattainment for criteria pollutants.

<http://www.epa.gov/oar/oaqps/greenbk/>
<http://www.epa.gov/oar/oaqps/greenbk/multipol.html>
<http://www.epa.gov/oar/oaqps/greenbk/caa-t1p.html>

Coastal Barrier Resources

Coastal barriers along the Atlantic and Gulf coasts, as well as those located along the shores of the Great Lakes are protected in an effort to minimize or prevent the loss of human life and impacts to natural resources.

http://www4.law.cornell.edu/uscode/html/uscode16/usc_sec_16_00003501----000-.html

<http://www.fws.gov/laws/lawsdigest/coasbar.html>
<http://www.environment.fhwa.dot.gov/guidebook/vol1/doc2c.pdf>

Coastal Zone Management

All Federal agencies are required to adhere to the regulations set forth by the Coastal Zone Management Act of 1972 (CZMA), the Coastal Zone Protection Act of 1996, and the Coastal Barrier Resource Act of 1982. The CZMA requires that each state with a coastal boundary, including those states that border the Great Lakes, establish a Coastal Zone Management Program, which would be administered by the responsible state agency.

http://www.coastalmanagement.noaa.gov/czm/czm_act.html
<http://coastalmanagement.noaa.gov/>
<http://coastalmanagement.noaa.gov/consistency/welcome.html>

Community Impacts

Community impacts resulting from the implementation of projects need to be assessed.

http://www.ciatrans.net/about_cia.html
<http://www.ciatrans.net/resources2.html>

Farmland

Legislation has been enacted to prevent or minimize the conversion of farmland to urban uses.

<http://www.nrcs.usda.gov/programs/fppa/index.html>
<http://www.environment.fhwa.dot.gov/guidebook/chapters/v1ch5.asp>

Floodplains

Executive Order 11988 defines floodplains as the “lowland and relatively flat areas adjoining inland and coastal waters, including flood prone areas of offshore islands, including, at a minimum, the area subject to a one percent or greater chance of flooding in a given year. This Order ensures that floodplains and floodways are kept clear of obstructions and facilities that could restrict or increase flow rates or volumes during flood conditions.

<http://isddc.dot.gov/OLPFiles/DOT/007652.pdf>
<http://www.epa.gov/owow/wetlands/regs/eo11988.html>
<http://msc.fema.gov/webapp/wcs/stores/servlet/FemaWelcomeView?storeId=10001&catalogId=10001&langId=-1>

Hazardous Waste and Brownfields

Guidelines have been developed to effectively manage hazardous and solid wastes. In addition, regulations have been set forth to guide and support the redevelopment of brownfield sites, which are defined as “real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. [Environmental Protection Agency (April 2008)

<http://www.epa.gov/swerosps/bf/glossary.htm>”]
<http://www.environment.fhwa.dot.gov/guidebook/chapters/v1ch7.asp>
http://www.epa.gov/brownfields/other_bf_related_laws.htm
<http://www.epa.gov/superfund/>
<http://www.epa.gov/swerosps/bf/index.html>

Historical and Archaeological Preservation

Historic properties are defined as properties that are either listed in or have been determined eligible for listing in the National Register of Historic Places (NRHP), including buildings, structures, historic districts, object sites, or archaeological resources. The regulations implementing the NRHP may be found in 36 Code of Federal Regulations

<http://archnet.asu.edu/Topical/CRM/usdocs/36cfr60.html>
<http://environment.fhwa.dot.gov/guidebook/chapters/v2ch10.asp>
<http://www.environment.fhwa.dot.gov/histpres/resources.asp>
<http://www.environment.fhwa.dot.gov/guidebook/results.asp?selSub=55>

Indirect and Cumulative Impacts

Indirect and cumulative impacts may not necessarily result directly from a proposed project. However, when considered in relation to other projects in the vicinity, the impacts could be significant and must therefore be considered.

<http://ceq.hss.doe.gov/nepa/ccenepa/ccenepa.htm>

http://ceq.hss.doe.gov/ntf/Collaboration_in_NEPA_Oct_2007.pdf

http://environment.transportation.org/environmental_issues/secondary_impacts/

Noise

Noise can be defined as unwanted sound and is assessed not only in terms of decibel levels, but the duration of the noise, frequency, time of day, personal preferences, and whether or not a person can control the sound.

