Effective Project Controls: Designing the Team

EXECUTIVE SUMMARY

One of the major factors in delivering a successful project is applying the appropriate level of project controls. Several inputs define how much control is necessary. Ultimately, these also define the size of a project controls team and the best systems to execute the project. This paper illustrates a framework to design a project controls team based on project criteria and required level of project control. The framework will need to be molded and adapted for each organization to address important variations. The primary focus is directed at how Owner's organizations develop their team, but the concept can be used for supporting suppliers and contractors.

Project Criteria → Level of Project Control → Project Controls Team

→ Project Management Tools

STARTING POINT

The dollar size of the project is a good starting point. Larger dollar size projects typically require more project controls and therefore a larger project controls team. Project teams need more control to protect the larger dollar investments and to reduce the risk of failure.

Using an example, a large project of more than $250,000,000 should have a full project controls team to optimize the probability of success. In general, this team will be made up of the following roles:

- Project Controls Manager
- Master Scheduler
- Junior Scheduler
- Cost Engineer
- Document Control Lead
- Document Control Admin
- Project Coordinator

For a mid-size capital project, the level of control will reduce. For a project with a value of $50,000,000 the size of the project controls team will shrink down to the following roles:

- Master Scheduler
- Part time Cost Engineer
- Document Control Clerk
- Project Coordinator

With a smaller capital project of $5,000,000, the size diminishes to the following roles:

- Part time Master Scheduler
- Part time Cost Engineer
- Part time Document Control Clerk
- Project Coordinator

PROJECT CRITERIA

Determining the appropriate level of control for projects should be based on many more factors than the simple dollar value starting point described above. High technology quick time to market projects in industries such as Pharmaceutical, Biotechnology and Microelectronics are complex in nature and their outcome can have great impact on operations and ultimately the business success.

To start, an organization should define key project criteria, or characteristics, to define their projects. The first criteria may be project dollar value. What other criteria may drive how much control a project requires?

Is more control required if the project impacts production capacity? Does the amount of control differ based on the contract strategy? Is a time and materials contract more difficult to control than a fixed price contract? Does a Greenfield project require more control than a simple site work project? Does a project important to your management require more control? What about the project location? Is it harder to manage a project in Puerto Rico?

The criteria and stated objectives for the project will drive the level of control required to deliver the desired outcome. Although these will be unique to each organization, a sample of what ORCAS has found useful follows:

Sample Project Criteria

- Project Dollar Value
- Production Impact
- Contract Strategy
- Importance of Success
- Project Type
- Visibility of Project Health
- Management Strength

- Importance to Management
- Proximity of Project Team
- Project Duration
- Estimated Risk of Change
- Estimated Volume of Project Documents
- Estimated Risk with Suppliers
- Project Location

LEVEL OF PROJECT CONTROL

The project criteria will determine the level of project control required for a project. Complex and high risk projects require more control than simple projects. Defining the level of project control may be accomplished in a variety of ways. Start with the main areas your company may control for a project. Examples include the following:

- Cost Control
- Change Management
- Schedule Control
- Earned Value
- Document Control
- Collaboration/Workflow Management
- Analysis/Decision Support/Visibility
- Turnover Package Management

For each of these control points, define the basic level of control required.   These levels of control can be simple at first and then expanded at a later time.   A good starting point is illustrated in the table below:

Control Point	Level of Control
Cost Control	Effective and Detailed Cost Control System and Reporting
	Overview "Big Bucket" Cost Management

Control Point	Level of Control
Change Management	Integrated Change and Cost Control: Strict Process, Procedure, and System
	Basic Change Log to document changes

Control Point	Level of Control
Schedule Control	Enterprise Level Project Schedule
	Integrated Project Schedule
	Basic Construction Schedule
	Milestone Schedule

Control Point	Level of Control
Earned Value	True Earned Value Analysis (Integrated Cost and Schedule) to determine project health.
	Basic Earned Value Analysis.
	No Earned Value Analysis.

Control Point	Level of Control
Document Control	Formal Document Control Process, Procedure, and System
	Basic Document Control Log
	Document Filing and Storage

Control Point	Level of Control
Collaboration/Work Flow	Centralized Workflow for Project Team
	Basic Logs to Track Actions and Workflow
	Manual Email Correspondence to Define Decisions and Identify "Ball in Court" Actions for Team Members

Control Point	Level of Control
Analysis/Decision Support/Visibility	Centralized and Integrated "Project Health" Analysis
	Management Presentations to Communicate "Project Health"
	Discrete Project Reports to Communicate "Project Health"

Control Point	Level of Control
Turnover Packages	Formal Turnover Process-Create Turnover Documentation throughout Project
	Basic Turnover Log-Assemble at End of Project

PROJECT CONTROLS TEAM-SUBJECTIVE APPROACH

The project criteria drives the level of project controls required to meet the stated objectives of the project. Likewise, the level of project controls determines the roles, size, and skill sets of the project controls team; the level of project control also drives the type of tools and systems required to manage projects.

