

Project Management

What Unique Things Must Be Considered

EPC Heavy Industrial Projects

By Bob Stevens

Project Engineering Manager (Retired)

Bechtel Corporation - 01/28/2020

In my career:

➤ Project Manager

Small to Midsized Projects

➤ Engineering Manager

Mega Projects (> \$10 Billion)

After explaining to two young engineers why I could not approve their calculation; explaining their thermodynamics error, one said to the other, “I told you he is not the Pointy-Haired Boss in DILBERT.”

“Yes, and please close the door behind you. We are behind schedule and running over budget. I have to figure out how we get back on track.”



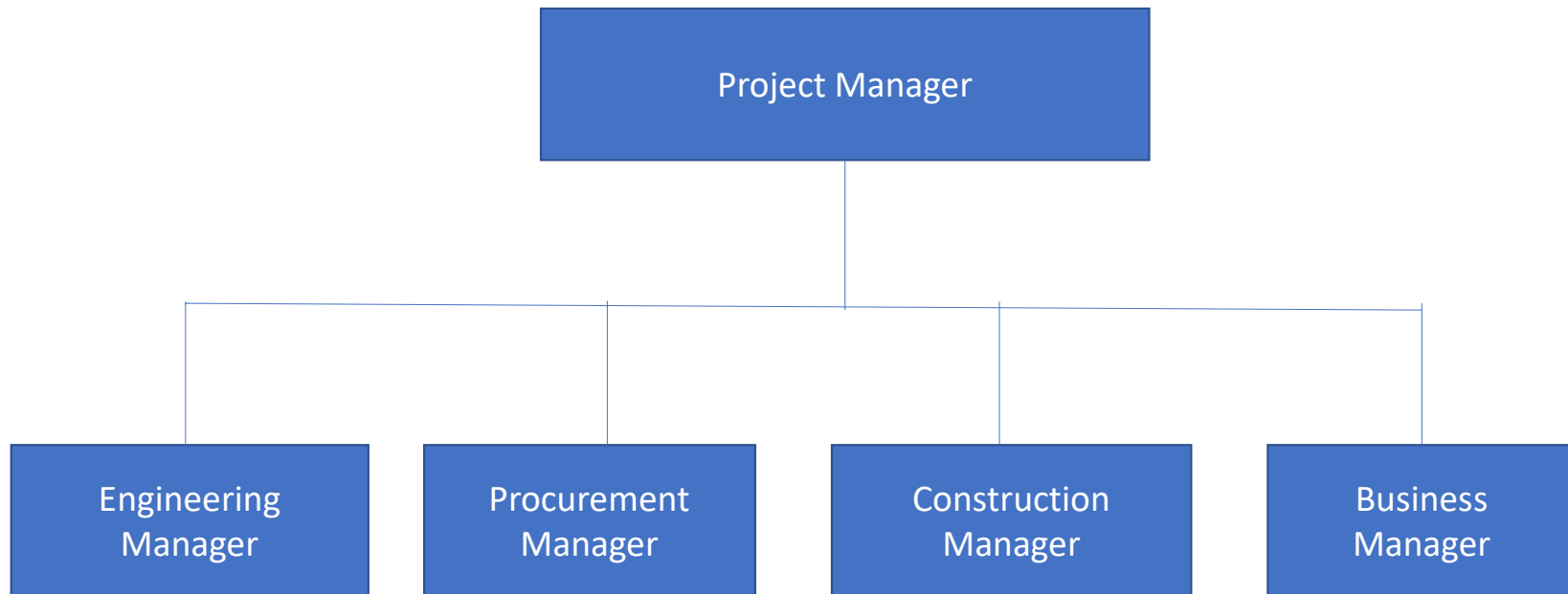
Tonight – An Enjoyable Graduate Level Lecture

- No Differential Equations
- No Exam

Project Management >> Scheduling and Cost Analysis

No Confidential nor Secret Information

Safety is NO Accident!



Engineering Manager (The Conductor, Color in the Blank Spaces)

- (ChE) - Process Engineering (Simulation, H&M Balance, PFD)
- (ChE/ME) - Project Engineering (P&IDs, Equip. Data Sheets, Info. to Others)
- (ME) - Mechanical Equipment Engineering – Equipment & Packages
- Environment Engineering (Air, Water, Solid, Environmental Controls)
- Materials Engineering (Selection, Specifications)
- Geo Technical Engineering (Soil Conditions)
- Civil Engineering (Concrete)
- Architectural / Engineering (Buildings)
- Structural Engineering (Steel)
- Piping Design (Model/Layout, Stress Analysis, Piping Isometrics, Pipe Hangers)
- Electrical Engineering (Power, Cathodic Protection)
- Control Systems Engineering (Instruments, Software, DCS)
- Etc.

