The EPC PM Leads a Project Team

- To execute the project to the satisfaction of both the customer and contractor.
- To integrate project activity across all phases of the project
- By managing project dedicated resources within a matrix relationship
  - Project Direction: What and when
  - Functional Direction: How to
Leadership Model

**BE**
Personal Qualities Required of a Leader
- Trustworthiness
- Care
- Respect for human dignity
- Fairness
- Courage
- Honesty

**KNOW**
Leadership Skills/Competencies
- Coaching
- Communication
- Empowering
- Developing colleagues
- Problem solving
- Decision making
- Teamwork
- Planning and organization
- Monitoring performance
- Giving feedback
- Mentoring

**DO**
Important Steps in Leading a Team
- Explain the purpose
- Identify the critical issues/problems
- Encourage contributions
- Make a clear decision
- Assign clear tasks
- Decision making
- Monitor progress
- Coach team members
- Review the activity

Adapted from Bechtel 2001 Leadership and CRA/MacDonald Leadership Models
Critical for project success: PM should have full responsibility, authority, and control (not a coordinator)

Roles, responsibilities, and authority should be clearly defined within the organization and with the customer

PM leads the project to its completion
JV Project Matrix Organization

Company A

- Sales Head
- Contracts
- Head, Project Operations
- Financial Controller

Company B

JV Board of Control

Project Team

- Project Managers
- Project Construction Mgr
- Project Cost/Schedule Engineer
- Project Procurement Manager

Functional Direction: How to

Note: Typical project team positions shown. Team could also incl. e.g. accounting and start-up
EPC Project Manager’s Responsibilities

- Customer relations – point responsibility
- Championing safety – zero accidents
- Meeting project quality objectives
- Leading environmental compliance and advocating sustainable development
- Execution Planning
- Project scope, cost, and schedule control
More EPC Project Manager Responsibilities

- Prime contract administration
- Risk management
- Project coordination and interface management
- Management reporting and financial control
- Delivering planned profitability (“as sold” or better)
- No surprises
EPC Project Engineering Manager’s Responsibilities (Typical)

- Engineering execution planning
- Managing the engineering design work of the project.
- Producing all engineering deliverables incl. design criteria, design drawings, technical and general specifications, material requisitions, equipment lists, necessary to define and construct the facility.
- Providing the engineering input to the project execution plan, Preparing the detailed engineering budget and schedule and the list of deliverables.
- Reporting to the Project Manager regarding overall performance of engineering activities, costs, and schedule.
Project Procurement Manager’s Responsibilities (Typical)

- Procurement execution planning
- Managing acquisition of equipment and materials (purchase orders and supply contracts) in response to material requisitions prepared by engineering or field requisitions generated at construction sites
- Managing purchasing, expediting, supplier quality surveillance, traffic and logistics, and material management services for supplier-furnished equipment and materials
- Reporting to the Project Manager regarding overall performance of engineering activities, costs, and schedule.
Construction (Site) Manager’s Responsibilities (typical)

- Construction execution planning,
- Development of the construction portion of the project schedules
- Development of field staffing plans, temporary facilities plans, and indirect cost budgets
- Directing technical execution (e.g., construction methods, subcontract administration) in accordance with the established construction quality standards,
- Reporting to the Project Manager regarding overall performance of the site activities, costs, and schedule.
Project Start-up Engineer’s Responsibilities (Typical)

- Startup services execution planning
- Scheduling, budgeting, and field performance of preoperational testing and plant startup services.
- Review and assistance in preparing preoperational test procedures during design,
- Preoperational testing and plant operational services, to full power operation
- Reporting to the Project Manager regarding overall performance of start-up activities, costs, and schedule.
Summary: Project Management – EPC Contractor’s Perspective

- Interface activities:
  - Practice/promulgate/manage
  - Effective communications
  - Provide/obtain information
  - Coordinate/manage work activities
  - Lead/guide/direct project team
## Project Management EPC vs. Construction Only

<table>
<thead>
<tr>
<th>Task/Focus Area</th>
<th>EPC</th>
<th>Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Execution Planning</td>
<td>Cross Disciplines and Project Phases</td>
<td>Cross Trades and Subcontracts</td>
</tr>
<tr>
<td>Risk Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ability to file claims</td>
<td>Lower (you own scope and schedule)</td>
<td>Higher (you are not the engineer)</td>
</tr>
<tr>
<td>Overall project cost/schedule</td>
<td>High influence. Life cycle focus</td>
<td>Lower influence, Total Initial Cost focus</td>
</tr>
<tr>
<td>Completion and Performance</td>
<td>Often guaranteed as part of LSTK</td>
<td>Physical completion objective</td>
</tr>
<tr>
<td>Communication</td>
<td>Superb skill required</td>
<td>Very good required</td>
</tr>
<tr>
<td>Leadership</td>
<td>Same</td>
<td>Same</td>
</tr>
<tr>
<td>Safety</td>
<td>Same</td>
<td>Same</td>
</tr>
<tr>
<td>Quality</td>
<td>Same</td>
<td>Same</td>
</tr>
</tbody>
</table>
## Project Management EPC vs. Construction Only