Applying these criteria can be done in a subjective or quantitative manner. Using the subjective approach will drive your decision for the level of project controls and the team with less rigor and certainty. This subjective approach is quick and it provides the decision maker with some general parameters to make decisions about the level of project controls and the team required to support the project.

In our earlier example of using project dollar value as the only project criteria to determine the size of the team, we illustrated a mid-size capital project requires the following project controls team:

- Master Scheduler
- Part time Cost Engineer
- Document Control Clerk
- Project Coordinator

If we consider additional project criteria, the recommended project controls team may change. For example, if the project significantly impacts the ability to produce product, is highly important to the company's business goals this year, is performed remotely in Puerto Rico using unknown suppliers and unproven contractors, and is a time and materials contract, then the recommended project controls team may be revised to include the following:

- Project Controls Manager
- Master Scheduler
- Junior Scheduler
- Cost Engineer
- Document Control Lead
- Project Coordinator

The subjective approach takes into consideration all key project criteria, not just the project dollar value.

PROJECT CONTROLS TEAM-QUANTITATIVE APPROACH

On the other hand, it is possible to use a quantitative approach to calculate the most appropriate level of project controls and team to meet the project objectives. This approach requires assigning priority weights and values to the project criteria and control values. The specific weights and values will be unique to each organization. To illustrate an example, consider two different projects:

- #1 Scale-up Project. This is a large scale retrofit and expansion project. The purpose is to launch a Pharmaceutical company from the research and development phase to full scale manufacturing. The project value is $125 Million and the project duration is two years.
- #2 Critical Shutdown Project. The location is in Puerto Rico. The importance of the project is significant, the risk is high, but the project dollar value is only $4 Million. The project duration is only 4 weeks.

Project Criteria

The first place to start is the project criteria. With a quantitative approach, it is now important to assign a weigh and a value to each of the criteria. The sample project criteria presented above is now broken down into much more detail, including the priority of the criteria, the possible criteria options, and their respective values. For this analysis the priority is from 1 to 10, where 10 is the highest priority for the project criteria. The values are assigned to each option, from 1 to 5. The highest value of 5 will drive the need for more project controls, where the lower values will drive a lower need for project controls.

Based on the characteristics of each of the sample projects we can calculate a Project Score. For each project, the appropriate option is selected for each criterion and then the priority is multiplied by the value of the option.

For the Project Dollar Value criteria, the Scale-up Project is worth $125 Million, so the score is 40 (10 X 4). On the other hand, the Shutdown Project is only worth $4M, so the score is only 10 (10 X 1). If we stopped here, the Scale-up Project would require significantly more project controls.

Project Score Table

Criteria Title	Criteria Options	Prior	Value	Project Score: Scale-up	Project Score: Shutdown
Project Dollar Value	150,000,000 Plus	10	5		
	50,000,000 to 150,000,000	10	4	40	
	10,000,000 to 50,000,000	10	3		
	5,000,000 to 10,000,000	10	2		
	Up to 5,000,000	10	1		10
Affect on Production Area	Yes	10	4	40	40
	No	10	2		
Impact on Production Capacity	Yes	10	4	40	
	No	10	1		10
Contract Strategy	T&M	9	5		45
	GMP	9	4	36	
	Unit Price	9	3		
	Fixed	9	2		
Importance of Success	Extremely High	9	5	45	45
	High	9	4		
	Normal	9	3		
	Low	9	2		
Project Type	Greenfield + Retrofit	8	5	40	
	Greenfield	8	4		
	Equipment Installation Only	8	3		24
	Site / Infrastructure Work	8	1		
Need for Visibility of Project Health	High	8	5	40	40
	Normal	8	3		
	Low	8	1		
Management Strength	Low	7	5		35
	Medium	7	3	21	
	High	7	1		

