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# PROJECT CONTROL IN INDUSTRY

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EMP - 9421

Group Project Report

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Group OCA - 1

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# ABSTRACT

Academic theory has defined project control as the definition of project standards, measurement and comparison of actual performance to the project standards, and taking corrective action when the actual performance varies from the project standard. The primary elements that project managers must control are time, cost, and performance. This paper documents a survey of project managers from four diverse companies in the Northwest, ranging from consulting firms to government agencies, to find out how projects are controlled within those companies. Each company's project control system and key areas of good and bad performance are identified. A set of recommendations is given for improvement of each company's control system. The key issues from the individual companies are compared for similarities, and a listing of critical areas of focus for effective project control is developed based on these similarities.

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# I. INTRODUCTION

The following report investigates the topic of project control for several local companies. Project control methods for Bonneville Power Administration, Engineering & Design Associates, Harris Group and Wacker Siltronic were evaluated. A literature search was conducted to clearly define project control, then a list of twenty questions pertaining to project control was developed. Selected managers from each of the four companies were interviewed, and a list of key issues and recommendations concerning project control for each company was developed. A summary list of issues and recommendations was compiled that would be applicable to any company.

This paper represents an overview of common project control methods. The survey questions developed were general in nature and were meant to promote discussion on the topic of project control. The subject of this paper did not lend itself to collecting numerical data and performing an in depth analysis. Many of the answers to the survey questions were subjective, and the results could differ had others been surveyed.

One of the primary benefits of this project was to allow the team members to investigate how their employers control projects. Much of the information gained was previously unclear or unknown to the team members. In addition to learning about their own organizations, team members learned how other organizations approach project control.

# II. DEFINITION OF CONTROL

In order to effectively manage a project in any of today's business environments, management must exercise some control over the project. This management function of control, according to Henry Fayol, sees "that everything appears in conformity with established rule and expressed command."[1,2] The control system should regulate the work and minimize the changes to the plan during the course of the project to guide the project towards the cost, schedule, and performance goals established at its beginning.

There are three basic elements to the control process. The most important component of the control process is planning. Planning and control are thought to be interrelated because it is difficult to tell where planning stops and control starts [7]. During the planning phase, the performance standards are defined, the budgetary cost estimates are created, and the work packages and schedules are developed. The second element of project control is comparison of actual project progress against the standards established at the start of the project. The last element is taking corrective action when the progress has deviated from the initial goals.

To aid in controlling a project there are formal and informal methods of organizational control available to project managers. Some of the formal methods of control include: project scope definition, formal budget restrictions, the amount of formal feedback required to management, restrictions or limitations created by production requirements, time reporting systems, and reliance on other formal reporting procedures. Informal methods of control include the frequency of contact between a manager and employees, frequency of contact with the customer, the interest of the manager in the product, the perceived importance of the

project, and feedback gained through informal networks with employees who know the standing of the project.

The engineering project manager must be careful in his application of project control because many engineers inherently dislike being controlled. The manager's task is further compounded by the high level of creativity and innovation required on today's high-tech projects coupled with short lead times to production. It is a common impression in the technical management field that the tight control practices of large corporate bureaucracies tend to hamper and discourage innovation. To ease this conflict a manager should identify the proposed methods of control, why those elements were chosen, and how the results will be evaluated and acted upon.

Most projects generally lend themselves to control of three primary dimensions: time, cost, and performance. To effectively manage these dimensions the project manager will set (or is involved in setting) budgets, schedules, and product requirements. These requirements are utilized as benchmarks for tracking the results of the project. This paper will take a closer look at the three dimensions of primary concern for project control.

## A. Time

The most effective way to begin time control on a project is through project planning. During the project planning phase, work packages are defined and assembled to provide a time based schedule for the complete project life cycle. These schedules are coordinated with those best qualified to support the work and then released for initial scheduling. The initial schedule should be laid-out with careful consideration of resource availability, primary work packages, and pertinent milestones. After the schedule has been finalized the information should be entered into a time-scaled network format, such as PERT, which can provide an excellent view of time and major dependencies of the various phases of the project on each other.

The schedule information should also be entered into a database which can keep track of the project as it proceeds. It is very helpful if the database can be entered into a computerized project tracking system. A computerized scheduling database can provide a variety of output formats that can help the project manager more easily identify areas of concern with regard to the schedule on the project. However, the information to be gained from a computerized schedule tracking system is only as accurate as the information fed into the database and the age of that information. It is important that a system be developed by each organization which will allow it to quickly process and enter information into its computerized project tracking system.

Accuracy of information supplied to the project manager in the high tech arena is critical, as meeting deadlines to market can be the difference between a company having a successful product and having a product that is behind the competition. Accurate schedule information allows the project manager to readily identify problems, analyze the root causes, and effectively adjust the work load or project scope accordingly.

## B. Cost

Project control in private industry quite often finds upper management focusing on cost as the primary element of concern.[2,3,5] This appears reasonable since a corporation must turn a profit, but hampers the quality or innovative processes when the manager dwells on cost alone. Cost controls are defined by the American Association of Cost Engineers as the application of systems and procedures to measure the current status and projected completion of projects against the authorized budgets and schedules to allow for corrective action when errant projects are identified.[2] However, cost control systems not only provide internal methods for monitoring cost but produce data for customer reports and contract obligations. These same systems could also generate data about the effectiveness of cost estimating procedures and allow for updating of methods to apply in future projects.

Cost control should start with the initial project proposal and an analysis of the proposed scope. The project breakdown should be carefully reviewed for accurate scheduling of work loads, production rates, interdependent processes, and the associated costs. This planning process should identify the work to be performed, assignment of appropriate tasks and accountability, and establishment of an integrated completion plan. These tasks should then be scheduled for the formulation of a critical path and integration of work packages to not only identify potential cost over runs but also identify materials and process that need to be pre-ordered to keep the project on schedule. Good project cost control systems should contain the following attributes:

Reports that contain:
- total probable cost
- identification of variances
- concise information in a uniform format
Timely routine production of reports
Implementation of procedures that will provide cost savings
Acceptable range for projects to fluctuate from forecasted budgets.

The real focus of cost control systems is to provide an accurate and timely method for monitoring projects and the ability to adjust the system before the variance from the projected cost is irreversible. With this intent, management should identify methods to effectively coordinate and format the data required in order to evaluate the status of projects within the framework of their corporate structure.

Individual organizations must create the systems most compatible with their business and with their personnel. These systems should exhibit these common elements: create cost consciousness, enhance decision making, and allow for wise investments. When properly developed and implemented cost controls should easily be used as a method of optimizing the project system, and not as a tool for identifying punishment.

## C. Performance

A well structured product scope, detailed standards of design, and a thorough understanding of the customer requirements are necessary for product performance evaluation.[1,5,6] These elements can be achieved through a consistent method of planning, organizing, and implementing actions with the goal of customer satisfaction and good work ethics.

The initial requirement of planning a project to guarantee performance is a thorough understanding of the client's scope. An effective method to ensure understanding is an initial review of the proposed scope and a meeting or conference to discuss the expected product. Any relevant issues should be addressed in terms of what the designer expects to produce and whether that aspect of the product meets with the client's expectations. Any items requested in the initial scope which appear to be vague or in possible conflict with other requirements should be dealt with at that time. If the client has any input for changes or modifications to the scope, they should be discussed and well documented. Any undecided or unaddressed issues should be addressed in the final proposal through a listing of assumptions. The results of a scope discussion should be detailed and identified through the final design proposal with a clear definition of the new scope and a listing of any additional assumptions.

Actual design quality and methodology should be a defined expectation of the design group or corporation. These requirements should consider industry standards and practices, legally developed codes, and the individual preferences of senior design personnel. The design team and project manager should have thorough understanding of the client's business and expected use of the product to allow for suggested changes. With sufficient insight into the product, a scope change may be addressed which generates superior performance or long term cost savings for the client. These adjustments or recommendations would build customer relations and provide exceptional results.

The initial proposal should set forth a structure, schedule, clear identification of resources, and defines an organized process of meeting with the client for regular reviews of the continuing design. This system allows the commitment of personnel and the assurance of regular review for the guarantee of the client's satisfaction. The client should be questioned for potential requirement changes or apprehensions about any aspect of the project.

In summary, while there are many components that can be controlled during the course of a project, an effective project manager will concentrate on controlling the elements of time, cost, and performance. A manager should not focus his efforts on trying to control one because they are all interrelated. If one of the three goes astray, it will pull the other two with it, causing all of the components to be off track. Proper control of these three factors will largely dictate if a project is a success or a failure.

## III. ANALYSIS OF INDIVIDUAL COMPANIES

### A. *Bonneville Power Administration*

Bonneville Power Administration (BPA) is organized into ten major offices. The office which was studied (Office of Engineering) is subdivided into six major divisions. The

division focused upon, Facilities Engineering, is organized as a matrix organization. To facilitate the work within the division, project managers are allowed to go outside the division to include personnel (electrical engineers, real estate experts, computer programmers, etc.) from other divisions. Although the division uses the matrix system for project management, it must function within a strong functional hierarchy that at times stifles the matrix process. The project managers typically have little control over the personnel working on the project or the initial project planning.

The projects within the division of Facilities Engineering vary greatly in size, level of complexity, and duration. They can include piping replacement projects which can be handled by a mechanical engineer in less than a year and have a budget of $30,000 to the construction of several hundred miles of transmission line which requires the services of a multitude of people for several years and costs hundreds of million dollars. Some typical projects that are currently being done by this division include: design of new transmission lines, design of major maintenance facilities and new control houses, replacement or installation of new HVAC systems in older substation control houses, removal of underground fuel storage tanks from BPA facilities, and installation of oil containment systems in substation switchyards.

## BPA's Project Control System:

Projects are initiated by requests for work being generated by the various maintenance offices (there are seven scattered throughout the service area) and then funneled to budget item coordinators for one of several maintenance and construction programs. The budget item coordinator will request a estimate of the proposed project if it appears to be feasible and in BPA's best interest to pursue. The scope for the estimate is developed from the initial request by the estimator with help from the budget item coordinator and the field personnel. Portions of the estimate are sent to the functional sections involved in the project for their input. The pieces that were sent to the functional sections are collected and the estimate is put together and tallied. The completed estimate is sent back to the budget item coordinator who, along with members of senior management, decides which projects are worthy enough to be a part of the budget item coordinator's program for that fiscal year.

