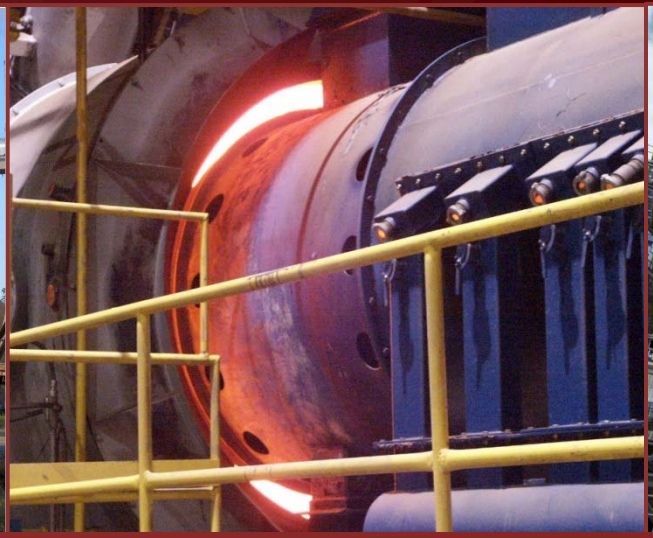
2016 BioEnergy/Pelice Conference
Atlanta, Georgia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Experience and Innovation Working for You

Value Creation through Engineering:

Creating Customer Value through Project Planning and Development

“By failing to prepare, you are preparing to fail.”

Benjamin Franklin

“A goal without a plan is just a wish.”

Antoine de Saint-Exupéry

“A good plan today is better than a perfect plan tomorrow.”

George S. Patton

“Give me six hours to chop down a tree and I will spend the first four sharpening the axe.”

Abraham Lincoln

“The plans of the diligent lead surely to abundance, but everyone who is hasty comes only to poverty.”

King Solomon (Proverbs 21:5)

“For which of you, desiring to build a tower, does not first sit down and count the cost, whether he has enough to complete it?”

Jesus Christ (Luke 14:28)

What is a project?

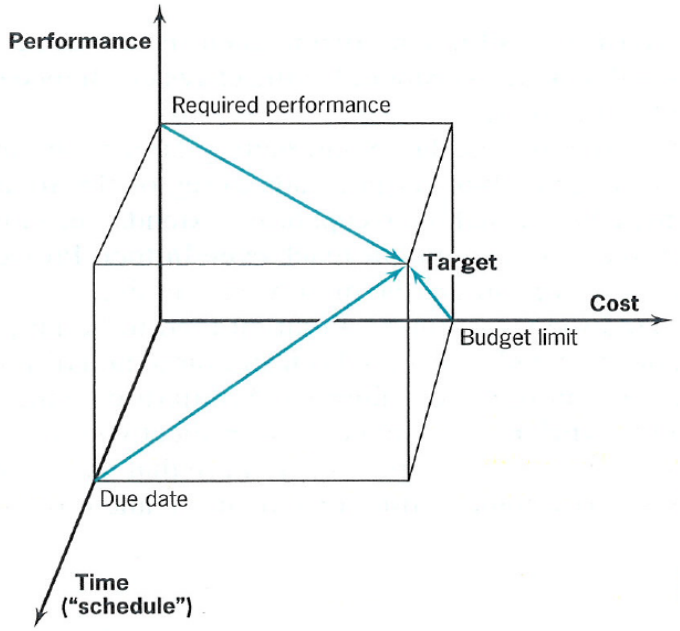
A project is - “a temporary endeavor undertaken to create a unique product or service.”

Project Management Institute(PMI):
Project Management Body of Knowledge (PMBOK) 5th Edition

A project is - “a modification to an existing plant process which will impact its economic viability.”

