Never Waste a Perfectly Good Crisis:
Improving Productivity When Uncertainty is High

COAA Best Practices Conference XXIII

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Introductions

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Framing the issue

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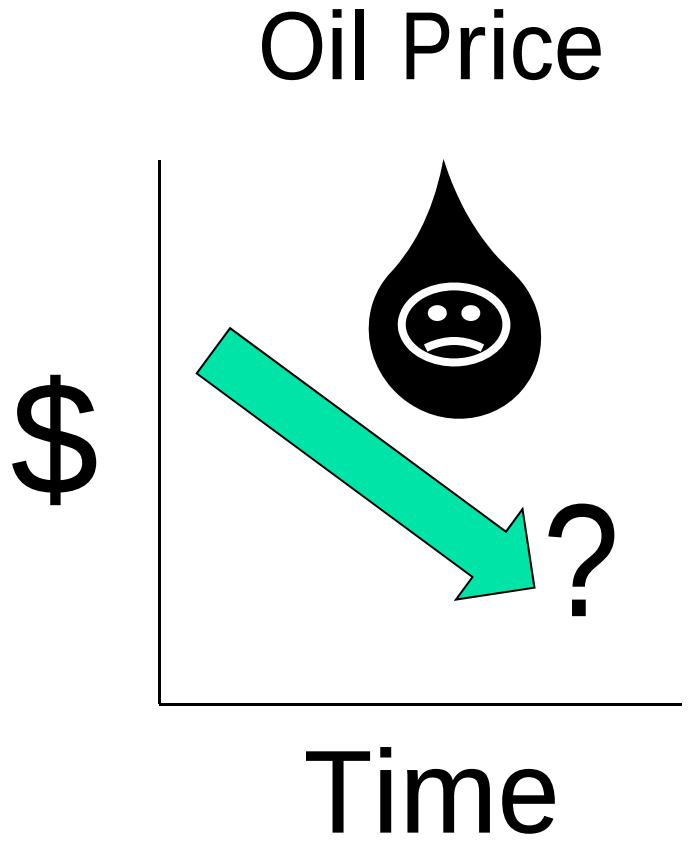
We are fast approaching a crisis in Alberta

Big companies are pulling the plug on their projects in Alberta's tar sands



Statoil halts multibillion-dollar Alberta oil sands project

Norway's Statoil ASA has shelved a multibillion-dollar oil sands project, **blaming rising construction costs** and the repeated delays in new export pipelines that would boost the value of Canadian heavy crude oil

Total shelves $11-billion Alberta oil sands mine

The **Joslyn oil sands mine** has been shelved indefinitely, a **result of rising industry costs** that made the $11-billion project financially untenable.

Total to Take $1.65 Billion Loss on Canada Oil-Sands Project

March 28 (Bloomberg) -- Total SA, Europe's third-biggest oil company, will book a $1.65 billion loss in the first quarter on the canceled **Voyageur Upgrader project** in Canada's oil sands after selling its stake to Suncor Energy Inc.

Shell halts work on Pierre River oil sands mine in northern Alberta

Cut Costs or Face Death Spiral

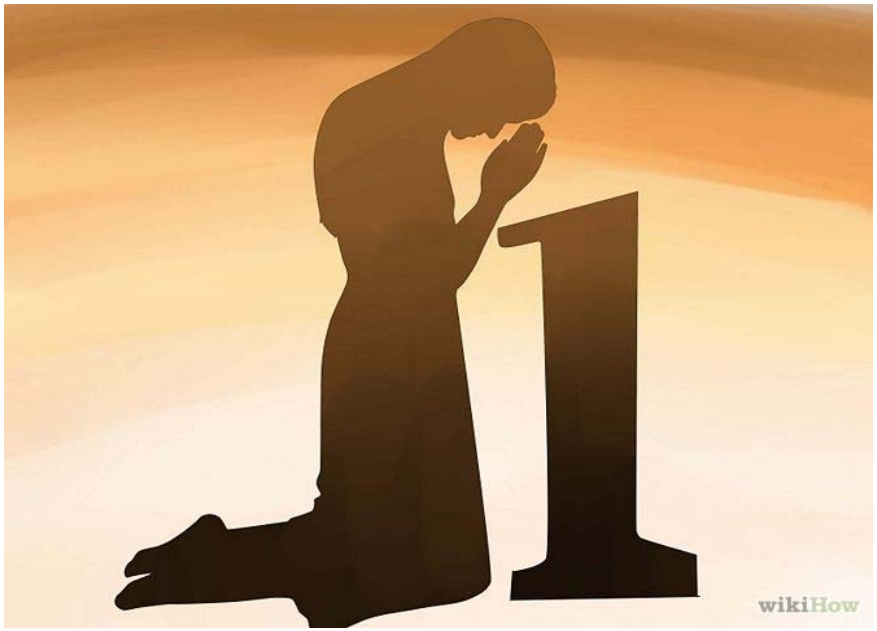
- "The made in Fort McMurray" cost of doing business has risen too quickly and must end.
- Oil sands producers were making three times the profit in 2004 when a barrel of oil cost about $40(US) than it did when price hit close to $100 in 2013.
- The rising costs from suppliers, and not world oil prices, were the reason that CNRL and others could no longer produce the profits it once did.
- .. Oil sands can only avoid collapse if the people in the room – contractors and service industry representative – begin to cut costs.
- An opportunity for every part of industry to cut costs and eliminate inefficiencies that were allowed to creep in when business was booming."

