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1.040 Project Management

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Project Management Engineering, Procurement and Construction

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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

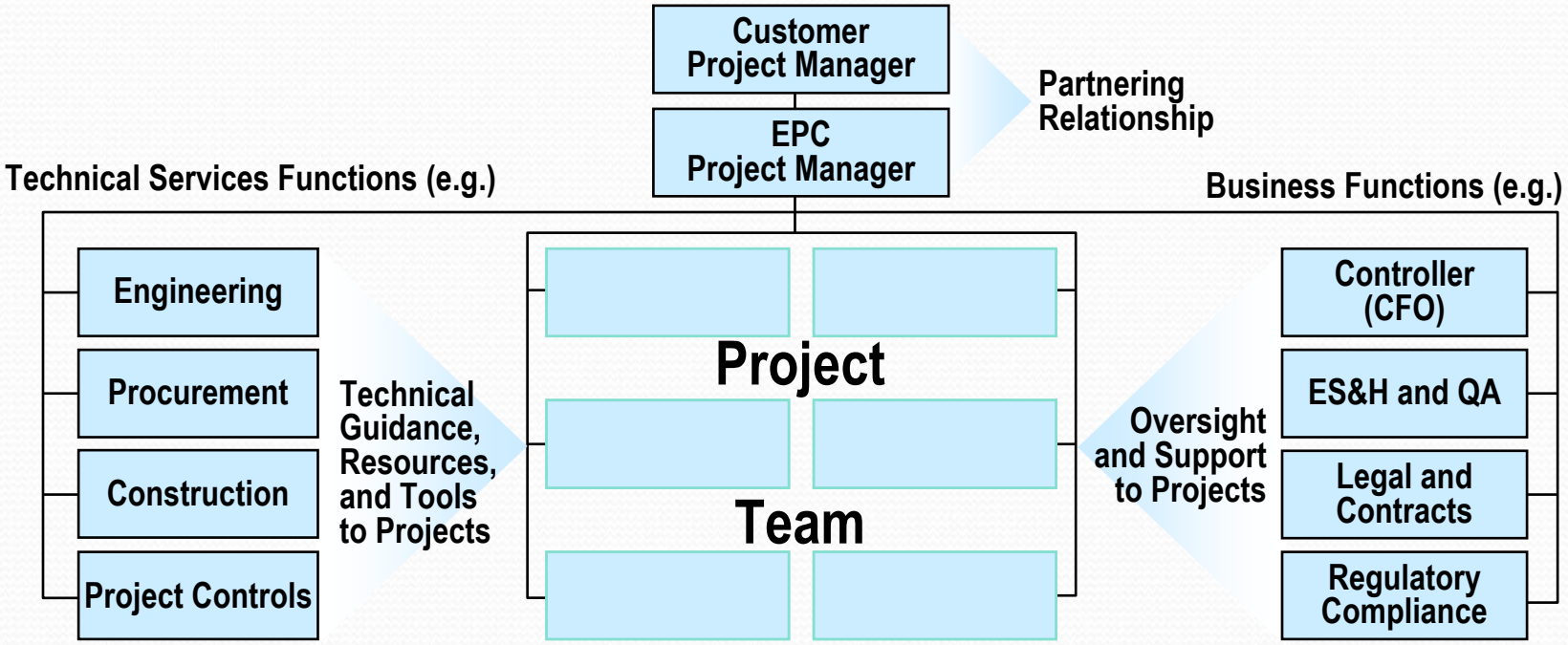
DO

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

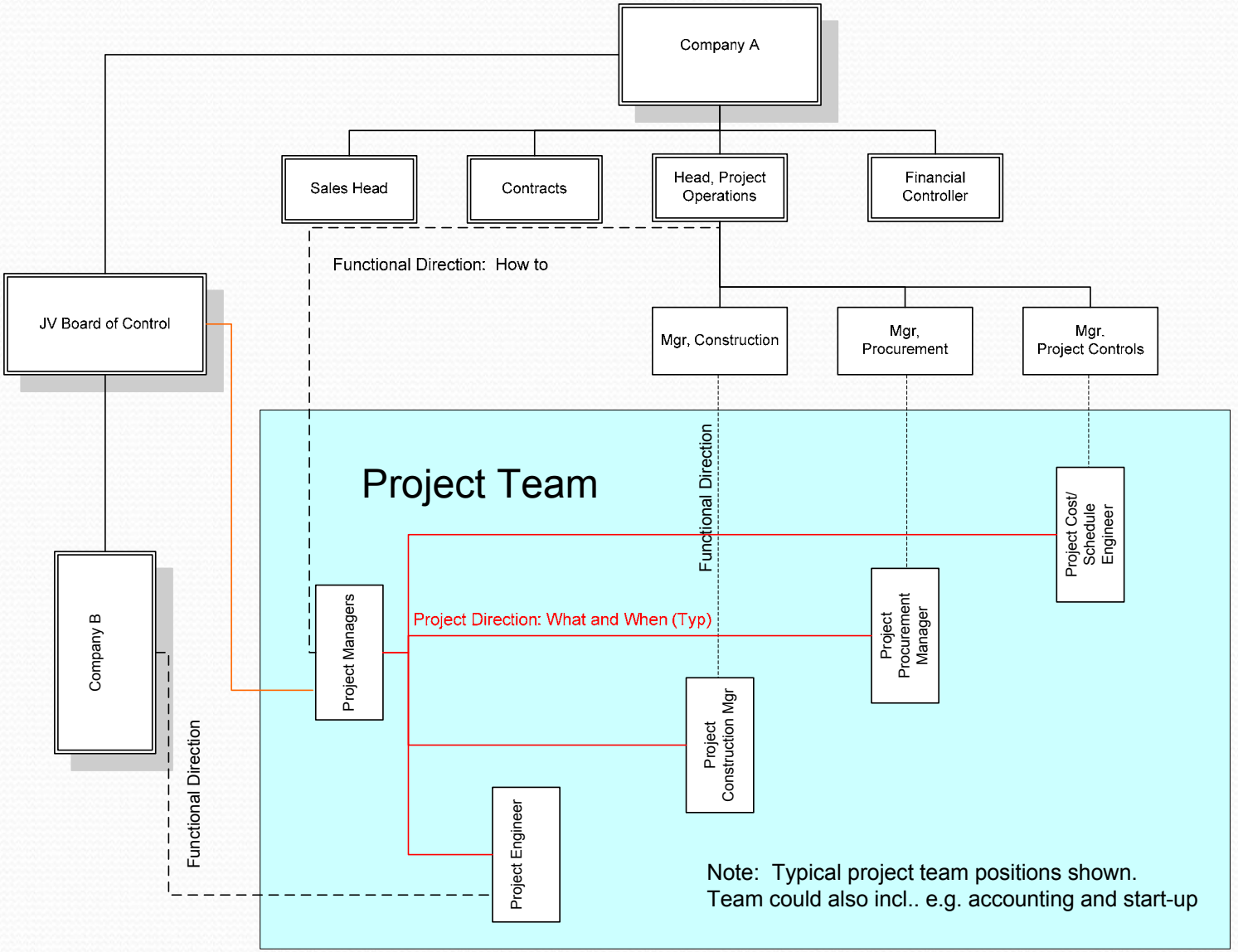
Adapted from Bechtel 2001 Leadership and CRA/MacDonald Leadership Models