3 Parts of a Project

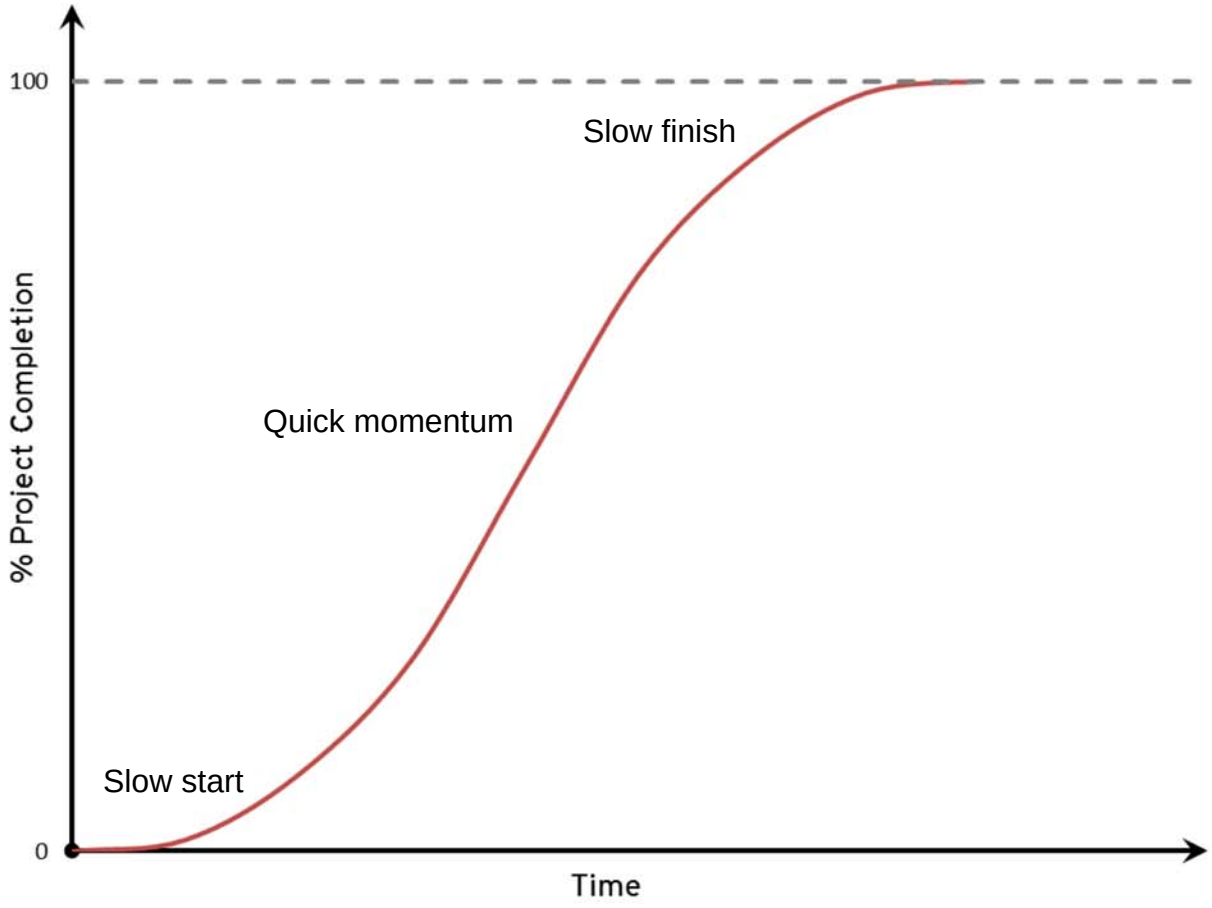
- Performance (Scope)
- Cost (Budget)
- Time (Schedule)



Note that each part affects the other two and good "performance" on all three are required for a successful project.

*Jack Meredith and Samuel Mantel: Project Management – A Managerial Approach 7th Edition