<http://onlinepubs.trb.org/Onlinepubs/millennium/00134.pdf>

http://www.fhwa.dot.gov/environment/noise/mem_nois.htm

Safe Drinking Water Act

<http://cfpub.epa.gov/safewater/sourcewater/index.cfm>

<http://www.environment.fhwa.dot.gov/guidebook/chapters/v1ch10.asp>

Scenic Byways

The National Scenic Byways Program was established by the FHWA in an effort to recognize, preserve, and enhance selected roads throughout the US. Roads are recognized based on one or more archaeological, cultural, historic, natural, recreational, and scenic qualities.

<http://www.fhwa.dot.gov/environment/scenguid.htm>

<http://www.byways.org>

Section 4(f)

Section 4(f) of the Department of Transportation Act of 1966 (49 USC 303) provides for the protection of publicly owned recreational resources and requires the analysis of potential impacts to these resources arising from DOT actions. Resources protected under Section 4(f) include public parks and recreation areas, wildlife and waterfowl refuges or management areas of national, state, or local significance, and historic sites of national state, or local significance.

<http://a257.g.akamaitech.net/7/257/2422/01jan20081800/edocket.access.gpo.gov/2008/E8-4596.htm>

<http://www.environment.fhwa.dot.gov/projdev/PD5sec4f.asp>

<http://www.environment.fhwa.dot.gov/projdev/4fpolicy.asp>

Title VI & Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, was enacted in 1994 to direct each Federal agency to develop a strategy to address environmental justice concerns in its programs, policies, and regulations. The purpose of this Order is to avoid disproportionately high and adverse human health or environmental impacts on minority and low-income populations with respect to human health and the environment. On July 16, 1997, the DOT issued its Final Order on Environmental Justice as Order 5610.2.

<http://www.environment.fhwa.dot.gov/guidebook/chapters/v2ch16.asp>

<http://www.fhwa.dot.gov/environment/ej2.htm>

<http://www.epa.gov/compliance/environmentaljustice/interagency/index.html>

http://www.fhwa.dot.gov/legsregs/directives/orders/6640_23.htm

Water Quality

The Federal Water Pollution Control Act of 1972, as amended by the Clean Water Act of 1990 (CWA), was instituted to protect the water resources of the US. It also provides the Environmental Protection Agency with the authority to regulate water quality and to require permits for actions that have the potential to adversely affect water quality. Compliance with the CWA is achieved primarily through the issuance of permits through the National Pollutant

Discharge Elimination System and for the dredge and fill permitting in compliance with Sections 402 and 404 of the CWA, respectively.

<http://www.environment.fhwa.dot.gov/guidebook/chapters/v1ch11.asp>

<http://www.environment.fhwa.dot.gov/guidebook/chapters/v1ch12.asp>

<http://www.epa.gov/owow/wetlands/regs/sec404.html>

http://environment.transportation.org/environmental_issues/water_wetlands/

<http://www.fws.gov/laws/lawsdigest/fwatrpo.html>

<http://www.fhwa.dot.gov/environment/wtrshd96.htm>

http://cfpub.epa.gov/npdes/home.cfm?program_id=6

Wetlands

Federal and state regulations have been established to minimize the continuing reduction and degradation of wetlands and Waters of the US and strive to achieve a “no net loss” policy. The Federal program is based on Section 404 of the CWA and the US Army Corps of Engineers implementation regulations. In addition, Executive Order 11990 directs all Federal agencies to minimize the destruction, loss, and degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands.

<http://www.fhwa.dot.gov/cadiv/pre/guide3.htm>

<http://www.fws.gov/nwi/>

<http://www.wetlands.com/fed/exo11990.htm>

Wild and Scenic Rivers and Wilderness Areas

The Wild and Scenic Rivers Act was implemented to facilitate the protection of rivers possessing “outstandingly remarkable scenic, recreation, geological, fish and wildlife, historic, cultural, or any other similar values.”

The Wilderness Act was established in 1964 in an effort to prevent areas that are designated as “wilderness areas” from being developed and provide protection and preservation of their wilderness characteristics.

<http://www.environment.fhwa.dot.gov/guidebook/chapters/v1ch15.asp>

<http://www.rivers.gov/wildriverslist.html>

<http://www.wilderness.net/index.cfm?fuse=NWPS>

<http://www.wilderness.net/index.cfm?fuse=nwps&sec=legisact>

Wildlife and Threatened and Endangered Species

Section 7 of the Endangered Species Act requires that the potential impacts to rare, threatened, and endangered species of flora and fauna and their critical habitats be identified to avoid adverse impacts to these species. Consultation with the US Fish and Wildlife Service and the responsible state agency is required to determine the potential presence of rare, threatened, or endangered species within a project area.