Engineering Manager (con't)

➤ Scheduling

- Most Common Tools - Primavera, MS Project
- Critical Path
- Staffing

➤ Cost Analysis

- **FORWARD LOOKING** (Accounting is **HISTORICAL**)
- Estimating (Lang and More Detailed)
- Wage Rate Mix
- Contingency / Senior Management (or Owner) Allowance
- Trends (Non-Variance/ Variance)
- Progress/Performance – Cost/Commitment

Procurement Manager

- Prime Contract Administration
- Direct Hire Administration
- Subcontract Administration
- Purchasing – Engineered Equipment
- Purchasing – Bulk Materials
- Expediting
- Traffic – (Ohio River Clearance, Highway and Rail Clearances)
- Logistics – (Permits for Shipments – Roads, Highways)

Construction Manager

- Superintendents
- Field Engineers
- Rigging Engineers
- Inspection / Quality Control & Assurance
- Labor Agreements (NMA, GPA, Open Shop, etc.)
- Craft Availability / Travelers (Estimating and Construction)
 - Craft Training (Especially in Developing Countries)

ALSO

- Commissioning
- Startup

Business Manager

- Accounting – (Backward Looking - **HISTORICAL**)
- Payroll / Timekeeper – (Allocation of Charges)
- Payment – Vendors (Engineered Equipment & Bulks)
- Management of the Money – “Cash Neutral”
- Taxes
- Administrative Assistants / Document Control Clerks
- Human Resources (Visas, as well)
- Legal
- Housing - (Especially International) – Pioneer and Construction
- Food - (Ditto)
- Emergency Response - (Evacuation, Fire, Medical, Snakes, etc.)
- Community Relations - (Government, Police, Community Relations)



Contract Methodology

- Design Bid Build – Competitive – Less Expensive?
- Design Build – Cooperative – Less Expensive?



Contract / Subcontract Types

- Lump Sum / Turn Key – (Hoover Dam)
 - Well defined scope
 - Grass Roots
 - Lower Unknowns
- Cost Plus (Reimbursable)
 - Not well defined scope
 - Unknown
 - Existing Facilities

Contract / Subcontract Types - Variations

- Unit Rates (Air to Soil Interface)
- Lump Sump with Unit Rates for Extras
- Incentives
 - Safety – Good – Risk – Taking Injuries Home in Your Pocket
 - Quality – Rework – Customer Satisfaction
 - Schedule – Permits, Long Lead Equipment (Pre-FID Work / Cancellations)
- Many Other Variations & Flavors



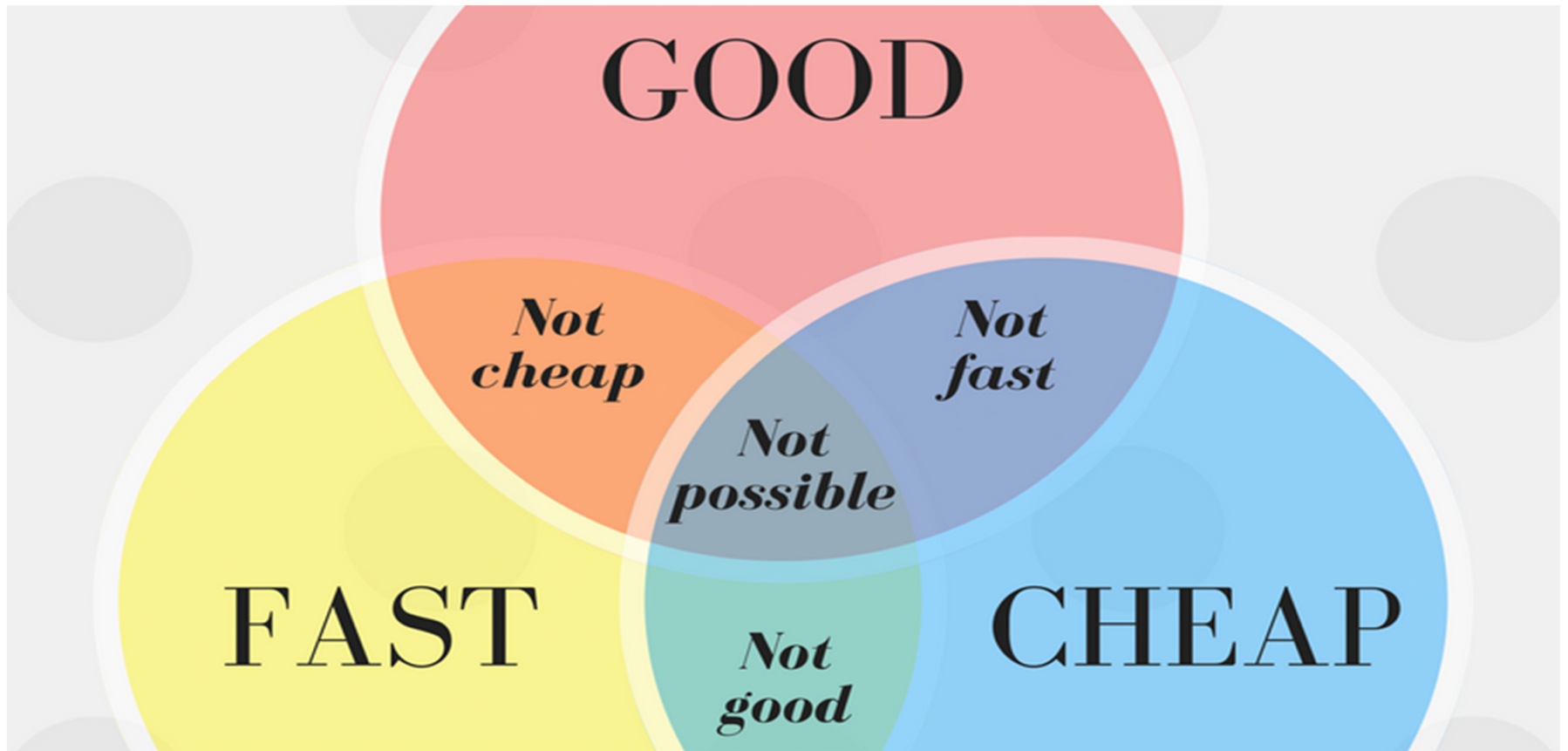
Contract / Subcontract – Risk Assessments