The Project Life Cycle



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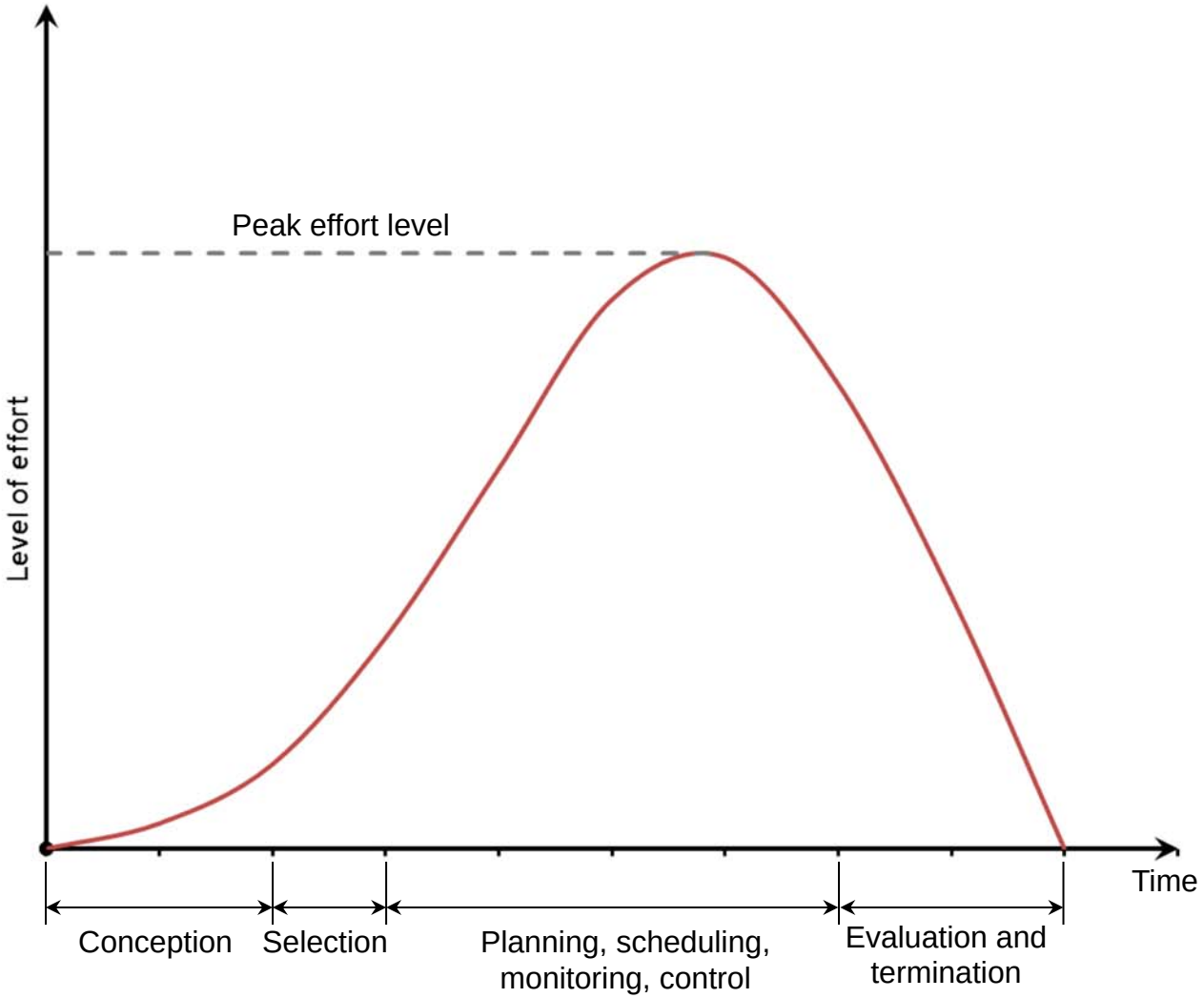
Time Distribution of Effort