Steve Laut President of CNRL

Globe and Mail, February 19, 2015, by Peter Scowen

Confession

- We all got it wrong!
  - Academics and industry
- We focus on the wrong issues!!!



Mega Oil Sands Projects

- No major problems re quality *and we are getting better at* safety
- Projects running in excess of design capacity
- Hardworking people
- No unskilled or unprofessional conduct
- Proud of Alberta's achievements

Mega Oil Sands Projects

- **Size and interfaces**
- **Technological complexity**

Mega Oil Sands Projects

Typical project cost allocation:

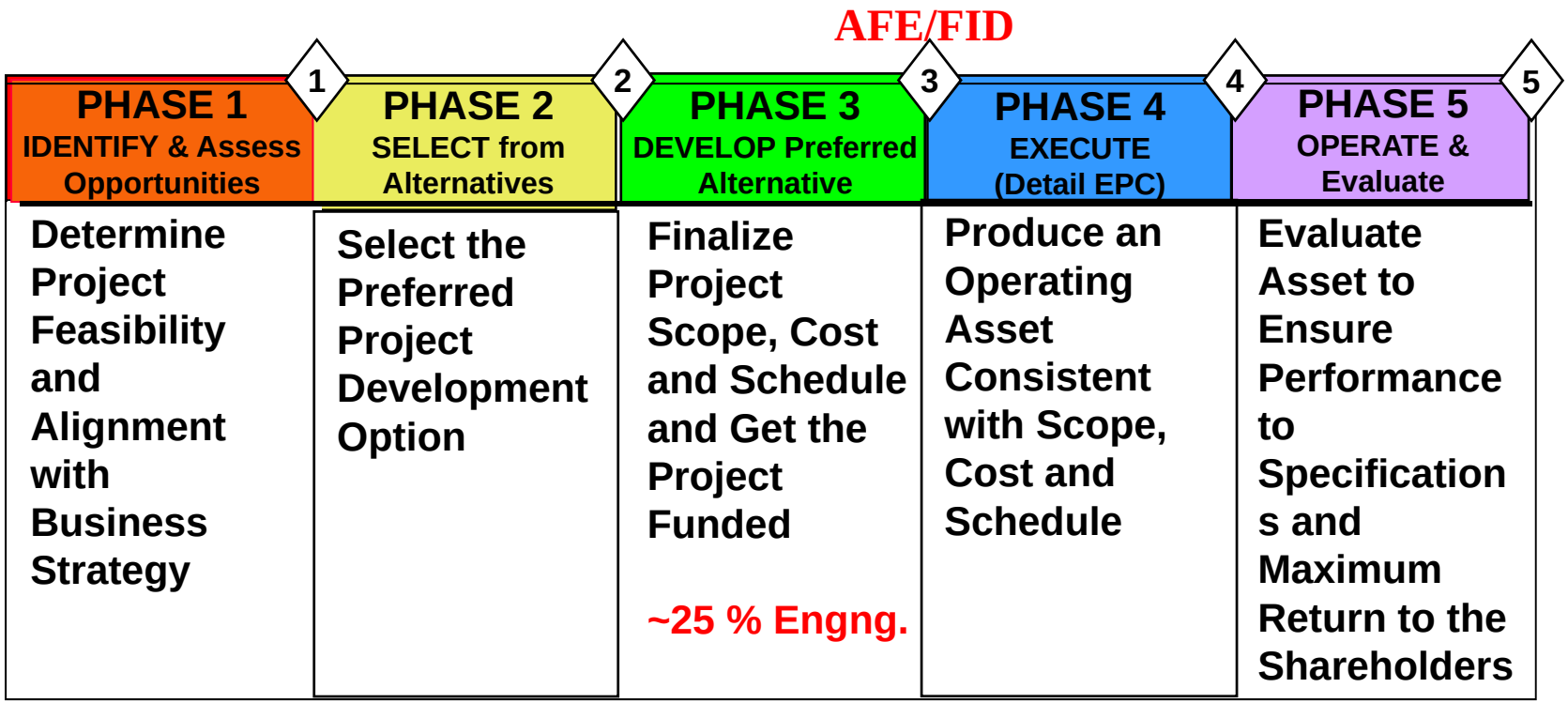
- Engineering: 8 – 15%
- Equipment: 32 – 35%
- Construction: 50 – 60%

Engineering is the smallest % with the biggest impact.