After the project has been "planned" it assigned to the functional section which is responsible for the majority of the design work. The functional manager for that section will assign the project to a project manager in the section. The project manager will examine the scope to determine if the scope that has been developed is complete or if it needs to be developed further. The project manager will create and issue a Project Design Plan (PDP), which is similar to the project summary plan, to describe the project, what will be done, and who is involved. During this time the project manager can have the project re-estimated if he has changed the scope. Once the PDP is reviewed and approved by the user and the budget item coordinator, with comments from all involved incorporated, it becomes the project budget and schedule.

During the course of the project the project manager is responsible for keeping the project on course although he has little authority to do it. The project manager has very little

<u>Recommendations for BPA:</u>

1. Institute "cradle to grave" project management. Involve the PM in the project sooner, and do not switch horses at mid-stream.

To overcome this deficiency, it is suggested that BPA move towards a "cradle to grave" project management system. This means that there would be one project manager from the inception of the project to the completion of construction. This would reduce the tensions between design and construction by not placing either in positions where problems occurring during construction could be labeled as "design's fault" or "construction's fault." They would be problems for the project manager to solve to keep the project on track. By removing the second project manager there would be not overlap in efforts and there wouldn't be a period of time during the early construction phase where the construction manager is involved in a learning curve about the project. This would reduce costs and save time. Lastly, the ability of the project to be controlled would be enhanced by allowing just one project manager, with one system and one style, to track time, cost and performance of the project and to bring it in line when the project strays from its course.

2. Update the way in which project information is entered into the PMIS. Use a method similar to Engineering & Design Associates for time sheets and percent complete. Possibly investigate a new PMIS that takes advantage of the power of the personal computers which all the project managers have on their desks.

Both project managers interviewed pointed out that they were unable to get up-to-date schedule and cost information about their projects. This inability to get current information limits their ability to effectively manage the project and places them in the role of "firefighter," putting out fires when problems occur, instead of allowing them to see problems developing so that they can take preventative actions. The cost information they get from the PMIS is typically two to three months old. Charges from on-site contractors against the project can take up to six months to make it into the system. Schedule information is usually one to two months behind, depending on how fast the data can be entered after changes are reported by the project manager.

To combat this situation BPA should adopt a policy similar to that used by one of our on-site contractors (Engineering & Design Associates) for their cost control system. In this system, the employees of the various project teams (including on-site contractors) would provide a record of the project expenses to the project control group in addition to the weekly time sheet that is provided to personnel. The project control group would be responsible for entering all of the cost information into the PMIS on a weekly basis. The budget information that is available from the PMIS would be no more than five days old. There should also be weekly project review meetings in which the project manager is asked to estimate the project's progress to that date and that estimate is then compared with expenses to date. If there are any large discrepancies the project manager would be asked to explain why. Changes to the schedule could be handled in a similar manner where the project manager would submit the project's progress to the project control group who would enter that information into the PMIS on a weekly basis. All of the project managers would need to

access the PMIS through their PC's and be able to get the information that they need out of the PMIS. A system such as the one described could help project managers to be proactive in their approach to project management.

3. Establish a formal program of project management that is company wide, with documentation available to all, so that the system could be understood and standardized.

The project managers interviewed had no knowledge of any formal documentation that BPA has to describe and set forth policies on project management. These two project managers have held that position for a combined total of 23 years. Project management skills and know how are passed along to junior engineers who aspire to project management by watching and learning from the "senior" project managers. However, each project manager has his individual philosophy and style of project management, which may work great for him but may not be quite correct or work for someone else. There is no standardization of techniques and procedures, so no one is sure exactly what needs to be done even though they may have a good idea. There are no procedures documenting what should be controlled in a project, how to control the various elements, or how to use the existing tools to help the project manager control the project. Lastly, there is nothing for new project managers to consult when they have questions about how things should be done. The only resources are the senior project mangers who may not be available.

BPA could take the opportunity during the current reorganization to overhaul the way that projects are managed. To do this BPA should hire a management consultant to study and analyze the way that projects are managed. The consulting firm could then recommend a different management system that would be more effective than the one project managers are currently struggling under, and one that would be compatible with the new organizational structure. As a part of the deliverables of this recommendation, the consultant should be responsible for the production of a manual for all project managers describing and outlining procedures and methods of the project management that are to be used at BPA.

4. Establish a more viable reward/punishment scheme in which the project managers are more closely "graded" on how well they manage their projects.

In the system that BPA uses for project management there is no reward/penalty system for the project manager who controls the cost, schedule, and performance of the projects he is assigned. If a project goes out of control (budget or schedule), only in the gravest of circumstances is the project manager punished. Only on projects that are of extremely high visibility do the project managers receive rewards for "good" management of the project. Good is used very subjectively in that it could refer just to the that fact that the project was completed, not that budgets or schedules were controlled. In this type of system mediocrity is rewarded: just do enough to be passable; don't worry too much about costs, schedules, and performance; just make sure it gets done and that a majority of the people are content with the project.

To remove this atmosphere of mediocrity, BPA could establish a reward/punishment system that has both tangible and non-tangible aspects. On the tangible side they could offer

monetary incentives to project managers that are based on the total performance of their project. They could also extend these benefits to a system that would reward the entire team for a successful project--successful in the way that it performed against the original budget and schedule--in addition to the satisfaction of the customer. BPA could also provide non-tangible benefits in the way of recognizing project mangers that had done a good job of managing a project: like a "project manager of the month," or a luncheon with their functional section to honor their accomplishment. On the punishment side the project manager could be assigned to "lesser" projects until he can get his act together and show top management that he can manage projects. If he shows that he has difficulties managing the smallest of projects, top management may want to remove him from project management and place him in a position that is technical in nature to utilize his skills without jeopardizing the successful control of projects.

5. Lack of authority is always the complaint of the project manager. Possibly, BPA could instruct top management to be more supportive of the project managers so that they feel more empowered.

The project managers interviewed noted that they felt that they weren't given enough authority to fulfill their responsibilities as project managers. From the lessons in this term's class, this is the universal cry of all project managers. However, it does appear that their authority is more limited than it should be for them to get the job done. They are not involved in the initial planning stages and have no say in how the project is originally defined for the original schedules and budgets. Typically the first thing that they do is re-define the scope of the project so that it is technically correct. This will cause escalation of the budget and sometimes the schedule. They have little authority to select the members of their project team. At times this can be unsettling as they wind up with team members that do not meet the performance criteria that they wanted, but they can't justify having removed. They do not have the authority to change the budget or the schedule, and can only suggest changes which must be approved by others (and usually are).

The recommendation for this issue is for BPA to loosen up their highly-functional matrix system and give the project managers a little more authority to do their work. With a standardized project management system like the one proposed earlier, there would be a greater understanding of what, when, and how projects should be managed which should allow the project managers to take on more authority. Project managers should also be involved with the projects earlier, and continue their involvement with the project through the project's complete life cycle. A greater involvement would require greater authority so that the project manager could work with more people.

B. *Engineering & Design Associates*

Engineering & Design Associates (EDA) is an engineering consulting firm established in 1970, which from its inception has specialized in the analysis, planning, design, field investigations, construction management, and system modifications and upgrades of electrical power systems.

EDA has built a reputation based on technical excellence and practical experience. Their staff of 80 people is comprised of 20 full-time and 12 part-time engineers supported by technicians, communications and computer specialists, GIS cartographers, drafters/CAD operators, construction inspectors, and other personnel. Many senior staff members are recognized experts in their fields. A majority are registered professionals with an average of over 23 years experience in all facets of the power industry, including hands-on experience in industry and utility management and operation.

Although EDA is a mid-sized firm, they are a major player in the electrical power system consulting field in the Pacific Northwest because of their concentration in the highly specialized area of electrical utilities.

EDA offers a complete range of electrical engineering services to large and small utilities, government agencies and industrial clients, as well as other consulting engineering firms. EDA can provide total project management from concept through startup. Alternatively, it can provide one or more individual consulting services related to power system analysis, planning, design, construction, or operation. Through every project phase, EDA works closely with its clients to maintain continuous communications, thus establishing EDA's project team as an extension of the client's staff.

During the past 24 years, EDA has designed, on a continuous basis, new substations or modifications to existing substations in voltages ranging up to 500 kV. It has also completed over 60 varied power system studies for its clients. EDA has worked on transmission lines in voltages up to 230 kV and has provided construction management for many of these substation and transmission line projects.

EDA'S Control System:

EDA is a private engineering consulting firm which generally bids on projects clients are looking to have designed. This bid process is the start of their internal project management program since it clarifies and defines the initial scope and deliverables in any project.

The bid preparation process begins with an in-depth review of the proposed scope. The engineering manager preparing the proposal identifies all major elements and clarifies any inconsistencies. This process continues with a definition of scope and any assumptions required to define missing elements of the initial scope.

The bid proposal contains the initial project schedule, project team organization chart, project updating systems, and proposed mechanisms for scope change corrections.

The project schedule defines all required work packages, the associated start and completion dates, any required milestones, and the final completion date. This schedule will be an integral part of the project tracking mechanism and must be well defined from the start.

The project team organizational chart allows the client to see the guaranteed resource allocation, review the credentials of the team, and identifies internal resource requirements to cover future projects.

The project team is required to provide monthly project updates to the appropriate client staff, which are generated through a weekly project time management system. This system utilizes weekly time sheets with project accounting codes to provide an up to date accounting of actual billed hours versus proposed hours, and the percentage completion. Each staff member provides weekly time sheets which cover the hours billed on their projects. These are coordinated with the entire firm to provide weekly and project to date billing records. The records are then associated with project completion estimates from each project manager and the proposed project schedule to identify the real status of each project. Any discrepancy in the hours billed and percentage of estimated completion is immediately analyzed for cause, and the appropriate changes are addressed.

This reporting system was set up to provide graphs and charts for real time reporting to clients.

The project manager is ultimately responsible for project condition and assessing the need for change orders if there is a change in scope initiated or agreed to by the client.

## Key Control Elements For EDA:

### 1. Real-Time Assessment System

The current system monitors the billed time for each employee through a weekly time sheet system. These records are assembled and coordinated to provide cost accounting on a project basis within three days of every week interval.

### 2. Current Percent Complete Analysis

The project manager is required to present actual percentage complete estimates for each project on a weekly basis. These actual completion level reviews are then tied with the original estimate to compare the progress.

### 3. Project Scheduling

EDA schedules each of their projects on a total project team basis, so there is team member continuity on a project throughout its life cycle. This allows thorough commitment of resources by management and responsibility for the project schedule.

### 4. Weekly Project Status Review

The weekly project status review is a meeting held every week which coordinates the time analysis and percent complete reports to update the project status. This coordination allows for rapid identification of project budget over runs which can immediately be

addressed for cause. If the over run is determined to be a scope change problem, then a change order is immediately submitted and work is suspended until approval is obtained.