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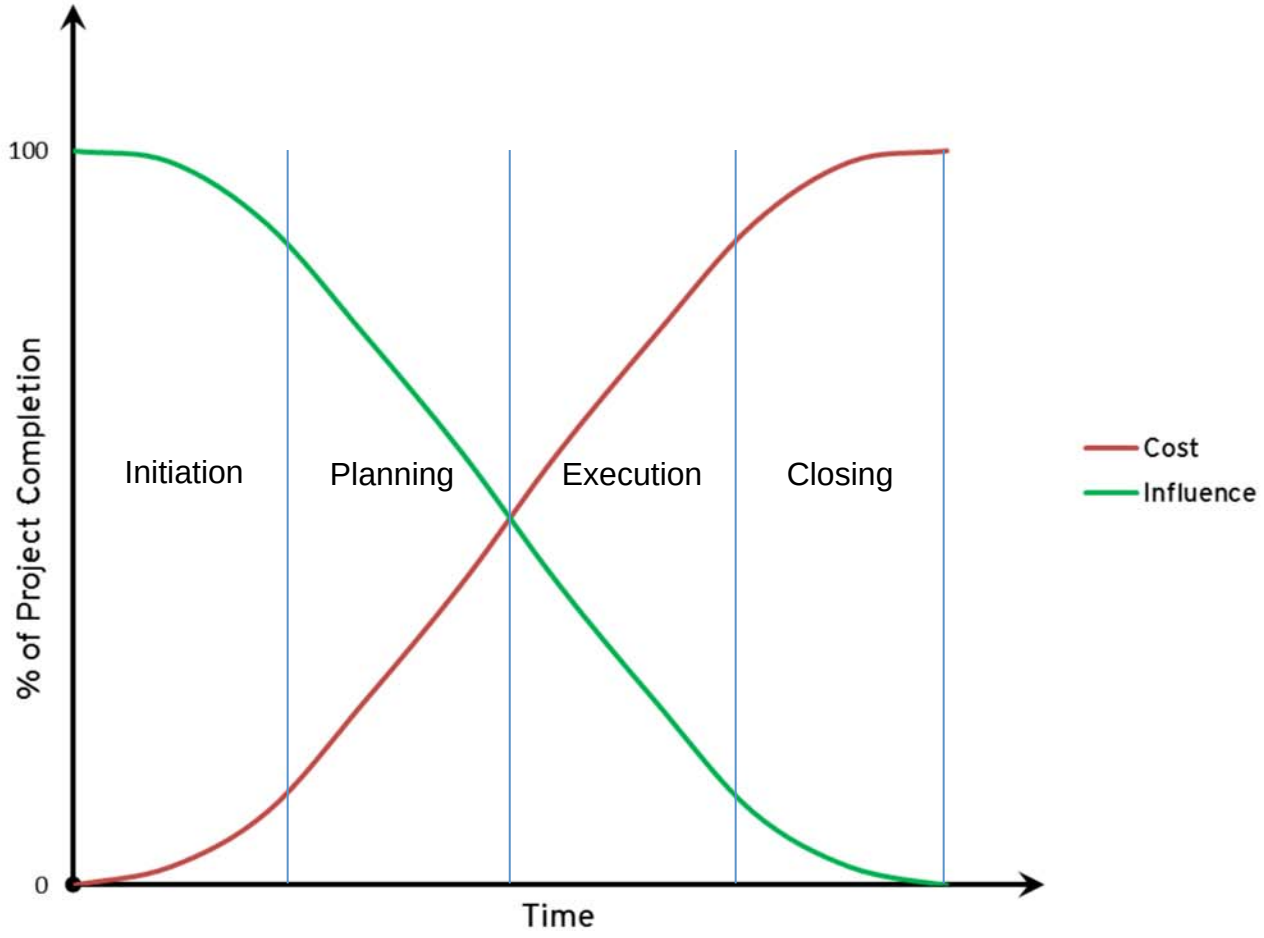
The Cost of Change



Creating Value Through Planning

Thorough Planning Early in a Project Allows You to…

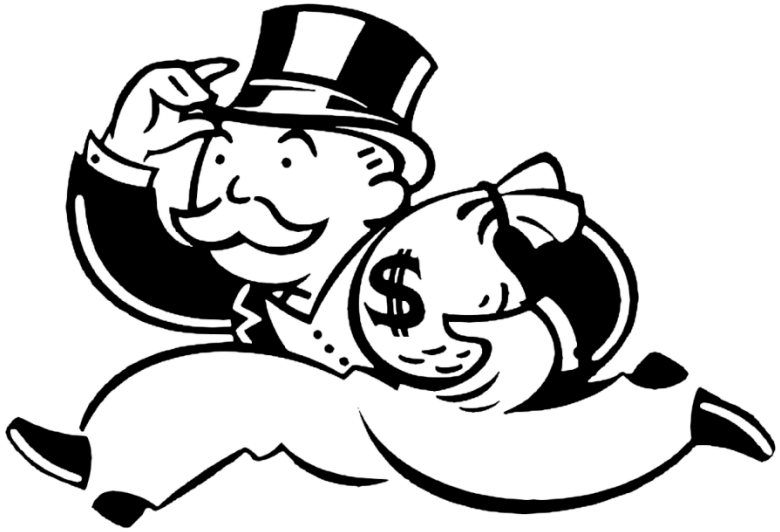
- Begin with the end in mind.
- Develop feasible designs early in the project life cycle.
- Brainstorm and develop many different layouts/designs and assign each one a capital cost.
- Value engineer - optimize design to save cost using high-quality, low cost solutions.
- Provide timely assistance at a lower realized cost.