Project Management Structure

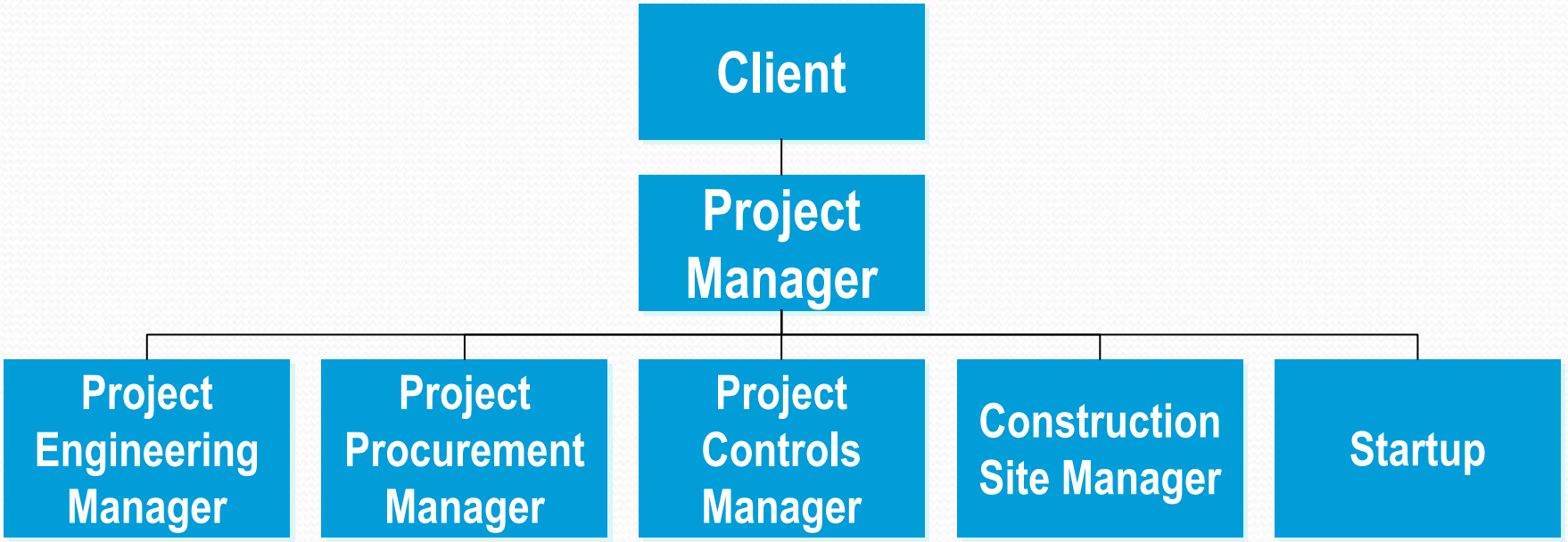


- Critical for project success: PM should have full responsibility, authority, and control (not a coordinator)
- Roles, responsibilities, and authority should be clearly defined within the organization and with the customer
- PM leads the project to its completion

JV Project Matrix Organization



Project Organization Chart



- Process
- Environmental
- Systems
- Disciplines
- Specialists
- Consultants

- Purchasing
- Subcontracts
- Expediting
- Supplier
- Quality
- Traffic

- Planning
- Scheduling
- Estimating
- Cost Control

- Constructability
- Field Engineering
- Field Procurement & Warehousing
- Labor Relations
- Construction Supervision
- Safety

- Preoperational Testing
- Training
- Startup Assistance

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

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

Project Management EPC vs. Construction Only

Personal Considerations	EPC	Construction
Education	Usually a degreed engineer	Can come up from trades
Development	Rotational Assignments	Single discipline Assignments
Focus	External and internal	More internal
Intensity	Same	Same
Direction	What, when	What, when, how to
Confidence	Same	Same
Comfortable asking for help	Very	???

