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Project Controls Expo – 13th Nov 2013
Twickenham Stadium, London

The Key Role of the Cost Engineer

Achieving an Integrated Work Process through a Holistic Mindset

by

Martin van Vliet

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COST ENGINEERING

About Martin van Vliet

- Cost Engineer/Sales Engineer at **Cost Engineering Consultancy**
- Degree:
  - Civil Engineer
- Years of Experience:
  - As a Cost Engineer and a Sales Engineer with **over 17 years of experience** in the field of cost estimating and cost engineering.
- Professional Field:
  - Member of the DACE
  - Chairman of DACE Labor Productivity Norms Workgroup
  - Team leader for planning, budgeting, contracting, cost estimating and management reporting for the services department. Software implementations and development and perform functional and technical specifications, requirement assessments, give training on the job and do presentations and showcases.

Agenda

- What is Cost Engineering?
  - Cost Estimating
  - Cost Control
- Challenges of the Modern Cost Engineer
- Achieving an Integrated Work Process through a Holistic Mindset

What is Cost Engineering?

AACEI defines Cost Engineering as:

"That area of engineering practice where engineering judgment and experience are utilized in the application of scientific principles and techniques to the problems of cost estimating, cost control and profitability".

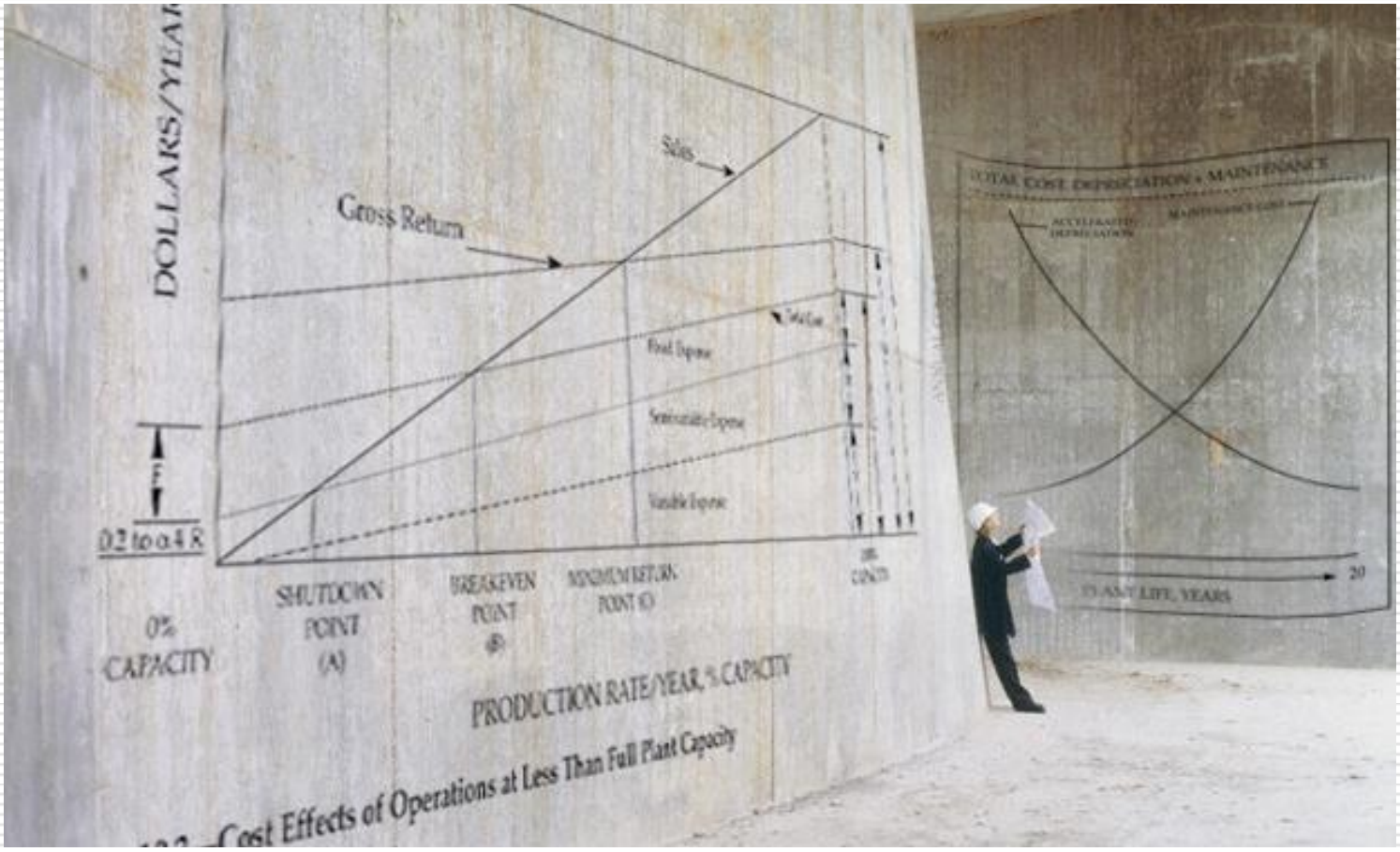
What is Cost Engineering?

The Profession of Cost Engineering:

Applying methods and techniques for:

- **Cost Estimating**
- **Cost control**
- Planning
- Contracting / Tendering
- Quantity survey
- Risk Assessment
- Value Engineering

Is Cost Engineering a Science?



Is Cost Engineering a Science?

Some advise:

- Keep it simple, Cost Engineering is not "Rocket Science"
- But it requires discipline!

Cost Is Everything

"It *costs* time"
"It *costs* resources"
" It *costs money*"

Everything invested
in assets and projects
is a Cost

Cost Estimating

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What is Cost Estimating?

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Can we predict the future based on the past?

Past performance is no guarantee for future results

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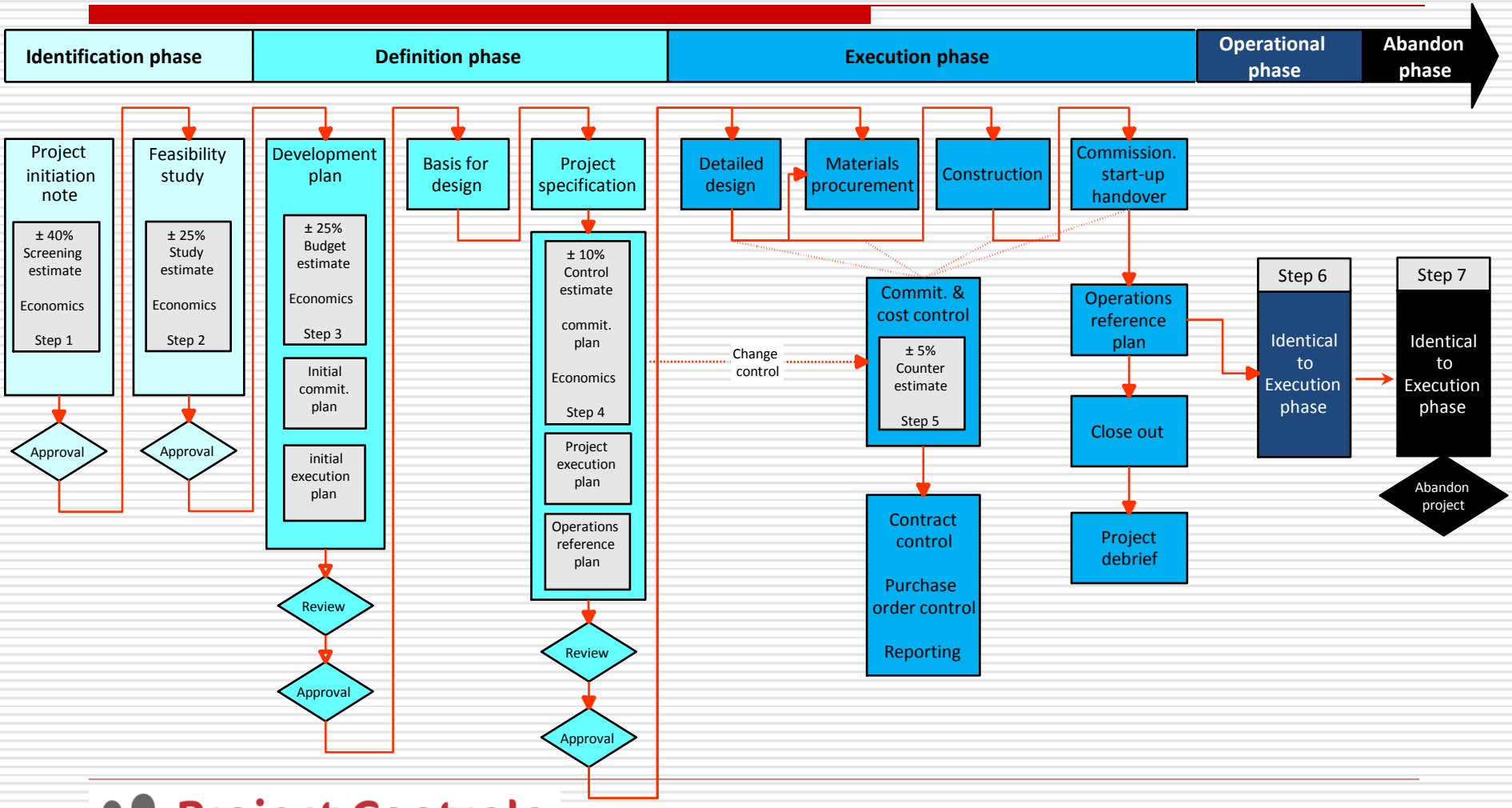
What Is Cost Estimating?