<table>
<thead>
<tr>
<th>Personal Considerations</th>
<th>EPC</th>
<th>Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>Usually a degreed engineer</td>
<td>Can come up from trades</td>
</tr>
<tr>
<td>Development</td>
<td>Rotational Assignments</td>
<td>Single discipline Assignments</td>
</tr>
<tr>
<td>Focus</td>
<td>External and internal</td>
<td>More internal</td>
</tr>
<tr>
<td>Intensity</td>
<td>Same</td>
<td>Same</td>
</tr>
<tr>
<td>Direction</td>
<td>What, when</td>
<td>What, when, how to</td>
</tr>
<tr>
<td>Confidence</td>
<td>Same</td>
<td>Same</td>
</tr>
<tr>
<td>Comfortable asking for help</td>
<td>Very</td>
<td>???</td>
</tr>
</tbody>
</table>
PM Project Execution Processes
(All are listed. Items 4 and 5 are elaborated)

1. Mobilize team/resources
2. Conduct team building
3. Establish and get alignment on the project execution strategy, mission, goals, and expectations

4. Establish the performance baseline
5. Lead the project execution planning effort

6. Manage the prime contract
7. Manage the interfaces of all organizations that contribute to the project
8. Establish and maintain communication channels
9. Establish and maintain customer relations
10. Promote and ensure safety, health, and environmental compliance
11. Promote and ensure professional and business ethics
The Project Baseline is that set point
Baseline Evolution

**Public**

**Proposal/Contract**
- Scope (Deliverables)
- Schedule
- Price
- Payment Terms

**Schedule Baseline**
- Schedule Milestones
- Work Execution Plans
- Quantity Release/Installation Curves
- Staffing Profiles

**Cost Baseline**
- Budget Definition and Account Codes
- Scope Change Control
- Material Cost Control
- Labor and Non-Labor Control
- Cash Flow (Forex and Cost of Capital)

**Private**

**Estimate**
- Scope
- Cost Detail (labor, material)
- Contingency
- Fees

**Project Execution Baseline**
- What I Have To Do – (Scope)
- When I’ll Do It – (Schedule)
- What Will It Cost Me – (Cost)

How Much I Get Paid – Project Cost = Gross Margin
Gross Margin - Allocated Overhead = Operating Profit
Key Baseline Element: Scope Definition

- Focus for program objectives
- Common understanding of specific expectations and requirements
- Accounting for all the work
- Framework for managing changes
- Basis for schedule and cost development
Well documented and communicated scope definition guards against scope creep (one of the most significant LSTK risks)

- Scope of Services
- Plant performance objectives
- Methods of achieving completion date
- Physical Quantities
Key baseline element: Commercial Terms and Conditions which illustrate

- Objectives of the parties
- Division of Responsibility
- Risk Allocation
- Guarantees
- Incentives
- Opportunities
Key Baseline Element: Project Execution Plan including, e.g.:

- Executive Summary
- Vision Statement and Project Objectives
- Scope and Structure of Work (illustration provided)
- Project Management Plan
- Functional Plans
- Constructability
- Project Procedures
- Risk Assessment
Typical Project Execution Plan Contents

Executive Summary

• General project description
• Project ownership/sponsor(s)
• Major contract considerations
• Project financing
• Key risks
Typical Project Execution Plan Contents

Vision Statement and Project Objectives

- Project mission/objectives
- Execution strategy and approach
- Environmental, safety, and health considerations
- Security
Typical Project Execution Plan Contents
Scope and Structure of Work

- Project Baseline
  - Technical Scope
  - Scope of Services
  - Work Breakdown Structure
  - Organization Breakdown Structure
- Schedule
- Cost
- Proposal team input (handoff to execution team)
- Project team kickoff (assuring the scope and contract requirements are understood)
Typical Project Execution Plan Contents

Project Management Plan

- Organization
- Project interfaces/relationships
- Work plan (roles, responsibilities, and accountabilities)
- Functional department (horizontals) oversight
- Constructability plan
- Project schedule
- Prime contract management
- Quality plan

- Progress and Performance reporting
- Project forecast plan
- Automation plan
- Public relations
- Risk management
- Intellectual property
- Best practices/lessons learned
Typical Project Execution Plan Contents