Warning Signs that we are repeating the same mistakes

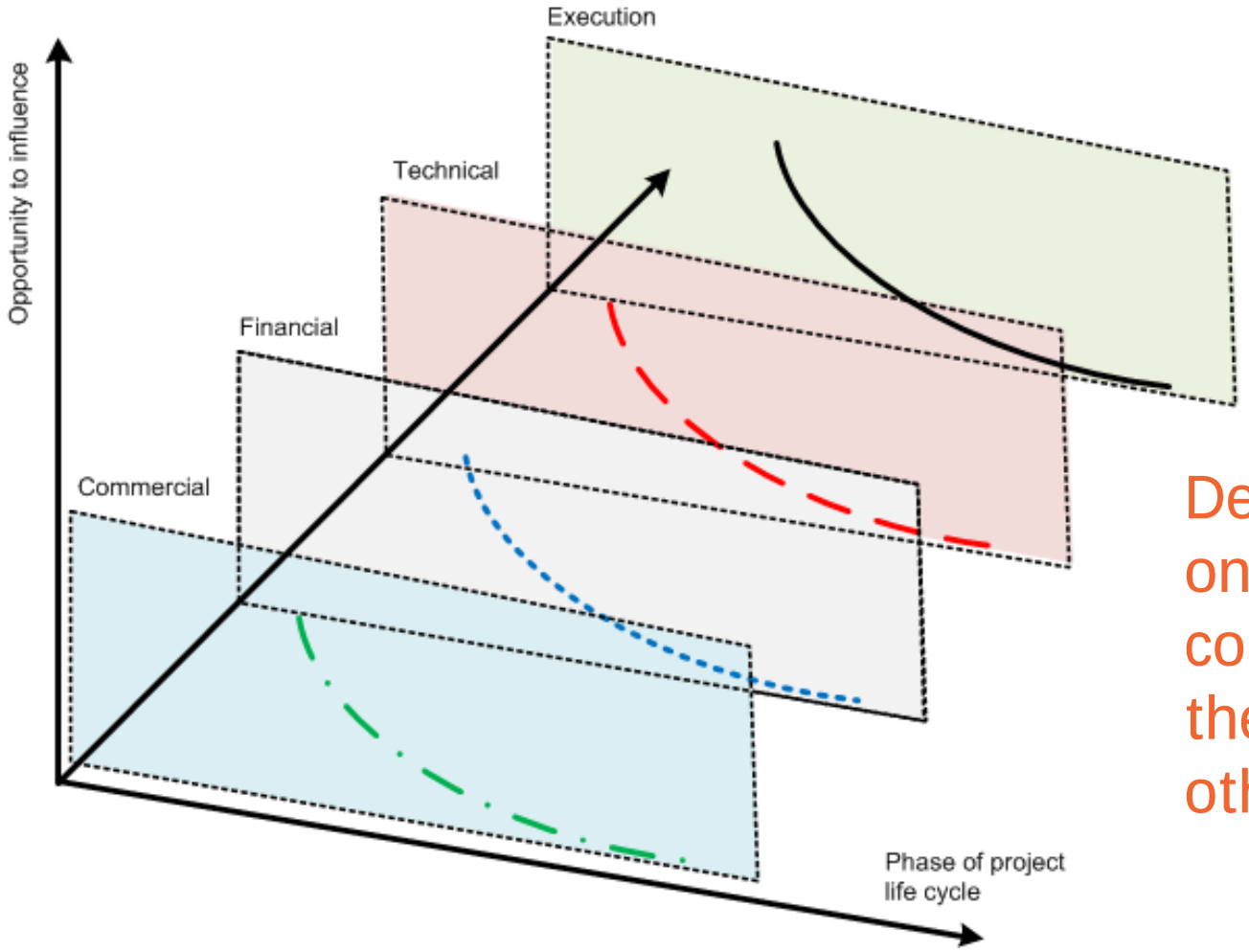
1. Project delivery model/Gated process
2. The four planes of decision process
3. Fast-tracking
4. Delays in engineering
5. Huge number of changes and project re-estimates
6. Contingencies and allowances

1. Project Delivery Model



25 % engineering is not enough to provide the required accuracy in the AFE budget!!!

2. The Four Planes of Decision Process



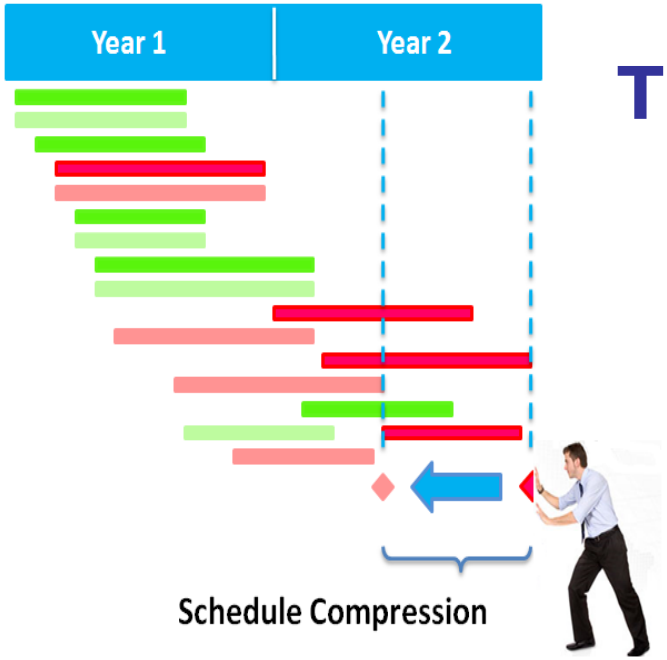
Decisions made in one plane without consideration of the impact on the other plane

2. The Four Planes of Decision Process: Examples

- Decision to fabricate in Korea
- Pipeline company accepts unrealistic completion deadline
- Business units impose unreasonable budget number or completion date.