- "An evaluation of all the costs of the elements of a project or effort as defined by an agreed-upon scope." (AACE 10S-90)
- Cost Estimate
  - Involves assumptions and unknowns
  - Involves probabilities (and therefore ranges of costs)
  - Involves a given scope
    - Contingency covers variability within the defined scope - not changes in scope

Project Life Cycle



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What Is Accuracy?

- An estimate should not be regarded as a single point number (or cost)
- An estimate is a range of potential cost outcomes, and associated probabilities of occurrence
- Thus – the accuracy range of an estimate is a probabilistic assessment of how far a project's final actual cost can be expected to vary from the estimate
  - The range is driven by risks

Cost Estimating Classification (AACEI)

Cost Estimate Classification System

	Primary Characteristics		Secondary Characteristics		
Estimate Level	Level of Project definition	End Usage	Methodology	Expected Accuracy Range	Preparation Effort
5	0% to 2%	Concept Screening	Capacity factored Parametric Models, Judgment or analogy	L: -20% to -50% H: +30% to +100%	1
4	1% to 15%	Study or Feasibility	Equipment factored or Parametric Models	L: -15% to -30% H: +20% to +50%	2 to 4
3	10% to 40%	Budget, Authorization or Control	Semi-detailed unit cost with assembly level line items	L: -10% to -20% H: +10% to +30%	3 to 10
2	30% to 70%	Control or Bid / Tender	Detailed Unit Cost with Forced Detailed take-off	L: -5% to -15% H: +5% to +20%	4 to 20
1	50% to 100%	Check Estimate or Bid / Tender	Detailed Unit Cost with Detailed take-off	L: -3% to -10% H: +3% to +15%	5 to 100

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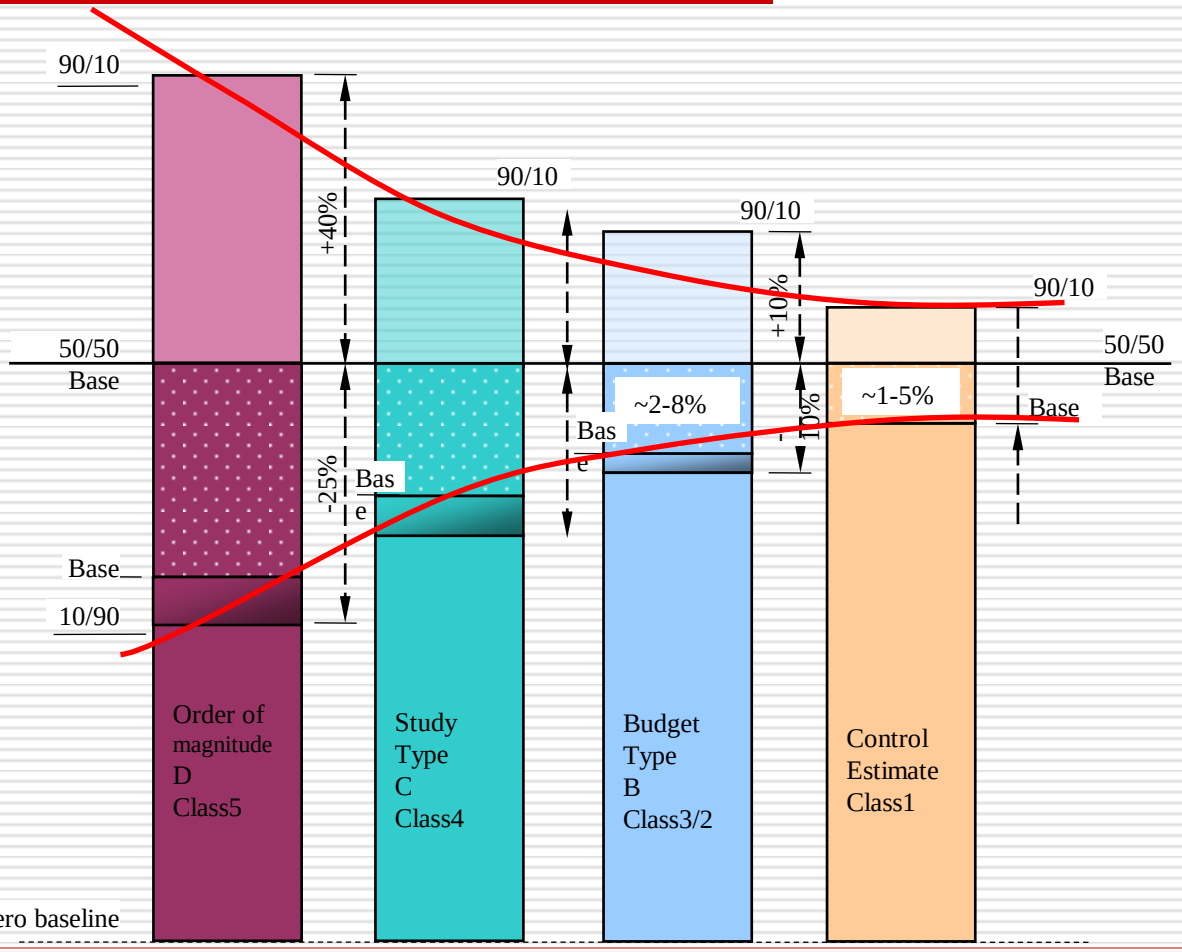
Accuracy Level of the Estimate



What Defines the Accuracy of a Cost Estimate?

Influences on the estimate

- Scope definition
- Knowledge of the cost engineer
- Tools
- Database
- Risk
  - Systemic Risk
  - Project Specific Risk
- Market influences

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Baseline of Cost Control

"Measurements are the key. If you cannot measure it, you cannot control it. If you cannot control it, you cannot manage it. If you cannot manage it, you cannot improve it." - **James H. Harrington**

Budgets are Always Under Pressure

What happens with too much pressure?

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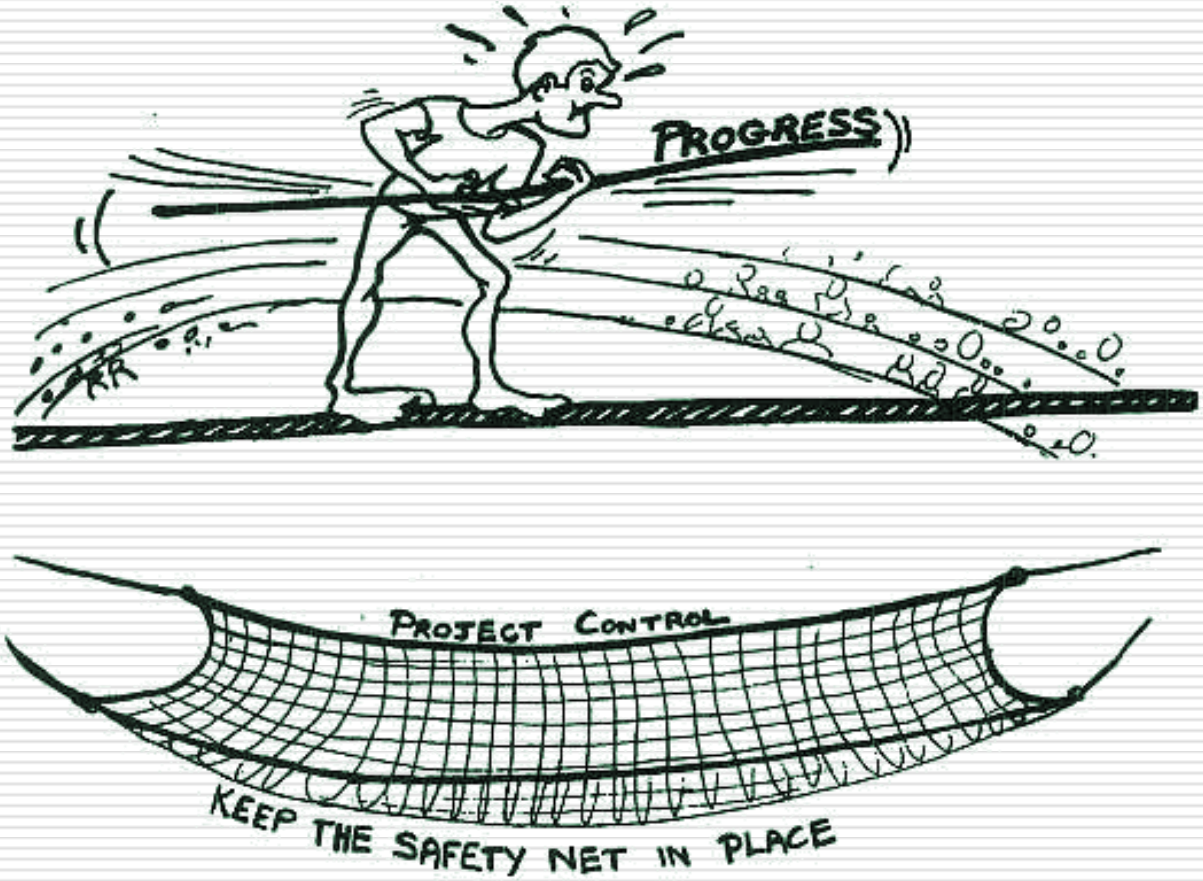
Cost Control

Cost Control



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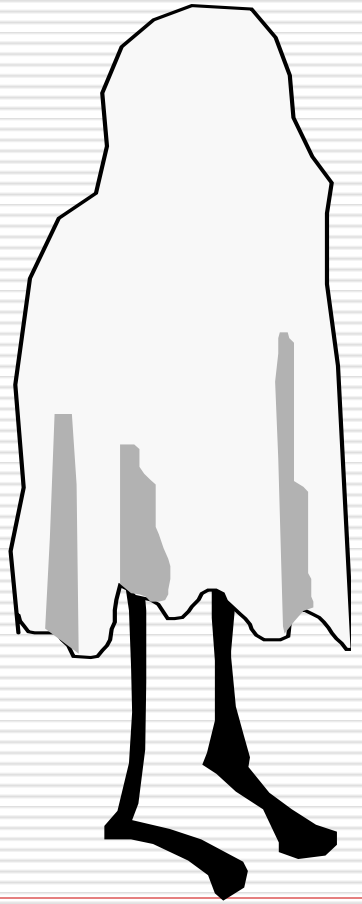
What Is Cost Control?