PM Project Execution Processes

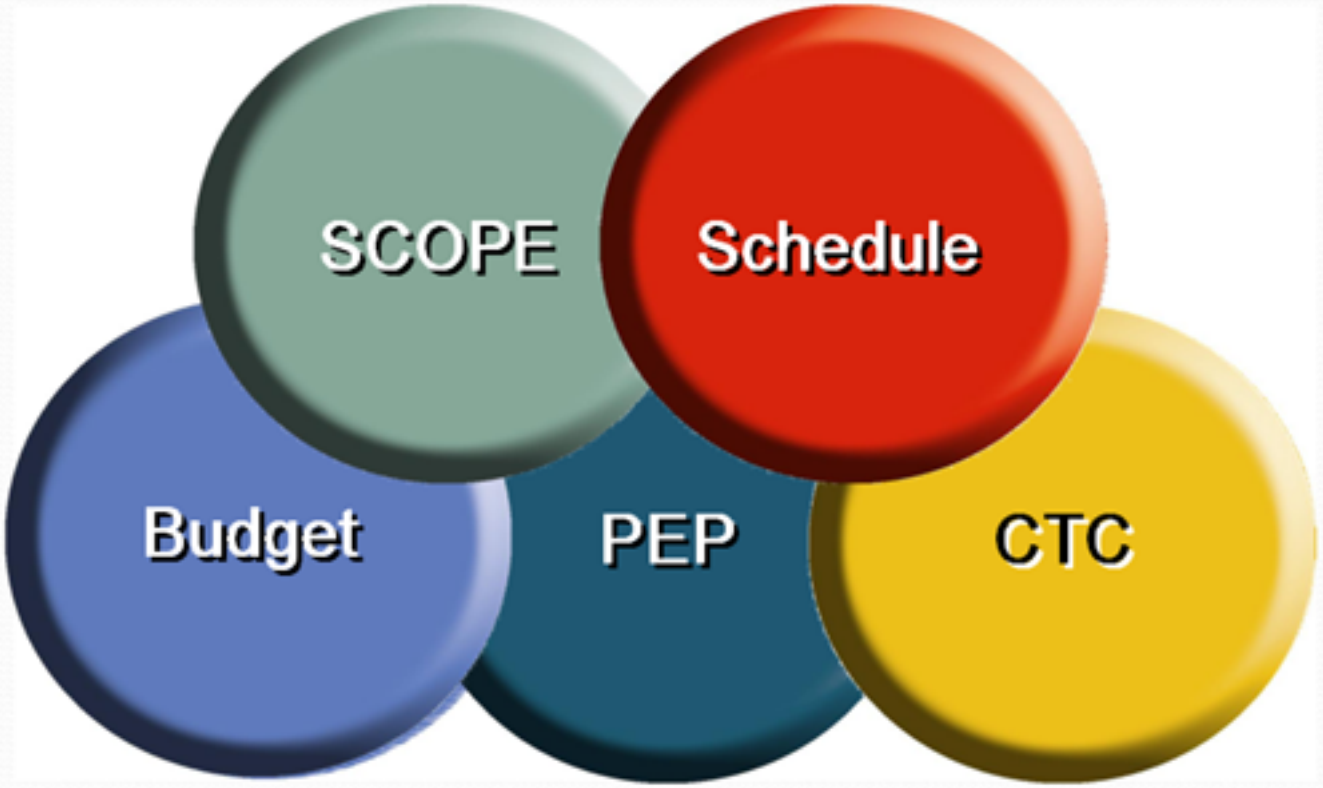
(All are listed. Items 4 and 5 are elaborated)