Importance to Management	Extremely High	7	4	28	28
	High	7	3		
	Normal	7	2		
	Low	7	1		
Proximity of Project Team	Dispersed International	6	5		30
	Dispersed Domestic	6	3	18	
	Centralized in Same Location	6	1		
Project Duration	2 Years to 3 Years	6	5		
	1 Year to 2 Years	6	4	24	
	6 months to 1 Year	6	4		
	Up to 6 months	6	2		12
Estimated Risk of Change	High	6	5	30	
	Low	6	1		6
Estimated Volume of Project Documents	High	4	4		
	Medium	4	3	12	
	Low	4	1		4
Estimated Risk with Suppliers	High	4	4		16
	Low	4	2	8	
Estimated Risk with GC	High	4	3	12	
	Low	4	1		4
Project Location	International	3	4		12
	Domestic	3	1	3	
				437	**361**

After calculating all the scores, these two very different projects end up with less of a difference: 437 vs. 361 (Min = 149 and Max = 459). Based on the project score, the requirement for project controls the target project controls score falls into one of three categories:

Project Score Range	Level of Project Controls Required	Target Project Controls Score
400 Plus	High	30-40
250-399	Med	20-29
up to 249	Low	10-19

Level of Project Control

As stated above, the three levels of project control is High, Medium, and Low. Correspondingly, the table above defines the target project controls score for each of these levels. In the Scale-up Project example, the 437 project score drives the need for a high level of project controls. The corresponding target project controls score must be at least with in the 30-40 range.

The project controls score is achieved by selecting specific project control items. Each item is assigned a value to correspond with how much the item contributes to the overall control of the project. The value is between 1 and 5, with 5 contributing to the most control for a project.   To balance the objectives of the project with the requirement for project controls, the team selects the items which best support the overall needs of the project. There are only two guidelines, 1) Only one value is selected for each "control point" category, and 2) The range of the resulting score must align with the table above. The following table illustrates how the Project Controls Score is achieved for each of the sample projects.

Project Controls Score Table

Control Point	Level of Project Control	Value	Project Controls Score: Scale-up	Project Controls Score: Shutdown
Cost Control	Effective and Detailed Cost Control System and Reporting	5	5	
	"Big Bucket" Cost Management	1		1
Change Management	Integrated Change and Cost Control: Strict Process, Procedure, and System	5	5	
	Basic Change Log to document changes	1		1
Schedule Control	Enterprise Level Project Schedule	5		
	Integrated Project Schedule	3	3	3
	Basic Construction Schedule	2		
	Milestone Schedule	1		
Earned Value	True Earned Value Analysis (Integrated Cost and Schedule) to determine project health.	5		
	Basic Earned Value Analysis.	3	3	3
Document Control	Formal Document Control Process, Procedure, and System	5	5	
	Basic Document Control Log	3		3
	Document Filing and Storage	1		
Collaboration/Work Flow	Centralized Workflow for Project Team	5		5
	Basic Logs to Track Actions and Workflow	3	3	
	Manual Email Correspondence to Define Decisions and Identify "Ball in Court" Actions for Team Members	1		
Analysis/Decision Support/ Visibility	Centralized and Integrated "Project Health" Analysis	5	5	5
	Management Presentations to Communicate "Project Health"	3		
	Discrete Project Reports to Communicate "Project Health"	1		
Turnover Packages	Formal Turnover Process-Create Turnover Documentation throughout Project	5	5	5
	Basic Turnover Log-Assemble at End of Project	1		
			34	**26**

Adding the values of the project control items will create the overall project controls score. This score card provides a flexible approach to designing an effective level of control for a project.

The Project Controls Team

The analysis concludes with how to design the size of the project controls team. For simplicity, the general size will be determined by large, medium, and small as illustrated in the table below:

Project Score Range	Level of Control Required	Size of Project Controls Team
400 Plus	High	Large
250-399	Med	Medium
up to 249	Low	Small

As a general guideline, the below matrix indicates the roles required for each size team: Large, Medium, and Small:

| Project Controls Team	Large	Med	Small
Project Controls Manager	x	x	
Cost Engineer	x	x	x
Master Scheduler	x	x	x
Junior Scheduler	x		
Document Control Lead	x		
Document Control Admin	x	x	x
Project Coordinator	x	x	

The specific team will ultimately be based on additional factors such as skill level, capability, level of teamwork, and project management tools used for project controls. Based on some of these additional factors, some of the above roles may be reduced to a part time effort for the project.

To conclude the examples, the Scale-up Project will require a large project controls team to deliver a successful project; The Shutdown Project will require the roles of a medium project controls team.