There are two processes used for controlling the costs of the project.

1. Change Management – a formal process that identifies any requested (or un-requested) changes to the contract.
2. Forecasting – predictions of the costs at completion for any cost elements in progress or not yet started.

Change Management



Don't run and hide !!!

All changes shall be documented, regardless if no net change in schedule or cost has happened.

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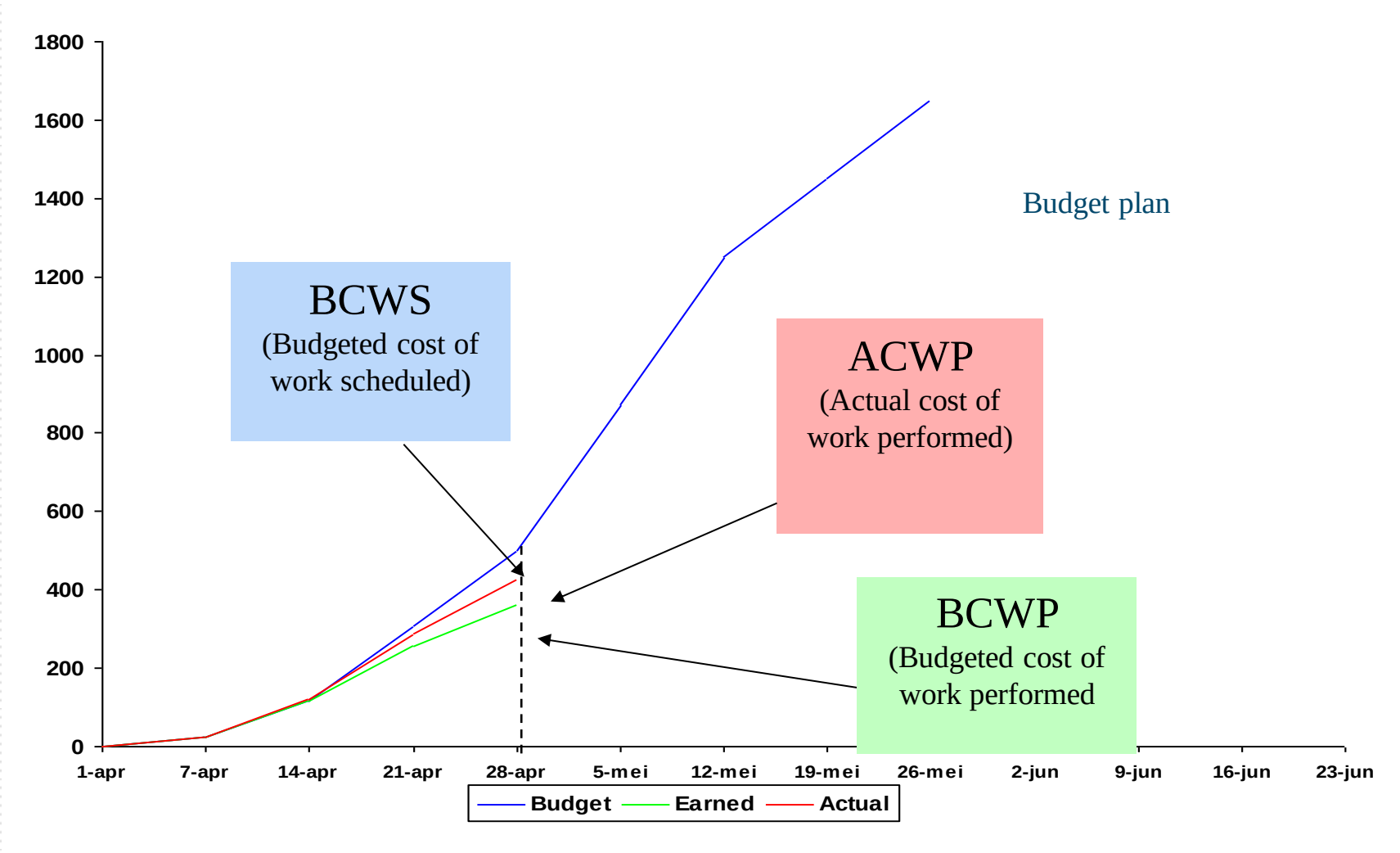
What Is Forecasting?

Forecasts are much like estimates. Whereas an estimate is always for future activities and assets, forecasts are predictions of the costs at completion for cost elements in progress.

Earned Value, Budget & Schedule Forecasting



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Challenges of the Modern Cost Engineer

A day in the office

Telephone rings.....

A business partner !!!!

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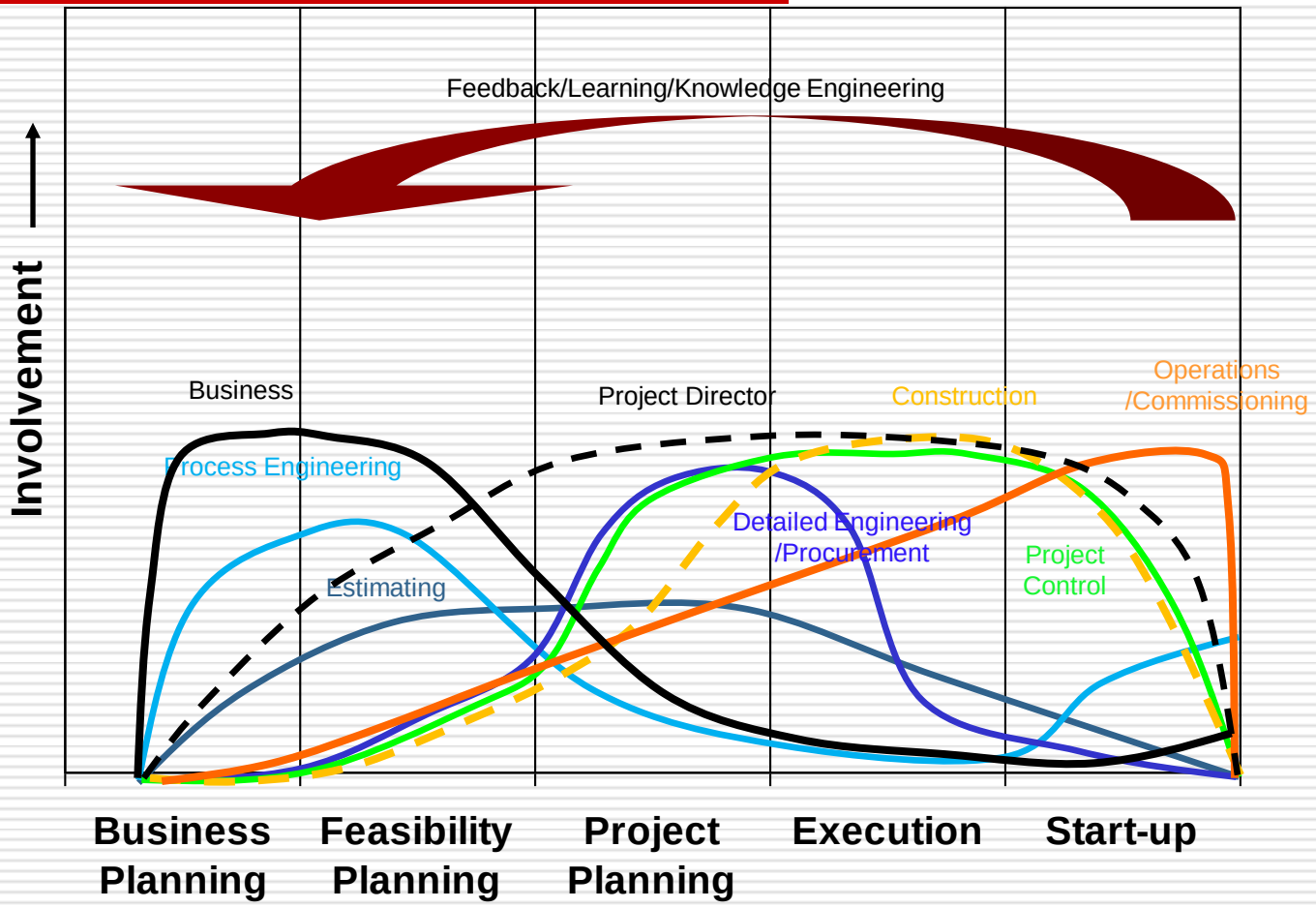
Involvement Process for Technical Projects