Functional Plans

- Project administration plan
- Engineering plan
- Supply chain and contracting plan
- Construction plan
- Startup and commission plan
- Project closeout plan
- Project controls plan
- Automation plan
- Financial management plan
Typical Project Execution Plan

Constructability

- CII definition: The optimum use of construction knowledge and experience in planning, engineering, procurement and field operations to achieve overall project objectives.
- Constructability ideas can range from something as simple as new types of nuts and bolts to a complex project erected from shop-assembled modules.
- The most valuable input is provided by experienced construction personnel integrated into the project team. This input is provided as the design develops.
Typical Project Execution Plan

Project Procedures

- Typically addresses interfaces (e.g. among team members) and externalities (e.g. client and vendor communication protocols)
- Calls out standard operating procedures of the performing functions
- Establishes protocols for adopting the standards for specific project applications (e.g. required approvals and conformance with QA program)
Typical Project Execution Plan

Risk Assessment

- Identifies types of risk, e.g.
  - Commercial (incl. payment, forex, cost and schedule)
  - Weather, or other acts of God
  - Political
  - Safety risks to humans, materials, structures, equipment, and components;
  - Hazardous substances; risks to the environment

- Specifies format and use of a risk register which, on a line item basis;
  - Identifies individual risk items and the project team member responsible for its management
  - Assesses probability of occurrence
  - Assesses financial or schedule impact
  - Lists actions for avoidance or mitigation
  - Forecasts cost of avoidance or mitigation
Execution Plan Illustration

Scope and structure of work
Work Breakdown Structure and Organizational Breakdown Structure

WBS

STATEMENT
OF
OBJECTIVES

OBS

DISTRIBUTION OF
ACTUAL
ORGANIZATIONAL
COSTS
Work Breakdown Structure

WBS

Code of Accounts
- Facility
- Commodity

Work Packages
- Engineering
- Construction
- Turnover

Code of Accounts $\rightarrow$ Scope Definition
Work Packages $\rightarrow$ Execution Vehicle
Code of Accounts

- Plot/Area
- Facility/Sub-facility
  - Process
  - Non-Process
  - Yard
  - Off-Plot
- Indirect
  - Construction Temporary Facilities and Services
  - Engineering and Other Services
- Commodity
  - General Civil
  - Earthwork
  - Concrete
  - Steel
  - Building Finish
  - Mechanical Bulks
  - Mechanical Equipment
  - Pipe
  - Electrical Equipment
  - Raceway
  - Wire and Cable
  - Instrumentation

100% of Scope by WBS
100% of Scope by Commodity
Thoughts about EPC LSTK

Characteristics, risks and mitigation
LSTK Unique Characteristics

- Owner gives up substantial control to contractor (usually just provides a performance spec)
- Project acceptance is based on demonstrated plant performance (or physical completion) perhaps with an operating period obligation
- Schedule and performance are guaranteed (usually capped at a percentage of LSTK price, perhaps with sub-caps for each element guaranteed)
- Schedules of liquidated damages and bonus provisions are usually associated with the guarantees
Associated Risks

- Project team capability
- Budget over-run
- Schedule over-run
- Vendor performance
- Shortfalls relative to guarantees
- Availability and cost of insurance
- Timely payment, especially since LSTK execution tends to be schedule driven
- Scope changes
- Force Majeure
- Joint venture partner disputes or default
- Delay in getting decisions form Owner
Risk Mitigation

- Develop clear contracting guidelines (e.g. accept no consequential damages)
- Clearly define the scope of each project bid and make sure it’s clear in the proposal
- Develop excellent EPC estimating talent.
- Develop Business Development staff who can negotiate limits to risk and fair reward for risks undertaken
- Assign “A-players” to the project team and make it easy for them to get all the support they need. Where possible, assign them during the proposal phase.
Risk Mitigation (Continued)

- Analyze risks as to expected and maximum values. Add the expected value to the bid price. Some others might be covered in contingency
- Flow down risks undertaken to suppliers, subcontractors and project specific insurance. Consider paying the premiums. It’s often a good investment
- Plan, Plan Plan. Review, Review, Review. Use experts, experienced consultants etc to help in this process
Training for EPC Project Management
Three Tier Program

General Management Program for Sr. PMs

Tier III
Business Management

Tier II
Project Manager’s Work Processes, Procedures and Tools

Tier I
EPC Organization and Operations

Suggested Tier II Modules
1. EPC Leadership /Team Building
2. Execution Planning/Project Controls
3. Baseline/Change Management
4. Prime Contract Management
5. Risk Management
6. EPC Joint Venture Management
7. Financial Management
8. Quality Assurance Management
10. Procurement and Supply Chain Management

Project Management Workshop: Introduction to Functions and Services