Example: Unrealistic Cost Estimates

3. Project Fast-tracking



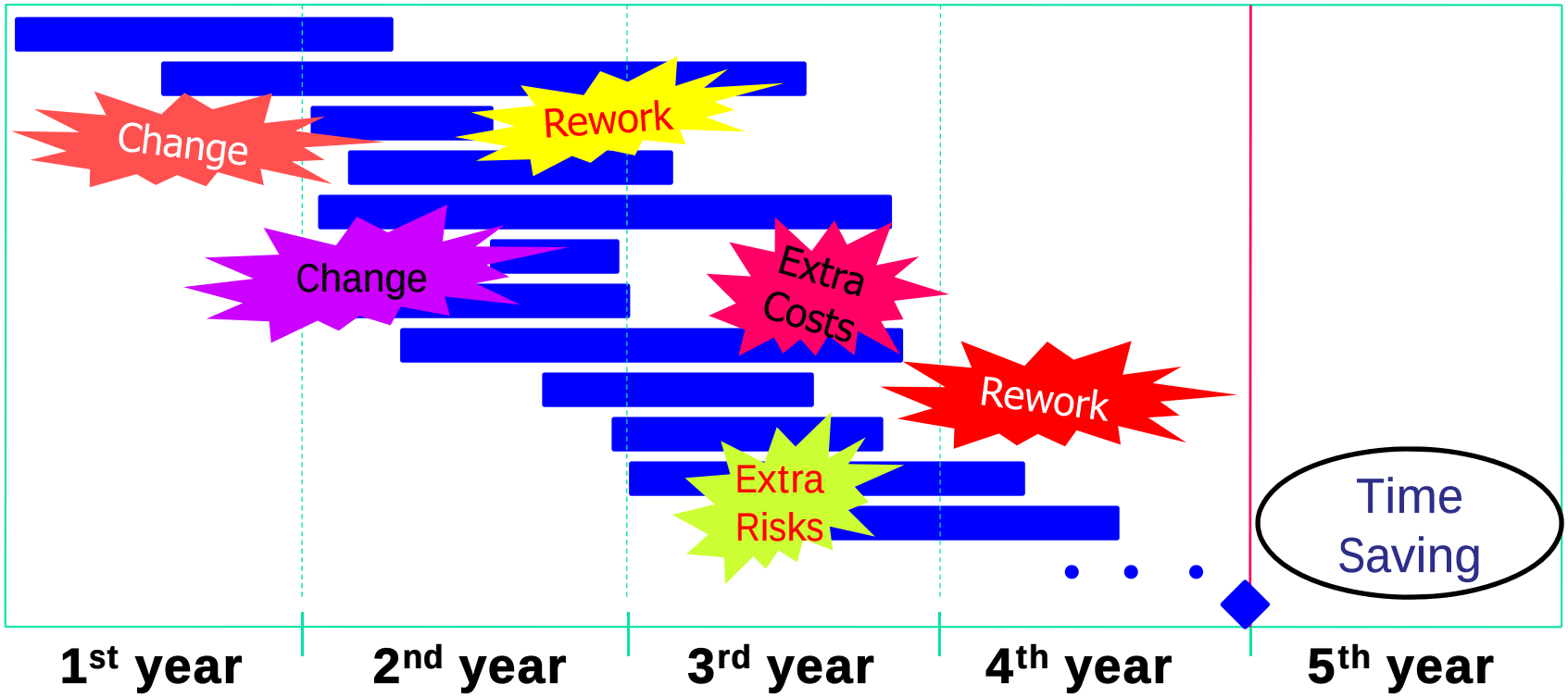
Time is Money

Shorter Project Duration ➡ **More Business Benefits**

Photo: colourbox.com

3. Project Fast-tracking

Very costly!!



3. Project Fast-tracking

Fast tracking results in:

- Poor/incomplete scope definition
- Underestimation/under appreciation of project complexity
- Unrealistic expectations re cost and schedule
- Inadequate plan of execution
- Changing customer requirements
- Lack of understanding the costs of changes
- Little constructability input
- Cost reimbursable contracts
- Lower than anticipated labour productivity.

4. Delays in Engineering

Delays in achieving early key engineering milestones:

- Substantial Completion of Engineering
- Freezing Process Flow Diagram's (PFD's)
- P&ID issued for design

What happens to the final completion date?

5. Changes and Project Re-estimates

- Huge number of changes and extras
- Project re-estimates after AFE

What happens to the final completion date?