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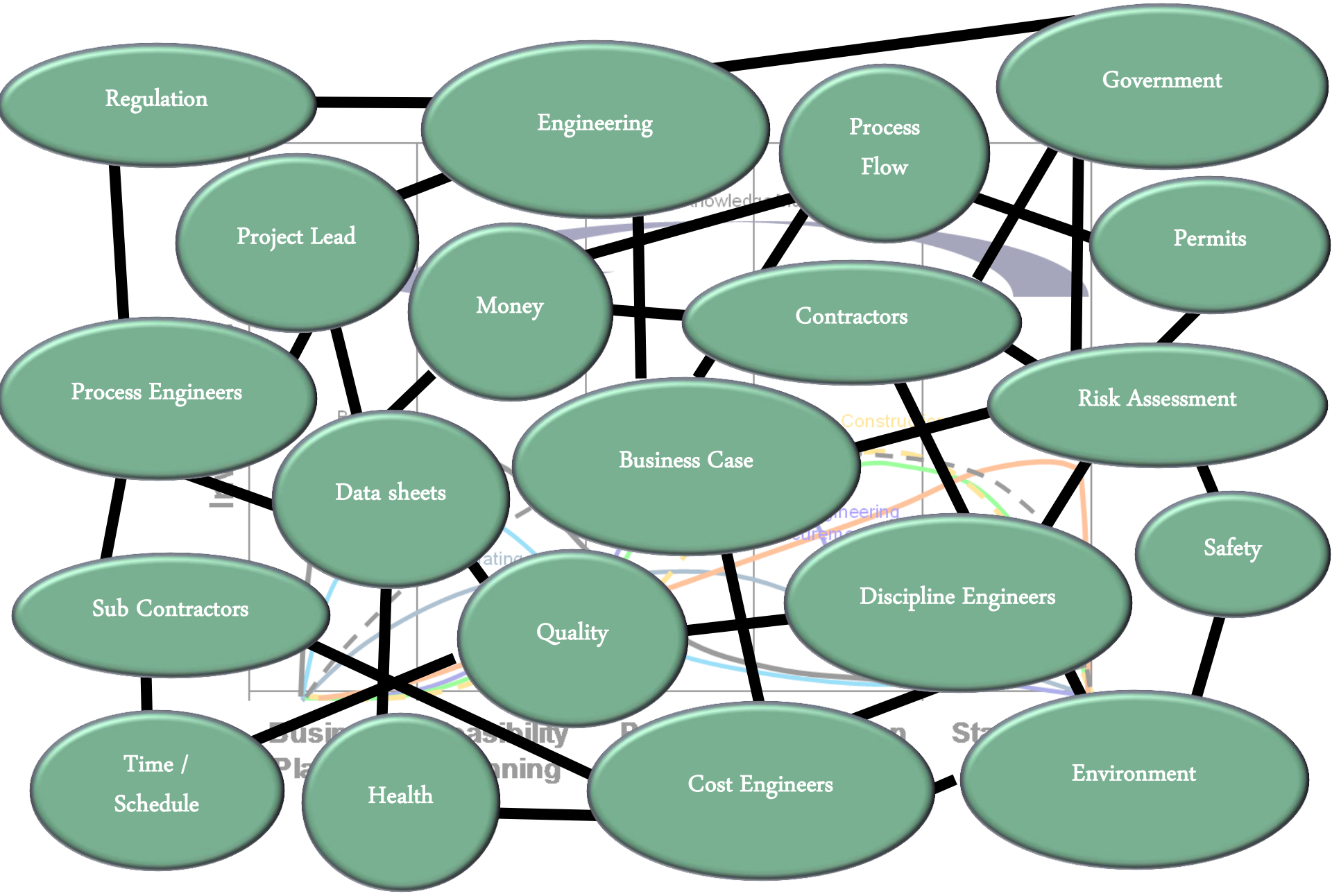
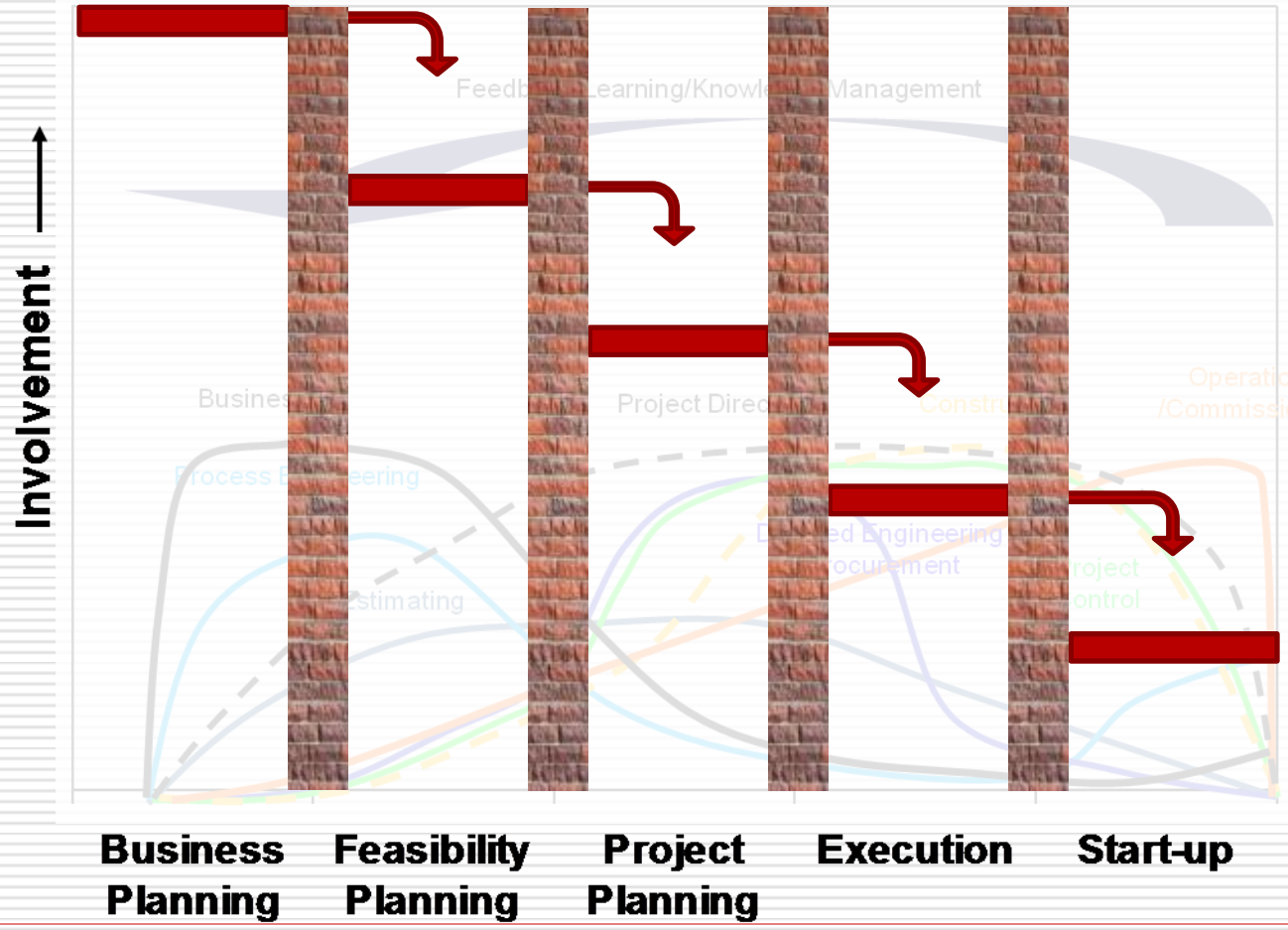
Involvement Process for Technical Projects



Current approach to deal with complexity (over the wall syndrome)