## Key Issues For EDA:

1. Bad scope analysis increases costs.

Cost over runs and change orders are often generated because of an insufficient scope analysis in the original proposal. This can create marketing problems when the client feels the scope was well defined and the change orders are not justified. Change orders that are accepted by the client may affect the scheduling of other projects and cause internal write offs because of this work load shifting. Changes in the intended scope that aren't billed or approved may also cause internal write offs, which ultimately affect the company.

2. Poor communication causes unnecessary rework.

Lack of thorough communication between the client and project management may create rework requirements and project over runs. This rework is inexcusable when caused by poor internal communication between the project manager and project engineer or the project engineer and other support employees.

3. Change orders hidden or avoided.

Recognition of change order requirements when they are initially created would cause easier acceptance of the change. If the project manager or engineer both agrees to do work and requests cost increases at the same time, the recognition of who created the changes would be more visible to the client.

4. Schedule control not enforced.

The current project management system requires the project manager to report on the estimated completion status of the project on a weekly basis. When this system is ignored or abused by the project manager, a cost over run or schedule delay may go unidentified until it becomes catastrophic.

## Recommendations for EDA:

1. The project manager should meet with clients to clarify the scope and lump sum bid items. This meeting should be documented to provide a clear reference for scope changes during the bid evaluation. The proposal should also include any additional assumptions which were unidentified or unable to be addressed by the client in the meeting.

2. Project managers and project engineers should communicate with clients and team members throughout the life cycle of a project to continually verify that the design direction and scope are in line with everyone's expectations.

Any work passed on internally should be thoroughly discussed for clarity of the requirements so rework requests can be avoided. To further ensure limited rework, the person who assigned work tasks should check on the progress and any potential trouble on a regular basis.

3. The project manager should continually monitor the scope vs. design to recognize when the client has created a change which justifies a change order. Any work requested by a client should be immediately addressed for scope changes, and a change order initiated if appropriate. If the variance isn't immediately recognized, then work should be suspended and a change order issued immediately upon recognition.

4. The project status (percentage complete) should be continually monitored to make sure it stays on schedule. This mechanism would allow the project manager to insure the identification of change orders through any schedule or cost variances.

## C. Harris Group, Inc.

Harris Group is a full service, multi-disciplinary consulting engineering firm. The services offered include feasibility studies, scoping and budgeting, engineering and design, project management, estimating, scheduling, modeling, procurement and construction management. Over 400 employees work in offices located in Appleton WI., Seattle Wa., Denver Co., Greenville S.C., and Portland Or.

Harris Group is a matrix organization. Project task force teams are created to support project work. Discipline managers are responsible for the engineering methods and quality of work carried out by their staff. All personnel assigned to a project are under the direct supervision of the project manager. This approach provides project control through single point management. Once a project is completed, the staff will return to the general pool where they wait for reassignment. It is not uncommon for an employee to work on several small projects at once.

Harris Group specializes in the design and engineering of heavy industrial facilities. Harris is actively involved in pulp and paper, oil and gas, and the petrochemical industries. Typical engineering fees range from $5,000 to $1,000,000. Due to the uncertain nature of the work, the majority of the contracts awarded are on a cost plus fixed fee, or time and material basis.

## Harris Group's Control System:

Harris Group recognizes three typical project phases: marketing and proposal development, project development, and project implementation.[8] During the marketing and proposal development phase, opportunities that are consistent with Harris Group's corporate objectives are identified and pursued. This phase usually ends with the award of a contract.

The goal of the next phase--project development--is to solidify the scope of the project and the scope of services offered. The project development phase includes conceptual

engineering and planning, feasibility studies, evaluation of options and finally design development. The end result of design development is the detailed scope of the project which includes physical parameters, a control budget, and a schedule.

The last phase of a project is project implementation. This phase includes the following activities:

- the development of the Project Procedures Manual
- detailed design
- procurement
- construction management
- commissioning and operations.

The heart of project control revolves around the development and use of the Project Procedures Manual (PPM). Every project over 1000 man hours is required to have a PPM. The purpose of the PPM is to clearly define for the customer and all Harris staff what Harris Group's role will be and how it will perform the assignment. Additionally the PPM should assist the customer to determine the support services they have agreed to provide. The PPM is tailored to the project scope and is consistent with the customer's organization and procedures. The project manager is responsible for the development, distribution and enforcement of the procedures outlined in the PPM.

The Project Procedures Manual typically addresses the following issues:

Project Procedure 1 - Scope of Project and Services
Project Procedure 2 - Organization and Responsibilities
Project Procedure 3 - Design Criteria
Project Procedure 4 - Code of Accounts
Project Procedure 5 - Engineering Account Breakdown
Project Procedure 6 - Document Control
Project Procedure 7 - Quality Control
Project Procedure 8 - Time Control
Project Procedure 9 - Cost Control
Project Procedure 10 - Material Control
Project Procedure 11 - Engineering Methods
Project Procedure 12 - Reporting
Project Procedure 13 - Safety

Project control begins with scope definition which includes time, cost and performance objectives. By clearly defining the scope as outlined in Project Procedure 1 (PP1), one is able to assess the status of future activities. A detailed work breakdown structure is created by all engineering disciplines to ensure a complete understanding of the project. A well defined scope at the beginning of a project will allow for out of scope work and changes to be readily identified. Project performance is primarily controlled by the use of PP1 which defines the deliverables.

Project Procedure 5 describes the requirements for developing an engineering account breakdown. These account numbers correspond with each line item in the work breakdown structure. Each account consists of five numbers which describe the engineering discipline, the type of service and the design activity. Additional accounts are typically set up for tracking out of scope work performed and change orders. The detailed engineering account breakdown allows for time, cost, and performance characteristics to be tracked and controlled.

Project Procedure 8 describes the requirements for time control. Typically a computerized schedule is developed and updated weekly throughout the project. The activities, or inputs, for the schedule are the items included in the detailed work breakdown structure. Harris uses a PERT scheduling program called Primavera to track project schedules. A bar chart format shows the percent complete, float, target dates and critical activities.

Project Procedure 9 describes the procedures for controlling project costs. Typically Harris creates a "Earned Value Report" for most projects. The vertical line items of this report correspond to the items in the work breakdown structure. The Earned Value Report generates data on the original budget, the current budget, percent complete, earned hours, actual hours, and estimated to complete. The project accountant updates part of the report as weekly time sheets are handed in. The cost codes on the time sheets allow the accountant to determine who worked on what, and for how long. In addition the project leads are responsible for assessing the "percent complete" and the "estimate to complete." The end result is a report showing how the hours were spent on the project.

Project Procedure 12 describes the methods for creating Engineering Progress Reports. Progress reports typically include:
- Scope Changes
- Urgent Issues
- Activities Last Month
- Activities Next Month
- Schedule
- Engineering Manpower
- Engineering Budget.

Engineering Progress Reports are issued monthly for the client's review. The preparation of this report allows the project manager to assess where the project is, and where it should be.

The final step in the control process is to take corrective action if the project is over budget, behind schedule, or not satisfying the scope of services. If additional staff is required on the job, the Project Manager must submit a request to the appropriate discipline manager. If there is someone available, they will probably be assigned to the job. If there are no additional employees available, the Project Manager and Discipline manager must debate on what is required and how it should be accomplished. Options include mandatory overtime,

borrowing an employee from another job, hiring temporary employees and hiring permanent employees. Other options include negotiating new target dates and budgets with the client.

Key Issues For Harris Group:

1. Success through procedures manual.

Harris Group's success in controlling projects is largely because of the use of the project procedures manual. This manual addresses the key issues that must be recognized in order to keep a project under control. The project procedures manual is tailored to the unique needs of each project. The manual prompts the project managers to develop a game plan prior to staffing the project. Clients are usually asked for their input once the procedures manual is developed. This helps clarify the roles of all involved parties before the work actually begins.

2. Changing project staff causes control problems.

Many of Harris Group's control problems are a result of the current organizational structure. As a matrix organization, project teams are continually changing. The project managers expect varying degrees of performance from the staff that works for them. Some project managers rigidly control projects, while others prefer a loosely structured system. The continuous change in project staff does not allow long term relationships to be forged. Many of the lessons learned on one project may not be used on the next project. Project team members are in a constant state of flux. Control problems are created because employees often do not settle into a routine until the project is almost complete.

3. Matrix organization inhibits effective control.

The matrix organization does not allow the project managers to effectively control their projects. The project managers have little recourse in terms of staffing for their projects. The discipline manager is often viewed as playing a minor role in project control. In reality, since the discipline manager controls the resources, they have a significant impact on the success of the project.

4. Scope and communication problems lead to control problems.

Many of the control related issues are centered around the scope of service provided. When a proposal is prepared, the project manager will solicit help from several lead discipline engineers. Each lead engineer will assemble an estimate on what they feel it will cost to get the job done. Often times there is a lag between the proposal and the award of the bid. During this time the lead discipline engineers that helped prepare the initial estimate are often reassigned to other projects. If the project is awarded, the project manager must reassemble another project team. Many times the new team members disagree with what the original lead engineers estimated. The new lead engineer may have a completely different assessment of what is required to complete the project. The original scope is often discarded

and an new one is developed. Control problems are created when there is a change in personnel on a project.

Adhering to the scope of services is a challenge for all members of the project team. The scope of the project is often not communicated, or is misinterpreted, which eventually leads to control problems. Many times the project manager is very comfortable with the scope of the project and he/she assumes that all team members are equally informed. Some team members feel compelled to deliver more than what was originally agreed upon in the scope of service. To compound the problem, clients often request additional work, but they are not eager to pay the necessary costs. Unforeseen activities or events are another reason why team members deviate from the original scope. Many people do not even realize that they are deviating from the original scope because they never truly understood the scope in the first place.

5. Outdated and cumbersome project control system.

The current project control system is a loosely linked system that has slowly evolved over time. Much of the data is redundant and does not reflect the true needs of the project manager. Several of the standard reports show the same information that is presented in slightly different ways. The software for the Earned Value Report and the Schedule do not communicate with one another. Much of the data has to be entered twice. The system is somewhat and cumbersome to use. Project managers feel that the current system is more of a hindrance than a tool. Some of the project managers prefer to use traditional manual Gantt charts for scheduling because they are simple to construct.

Recommendations for Harris Group:

1. Modify the organizational structure to emphasize teams and stability.

One way to correct some of the control problems would be to modify the organizational structure. A structure that emphasized project teams and stability would benefit Harris Group. One approach would be to have a semi permanent skeleton staff assigned to each project manager. This staff would work together anytime the project manger was assigned a project. There would be two representatives from each discipline. By providing two members from each discipline, a certain amount of flexibility can be achieved if one of the members is assigned to another project. This structure would minimize the problems associated with rotating staff.