6. Contingencies & Allowances

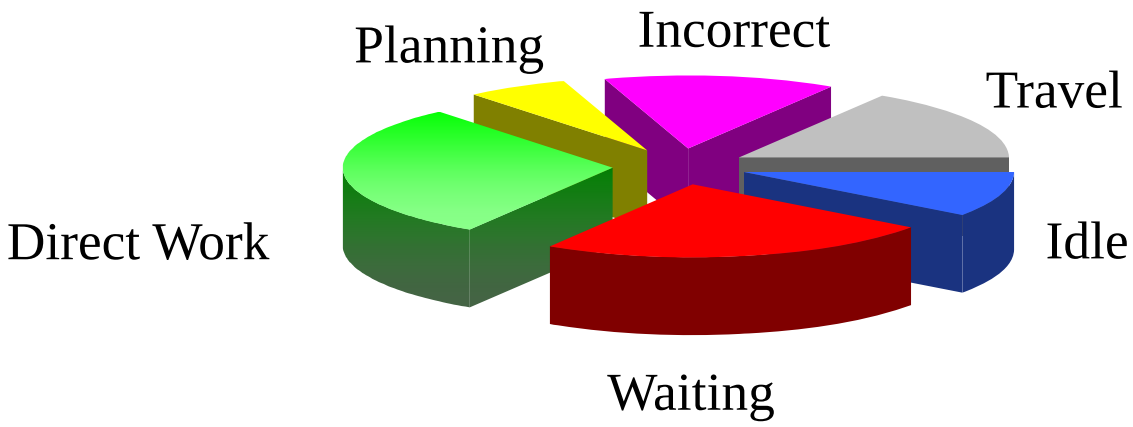
Contingencies and Allowances consumed quickly