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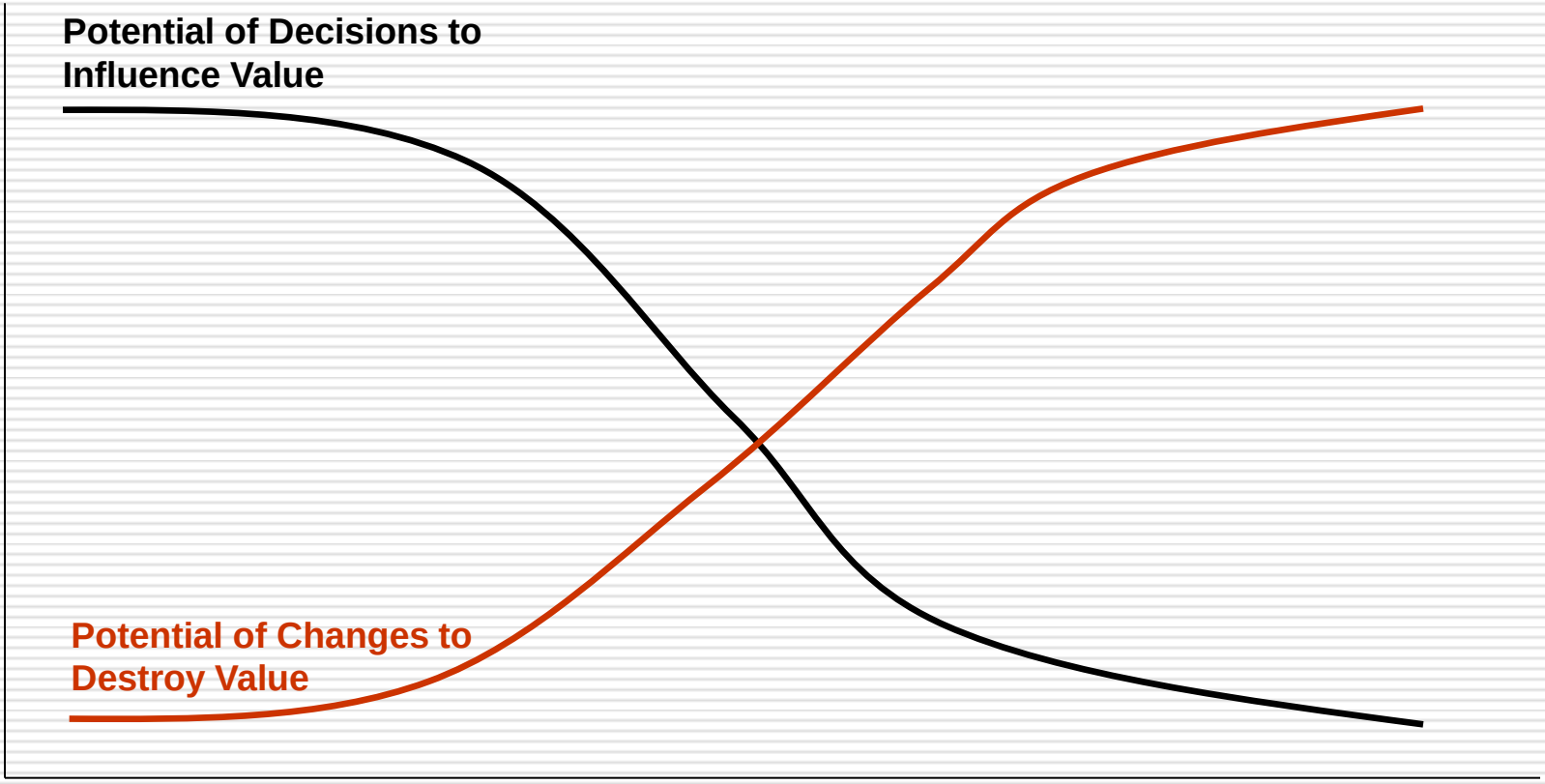
Common Problem with Current Approach



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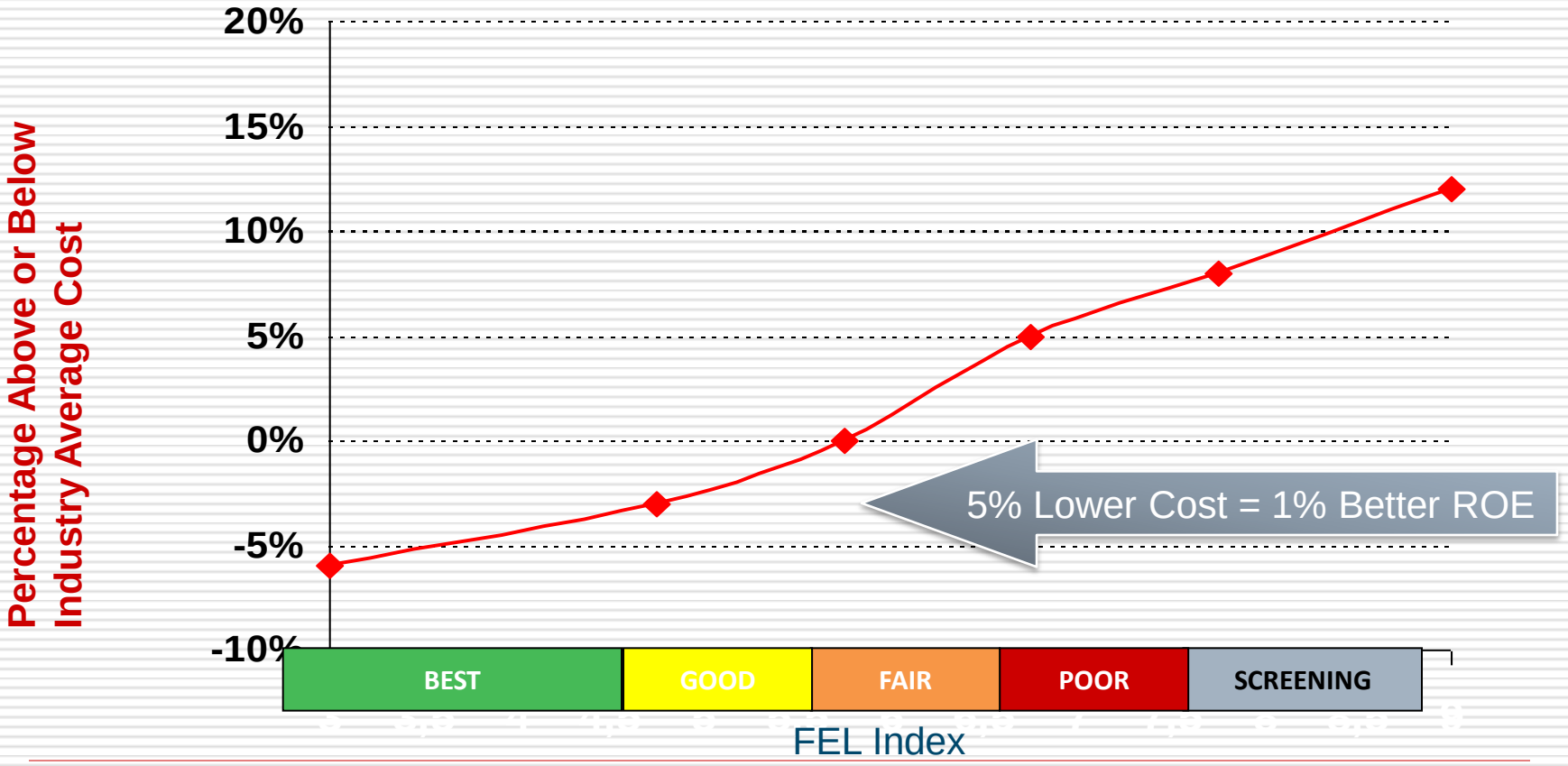
Better Scope Definition Drives Better Absolute, Bottom-Line Cost Performance

Front End Loading (FEL)

From: *Hollmann, John K., Best Owner Practices For Project Control, 2002 AACE Transactions*



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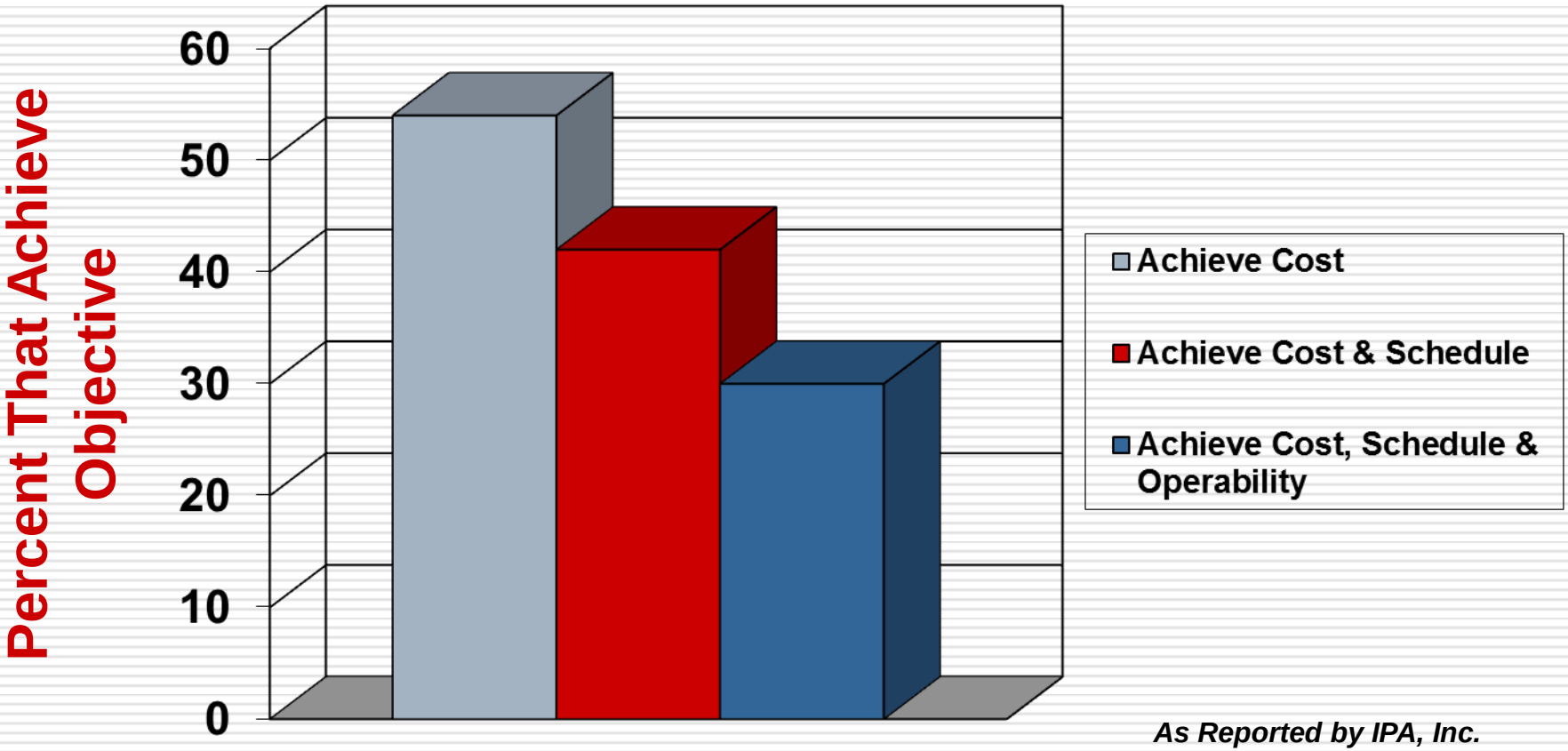
Less than 30% of Projects Achieve All Business Objectives



As Reported by IPA, Inc.