WHO CAN BEST MANAGE AT LEAST COST?

Owner or Contractor / Subcontractor?

- Construction Productivity
- Asbestos / Lead Paint Abatement
- Underground Surprises – Benzene Mitigation, U/G Obstructions
- Unknowns / Unknowables
- Force Majeure

Choose Any 2 of the 3



FAST / CHEAP / GOOD

- **Good / Cheap** – Well Defined Lump Sum (Grass Roots Plant)
- **Good / Fast** – A Lot of Unknowns and Little Time
 - Restore Rail Car Loading Facility – High Margin Specialty Chemical
 - Piping Isometrics – Design Review, SOE Review, Fabrication, Install
- **Fast / Cheap** – Temporary Facility (Run a Hose, Temp Piping)



Regulatory / Permits

- **Expansion of Interstate 70 – Denver – 12 miles**

- Permit work – 13 years
- 8,951 of Pages with 7,307 Pages of Appendices
- Senior Government Officials Asked By the Cabinet Secretary
 - “Did you read all the pages of these documents?”
 - “No” was the emphatic answer

- **Keystone XL Pipeline**

- Permit work – 12 years
- Partial Approvals
- Still not fully Approved

Environmental

- Existing Brownfield Site – Prospective Chemical Plant
 - Open Pit Quarries – Trees – Backfill
 - Fly Ash Pond – Old Coal Fired Power Plant

External Infrastructure

- Permits – Work with Governmental Agencies
- Corp of Engineers – River Locks and Dams
- Coast Guard – River Traffic
- Railroad
- State Highway Expansion
- Natural Gas
- Electrical Power – Substation, Additional Power Plant Unit
- Etc.

Ethics

- Chemical Plant – 1 of 3 Proposed Locations - \$5 Billion Plant
 - Half River Bottom, Half Up on Two Hills
 - Laydown
 - Parking
- Owner of the Site
 - “How Much Will It Take to Recommend My Site?”
 - “May the Best Site Win”
 - “You are Such a Boy Scout. I Admire You. Not How I do Business, Though.”

Heuristics

1. Schedule – 2x As Long as First Appears
2. Cost – 3x as Much as First Appears
3. Cost & Schedule Contingency
4. If you are just running on track, you will end up behind.
 - There is always unforeseen items around the corner.
5. The bitterness of poor quality remains long after the sweetness of low price is long forgotten.

Quality Corrective Action Report

➤ Egypt – Pipe Welding Inspection

- Inspector – 6 months – Full Penetration Welds Error
- Action: Reinspect all Shots, Grind out and Redo all Errors

➤ Waste Treatment Plant – Misspelled Word – P&ID Notes

- Threatened – Whistleblower
- 40 Hours of Investigation and Resolution
- Procedure Says – Red Pencil on Master Stick File





Engineered Lifts

- Heavy Vessel Lift – (Vit Plant)
- Tight Clearances – (Low Sulfur Diesel Hydrotreater)





Whatever it Takes...