Many of the problems associated with understanding and following the scope of services could be minimized by altering the organizational structure as stated above. The discipline leads would be responsible for both estimating and working on the projects. Minimizing changes in the staff at the beginning of the project would help ensure there are no misunderstandings concerning the scope of the project. This would help promote ownership among the engineers assigned to the project.

2. Establish procedures for better understanding and communication of scope.

A procedure should be set up to ensure each team member fully understands the scope of the project, the budget, and the schedule. In the event of design changes, there should be a formal document that describes the change and what effect it will have on the budget and the schedule. Team members must be held accountable for understanding the scope of the project prior to beginning work on the job. If a new team member disagrees with the initial scope, their conflicts should be communicated, debated, and settled upon prior to beginning work. Each team member's work should be reviewed to determine if it meets, exceeds, or falls short of the scope of services. The discrepancies should be noted and tracked. This would serve as a useful tool, while emphasizing scope accountability among team members.

### 3. Upgrade the project control system.

The current project control system should be upgraded to meet the needs of the project managers. The existing system should be reviewed and corrected as necessary. The computer software should be linked so that the same data can be used for accounting, scheduling and budgeting activities. A manual should be developed, along with a training program to educate the project managers on the tools that are available. The new system should be flexible enough to account for project control variables such as project size, project type and client preferences.

## D. *Wacker Siltronic*

Wacker Siltronic is a manufacturer of polished silicon wafers for the electronics industry. The manufacturing of this product employs a wide range of technologies to produce a deceptively simple-appearing product that conforms to the market demands for: geometry, cleanliness, and physical and chemical composition. There are about 1,000 employees at Wacker's Portland plant, and an additional 6,000 at the parent organization's plant (Wacker Chemitronic) in Germany.

### Wacker Siltronic's Control System:

Projects at Wacker can be divided into capital and non-capital, based on costs. Any project over $5,000 must be a capital project, and control of capital projects is more formal than "expensed" projects. For this study, only capital projects were considered. The corporate engineering department is staffed by several engineers who are assigned to manage capital projects. Other engineers are occasionally expected to manage projects within their department as the need and opportunities develop. The number of projects per engineer varies depending on the size of the project and the capability of the engineer.

There is no "typical" capital project, as the costs range from $5,000 to over $10 million. The projects must contribute to one of the company's objectives, which are basically to produce a high quality product that meets market demands at a reasonable price. Projects can be anything from purchase of a computer system to design, construction, and outfitting of a completely new facility. No matter the size or cost of the project, each follows the same basic flow:

Submit proposal for approval.
Gain approval.
Project Manager and team perform project.
Capital projects coordinator tracks all the capital projects, and reports regularly.
Certain items must all be completed before the project is considered complete.

The corporate procedure and documentation are currently undergoing a thorough revision which has not yet been completed. As such, existing control procedures are a mixture of those from the old documentation, those from the new documentation, and those that are not documented. The following are the common features of the control systems now in place:

Monthly update and revision by Project Managers of the Project Schedule.
Tracking of project expenses through the purchase order and cost tracking system.
All other aspects of cost and schedule control are at the discretion of the project manager.

Description of the project cycle:[9, 10]

1.    Concept Phase.
    A Project Proposal is prepared and submitted for approval. This document identifies the problem, proposes a solution, and includes investigations into alternatives as well as preliminary cost and schedule estimates. It does not necessarily originate from the project manager, and usually comes from the end user. Approval of the project proposal ends the Concept Phase and initiates the Development Phase.

2.    Development Phase:

    The Project Manager is assigned, a team is formed (if necessary), and the "Project Implementation Plan" is prepared. This plan includes detailed costs, scope, responsibilities, preliminary design, schedules, justification, and the implementation plan for the complete project. The project team is assembled as appropriate from departments throughout the company, and a responsibility matrix is created to describe how the individuals relate to the project. The project team uses matrix organization, in that its members belong to their original departments, and are brought together as a team temporarily for the duration of the project.

    The Capital Projects Committee must approve the Project Implementation Plan, and approval marks the beginning of the Implementation Phase. After approval, cost accounting codes are established, and the project can officially begin.

3.    Implementation Phase:

    The project manager performs the project as determined in the Project Implementation Plan. This involves final design, buying, installing, and contracting parts of the project as

needed. The project manager is in charge of the project, but is limited (by the approved plan) to the amount of money available for the project.

Costs are tracked through the corporate purchase order system. Separate account numbers for each project are established at its outset, and these accounts are monitored throughout the project. Monthly reports of project costs are produced by computer. If the overall project cost exceeds the original estimate by 10%, a revised Project Implementation Plan must be submitted to the Capital Projects Committee.

Project Managers submit monthly progress and schedule updates, and the overall project duration is monitored and reported monthly.

Performance controlling is not centrally tracked. The expectations of each project are contained within the Project Proposal, and the Project Implementation Plan has provisions for testing and evaluating the performance of each individual project.

Change orders can be indicated as such on the purchase requisition by the project manager. In this way they become part of the project's permanent record. There is no standardized way for keeping track of revision levels. It is up to the project manager to keep the revisions current.

Scope control (or adherence to the original scope) is left to the project manager. When the original scope no longer applies, it is the manager's responsibility to obtain agreement and authorization for a scope change.

4.    Closure Phase:

The project is considered complete when testing and verification is done to show that the project met the original scope and objectives, and that the project is accepted by the end users. Along with acceptance of the performance, a list of certain items must be also be completed before a project closure can occur. This list includes: property asset numbers assigned, manuals, drawings, spare parts, preventative maintenance schedule and procedure, and an accounting summary of all the costs. Even if the new system is installed and running for the end user, the project stays open until all the bills are paid and the appropriate paperwork completed.

A post project analysis is recommended to evaluate the project's performance against the original plan. Evaluations of scope changes or other special factors are expected to aid future projects.

<u>Key Issues For Wacker:</u>

1.    Lack of Enforcement--costs, schedule, performance.

The main cost control provision is to re-apply to the projects committee for more money if the costs escalate. The inherent assumptions are that increased costs are the result

of a scope change outside the control of the project manager, and that adequate planning was done at the beginning. Project approval means that the project is considered essential to help the company meet its corporate objectives, and once a project is started it is rare to have it cancelled, even if the costs are much more than originally anticipated. The project managers are not penalized directly for cost over-runs, although they do not go unnoticed, and the effects of repeated overruns could be expected to show up in a project manager's review.

There are no teeth provided in the current schedule tracking system. It is also not very detailed, only monitoring the time from open to close of a project. The closure phase of a project (the paperwork and final summaries) after the installation and testing phase is complete has been known to linger without activity for months. Projects over schedule by 200% or more are not unusual.

Performance criteria are not controlled in a centralized way. Each project is treated individually, and uses its own set of criteria for evaluate the effectiveness of its new system.

2.     Lack of Recognition for Project Managers.

Good, bad, and average performance by the project managers largely gets treated in the same way--assignment of more projects to complete. Successful project completion is subjectively defined usually as "the project was completed," and does not always take schedule, budget, or performance into consideration. Small rewards, such as coffee cups or pen knives with the company's logo on them, have been used. These may seem insignificant to a project engineer who could have just completed a major project ahead of schedule and several hundred thousand dollars below budget. It is generally agreed that a systematic and objective reward system for effective management of projects would be a good thing for project management at Wacker.

3.     Lack of Consistency (training, documentation, methods, and treatment).

There is no recommended formal training for project managers. It is expected that they either know what they are doing or can learn from others on the job. Individually motivated training (seminars, courses, etc.) is supported but not mandated. Tools and guidelines are available as resources, but there is not a cohesive plan for their use available to a project manager in search of help.

The state of project management and control documentation is not good. There is a great mixture of old, outdated, proposed, and non-standardized documents available. This is changing, as the project to revise and update the corporate project management procedures progresses, but currently it is very inconsistent.

Each project manager manages projects differently. This is to be expected, given the range of projects and the variety of project managers. However, a consistent basic framework would make project management, tracking, and communication easier. The software program "Project Workbench" is being prepared as the main software tool for project management, control, and reporting within the company.

The project managers are treated inconsistently by management when it comes to project control. Depending on the situation and on the personalities involved, individuals may receive different treatment in response to slipping schedules or escalating budgets.

4. Control System is effective, but not necessarily optimum.

Although not optimum, the project control system at Wacker works. From the "user's" perspective, the project control system seems to work, at least in the most broad sense. Several million dollars are spent by the company each year on capital projects, and the new equipment or technology gets installed and contributes to the manufacture and sale of a quality product at a competitive price.

The general user is unaware of the details of the capital project process--budgets, accounting, paperwork, schedules--and only sees the end effect of the system: a new machine here, better processing equipment there. The general user will hear the rumblings of the grapevine, which often includes tales of project cost overruns, and cannot help but think that there should be a better way to wisely use the money within the capital projects system.

Recommendations for Wacker:

1.     Consistent use of modern and functional software as a project management tool.

Finish installation and training on project management software (currently "Project Workbench"). Consistent and intelligent use of this software by project managers could make project control (costs and schedules) and reporting much easier to do.

2.     Revise procedures and documents, streamline the project control bureaucracy.

Complete the revisions currently in progress to corporate project management documents and procedures, and the simplification of the bureaucracy. The current plans and vision for project management procedures are a great improvement over the existing system. Communication and training will become important as the procedures become official. It is essential that all affected parties be trained on and adhere to the new policies and procedures.

3.     Training of engineers expected to be Project Managers.

A regular and endorsed program of training in project management skills could prove useful to the project managers. Of course, training on the company's procedures and policies continues to be necessary.

4.     Recognition.

An objective and meaningful system of recognition for successful completion of projects should be implemented. Like the recommendations for BPA discussed earlier, standards of evaluation should be established, and the results publicized. Rewards for consistent and successful performance must be available to project managers.

5.   Enforcement of Costs and Schedules.

A better method of tracking the progress of projects is needed.  Widespread intelligent use of the project management software ("Project Workbench") would prove very useful. The current tracking of only open and close dates is inadequate.

Cost enforcement should be revised.  A project to arrive at some means of enforcement would be best if instigated by management.  No clear-cut recommendation is possible at this time, but the project managers should be held accountable for cost over-runs that are within their realm of control.