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Achieving an Integrated Work Process through a Holistic Mindset

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From only calculating to…

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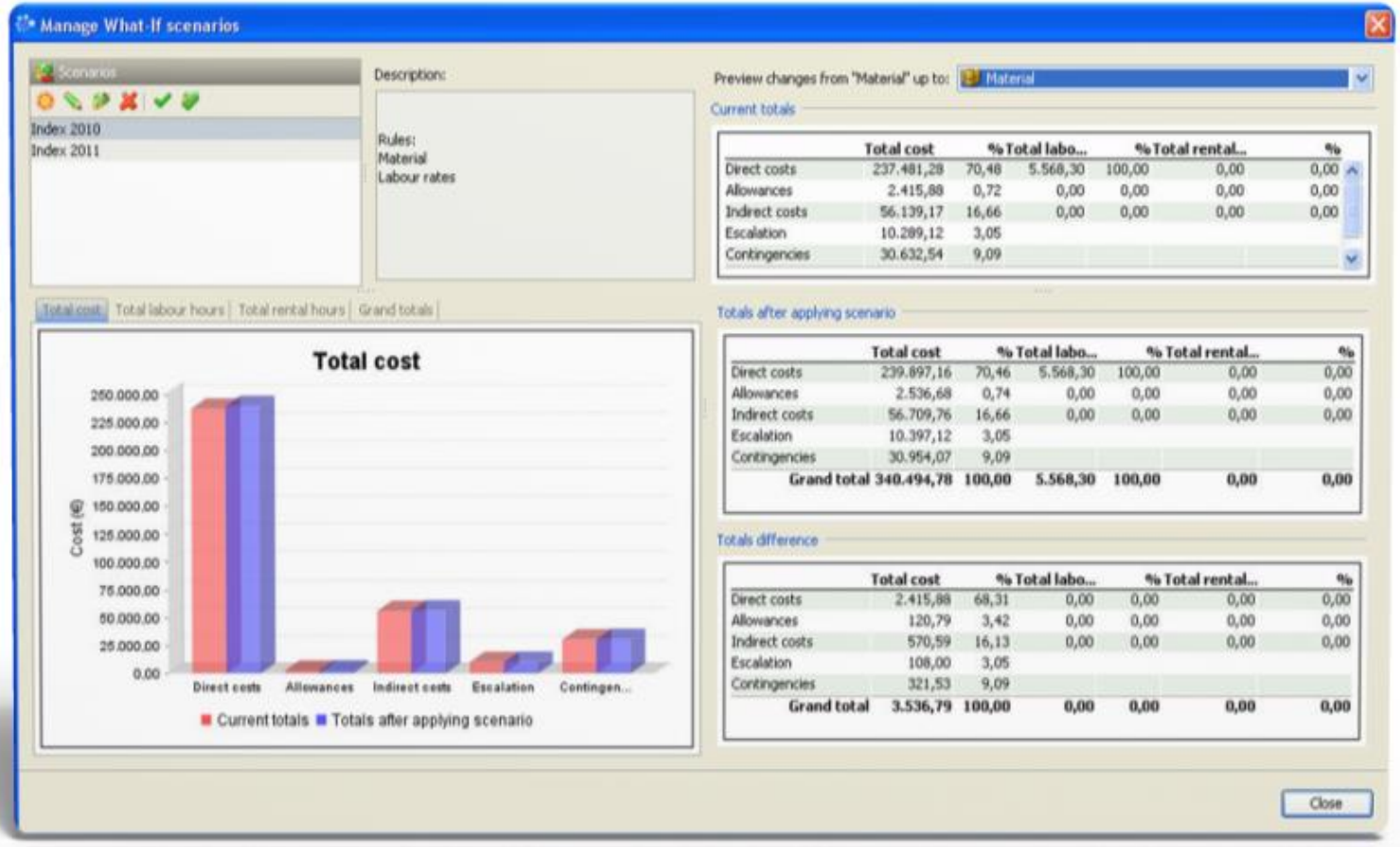
… What-if Analysis



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Regression Analysis

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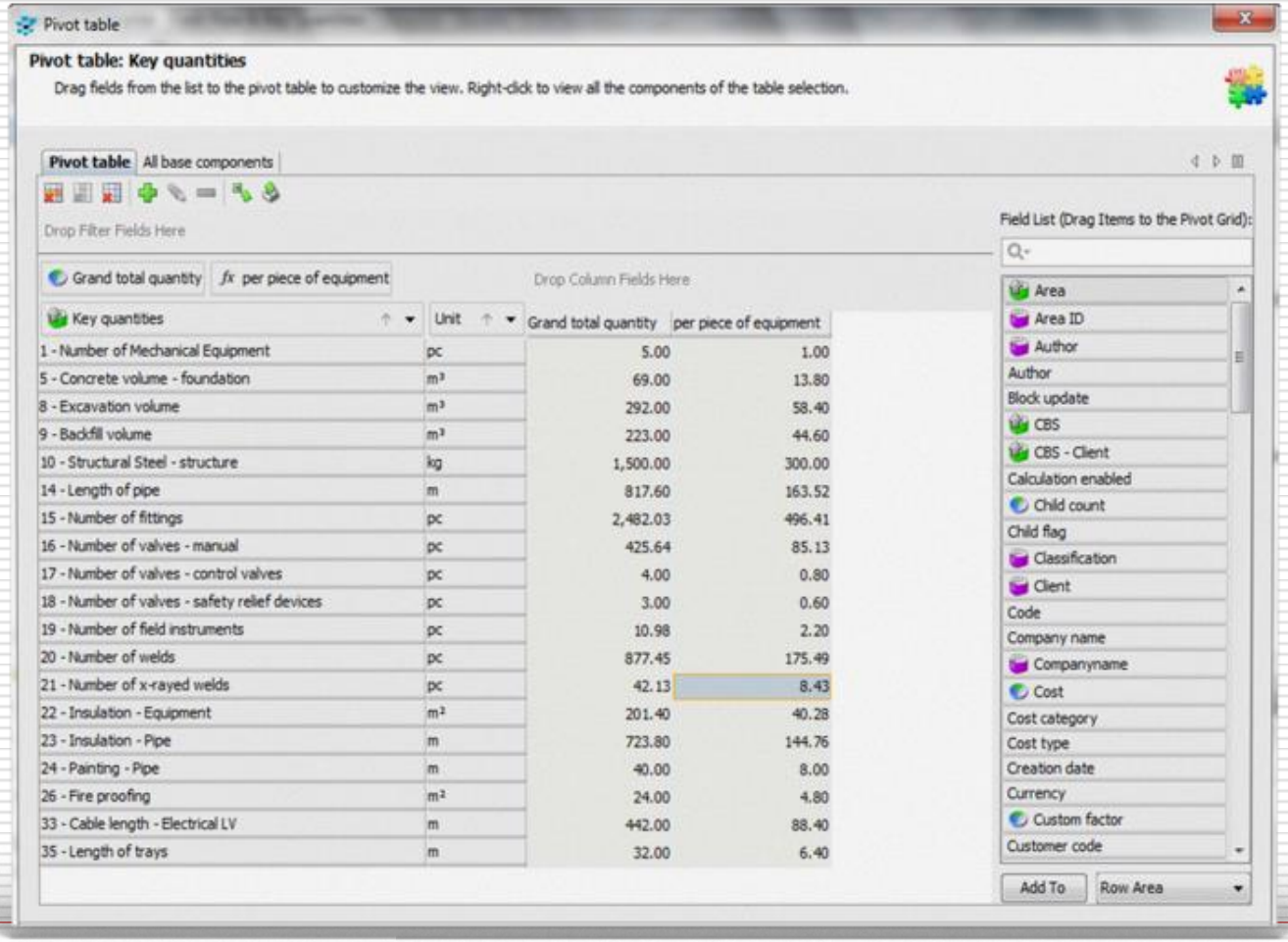
Key Metrics Analysis