Whatever it Takes...

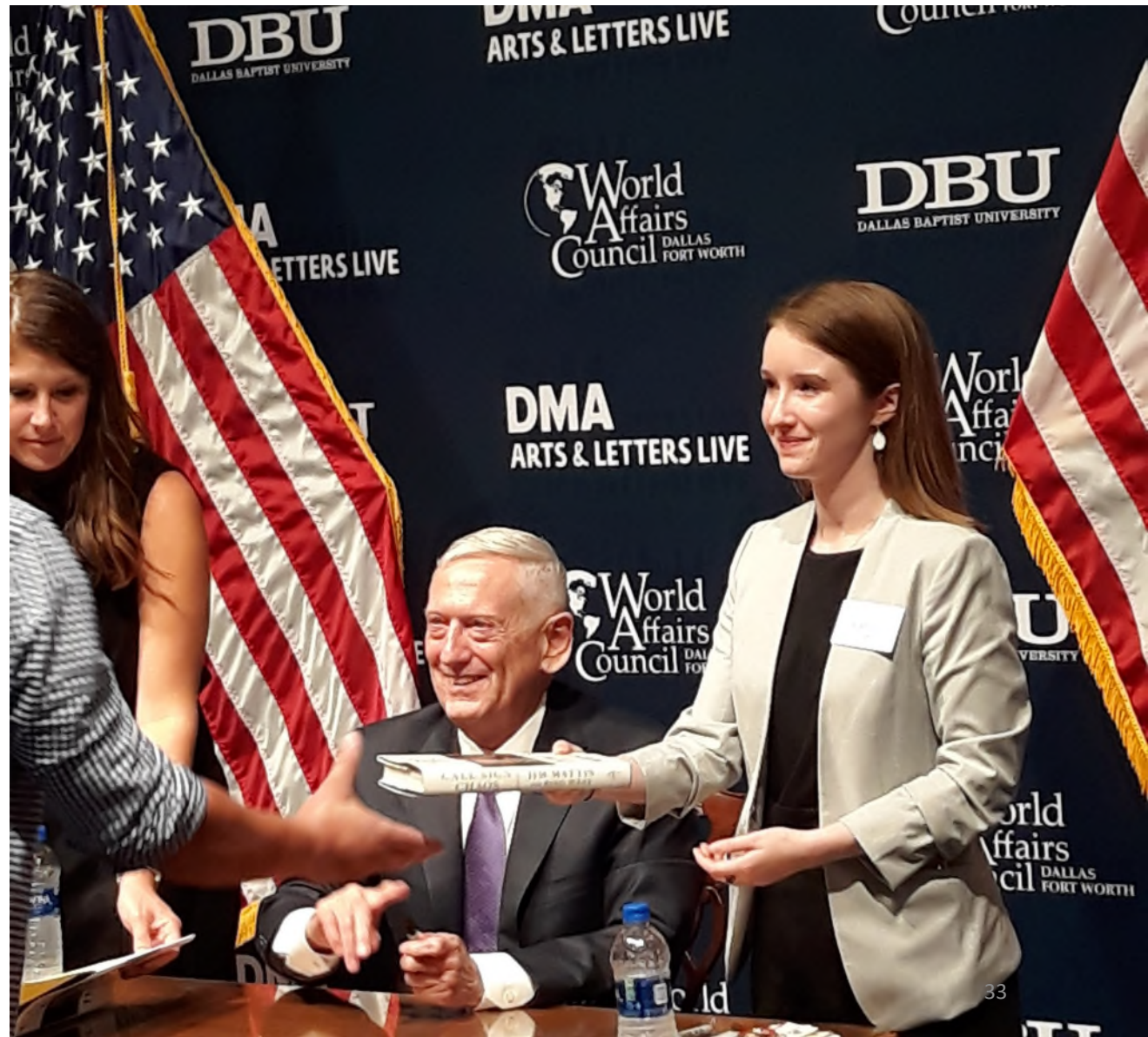
High Task, High People Relationships



General Jim
Mattis

USMC (Ret.)

Sec of Defense
(Former)



CALL SIGN CHAOS

LEARNING
TO LEAD

TO BOB - A FELLOW RICHMONDER!

JIM MATTIS

and Bing West

Jim Mattis

Whatever it Takes...

High Task, High People Relationships

Servant Leadership

Or

*What the Project Manager does when his team is at his
Christmas Dinner party*



What
happened to
my CAR?