<http://www.environment.fhwa.dot.gov/guidebook/chapters/v1ch4.asp>

<http://www.fws.gov/angered/>

<http://www.fws.gov/angered/consultations/s7hndbk/s7hndbk.htm>

Public Involvement

FHWA offers public involvement techniques including how to design a public involvement program. The links on the left hand side of the page offer planning information with case studies, publications, training and education opportunities, and case studies in different planning topics.

<http://www.planning.dot.gov/Pitool/toc-foreword.asp>

The following link from the FHWA website is a booklet on How to Engage Low-Literacy and Limited-English-Proficiency Populations in Transportation Decision-making. The booklet offers tips and strategies on getting the Environmental Justice communities involved in transportation decision making as well as lessons learned.

<http://www.fhwa.dot.gov/hep/lowlim/lowlim2.htm>

The FHWA website also offers visualization planning techniques for public involvement including practices and innovative uses. The site also provides links to AASHTO's Visualization in Transportation; a Guide for Transportation Agencies and other sites such as the Transportation Research Board.

<http://www.fhwa.dot.gov/planning/vip/index.htm>

This FHWA link takes you to a presentation on Public Involvement for Transportation Decision Making. Information is given on everything from the type of meeting to have and techniques for getting feedback from participants. This is a great guide for anyone that needs to plan a public meeting for a transportation project.

<http://www.fhwa.dot.gov/reports/pittd/cover.htm>

Public Involvement Plan (PIP)



Florida's Department of Transportation has the steps to develop a comprehensive public involvement plan.

http://www.dot.state.fl.us/emo/pubs/public_involvement/Chap%206%20Public%20Involvement%20Plan.pdf



Montana Department of Transportation offers a guideline to creating a news release for a project.

http://www.mdt.mt.gov/other/dir/external/forms/news_release_guidelines.pdf

Informing and Involving Elected Officials



http://tools.ysa.org/downloads/tipsheets/advocacy/Elected_Official_Tips_for_Invitation.pdf is a link from Youth Service America that gives tips on the inviting of elected officials to the event. There is a sample form letter as well that can be used by changing the event and agency information.



The American Planning Association (APA) <http://www.planning.org/ncpm/pdf/electedsampleletter.pdf> has sample letters on engaging elected officials. The site also offers tips on effective meetings. The APA site has a plethora of information on legislation and policy, publications, and a knowledge exchange.

<http://www.planning.org/ncpm/pdf/electedsampleletter.pdf>

Involvement Customers (Stakeholders, Community, and Business Owners)



The Texas DOT website offers sample wording for public meetings, and public hearing, press releases, and notices for construction. http://onlinemanuals.txdot.gov/txdotmanuals/env/sample_forms.htm#i1005916

Draft & Final Environmental Document

The FHWA website has a list of all of the possible environmental documents, what determines each, and who should receive a copy of it for review. <http://environment.fhwa.dot.gov/projdev/impTA6640.asp>

Design Activities

The FHWA website has a list of all of the state roadway design manuals

<http://www.fhwa.dot.gov/programadmin/statemanuals.cfm> and the state standard drawing information as well located at <http://www.fhwa.dot.gov/programadmin/statestandards.cfm>

The FHWA website list and discusses the different phases of design.

<http://www.fhwa.dot.gov/environment/flex/ch01.htm>

Preliminary Engineering



The Department of Public Works for the City of Hurst in Texas has a PE Plan checklist.
http://www.ci.hurst.tx.us/Publications/Planning/Preliminary_Engineering_Plan_Checklist.pdf

Semi-final Reviews

This chapter of the design guide from Texas DOT discusses the review process, including who should be involved in the meetings and information that should be part of the submittal. These items may or may not be relevant to your agency and will need to be tailored to meet individual needs.

<ftp://ftp.dot.state.tx.us/pub/txdot-info/des/dgnguide/chapter4.pdf>

Plans, Specifications, & Estimates



Colorado DOT has a comprehensive final checklist for PS&E.
<http://www.dot.state.co.us/FormsDepository/cdot1299.pdf>

This link to FHWA has information on the PS&E approvals including training, guidance, and policy.