Key quantities	Unit	Grand total quantity	per piece of equipment
1 - Number of Mechanical Equipment	pc	5.00	1.00
5 - Concrete volume - foundation	m³	69.00	13.80
8 - Excavation volume	m³	292.00	58.40
9 - Backfill volume	m³	223.00	44.60
10 - Structural Steel - structure	kg	1,500.00	300.00
14 - Length of pipe	m	817.60	163.52
15 - Number of fittings	pc	2,482.03	496.41
16 - Number of valves - manual	pc	425.64	85.13
17 - Number of valves - control valves	pc	4.00	0.80
18 - Number of valves - safety relief devices	pc	3.00	0.60
19 - Number of field instruments	pc	10.98	2.20
20 - Number of welds	pc	877.45	175.49
21 - Number of x-rayed welds	pc	42.13	8.43
22 - Insulation - Equipment	m²	201.40	40.28
23 - Insulation - Pipe	m	723.80	144.76
24 - Painting - Pipe	m	40.00	8.00
26 - Fire proofing	m²	24.00	4.80
33 - Cable length - Electrical LV	m	442.00	88.40
35 - Length of trays	m	32.00	6.40

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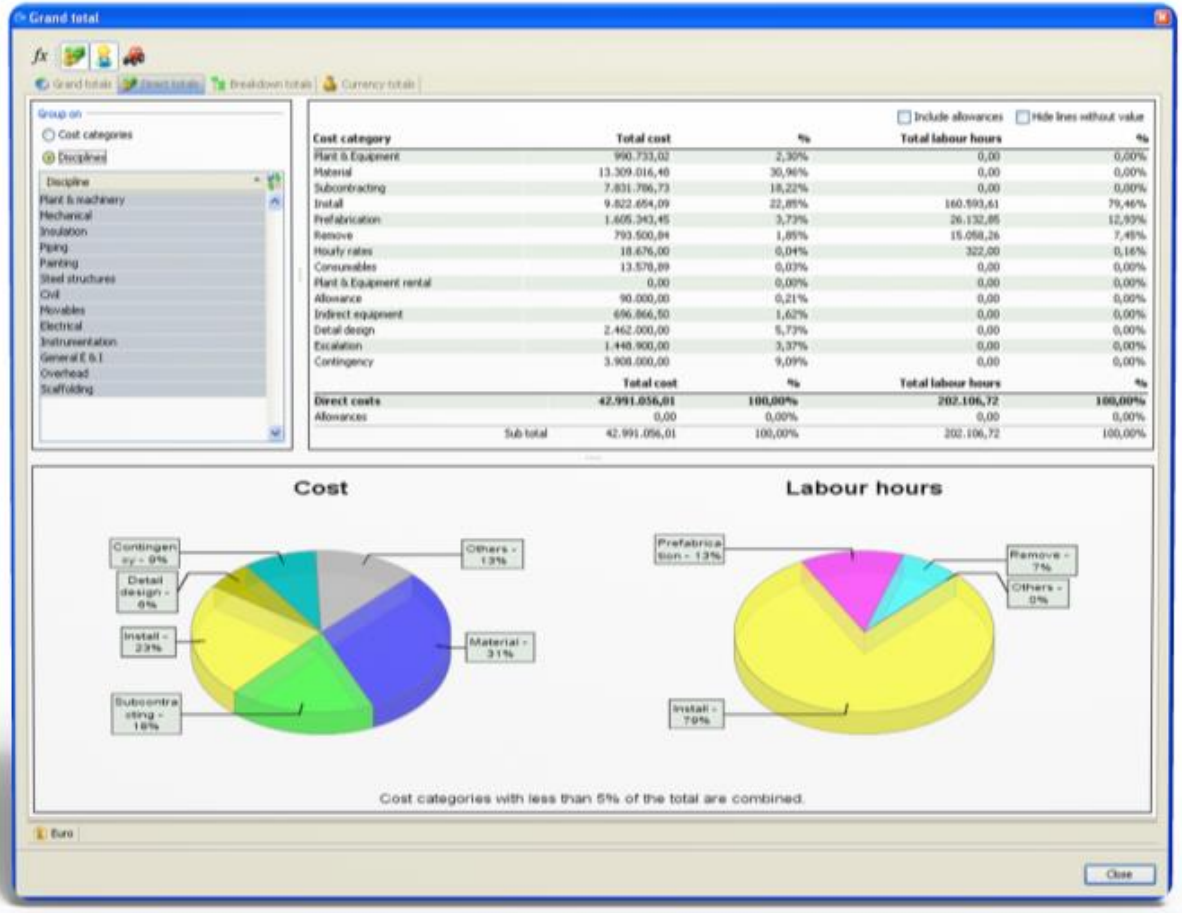
From Just Estimating, to…



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… Solution in 4D or 5D Interfacing (BIM)

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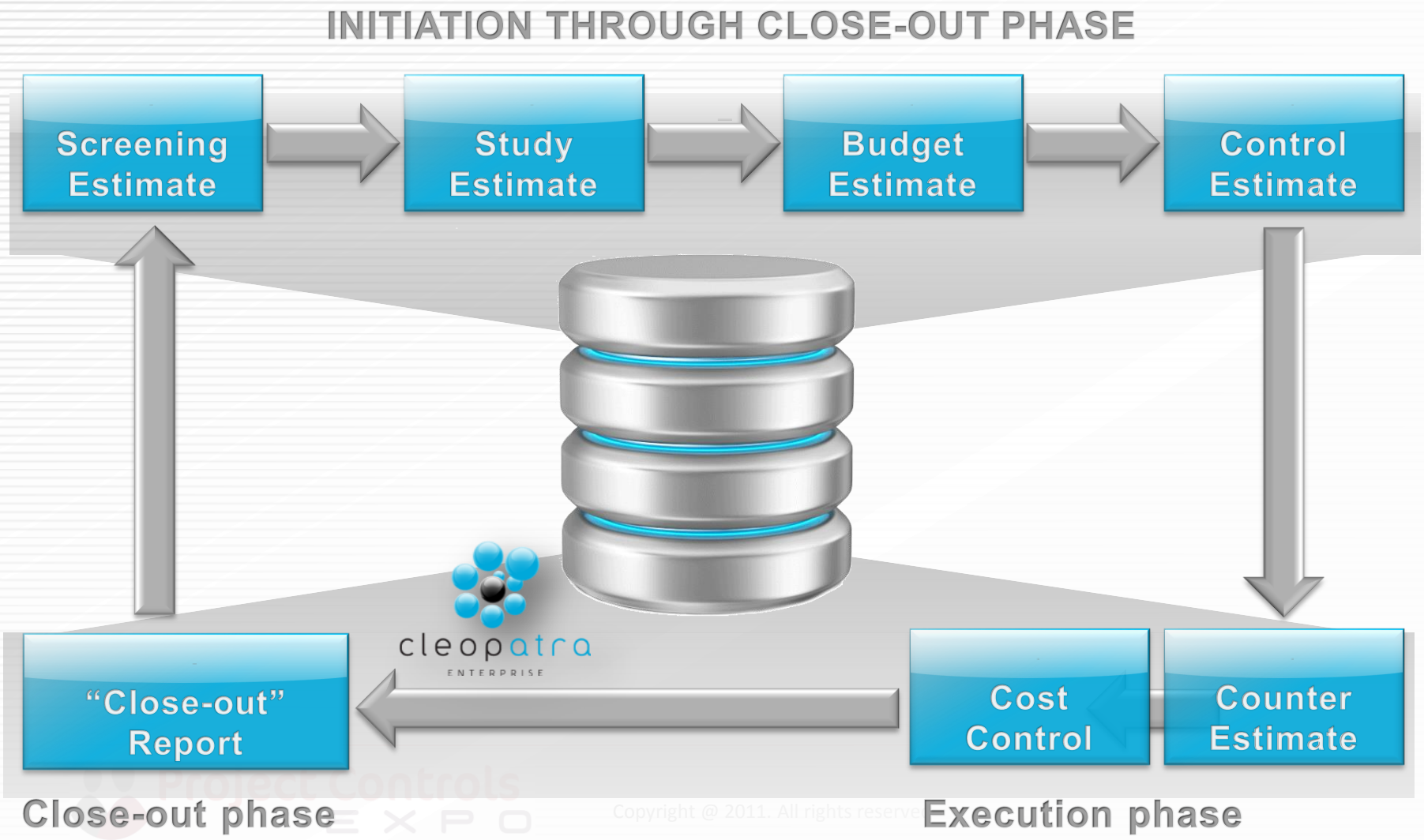
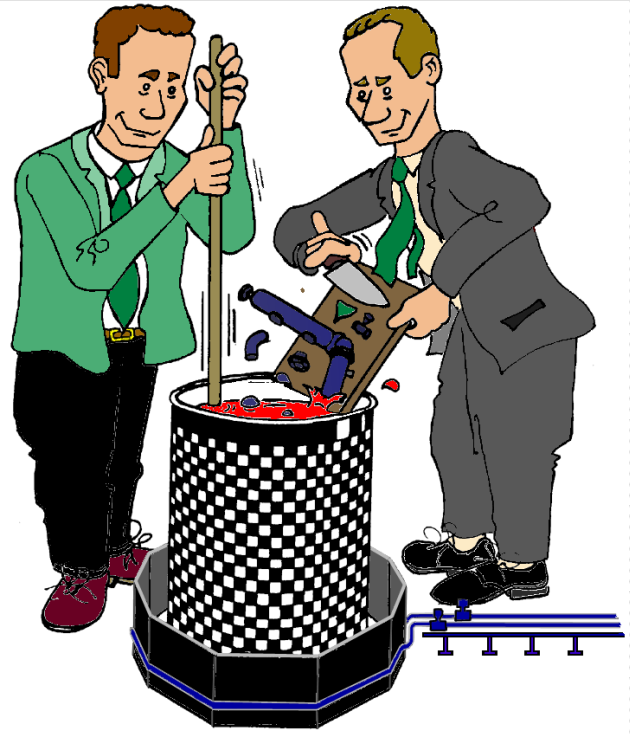
Estimating Cycle: The Ideal Scenario