Creating Value Through Planning

- Knowledge of codes, standards, and design principles
- Process Hazard Reviews
- Process knowledge and design experience
- Knowledge of construction methods and costs

Creating Value Through Planning

- Innovate creative solutions to complex problems
- Assist in project planning and development



Case Study: Typical Project

Project Capital Cost:

- Ranges from several million dollars to tens of millions of dollars.
- Typical cost breakdown is about 60% for equipment and 40% for everything else.

RECENT PROJECTS					
Projects	Total Capital	Equipment	Labor	Equipment %	Labor %
Equipment Rebuild	$ 36,000,000.00	$ 20,000,000.00	$ 16,000,000.00	56%	44%
Equipment Rebuild	$ 21,000,000.00	$ 12,000,000.00	$ 9,000,000.00	57%	43%
Process Line Replacement	$ 23,000,000.00	$ 15,000,000.00	$ 8,000,000.00	65%	35%
Logyard Options	$ 17,000,000.00	$ 10,000,000.00	$ 7,000,000.00	59%	41%
Paint / Strapping Line	$ 6,000,000.00	$ 5,000,000.00	$ 1,000,000.00	83%	17%
Screen Replacement	$ 1,000,000.00	$ 600,000.00	$ 400,000.00	60%	40%
Woodyard Modifications	$ 600,000.00	$ 400,000.00	$ 200,000.00	67%	33%
Knuckleboom Loader Addition	$ 300,000.00	$ 100,000.00	$ 200,000.00	33%	67%
Totals	**$ 104,900,000.00**	**$ 63,100,000.00**	**$ 41,800,000.00**	**60%**	**40%**

Case Study: Typical Project

Inflation:

- Capital equipment inflation (under regular economic conditions) is between 5% to 6% per year.
- Inflation rates for construction labor and materials (excluding copper and structural steel) is approximately 2.5% per year.
- This is a significant economic cost. Must be weighed against other risks.

Case Study: Typical Project

<u>Ways to save during preliminary design</u>:

- Eliminate conveying
- Smaller equipment footprint
- Utilize existing structures, when economical
- Minimize detailed engineering design changes
- Master Schedule – Let the project pick the outage date, don't be limited by the outage.

Case Study: Typical Project

<u>Economic Cost Savings</u>:

- Trading downtime to save capital cost
- Market timing
- Out of line construction
  - Is there space to do it without a large increase infrastructure cost?
  - Is the market so hot for a existing product that installing “out of line” has good a good economic return?

Case Study: Typical Project

<u>Cost Saving Opportunities during the project</u>:

- On-site Personnel Selection
- Selecting a Contract Strategy and Contract Type that best suits your project
- Manage the timing on when to issue contracts. There will be added costs to have contractors on site too early.

Case Study: Typical Project

<u>Fast Tracking can inadvertently lead to increased costs if you're not careful about picking your contract strategy</u>:

- Fast Tracking leads to overlap of construction and engineering activities.
  - This opens the door for design changes that can lead to change orders to the construction contracts.
  - Research shows that the different contract types can react differently at different levels of design completeness (% of actual design completed when contract is awarded)
  - It is important that the project engineer has a very good understanding of the process so that they can make good judgements on critical path designs that need to completed first to keep the project on path.

Closing Comments

As you start future projects consider the following suggestions:

- Develop the project with front end engineering included
- Have a good understanding of the codes and the cost they may have on your project
- Learn about others project execution process (FEL, Phased Approach, Stage-Gate Process, etc.)
- Develop a strong project scope early and allow for some detailed engineering during scope development

Closing Comments

As you start future projects consider the following suggestions:

- Determine the right contract strategy for your project
- Develop a realistic project schedule and determine the proper timing for release of equipment & construction contracts (release when proper amount of engineering complete).
- Establish the level of construction management that will be required and staff it with well qualified personnel.
- Follow your plan and drive the project with your schedule

Thank You!

Stop by and see us at Booth 215.

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