<http://www.fhwa.dot.gov/construction/cqii/pse.cfm>

Agreements Process



The US Army Corps of Engineers Policy and Compliance Division has sample Agreements and Memorandums of Understandings on their website as well as other approved model agreements. All models have been updated to include the latest references and language. <http://www.usace.army.mil/cw/cecw-p/pca/ccpca.htm>



North Carolina DOT has their version of the guidelines for the agreement process and reimbursement to the DOT from a municipality or developer posted on their website. The site also has an agreements process flowchart.
<http://www.ncdot.org/doh/preconstructi/altern/value/manuals/rbd.pdf>

Permits and Final Approvals



The Western Governor's Association has a regulatory compliance checklist using Wyoming as an example.
<http://www.westgov.org/wga/initiatives/coalbed/cbm-d.pdf>



Minnesota DOT has a checklist of permits and approvals that are likely to be required.
<http://www.dot.state.mn.us/tecsup/xyz/plu/hpdp/book3/2f/permits/pdf/checklist-permits.doc>

Bid Opening



TX DOT offers general requirements checklists. This link goes directly to the bid document preparation that lists all of the federal requirements.

http://onlinemanuals.txdot.gov/txdotmanuals/cah/general_requirements_checklist.htm

This link to FHWA is to guidelines on preparing the engineer's estimate, bid reviews, and evaluation for construction projects. <http://www.fhwa.dot.gov/programadmin/contracts/ta508046.cfm> and <http://www.fhwa.dot.gov/construction/cqit/opening.cfm> has the laws, regulations, guidance and training.

Awarding the Contract

Bid considerations and analysis, post award reviews and other information that is needed prior to concurrence in award can be found at <http://www.fhwa.dot.gov/programadmin/contracts/ta508046.cfm> and bid analysis and award of contract information including laws, guidance, and training can be found at <http://www.fhwa.dot.gov/construction/cqit/award.cfm>.

The Public Procurement Guides website has information on bid analysis and awarding the contract. http://www.publicprocurementguides.treasury.gov.cy/OHS-EN/HTML/index.html?7_5_6_change_management.htm



Professional RFP letters offers free documents including contract award letters, disqualification letters, and also has a Frequently Asked Questions sections on bids, procurement to name a few. <http://rfptemplates.technologyevaluation.com/RFP-Contract-Award-Letter.html>

Redline Revisions

Red-line revision process information can be found at the following links:
<http://www.howardcountymd.gov/DPZ/DPZDocs/REDLINE120607.pdf>
<http://www.okladot.state.ok.us/materials/pdfs-ohd/ohd100.pdf>

Construction Phase

Construction Activities

The FTA has a project management manual on their site for construction projects. IT is a guide for those that do not have a lot of experience with transit projects. The site also offers other information relative to the DOT agencies projects. http://www.fta.dot.gov/documents/Construct_Proj_Mangmnt_CD.pdf



www.misonet.com Misonet Construction Information Services offers management, estimating, scheduling, and reporting software and e-books that are available for download. The site offers e-books on project management and leadership skills for engineering and construction projects and case studies in construction management.



The North Carolina DOT has forms on the progress of field work, daily reports, and claims resolution forms. http://www.ncdot.org/doh/operations/dp_chief_eng/constructionunit/formsmanuals/

The ASTM International website provides standards worldwide. The site has an open forum for the development of international standards that are used around the world. The site includes articles, standards information on a great number of areas, testing and training courses, as well as workshops and directories. <http://www.astm.org/>

Contractor Education

The FTA has a document on the website that gives information and best practices of wage determinations and types of bonds. The site provides federal requirement information that should be included in contracts to the contractors.

http://www.fta.dot.gov/documents/BPPM_ch8.doc



TX DOT has a pre-construction conference agenda that can be used for topics of what to educate your contractors on. http://onlinemanuals.txdot.gov/txdotmanuals/cah/pre_construction_conference.htm

Contractor Communication

The Grading and Excavation Contractor magazine website has an article on Communication: The most important and overlooked construction site BMP, the article discusses regulatory agencies and the relationship between the designer, contractor, agencies, and inspectors.

http://www.stormcon.com/gx_0211_communication.html

Tracking Construction Progress

This FHWA link discusses construction management systems and automated contract tracking.

<http://www.fhwa.dot.gov/construction/fs01022.cfm>

Request for Information Management

Louisiana DOT and Development has a Request for Information form on their website.

http://www.dotd.la.gov/construction/rfi/documents/rfi_form.pdf

Change and Claims Management

Public Procurement Guides website offers best practices and templates to change management.

http://www.publicprocurementguides.treasury.gov.cy/OHS-EN/HTML/index.html?7_5_6_change_management.htm

Construction Complete

This link to FHWA goes in depth on the inspections at project completion.

<http://www.fhwa.dot.gov/construction/cpmi0405.cfm>