From Specialist to All-Round Cost Engineer

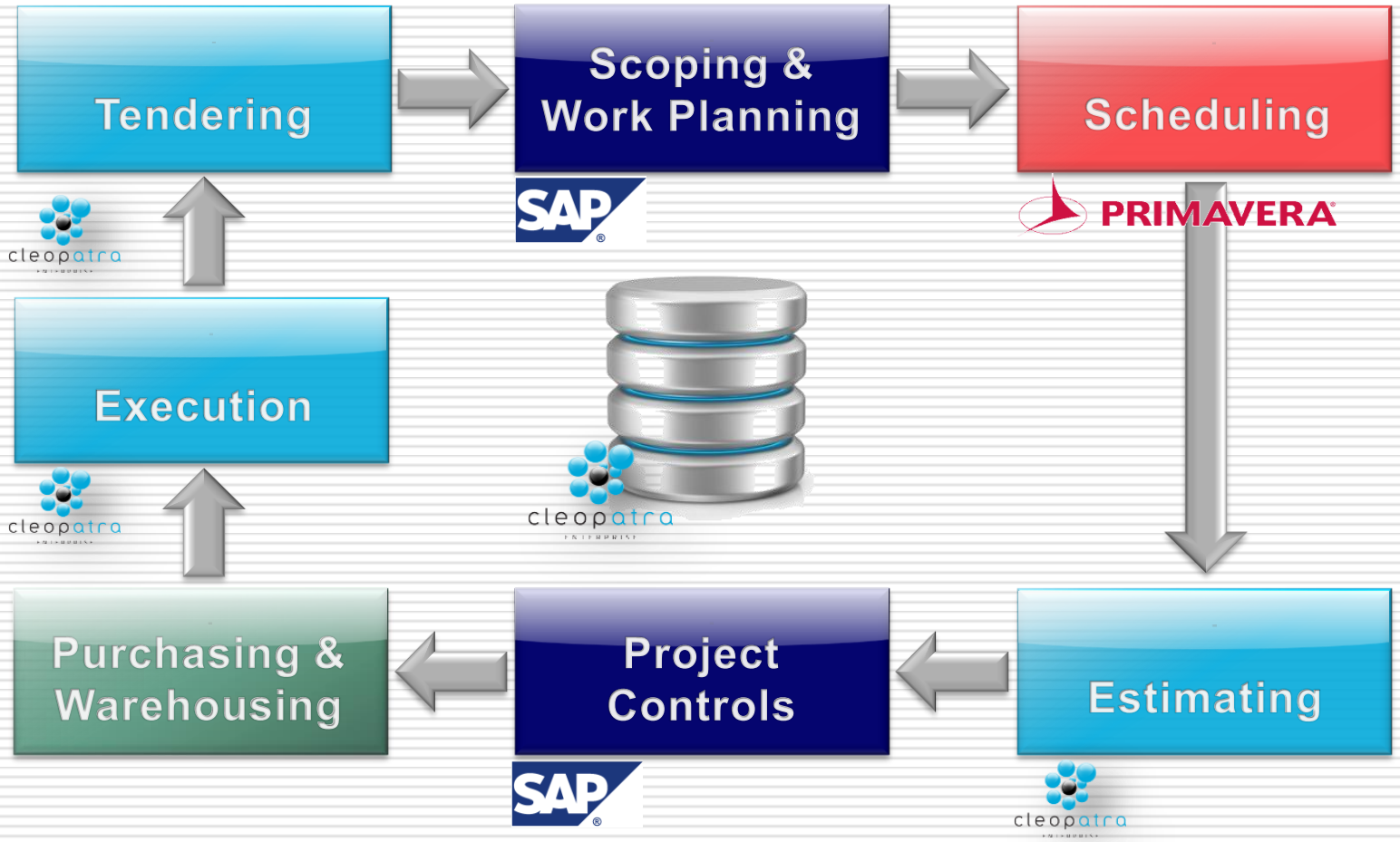
Mixing all different ideas together



Continuous Improvement Cycle

- A process for collecting, maintaining, and analyzing project historical information so that it is ready for use in an effective form by each functional process
- Empirical information is the most fundamental project planning resource available
- It is manifested in the form of quantified and documented historical data and information
- The purpose is not to repeat history, but to learn from it (continuous improvement)

Typical Integrated Work Process



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Integrated Work Process

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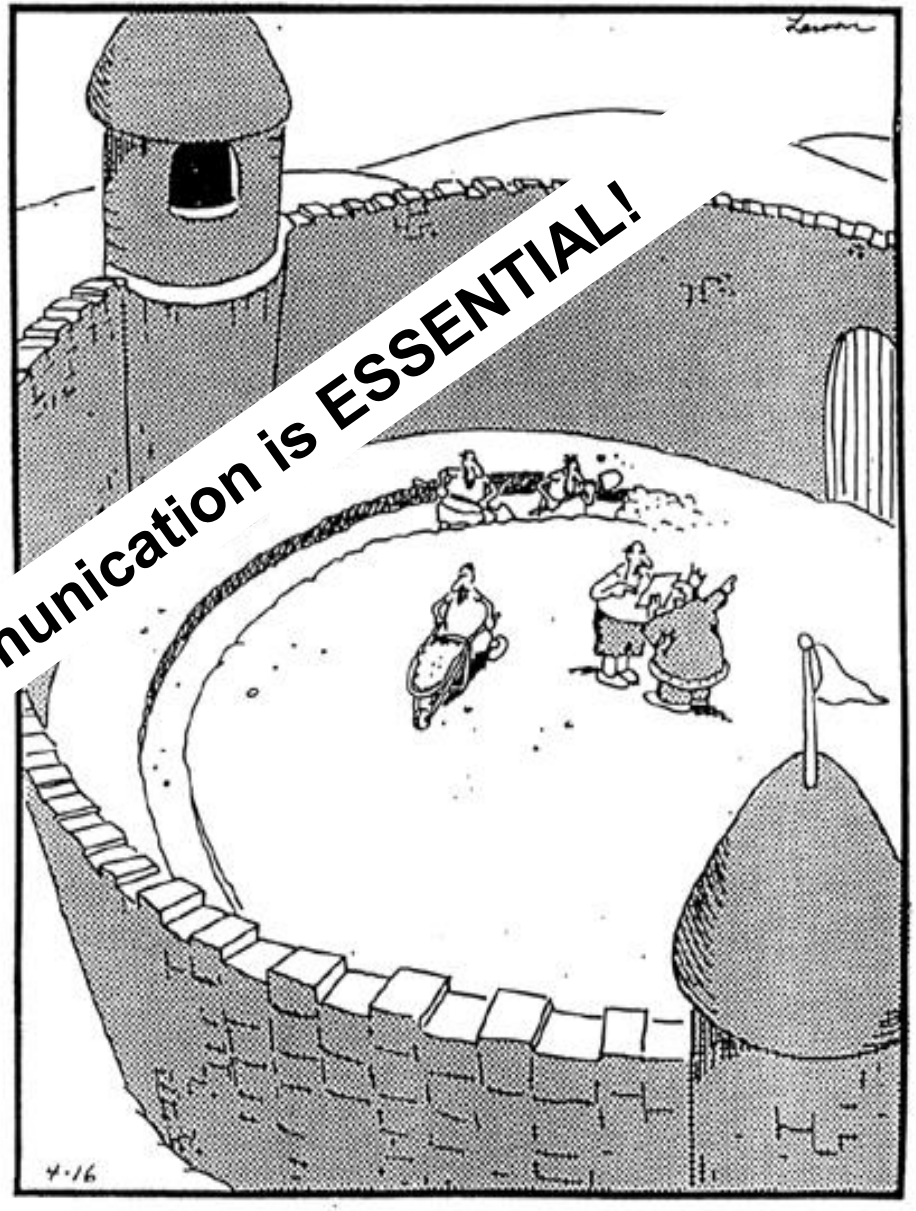
Suddenly, a heated exchange took place between the King and the project manager

What was objective?

"dig a ditch next to t
castle wal
o
"defend t astle from
ack"

Good Scope and Communication is ESSENTIAL!



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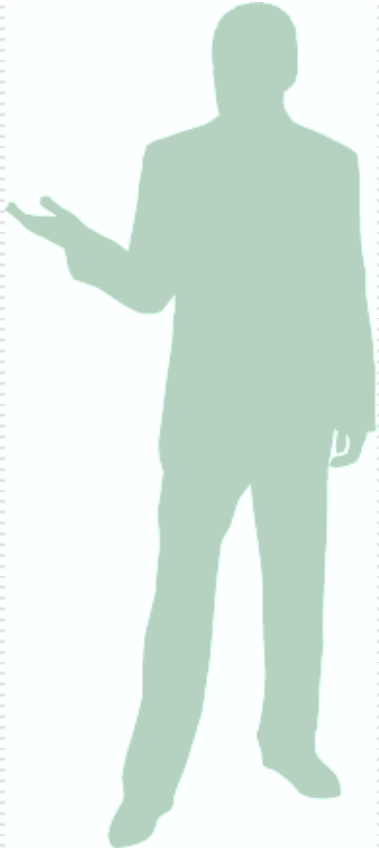
Questions?



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