- Proving to be inadequate

Warning signal to the PM that events are not evolving as expected

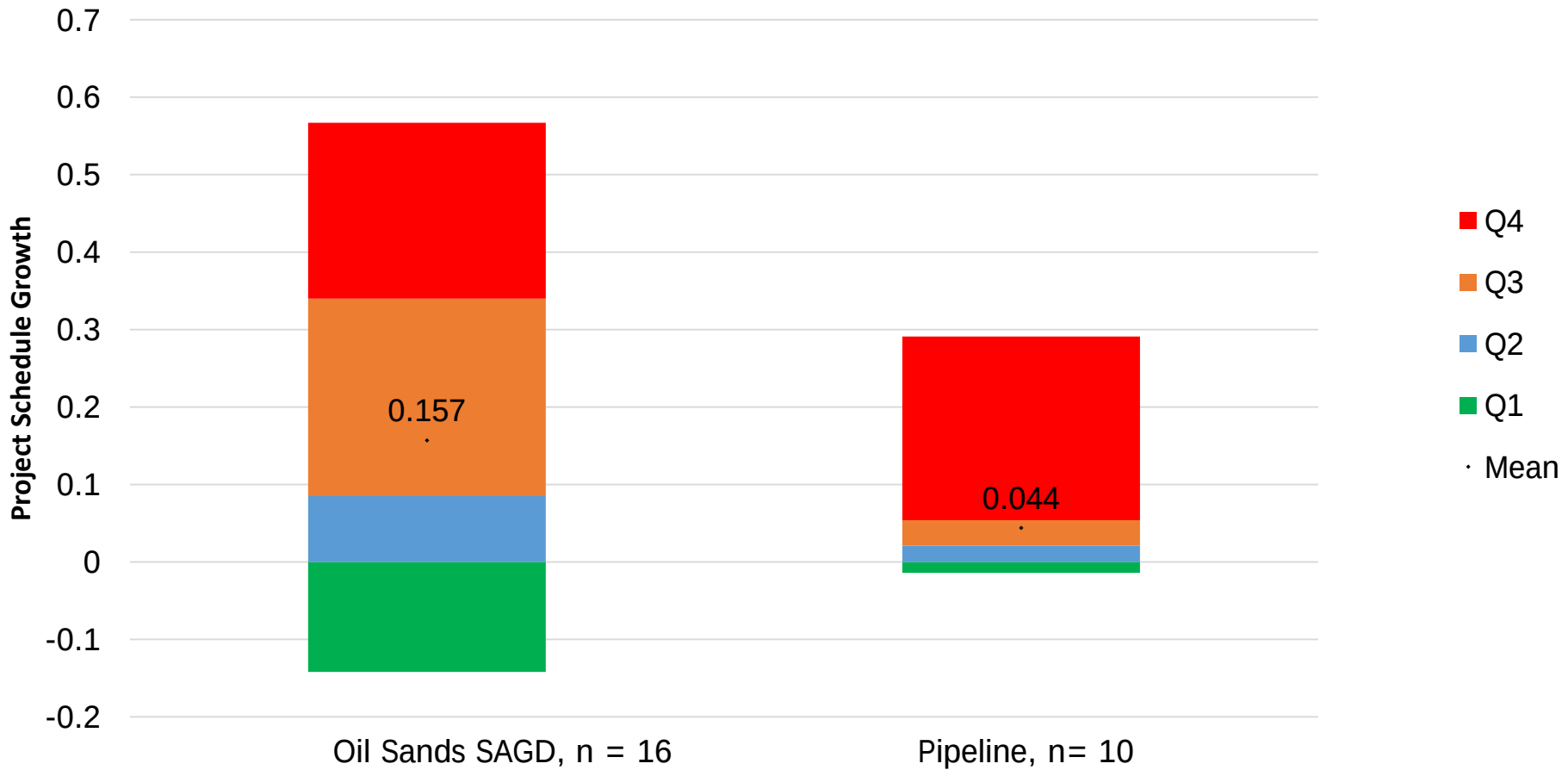
Consequences: Labour Productivity

30 % of work day in direct work
… or 3 hrs / 10 are on real stuff



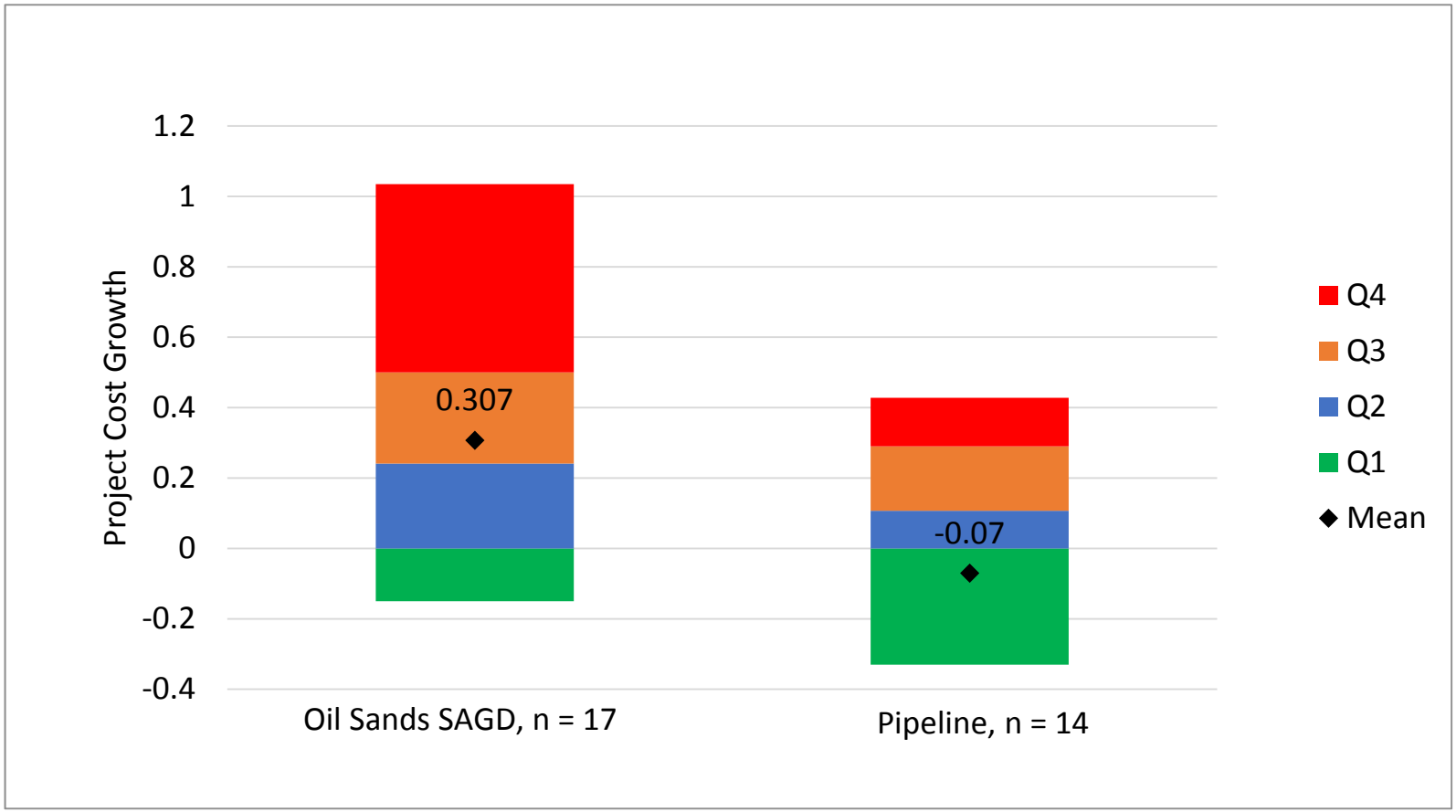
Blame unfairly placed on workers

Project Schedule Growth
Oil Sands SAGD and Pipeline Projects



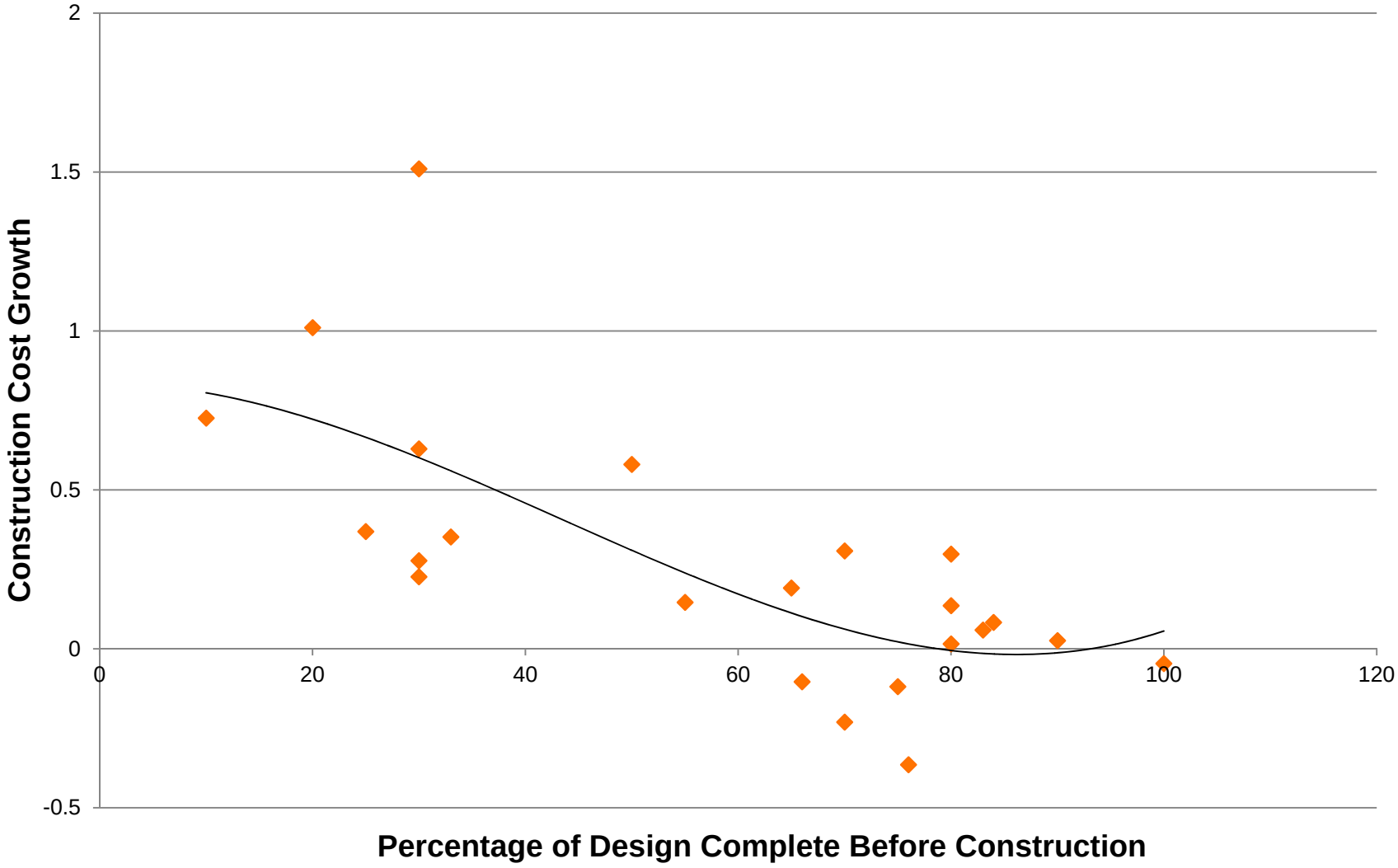
The average schedule growth was 15.7% ranged from -12% (early finish) to 58% (late finish). COAA/CII/U of C

Project Cost Growth
Oil Sands SAGD and Pipeline Projects



The average cost growth was 30.7%. Ranged from -18% (under budget) to 105% (over budget). COAA/CII/U of C