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

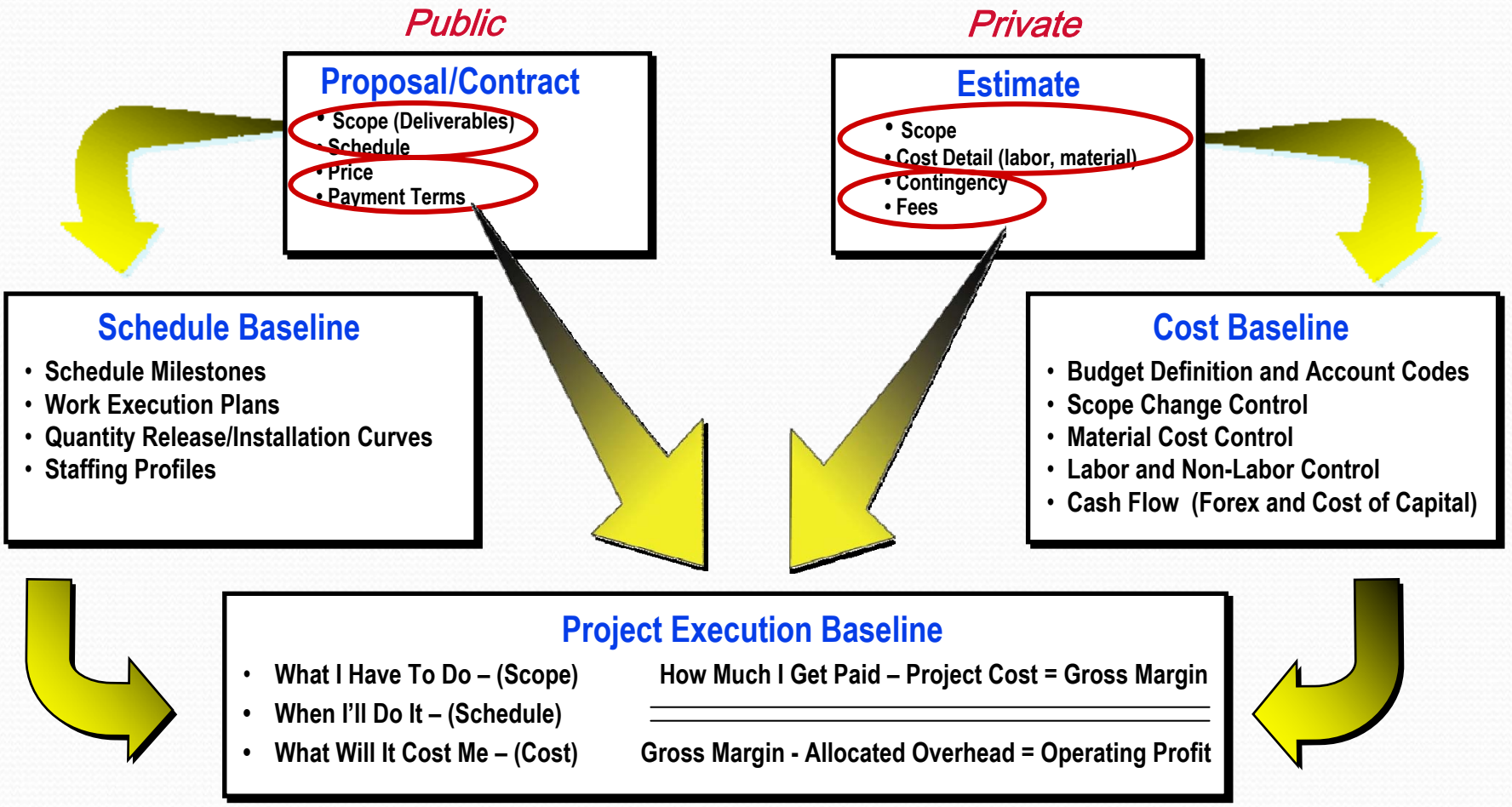
4. *Establish the performance baseline*
5. *Lead the project execution planning effort*