6.   Tracking and Monitoring of Performance.

Reports on final vs. expected performance of a project should be mandatory.  Each project is entered into with hopes and expectations for final results, but the actual results are not systematically compared with the initial forecast.  In addition to the recommended post project analysis, Wacker could revisit the end user 6 months or a year after completion of the project to evaluate the system's performance, compare it with the original project scope, and submit a report.  This may not be reportable as a percent of expectations in all cases, but a continuing series of follow-up reports would give feedback to the controllers of the capital budget and the project mangers of whether the investments are actually paying off over the long run.

## IV.  CONCLUSIONS

The following is a list of issues that often result in control problems at the interviewed companies:

- lack of documentation
- inadequate scope development
- insufficient project management information systems
- no penalties or rewards for performance
- changing key staff during the project

These issues were significant in varying degrees at Bonneville Power Administration, Engineering & Design Associates, Harris Group, and Wacker Siltronic.

Documentation:

Proper documentation is necessary to adequately control a project.  It is important that there is a system in place that allows projects to be consistently managed.  Documentation should set the minimum standard that is expected to be achieved.  Proper documentation allows for new employees to be easily trained for the role of project manager.

At Harris Group, the project manager must assemble a project procedure manual for all jobs.  This manual acts as the project bible and has been instrumental in successfully

- controlling past projects. Project control for Wacker is a little more difficult since they are currently in the process of revising their existing outdated documentation. Projects are currently being ran without any formal documented guidelines for control. The end result is several project managers are performing similar tasks in different ways. Surprisingly the BPA has virtually no documentation on project control. Future project managers learn what is required by working with senior project managers.

Scope:

Scope development and communication is the cornerstone of project control. In order to control a project, a standard must be set so that future progress evaluations can be made. Scope definition is the basis for developing budgets, schedules and performance objectives. Team selection and work planning require a clearly defined scope.

Many of EDA's control problems revolve around the issue of scope definition. Rework is often the result if the initial scope is not rigidly adhered to. If the client decides they would like something in addition to the original scope, EDA has the option of submitting a change order. Successful change order negotiations are only possible when the scope has been well defined at the beginning of a project. Legitimate change orders are often rejected because they were assumed to be part of the original scope. Wacker has recently revised much of their documentation pertaining to scope definition. Recent project over runs have clearly shown what can happen if the complete scope of the project is not tied down.

Project Management Information Systems:

Project Management Information Systems (PMIS) are necessary to assess the status of a project. An easy to use and up to date PMIS will allow the project manager to recognize when a problem is developing. Only after problem recognition can the manager begin to take corrective action.

Wacker has recently purchased a new software package designed to help manage projects. To date employees have not actively began using the software so no benefits have been recorded. Harris Group has a very loosely linked information system. The current system is very complex and many project managers feel it is more of an anchor than a tool. BPA's information system provides outdated data and therefore has a limited use in project control. By the time the project manager receives the necessary information it is too late to take any corrective action. Over the last few years EDA has invested in a new PMIS that is working quite well. Managers can now receive real time data on project schedules and budgets. This allows them to take corrective action as problems arise.

Performance Recognition for Project Managers:

"Pay for performance" often helps motivate employees to take an active role in the control of their projects. Effective project control requires employees to take ownership in the control process. Organizations that assess penalties and rewards for performance help

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eliminate an atmosphere of mediocracy. An employee is more likely to take ownership in the control process if it will have a direct bearing on their career or paycheck.

None of the companies interviewed distributed significant penalties or rewards based on project performance. Wacker occasionally distributes coffee cups for a job well done. Harris Group give out "Team Player" awards to employees who go beyond the call of duty. There are virtually no consequences at any of the organizations for going over budget and beyond schedule. Only under the most extreme cases of continual project failure would a penalty be assessed for lack of performance.

Project Staff Consistency:

Changing key staff members during the course of a project can be detrimental to effective project control. When leadership is changed there is often a change in the focus of a project. Often times a change in leadership opens the door for accusations of mismanagement if the project does not go well. The current employee will claim the project was under control while he/she was on the job. The new employee will suggest that the project was mismanaged from the beginning. Control problems can be minimized by maintaining a stable work force throughout the duration of the project.

BPA experiences significant control problems when the project manager hands the job to the construction manager after the detailed design phase. The project manager is theoretically still responsible, but the construction manager is the one actually making all of the decisions. HGI experiences tremendous control problems by not requiring the engineer who estimated a job to actually work on the project. During the time lag between the proposal and the award of the contract, the original estimator often moves on to another project. A new team player is then brought in and expected to conform to a budget and schedule in which they had no input.

In summary, each of the companies interviewed have adequate control systems. Organizations wishing to excel in the project control arena may wish to consider the issues described in this paper. Documentation, scope development, PMIS, motivation and staff consistency are some of the key issues that corporations will need to address in order to effectively control projects.

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# VI. APPENDICES/ATTACHMENTS

## A. Interview Questions

PROJECT SURVEY

POSITION:

1. Who is responsible for defining the initial scope, budget and estimate? Briefly describe this process and what tools are commonly used.

2. Who in your organization is primarily responsible for project control?

3. Does the project manager typically follow a project from beginning to end? If not, does this create internal organizational conflict and control problems? Please describe.

4. Are there other people in your organization who have some responsibility for project control? If so, what role do they play.

5. Does the person identified in question 1 have the authority to take corrective action once a problem has been identified?

6. What areas of control does the project manager have limited authority?

7. Does the organizational structure lend itself to empowering those who are responsible for project control? If not, what changes would you recommend.

8. Is the project manager penalized if a project becomes out of control, and schedules, budgets and performance begins slipping? If so, please describe.

9. How is the project manager rewarded for successfully controlling projects?

10. Other than time, cost and performance, what other elements must be controlled on a project?

11. Do project control methods change with the size and nature of the project? If so, please describe how.

12. What is the biggest challenge in using the current project control system?

13. What recommendations would you make to improve the current project control system?

14. Is there published documentation, or formal training on what is to be controlled and how? If not, how do project managers know how to control a project?

15. How are project changes controlled?

16. Are the project managers responsible for a portion of the design work in addition to their project management responsibilities?

17. How current is the project control information? is there a problem with receiving and using outdated information? If so, please describe.

18. Does the project manager have authority to make changes in the makeup of his/her project team?

19. How much influence does the client or customer have on the control process?

20. What one lesson could you share concerning the topic of project control?

### B. BPA Interviews

Interview with Bob Sinclair:

Bob Sinclair is a project manager/senior engineer for the Mechanical Design section of the Facilities Design Branch. This branch resides in the Division of Facilities Engineering. Bob has worked for BPA for 16 years and has been a project manager for 7 seven years.

**1. Who is responsible for defining the initial scope, budget, and estimate? Briefly describe this process and what tools are commonly used.**

Bob thinks that the project managers define the initial scope through the acquisition of al available inputs (i.e., maintenance, operators, construction managers). · Bob tries to get everybody's input of how the project will affect them before he develops the final scope. This scope that he has defined is then used by the estimating section to develop an estimate for the project. The budget for the project is developed by the budget item coordinator for the program in which the project falls. The development of the budget will also determine the scheduling of the project so that there is money on the overall program budget for the project.

A project is initiated by the area (there are 11 maintenance areas in Bonneville's service area) requesting a project be done. The request is then funneled to an project manager who is in the functional section which the project is assigned to.

**2. Who in your organization is primarily responsible for project control?**

The project manager is primarily responsible although there is a hand-off of the project to a construction project manager when the design is complete and construction is ready to start. At that point in time the initial project manager only gets involved when something goes wrong. Bob believes that organization does not afford the project manager enough authority to control the responsibilities that the project creates.

**3. Does the project manager typically follow a project from beginning to end? If not, does this create internal organizational conflict and control problems? Please describe.**

No, the project manager originally assigned the project hands it over to a construction project manager upon the completion of the design work. This causes problems in that parts of the design work are open to misinterpretation by the construction project manager or portions that had special emphasis due to regulations or requirements are relaxed in the field when they are being constructed. The construction project managers will frequently make these changes without consulting the design project manager. A atmosphere of "us vs. them" is created between design and construction, creating a rift between two major portions of the organization.

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**4.     Are there other people in your organization who have some responsibility for project control?  If so, what role do they play?**

There are the budget item coordinators who control the budgets of all the projects and also the schedules by being able to move the schedules so that their overall program budget is balanced.  There are construction contracting people who control which contractor is selected and the flow of money during construction.  There are field inspectors who determine whether or not the contractor's work fulfills the design requirements and most directly controls the activities of the contractor during construction.

**5.     Does the person identified in question 1 have the authority to take corrective action once a problem has been identified?**

Yes, during design the project manager has the authority to make scope changes to insure that the design is done correctly, this implies that he has some authority to make changes to the budget and schedule both of which would be affected by a change in scope.  During construction the construction would be able to make those same changes.

**6.     What areas of control does the project manager have limited authority?**

The project manager has limited authority in the sense that his authority does match the responsibilities of the project.  He does not have any authority in controlling costs, contracting, not getting a desired contractor, and how the project ties into the overall program.  He also does not have any say about the master plan for the program where his project resides and affects the budget and schedule for his project.

**7.  ·  Does the organizational structure lend itself to empowering those who are responsible for project control?  If not, what changes would you recommend?**

Yes, the organization does empower those who are responsible for project control although authority is lacking in the areas mentioned in question #6.  Bob would like to see additional control in those areas to further empower the project managers.

**8.     Is the project manager penalized if a project becomes out of control, and schedules, budgets, and performance begins slipping?  If so, please describe.**

Project managers have been penalized for covering up project errors or by continually blowing their project budgets.  The penalty would come in the form of lower performance appraisals and potential damage to their upward mobility.  For most of the project managers

there isn't any penalty for occasionally missing schedules or budgets. Missing performance parameters rarely happen as projects will continue until the performance aspects of the project are met.

**9.     How is the project manager rewarded for successfully controlling projects?**

There are special act and on-the-spot awards which are cash awards. Non-tangible rewards include recognition and praise from contemporaries and those whom you've worked with. Good performance helps build a rapport with the personnel out in the field who you will have to work with on future projects.

**10.     Other than time, cost, and performance, what other elements must be controlled on a project?**

The other elements that need to be watched if not controlled would include quality of workmanship, concern for how the work is getting done, respect for the input of the other technical disciplines.

**11.     Do project control methods change with size and nature of the project? If so, please describe how.**

The control methods vary greatly depending on the size or complexity of the project. Small projects tend to be viewed as insignificant and are not well supported. In this respect it can make the smaller projects harder to manage because it is harder to get things done. The large, complex projects tend to be high visibility and have a lot of people willing to help on the project. The larger projects however do require more reports and the reports have to given to a higher level than the smaller projects.