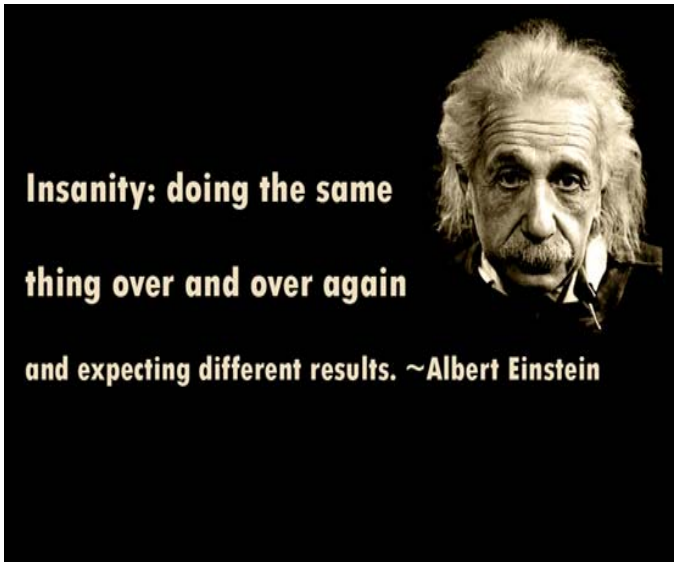
Construction Cost Growth and Percentage of Design Complete Before the Start of Construction



More Consequences

1. Cost reimbursable contracts
2. Myopic risk allocation and management
3. Outsourcing engineering and fabrication
4. Owner's don't plan for the future but react to present cash flow
    - Stop or delay projects then speedup!
5. Owners now requiring their contractors and suppliers to reduce costs!!!
    - Market Intervention

Any Connection



Findings of a New Study

- **"Performance Challenges Of Mega Capital Projects",** a report to GO Productivity Alberta, George Jergeas and Jim Lozon, November 2014.