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



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

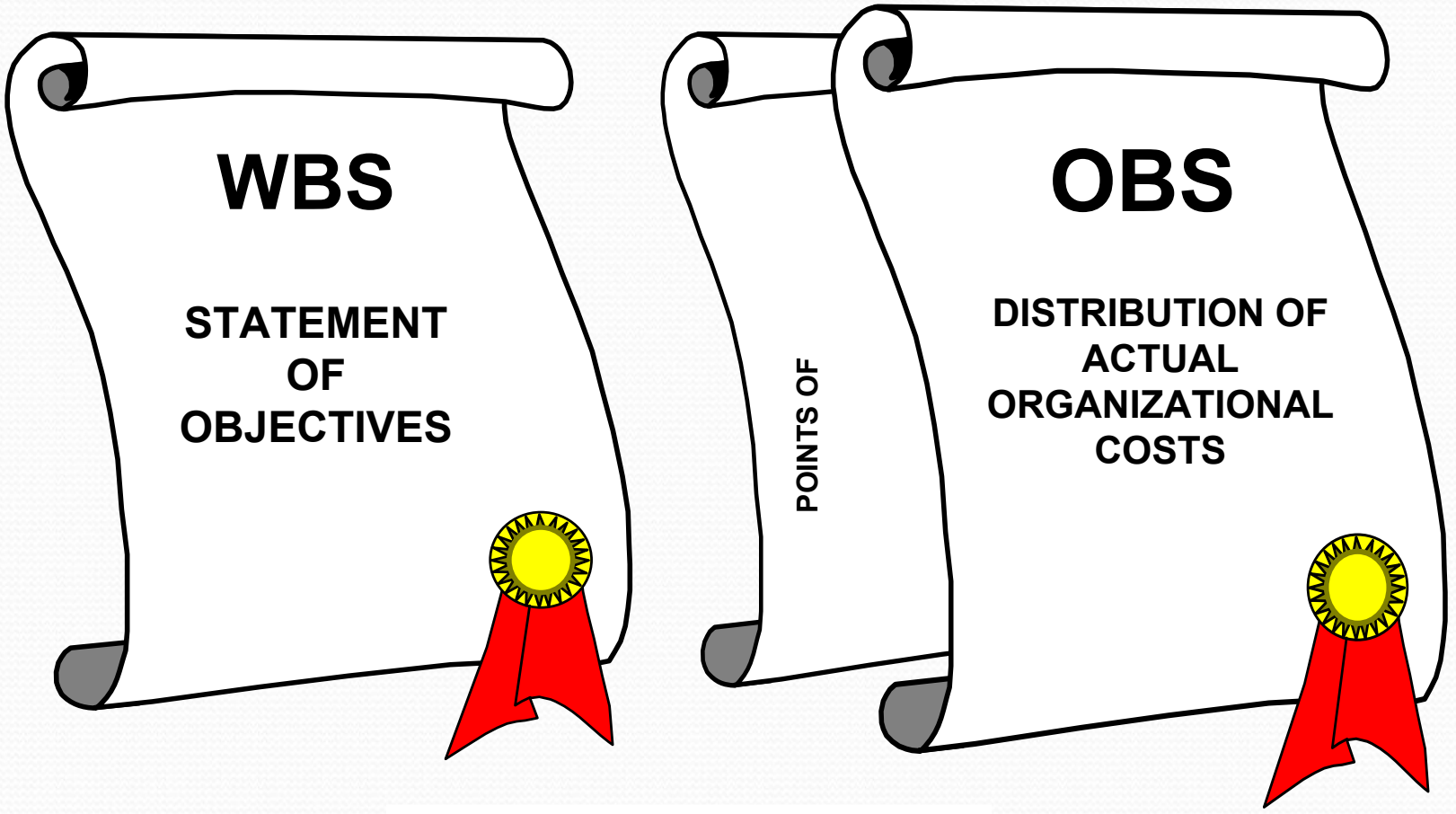
Risk Assessment

- 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

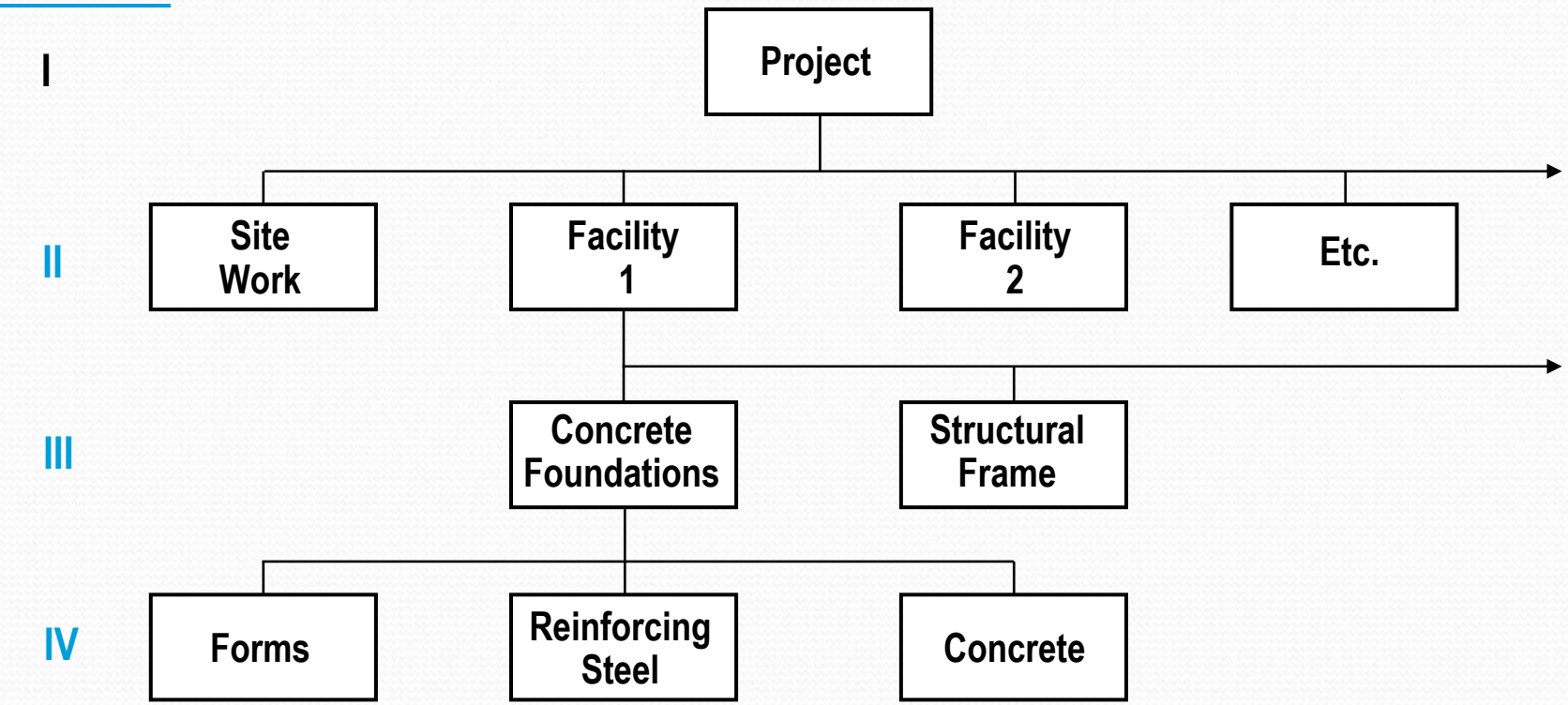
Execution Plan Illustration

Scope and structure of work

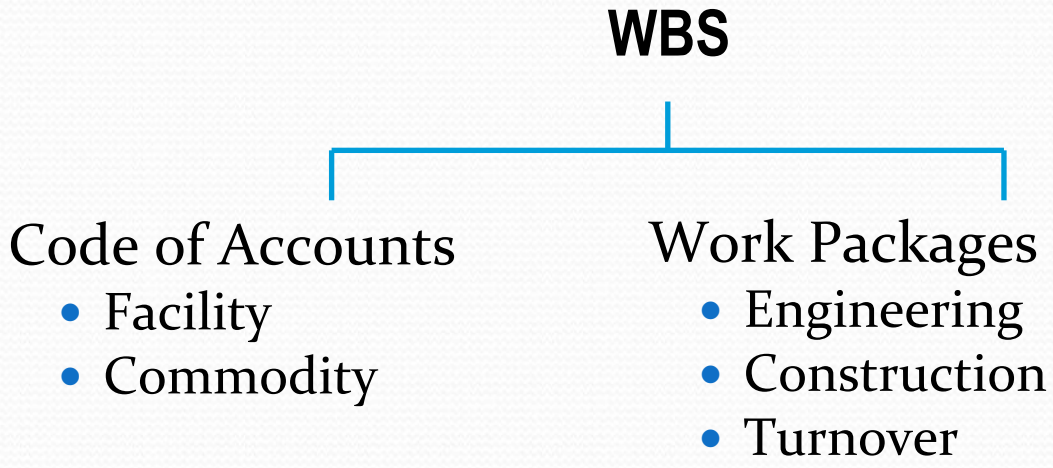
Work Breakdown Structure and Organizational Breakdown Structure