**12.     What is the biggest challenge in using the current project control system?**

To Bob the greatest challenge in using the current project control system is finding the time to do it. Proper project takes time and when you are overloaded between project management and design responsibilities it makes it very hard to maintain proper control.

**13.     What recommendations would you make to improve the current project control system?**

Bob would like to see "cradle to grave " project management instituted at BPA. This would provide consistency in the way that the project is controlled, avoiding a hand-off halfway through the project and create fewer mistakes attributable to the hand-off. Bob would like to see authority given to project manager to be able to stop construction should they find discrepancies in the construction from the design. This would save money so that things would not have to be over and over to get them right. Bob would like to see more contractual control over the Engineering contractors hired to do design work so that we could get design work that is acceptable to all disciplines and all input from the various sections is given equal heed. If they continue with the two project manager system, Bob would like to

see a complete hand-off of responsibility so that one project manager does not have to be responsible for the actions of another project manager.

**14. Is there published documentation, or formal training on what is to be controlled and how? If not, how do managers know how to control a project?**

No, BPA does not have formal guidance on project management. The way the current project managers learned how to control projects is from watching previous project managers do it when they were members of product teams.

**15. How are project changes controlled?**

Minor changes aren't really controlled, they reported to the appropriate elements of the organization. Major changes involve doing a lot of the initial project planning work over. Scopes are changed, estimates are revised, and schedules are updated. All of the changes are also reported to the same elements in the organization which keep track of costs and budgets.

**16. Are the project managers responsible for a portion of the design work in addition to their project management responsibilities?**

Yes, for all but the largest of projects the project manager has to do design work in addition to managing the project.

**17. How current is the project control information? Is there a problem with receiving and using outdated information? If so, please describe.**

Cost information is usually two to three months behind. Published schedule formation is also two to three months behind, however most projects managers will make phone calls to those involved in the project to find out where the project really stands. It is nearly impossible to control costs when the information you are getting is so far out of date.

**18. Does the project manager have authority to make changes in the makeup of his/her project team?**

Within reason the project manager can approach a functional manager to ask them to change assignments within their section.

**19. How much influence does the client or customer have the control process?**

The customer/client exerts a fair amount of control over the project. How much control depends on how much they are involved in the process from the beginning. All of the customers/clients we deal with are funding the work we are doing. It is imperative as a project manager to not blindside them with major changes in scope, schedule, and especially, cost.

**20. What one lesson could you share concerning the topic of project control?**

Responsibility vs. authority. They must be equal or nearly equal otherwise your project is doomed for failure.

Communication, talk to everyone with a vested interest in the project, from the lowest to the highest.

Interview with Bob Eddy:

Bob Eddy is a senior project manager in the Projects section of the Project Management Branch. This branch resides in the Division of Facilities Engineering. Bob has worked for BPA for 27 years and has been a project manager for 16 years.

**1.     Who is responsible for defining the initial scope, budget, and estimate?  Briefly describe this process and what tools are commonly used.**

The budget item coordinator defines the initial budget and schedule.  System planning determines if there is a need in the system and will then issue estimate requests.  All sections involved will have an opportunity to input their budgetary needs.  This information is turned over to BIC who sets the scope, schedule, and budget and then hands project over to PM.

**2.     Who in your organization is primarily responsible for project control?**

The project manager is the one primarily responsible for project control, yet does not have any authority to control the project.

**3.     Does the project manager typically follow a project from beginning to end?  If not, does this create internal organizational conflict and control problems?  Please describe.**

In our organization a PM does not follow a project from beginning to end.  System planners will do the planning and initial scope of the project and during construction construction PM's will oversee the project.  However, after the project has been assigned to PM he does have some sort of varying degree of responsibility for the project (i.e., during construction if there is an increase the construction cost the PM will be the one to initiate changes to have the budget increased).  Yes, this does cause problems.  Not having the PM involved the whole causes a lack of continuity.  Things slip through the cracks and get overlooked.  Items which may be important at one stage are diminished or even forgotten about in other stages.

**4.     Are there other people in your organization who have some responsibility for project control?  If so, what role do they play?**

Senior project managers delegate some authority for project control out to project engineers on projects that are relatively simple and can be done by those project engineers.  It isn't a formal delegation as the PM retains responsibility and signature authority for that project.  The BIC also has some control in that they control the program's total dollars available.

**5.     Does the person identified in question 1 have the authority to take corrective action once a problem has been identified?**

No, the BIC does not have the authority to take corrective actions unilaterally. The changes are proposed by the PM, and then approved by involved parties before the BIC can make the change.

**6. What areas of control does the project manager have limited authority?**

The PM has limited authority mostly within he confines of this division. They have control over divisional resources, including very limited control over personnel available to them.

**7. Does the organizational structure lend itself to empowering those who are responsible for project control? If not, what changes would you recommend?**

Our present organizational structure does not empower those who are responsible for project control. Upper management is portion that blocks the empowerment of those who control projects. They do not support or encourage relationships between divisions so that any cooperative efforts between divisions are very difficult.

**8. Is the project manager penalized if a project becomes out of control, and schedules, budgets, and performance begins slipping? If so, please describe.**

To Bob's knowledge PM's are really penalized for projects going out of control. There have times when a direct action by the PM that has caused a project to have major problems will have been penalized with a lower performance appraisal and it has damaged careers in that respect for the individual is lost.

**9. How is the project manager rewarded for successfully controlling projects?**

Special Act or On-the-Spot cash awards are the most tangible. Increased respect in the organization and consideration for more complex projects to manage are intangible.

**10. Other than time, cost, and performance, what other elements must be controlled on a project?**

Bob though that in addition to the parameters listed, quality, safety, and reliability were elements that needed to be controlled. Reliability is very important to us at BPA as many times it is the difference between our customers having power and not having power.

**11. Do project control methods change with size and nature of the project? If so, please describe how.**

Project control methods do change with the size and nature of the project. Limited number of functional groups and other organizations involved will make the project much easier to manage while a project that requires many disciplines and has many complex relationships will much more difficult to control.

**12.   What is the biggest challenge in using the current project control system?**

In the current system the PM's have all the responsibilities to control a project yet no authority to control the project, which includes the budget, schedule, personnel, and other resources. It is also difficult to make the project team feel like they have a say in what goes on with the project.

**13.   What recommendations would you make to improve the current project control system?**

Bob recommended "cradle to grave" project management. He thought that having one PM involved with the project from inception to conclusion would make the control of the project more consistent. Bob would also like to see more authority given to the PM's for the budget and schedule, so that they would have the ability to make changes in a shorter amount of time than it currently takes to get project changes approved.

**14.   Is there published documentation, or formal training on what is to be controlled and how? If not, how do managers know how to control a project?**

The only formal piece of literature than exists on PM for our division is a matrix management guide that explains the matrix management system and the roles and responsibilities of project manages and team members. Training is gained by working with more experienced project managers and having them show the younger project mangers the ropes.

**15.   How are project changes controlled?**

Project changes are controlled through committee. The project manager will suggest changes to the scope, budget, or schedule and they will go to a work plan control committee which will either approve the changes or disapprove them. The changes are evaluated on the impact that they'll have on the system and the program (i.e., that program may not have funds available for a budget increase).

**16.   Are the project managers responsible for a portion of the design work in addition to their project management responsibilities?**

On all except the largest of projects the project managers are responsible for some of the design work. As the project gets larger more and more of the project manager's time is taken up by the tasks required to manage the project.

**17.   How current is the project control information? Is there a problem with receiving and using outdated information? If so, please describe.**

The current PMIS (project management information system) is usually a month or two behind on budgetary figures and is up to date on schedules. This is an improvement over the past but is still a resource of frustration when a project manager is trying to control budget

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when he doesn't really know and can't find out what has been spend to date. The most accurate he can get is what was spent as of two months ago.

**18. Does the project manager have authority to make changes in the makeup of his/her project team?**

In a strict sense project managers do not have the authority to pick and choose the people they want, but some project mangers that are highly regarded do have the ability to pick the people they want on certain projects that are important and highly visible.

**19. How much influence does the client or customer have the control process?**

The client does exercise some limited control over the budget and schedule. Most of our work is done for ourselves but in limited cases we have done work for others. In those cases the customers has had approval authority over increases to the budget and lenthgening of the schedule.

**20. What one lesson could you share concerning the topic of project control?**

Bob said that the one thing he thought is the most important as far as controlling projects is access to a comprehensive project management information system in which one can get real time information about the project. Such a system would allow the project to make changes at appropriate times and also help him to identify deviation from established targets much sooner.

## C. EDA Interviews

Interview with Jack Otterson:

Mr. Otterson is the manager in charge of engineering at EDA and has recently made changes to the project management system to acquire better internal cost controls.

**1.    Who is responsible for defining the initial scope, budget, and estimate?  Briefly describe this process and what tools are commonly used.**

The client will define the initial scope as part of a request for proposals. I will fill any wholes in the initial scope with a list of assumptions in the proposal. This scope and list of assumptions will be coordinated with the expected project manager before submittal.

**2.    Who in your organization is primarily responsible for project control?**

The Project Manager is responsible for project control and the performance of the team members.

**3.    Does the project manager typically follow a project from beginning to end?  If not, does this create internal organizational conflict and control problems?  Please describe.**

Yes, the project manager is given input on the proposal for potential projects and then the responsibility of completion after the client acceptance.

**4.    Are there other people in your organization who have some responsibility for project control?  If so, what role do they play?**

My role as Engineering Manager makes me ultimately responsible for all the projects being designed. Through weekly review meetings these projects are analyzed for cost control to identify any potential problems.

**5.    Does the person identified in question 1 have the authority to take corrective action once a problem has been identified?**

Yes, I can adjust work loads, require change orders, and change team members since the entire engineering staff is under my control.

**6.    What areas of control does the project manager have limited authority?**

The project manager cannot directly effect staffing, reprimand employees, or change the project requirements. They can however effect these systems through requests to the appropriate entities.

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**7. Does the organizational structure lend itself to empowering those who are responsible for project control? If not, what changes would you recommend?**

The system allows the project manager to assign work and set deadlines for work packages. this is ample control given the style of projects and the ability to provide performance feed back to functional managers and request scope changes from the clients.

**8. Is the project manager penalized if a project becomes out of control, and schedules, budgets, and performance begins slipping? If so, please describe.**

Yes it will directly impact his review if it is a consistent problem. If the review doesn't effect the performance it may lead to dismissal. This assumes the problem is caused by the project manager.

**9. How is the project manager rewarded for successfully controlling projects?**

The successful project manager is rewarded through recognition of performance and good performance reviews which lead to increased pay.