In fact, the Scale-up Project presented is an actual project supported by ORCAS. Our company provides a turnkey project controls department to support the successful delivery of this Pharmaceutical Industry Scale-up. Specifically, the project controls team is comprised of the following roles:

- Project Controls Manager [ORCAS]
- Cost Engineer [ORCAS]
- Master Scheduler [ORCAS]
- Production Scheduler [Client]
- Document Control Lead [ORCAS]
- Document Control Admin [Client]
- Project Coordinator [ORCAS]

The actual Scale-up Project organization is illustrated in the following:

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                          ┌─────────────────┐
                          │ Project Director│
                          └────────┬────────┘
                                   │
                          ┌────────┴────────┐
                          │ Project Manager │
                          └────────┬────────┘
          ┌────────────────────────┼────────────────────────┐
 ┌────────┴────────┐      ┌────────┴────────┐      ┌─────────┴────────┐
 │  Construction   │      │  Project Admin  │      │ Project Controls │
 │ Project Manager │      └─────────────────┘      │     Manager      │
 └────────┬────────┘                               └─────────┬────────┘
     ┌────┴────┐                                             │
┌────┴─────┐ ┌─┴────────┐                                    │
│ Project  │ │ Project  │                                    │
│Engineer 2│ │Engineer 1│                                    │
└──────────┘ └──────────┘                                    │
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Project Engineer 1 reports to:
- Project Coordinator
- Cost Engineer
- Cost Accountant

Project Controls Manager reports to:
- Master Scheduler
  - Production Scheduler
- Document Control Lead
  - Document Control Admin
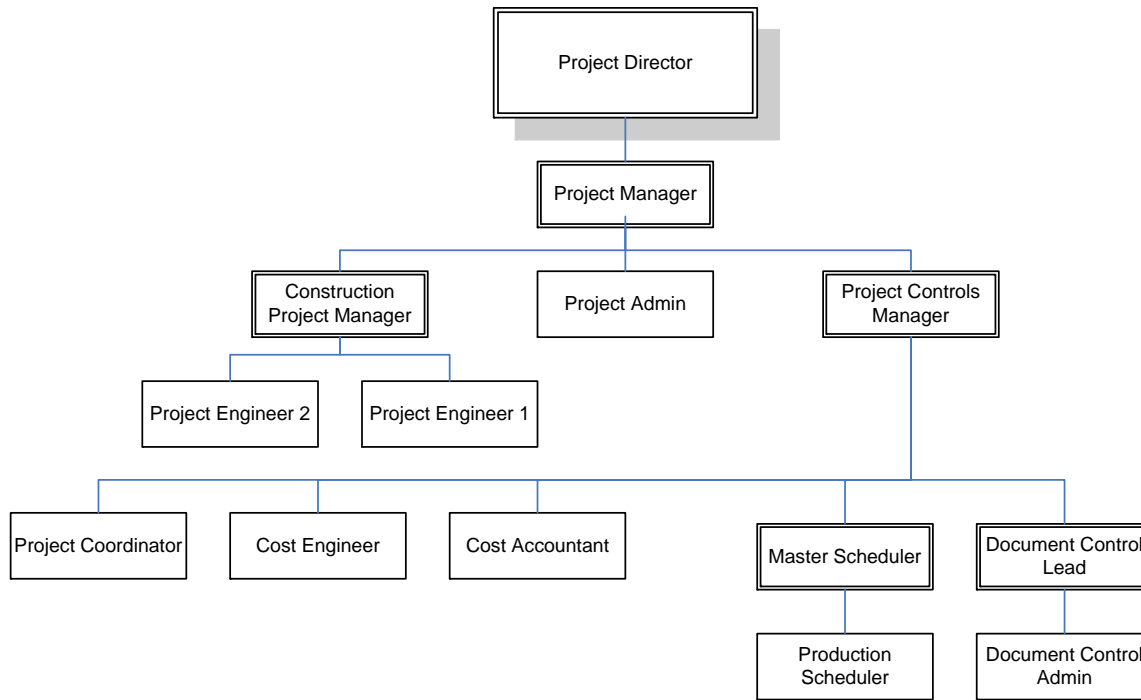
Summary

Delivering a successful project depends on applying the appropriate level of project controls. Several factors define how much control is necessary. Ultimately, these factors also define the size of a project controls team and the best systems to execute the project.

Project Criteria ➡ Level of Project Control ➡ Project Controls Team

➡ Project Management Tools

The framework presented here provides a starting point for an organization to design an effective project controls team to deliver successful projects. As a starting point, the framework needs to be molded and customized to address the uniqueness of each organization. What are the most important project criteria for your organization? What level of project control do you need to be successful?

The project controls team supports you with processes, people, and systems; invest some time up front to design the best team for your project. With the right people on your side, success looks easy.