Example of Work Breakdown Structure



Work Breakdown Structure



Code of Accounts → ***Scope Definition***

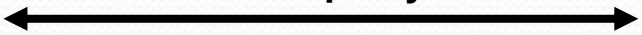
Work Packages → ***Execution Vehicle***

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

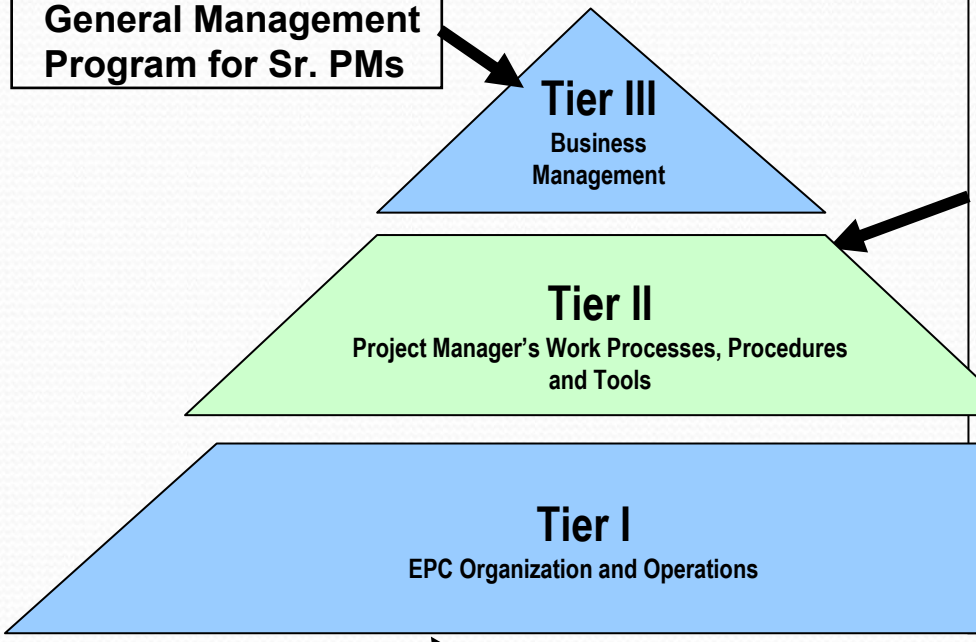
- Develop clear contracting guidelines (e.g. accept no consequential damages)
- Clearly define the scope of each project bid and make sure it's clear in the proposal
- Develop excellent EPC estimating talent.
- Develop Business Development staff who can negotiate limits to risk and fair reward for risks 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



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
9. Engineering Management
10. Procurement and Supply Chain Management