**10. Other than time, cost, and performance, what other elements must be controlled on a project?**

The nature of our business makes time, cost and performance the essential elements of control.

**11. Do project control methods change with size and nature of the project? If so, please describe how.**

No, the system stays the same only the span of control may change. Larger projects may require the tracking of sub-tasks based on the requests of the client.

**12. What is the biggest challenge in using the current project control system?**

The biggest challenge is to identify the real level of completion of a project and the reasons for variance at any given time.

**13. What recommendations would you make to improve the current project control system?**

Automatic charting of budgetary expenditure, coordinate the payroll and project time sheet systems, and automate the scheduling systems to coordinate with the time sheet system.

**14. Is there published documentation, or formal training on what is to be controlled and how? If not, how do managers know how to control a project?**

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The project managers learn control through observation during the project engineering stage and following a list of published reasons for previous project control problems.

**15. How are project changes controlled?**

Project changes are identified through scope changes directly or indirectly request by the client then formally processed through the change order system. This allows a client to approve additional funding and schedule changes.

**16. Are the project managers responsible for a portion of the design work in addition to their project management responsibilities?**

Yes, unless the project is very large the project manager generally has some design work responsibility.

**17. How current is the project control information? Is there a problem with receiving and using outdated information? If so, please describe.**

The weekly project meetings are utilizing information that was generated for the previous week which seems fairly concurrent.

**18. Does the project manager have authority to make changes in the makeup of his/her project team?**

No, it can only be requested of the functional manager.

**19. How much influence does the client or customer have the control process?**

The client can request the frequency of progress reporting and the associated level of data transferred in each report.

**20. What one lesson could you share concerning the topic of project control?**

The need for communications between every employee and the client with the project manager can't be stressed enough. This communication will ultimately limit design control problems.

Interview with Mr. X (interviewee requested that his name be withheld):

Mr. X is an engineer and project manager for EDA with several years of experience as a project manager in the consulting business..

**1. Who is responsible for defining the initial scope, budget, and estimate? Briefly describe this process and what tools are commonly used.**

The client will define the initial scope as part of a request for proposals. The engineering manager will then create a proposal with the help of a project manager and include any assumptions used to define the scope of the product.

**2. Who in your organization is primarily responsible for project control?**

The Project Manager is responsible for project control and the performance of the team members but has no formal control over the individual team members.

**3. Does the project manager typically follow a project from beginning to end? If not, does this create internal organizational conflict and control problems? Please describe.**

Yes, I track my projects from the proposal through product.

**4. Are there other people in your organization who have some responsibility for project control? If so, what role do they play?**

Yes, the Engineering Manager has the final responsibility over EDA's entire engineering wing.

**5. Does the person identified in question 1 have the authority to take corrective action once a problem has been identified?**

Yes, The Engineering Manager must provide any resource changes and gives direction if scope changes are required.

**6. What areas of control does the project manager have limited authority?**

The project manager cannot directly effect staffing, reprimand employees, or change the project requirements. They can however effect these systems through requests to the appropriate personnel.

**7. Does the organizational structure lend itself to empowering those who are responsible for project control? If not, what changes would you recommend?**

The system allows the project manager to assign work but doesn't allow him to change team members or effect performance without going through the functional manager.

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8.    Is the project manager penalized if a project becomes out of control, and schedules, budgets, and performance begins slipping? If so, please describe.

Yes I would be formally reprimanded and possibly fired if it continued..

9.    How is the project manager rewarded for successfully controlling projects?

I would be rewarded through recognition of performance and good performance reviews.

10.    Other than time, cost, and performance, what other elements must be controlled on a project?

This business requires only controlling these variables if performance includes the final product.

11.    Do project control methods change with size and nature of the project? If so, please describe how.

No, the system stays the same only the span of control may change. Larger projects may require the tracking of sub-tasks based on the requests of the client.

12.    What is the biggest challenge in using the current project control system?

The biggest challenge is to assess the level of completion and make sure your directions are understood.

13.    What recommendations would you make to improve the current project control system?

The existing system could provide automated outputs for client review of the progress.

14.    Is there published documentation, or formal training on what is to be controlled and how? If not, how do managers know how to control a project?

I learned through on the job mistakes and direction from the Engineering Manager.

15.    How are project changes controlled?

Project changes are processed through the submission of change orders to the client.

16.    Are the project managers responsible for a portion of the design work in addition to their project management responsibilities?

Yes, I am always responsible for the design.

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**17.** How current is the project control information? Is there a problem with receiving and using outdated information? If so, please describe.

The weekly project meetings are utilizing information that was generated for the previous week which seems fairly concurrent.

**18.** Does the project manager have authority to make changes in the makeup of his/her project team?

No.

**19.** How much influence does the client or customer have the control process?

The client can request reviews and any other changes in the standard process.

**20.** What one lesson could you share concerning the topic of project control?

Communicate with the client on a regular basis to avoid changes that could be addressed early in the design.

## D. Harris Group Interviews

POSITION: Discipline Manager

**1. Who is responsible for defining the initial scope, budget and estimate? Briefly describe this process and what tools are commonly used.**

Project manager serves as leader for putting together proposal. Often times who ever is available will work on the proposal. These individuals may not actually work on the job.

**2. Who in your organization is primarily responsible for project control?**

Project manager - the discipline manager plays a minor role.

**3. Does the project manager typically follow a project from beginning to end? If not, does this create internal organizational conflict and control problems? Please describe.**

Since more proposals are submitted than jobs awarded, there are often changes in staff after being awarded a job. Who ever is available at the time will do the estimate.

**4. Are there other people in your organization who have some responsibility for project control? If so, what role do they play.**

Every one is responsible to some degree.
The accounting department and discipline managers play a limited role.

**5. Does the person identified in question 1 have the authority to take corrective action once a problem has been identified?**

There is a very limited ability to take corrective action.
The project manager is not allowed to write off expenses or hire additional employees.
Once a project is behind schedule it is almost impossible to catch up due to a lack of resources.

**6. What areas of control does the project manager have limited authority?**

Staffing
Finances
The project manager does have some control over accepting additional work.

**7. Does the organizational structure lend itself to empowering those who are responsible for project control? If not, what changes would you recommend.**

The discipline manager role should be eliminated and the company should have more of a project focus. In addition there should be more leadership and TQM training. Project managers should be replaced by project leaders.

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**8. Is the project manager penalized if a project becomes out of control, and schedules, budgets and performance begins slipping? If so, please describe.**

No penalties.

**9. How is the project manager rewarded for successfully controlling projects?**

Recognition from the client.

**10. Other than time, cost and performance, what other elements must be controlled on a project?**

Communication

Quality

**11. Do project control methods change with the size and nature of the project? If so, please describe how.**

Smaller projects are more informal. The degree of complexity and number of engineering disciplines dictates the required control methods.

**12. What is the biggest challenge in using the current project control system?**

Relating budget and schedule.

Getting people to take ownership in schedules and budgets.

**13. What recommendations would you make to improve the current project control system?**

Develop a project control system with one data base.

**14. Is there published documentation, or formal training on what is to be controlled and how? If not, how do project managers know how to control a project?**

The PIMM manual describes how to assemble the project procedures manual.

Past experience is heavily relied upon.

**15. How are project changes controlled?**

There is a system to handle change orders, but the workers typically do not use the system. Management does not find out about changes until well after the fact.

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POSITION: Project Manager

**1. Who is responsible for defining the initial scope, budget and estimate? Briefly describe this process and what tools are commonly used.**

According to the books, the PM is responsible for scope definition. In reality the customer must communicate what their need are. The client may or may not ask HGI for assistance in scope development.

**2. Who in your organization is primarily responsible for project control?**

Project manager.

**3. Does the project manager typically follow a project from beginning to end? If not, does this create internal organizational conflict and control problems? Please describe.**

The project manager typically follows the project all the way through. Often times the rest of the team may change from those that initially did the estimate. There is seldom enough information to fully understand the project during the proposal phase. When there is a change in personnel their is a tendency to ignore the initial budget and schedule. With people come their individual preferences.

**4. Are there other people in your organization who have some responsibility for project control? If so, what role do they play.**

All people assigned to the project have responsibility. The functional manager participates but really has no responsibility for control. The functional managers control projects by the people they assign to the job. The PM dictates what is to be done and the FM states how it will be done. Many times this is a gray area.

**5. Does the person identified in question 1 have the authority to take corrective action once a problem has been identified?**

About the only thing that can be done is to request employees work overtime. The PM are not allowed to make staff changes or spend unauthorized funds.

**6. What areas of control does the project manager have limited authority?**

Money.
Additional training for employees.

**7. Does the organizational structure lend itself to empowering those who are responsible for project control? If not, what changes would you recommend.**

Team building should be given a high priority. The current project are of a very short duration and the employees never really get in synch with one another. The office should be organized around projects and not disciplines. The organizational structure should reflect the way HGI does business.

**8. Is the project manager penalized if a project becomes out of control, and schedules, budgets and performance begins slipping? If so, please describe.**

Employees are not penalized for lack of control. Most people realize when they have not adequately performed.

**9. How is the project manager rewarded for successfully controlling projects?**

Some people receive recognition from the client if there is a close relationship. The office hands out "Team Player" certificates for those that go beyond the call of duty. Occasionally an employee will be sent for additional training or to a seminar if they have done an outstanding job.

**10. Other than time, cost and performance, what other elements must be controlled on a project?**

Scope of project.
Scope of services.
Getting enough people on the job.
Documentation due to the liability associated with engineering.

**11. Do project control methods change with the size and nature of the project? If so, please describe how.**

On small projects there is less formality. One still needs to maintain an understanding of what was spent and what needs to be done. Multiple discipline projects must be coordinated more carefully.

**12. What is the biggest challenge in using the current project control system?**

The existing system is complex to use. Manual schedules are much easier and provide detailed enough information for our purposes. Getting real input from people doing the work is often very difficult. When you ask some one what the "percent complete" is you may or may not get the right answer. People should recognize the value of work lists. The functional manager should insist that work lists be kept on all projects. The functional managers are the only source of consistency on all projects.

**13. What recommendations would you make to improve the current project control system?**

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The existing system should be integrated and should be less complicated to use. Many of the standard reports are redundant. The whole system needs to be revised. There should be a data base that indicates who is working on which projects. The current database is usually incorrect.

**14. Is there published documentation, or formal training on what is to be controlled and how? If not, how do project managers know how to control a project?**

Upper management relies heavily on the past experience of project managers. The PIMM manual describes how to perform many of the PM functions, but not why. The project procedures manual provides a baseline for all projects to be managed.