Table 9: Factors that affect Project Performance (references)

Factors that affect project performance	Reference
1. Insufficient/incomplete front end planning, cutting corners	1, 2, 5, 19, 28, 33, 50, 52, 57, 59, 61
2. Inaccurate/unreal estimates/economics, optimistic bias, aggressive targets	2, 16, 19, 25, 39, 50, 55, 57, 61, 79, 86
3. Poor risk assessment/management, uncertainty, poor risk sharing	2, 6, 25, 42, 50, 52, 57, 61, 78, 79
4. Poor governance, oversight, support, business/project/strategy management	2, 5, 9, 28, 36, 37, 55, 57, 86
5. Team conflict, turnover, lack of integration, lack of continuity, poor interface management	
6. Unclear scope/objectives, late scope changes, scope creep	
7. Changes, slow/poor decision making	
8. Contract strategy, responsibilities, slow payment, lump sum barriers	
9. Unmet stakeholder requirements, poor stakeholder/user engagement	
10. Poor monitoring/control, lack of control	
11. Incomplete contingency plan, low contingencies	
12. Inexperienced, lack of project management skills	
13. Underestimating complexity and magnitude of the project	
14. Incomplete engineering design before construction start	
15. Compressed and aggressive schedule, fast tracking	
16. Poor communication	
17. Procurement strategy (global/local), late material/equipment delivery	
18. People (limited resources), labour, engineering, construction management	
19. Engineering/construction productivity	
20. Technology	
21. Insufficient modularization, pre-fabrication	

Table 10: Categories of Factors that affect Project Performance

Project Planning	AFE	Project Implementation
• Large project size • Lessons learned ignored • Unclear scope/objectives • Poor scope management • Incomplete front end planning • Inaccurate/unreal estimates • Compressed/aggressive schedule • Incomplete contracting strategy • Inadequate procurement strategy • Inadequate risk assessment • Incomplete project execution plan • Poor governance, oversight, support • Inadequate staffing • Unsatisfactory contractor selection • Onerous legal contracts • Poor communication • Deceptive low bidding • Biased risk management • Incomplete contingency plan • Distrustful project culture • Incomplete transfer of information • Poor stakeholder engagement		• Poor project management skills • Slow decision making • Uncontrolled scope creep • Incomplete engineering design • Complex new technology • Low contingencies • Rework and changes • Risk averse behaviour • Lack of innovation • Poor monitoring and control • Mishandled claims and disputes • Team conflict • Insufficient modularization • Unsatisfactory productivity • Unmet stakeholder requirements • Poor communication • Poor construction management • Late material delivery • High worker turnover • Poor monitoring and control • Undefined lines of authority • Poor interface management

3) What can we do tomorrow?

The researchers and professional organizations offered many ideas as to what we could do to improve our capital projects including: (a) actions to improve project performance, (b) executive oversight, (c) systems thinking, (d) leading indicators (early warnings) and (e) benchmarking programs.

(a) Actions to Improve Project Performance

Table 11: Actions to improve Project Performance (refere

Actions to improve Project Performance	Reference
1. Leadership, governance (see Executive Oversight questions below)	16, 33, 36, 38, 39, 42, 86
2. Stakeholder input/communication/ alignment	17, 21, 30, 38, 43, 57,
3. Strong risk management program (share risks)	14, 18, 42, 43, 52, 54,
4. Comprehensive front end planning (get it right)	15, 33, 45, 46, 57, 58
5. Clear roles and responsibilities	18, 21, 41, 42, 52, 54
6. Strong cost and schedule monitoring and control (stick to the plan)	41, 43, 46, 49, 52, 66
7. Interface management	18, 19, 21, 40, 80
8. Manage engineering (do not fast track engineering)	16, 33, 49, 52, 57
9. Clear scope definition	21, 55, 57, 72
10. Assign project team early (adequate staffing)	42, 55, 57, 58
11. Restrict changes (e.g. after constructability review)	4, 7, 9, 72
12. Manage changes	21, 41, 43, 52
13. Higher modularization and offsite fabrication	7, 19, 33, 49
14. Develop contracting strategy early	9, 21, 33, 52
15. Realistic cost and schedule estimates	14, 42, 43, 66
16. Strong construction contract management	15, 19, 33, 52
17. Standardize designs and work processes	18, 55, 57, 78
18. Integrated project team	46, 58, 63
19. Reduce project complexity/size	41, 49, 61
20. Manage key suppliers/logistics	18, 19, 41
21. Align expectations/team	28, 57, 72
22. Strong construction labour relations (incentives, schedules, site, size)	33, 49, 52
23. Board of Directors oversight (see Executive Oversight questions below)	57, 86
24. Cost driven not schedule driven	55, 66
25. Risk assessment before estimates	27, 66
26. Use Best Practices (CII and others)	7, 72
27. Develop dispute avoidance/resolution model	13, 52
28. Focus on Project Management best practices (skills training)	14, 52
29. Apply lessons learned	14, 72
30. Early focus on supply and contract optimization	18, 52
31. Clear communications	18, 33
32. Complete constructability reviews	20, 33
33. Develop long term relationships	52, 78
34. Optimize scarce talent	52, 82
35. Select appropriate project delivery system	42
36. Less fast tracking	66
37. Near term thinking	36
38. Early contractor involvement	4
39. 10-4 construction site work schedule	7
40. High quality FEED	9
41. Complete the project execution plan	9
42. Incremental design optimization	78
43. Develop construction plan early	9
44. Local versus global sourcing	49
45. Monitor and control global sourcing	11
46. Select better projects	14
47. Manage cash flow	14
48. Trim project portfolio (less projects simultaneously)	16
49. Independent peer reviews	17
50. Benchmark projects	17
51. Capture risk history	27
52. Review risks at 30% review	27
53. Manage political influence	33
54. Continuous improvement culture	72
55. Accelerate operational readiness	82