**15. How are project changes controlled?**

There is a formal "change notice" and "change request" procedure. The problem is that most people do not understand and therefor do not follow these procedures. Many times the personnel representing the client will change. Because of this there is often confusion in what was included in the original scope. Many times if the client knows the cost of additional work they will not request a change in the initial scope.

**16. Are the project managers responsible for a portion of the design work in addition to their project management responsibilities?**

Yes, on small projects.

**17. How current is the project control information? is there a problem with receiving and using outdated information? If so, please describe.**

The project control information is no more than two weeks old. This in usually not a problem for project control activities.

**18. Does the project manager have authority to make changes in the makeup of his/her project team?**

No, the project manager must take what they can get in terms of staff.

**19. How much influence does the client or customer have on the control process?**

The amount of influence depends on the client. Some clients require detailed schedules and budgets; other clients leave project control up to Harris.

**20. What one lesson could you share concerning the topic of project control?**

People must understand the scope of the project prior to beginning work.

The concept of team development should be pursued for project organization.

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Wacker Interview 1: Project Engineer

Perspective on Project Control:

This engineer has recently completed a project to design and install a facilities system for one portion of the plant. This engineer has completed similar projects over several years with the company.

**1.    Who is responsible for defining the initial scope, budget and estimate? Briefly describe this process and what tools are commonly used.**

Requestor (not necessarily the Project Engineer) submits a plan or problem statement, and the Project Engineer sets the scope and investigates alternative plans or approaches. There are no exotic tools used at this step--Request for Quotes, Estimates, etc.

**2.    Who in your organization is primarily responsible for project control?**

The Project Engineer is responsible for control of the project.

**3.    Does the project manager typically follow a project from beginning to end? If not, does this create internal organizational conflict and control problems? Please describe.**

Typically, yes. Extreme cases of "surprises" or extraordinary situations could cause some changes, but this is rare.

**4.    Are there other people in your organization who have some responsibility for project control? If so, what role do they play?**

Other with the responsibility are usually the supervisor, placing pressure for budgets, schedules, etc.

**5.    Does the person identified in question 1 have the authority to take corrective action once a problem has been identified?**

Before the project, the authority is there, and the emphasis is placed on having a thorough enough scope and definition of the project that "problems" will not arise, or will be accounted for in the initial estimate. After the project has been approved and started, there are definite limitations on money -- needing more means a trip back to the Projects Committee.

**6.    What areas of control does the project manager have limited authority?**

Limited authority mostly for money. There is a contingency fund included with all projects, but when that is used up the original plan must be revised, and additional funds must be asked for.

**7. Does the organizational structure lend itself to empowering those who are responsible for project control? If not, what changes would you recommend?**

Yes and no. The structure is amenable to empowered employees, but does not actively encourage it. A good change would be to better recognize employee contributions, or outstanding or successful performance of individuals.

**8. Is the project manager penalized if a project becomes out of control, and schedules, budgets and performance begins slipping? If so, please describe.**

Not really. Some engineers get more penalties than others. Can depend on personalities. No formal system in place; just pressures and expectations.

**9. How is the project manager rewarded for successfully controlling projects?**

Not really rewarded--get a cup of coffee or a pocketknife with the company logo on it. There is a lot of room for improvement here that could be worthwhile to the project managers and the company.

**10. Other than time, cost and performance, what other elements must be controlled on a project?**

Documentation and specifications. It is better to do these earlier in the project rather than later. There is too much of a tendency towards "as-built" drawings and not enough emphasis on doing them earlier in the process.

**11. Do project control methods change with size and nature of the project? If so, please describe how.**

Yes. Bigger projects bring an exponential growth in the number of meetings necessary and the number of people involved. Different techniques will be used for different project sizes.

**12. What is the biggest challenge in using the current project control system?**

A big challenge is the program used for the cost tracking system. This can be intimidating for those who don't use it much.

**13. What recommendations would you make to improve the current project control system?**

Recommendations:
>    Better cost tracking system

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- Recognition for good performers

**14.** **Is there published documentation, or formal training on what is to be controlled and how? If not, how do project managers know how to control a project?**

The published company document is old but under revision. The knowledge comes from experience over time. There was once a trainer brought in for in-house courses, but the information provided was too much and too vague to be of much immediate help.

**15.** **How are project changes controlled?**

Changes are monitored through the company's Purchase Order system. "Change Order" can be highlighted on Purchase Reqs and Purchase Orders to help keep track of the project changes.

**16.** **Are the project managers responsible for a portion of the design work in addition to their project management responsibilities?**

Almost always yes. In large projects they don't have a technical hand in everything, but there is always some area where they do.

**17.** **How current is the project control information? Is there a problem with receiving and using outdated information? If so, please describe.**

Defining "current project control" as current state of control over an ongoing project, the state of the information is up to the project manager. Revision levels become very important, and it is essential to make sure that contractors are working off of the most current revision. There have been times when the contractor's headquarters have received the correct revision, but not the workers on-site. This can cause problems.

**18.** **Does the project manager have authority to make changes in the makeup of his/her project team?**

No.

**19.** **How much influence does the client or customer have on the control process?**

None.

**20.** **What one lesson could you share concerning the topic of project control?**

The greatest lesson to learn is that project control depends a lot on personalities.

Interview 2: Ed Fransen, Capital Projects Coordinator

Perspective on Project Control:

Ed tracks and reports on all of the open Capital Projects (projects costing more than $5,000). His report is to the Projects Committee (director-level and above) and also back to the Project Managers. He does not manage any of these projects himself, and does not have any of the Project Managers reporting directly to him.

**1.      Who is responsible for defining the initial scope, budget and estimate?  Briefly describe this process and what tools are commonly used.**

Project Manager is responsible.  Current system is undergoing some changes right now, but the following is the direction it is headed:
   a.      "Project Proposal" prepared by project manager, submitted to Projects Committee.  Contains problem statement and analysis, proposed solution, and resource analysis.
   b.      "Project Implementation Plan" document prepared by project manager. Contains schedules, budgets, and particular plans.  This document is not yet ready for distribution and implementation.

The actual source of the problem or problem statement may come from various directions, but it is the intent of the system for the project manager to define the initial scope, estimate, and budget.  The budget must be reviewed and approved by the Projects Committee.

**2.      Who in your organization is primarily responsible for project control?**

The responsibility is with the Project Manager.  The coordinator tracks and reports time and costs of all the projects, but is not responsible for controlling them or keeping them all on schedule.  The coordinator will make efforts to hasten project completion for projects that are "near completion" or lacking only a few pieces of paperwork or something.  The tracking and reporting system shows that projects typically are 100% of schedule over-due, and the most delinquent project is overdue by 1100% of the original schedule.  Projects have a tendency to linger on and on without official closure, which shows up dramatically on the tracking system.  There is no official program to address this.

**3.      Does the project manager typically follow a project from beginning to end?  If not, does this create internal organizational conflict and control problems?  Please describe.**

Typically, yes.  Not in much of a position to completely know about this question.

**4.      Are there other people in your organization who have some responsibility for project control?  If so, what role do they play?**

Beyond the Project Managers, the coordinator has a little responsibility (but is not held accountable for others' projects), and the Projects Committee holds a certain amount of responsibility, too.

**5.    Does the person identified in question 1 have the authority to take corrective action once a problem has been identified?**

Yes, within the approved budgetary constraints of the original project. Design and technical considerations, he's not sure. Theoretically, if the project goes 10% over (or under) budget, the project must be reviewed by the Projects Committee.

**6.    What areas of control does the project manager have limited authority?**

Not in a position to answer this question.

**7.    Does the organizational structure lend itself to empowering those who are responsible for project control? If not, what changes would you recommend?**

Not really. Would be better off with 1 project at a time--not multiple ones or all the additional responsibilities that the Project Managers now have.

**8.    Is the project manager penalized if a project becomes out of control, and schedules, budgets and performance begins slipping? If so, please describe.**

No penalty. Schedule and budget are tracked, but no penalty is included for slippage. Accounting problems are created when budgets fall into different fiscal years, but that can be dealt with.

**9.    How is the project manager rewarded for successfully controlling projects?**

No reward, but is a good idea, and one that should be implemented.

**10.    Other than time, cost and performance, what other elements must be controlled on a project?**

Nothing additional to add--time, cost, performance.

The current system controls costs pretty well, and monitors (not controls) the schedule really well, and does not address performance.

**11.    Do project control methods change with size and nature of the project? If so, please describe how.**

The basic change is <$5,000 and >$5,000. For <$5,000 no official tracking or paperwork. For >$5,000 ("Capital" projects) all of this applies. The general tools remain the same, but there's more details involved for the large projects. From the coordinator's

perspective, all projects are treated the same. Some just have more money or time involved with them.

**12.    What is the biggest challenge in using the current project control system?**

The biggest challenge with the current system is enforcing it, or getting all of the project managers to meet the system's requirements for information.

**13.    What recommendations would you make to improve the current project control system?**

Recommendations:

Current System:
    Put "some teeth" into the system.
    Get everyone to follow their projects through without excessive badgering.
    Put more emphasis on planning.
    Implement the proposed system.
Proposed system:
    Use a good software tool (current plan is for "Project Workbench")
    Train everybody in its use
    Make sure the tool gets used.
    Better paperwork with more useful information

**14.    Is there published documentation, or formal training on what is to be controlled and how? If not, how do project managers know how to control a project?**

He swears by the PMI notebook on how to manage projects--it contains everything one should need to know. There is no formal training on project management, but the book and other resources (other project managers, independent training or courses, local PMI chapter) are available for the motivated project manager who is eager to learn. A course such as this one (EMGT 545) would be an excellent idea for everybody who is expected to manage projects.

**15.    How are project changes controlled?**

Changes:

    Budget revisions are supposed to be reviewed by the Projects Committee. They meet every other week.
    Schedule revisions are prepared by the Project Managers on a monthly basis and submitted to the projects coordinator for tracking and monitoring.

**16.    Are the project managers responsible for a portion of the design work in addition to their project management responsibilities?**

Typically, yes.

**17.    How current is the project control information?  Is there a problem with receiving and using outdated information?  If so, please describe.**

The procedures are not current enough.  There are massive revisions currently in process to the procedures and paperwork.  The existing ones are greatly out of date and are not serving the organization as much as they should.  The revisions are taking a great deal of time and effort.

**18.    Does the project manager have authority to make changes in the makeup of his/her project team?**

Yes.

**19.    How much influence does the client or customer have on the control process?**

Not in a position to answer this question.

**20.    What one lesson could you share concerning the topic of project control?**

Best lesson is to spend more time carefully planning the project.