HOUSTON BUSINESS ROUNDTABLE

# BOOST ENGINEERING QUALITY

Jim Cravens

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# Biography: Jim Cravens

**Title:**

- Sr. Executive Associate, Pathfinder, LLC

**Degrees:**

- BA, Southern Benedictine College

**Years of Experience/Professional Field:**

- 40 year Project Control professional with particular skill in the implementation of Cost/Schedule control systems and procedures.
- Involved in the design and implementation of processes aimed at the measurement and control of Engineering
- 7 years as Director of Engineering Project Controls with responsibility for Engineering Cost and Schedule control on more than 35 large EPC projects
- Served as Vice President of Project Controls and Estimating for a large EPC Contractor responsible for the Project Controls function on all significant projects

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# INTRODUCTION

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- Last round of major project expansions has shown that engineering quality is significant issue
- Concern due to:
  - Poor project definition from Owners
  - Miscommunication between Owners and Contractors
  - “More for Less” expectations by Owners
  - Less experienced staff on Contractor side

- Engineering deliverables are handed over late & not aligned with Owner’s business needs/objectives
  - In some cases, not  suitable for Bid Packages

# Introduction

- Industry leaders say biggest factor affecting quality is lack of experienced technical staff
- Expansion in activity but limited increase in skilled resources
  - Senior-level engineers can't handle  workload
  - Junior Level lack experience

# Introduction

- Industry has partially filled gap with tools but this approach may:
  - Reduce users' knowledge of engineering fundamentals and rob early career staff of valuable experience
  - Result in lack of awareness of what "good" looks Like
  - Mislead inexperienced engineers who believe:

**"If the system spits it out, it must be good!"**

# Introduction

- Even with more electronic systems & tools, engineering hours for projects have **not** dropped
- Engineering cost management requires balance with consideration of the following:
  - Engineering is only 12-15% of Cost
  - Procurement and Construction are primary cost drivers
  - The quality of Engineering may reduce or increase cost

# Introduction

- Building projects flawlessly in today's less-experienced project team environment is more critical than reducing engineering hours
- Electronic systems add benefits but gain can be offset by other factors:
  - Poor communication between Owner and Contractor
  - Limited availability of experienced resources
  - Increases in project complexity

# Engineering Skill Set vs Tool Utilization Combined Efficiency

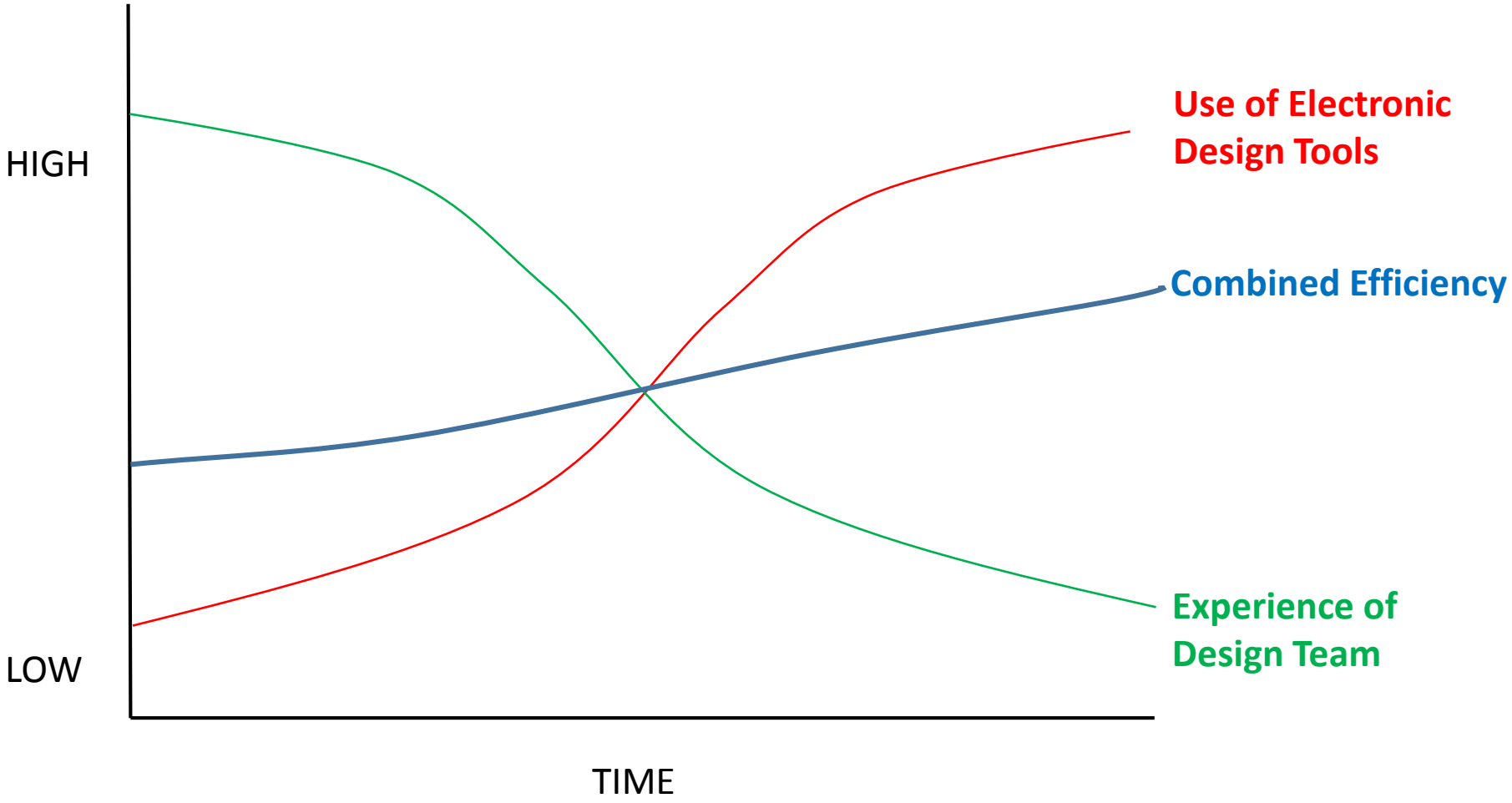



*Figure 1: Electronic tools can't fully overcome the loss in efficiency from lack of experienced staff.*

# QUALITY ISSUES

# Quality Issues

- Many cases of misaligned quality expectations related to :
  - Future expansion
  - Product flexibility
  - Capacity fluctuations
  - Reliability

- To avoid problems - Owner's engineers/operations staff/business leaders should agree on project functional objectives
  - Gives contractors clear message

# Quality Issues

- Owners must drive early agreement on front-end execution, contractor and contract award
  - ➢ Allow enough time and resources to complete conceptual & basic engineering efforts

# Quality Issues - ECC

Primary root-cause issues identified by industry leaders at Sept. 2014 Engineering and Construction Contracting (ECC) conference:

1. Holding contractor to pre-determined deadlines and minimizing allowable time for early contract issues, scope clarification challenges, funding delays, etc., causes inefficiencies in contractor's shop

# Quality Issues - ECC

2. Overlapping Front-End planning phases
   - Owners & contractors build teams by recruiting staff from other industries
   - Requirements at each stage gate vary across industries/ sometimes aren't clearly defined
     - Results in misaligned expectations at phase-gate decision
     - Leads to unsatisfactory understanding of quality expectations
     - Leads to poor project results
   - Violates proven industry best practice of stage gates

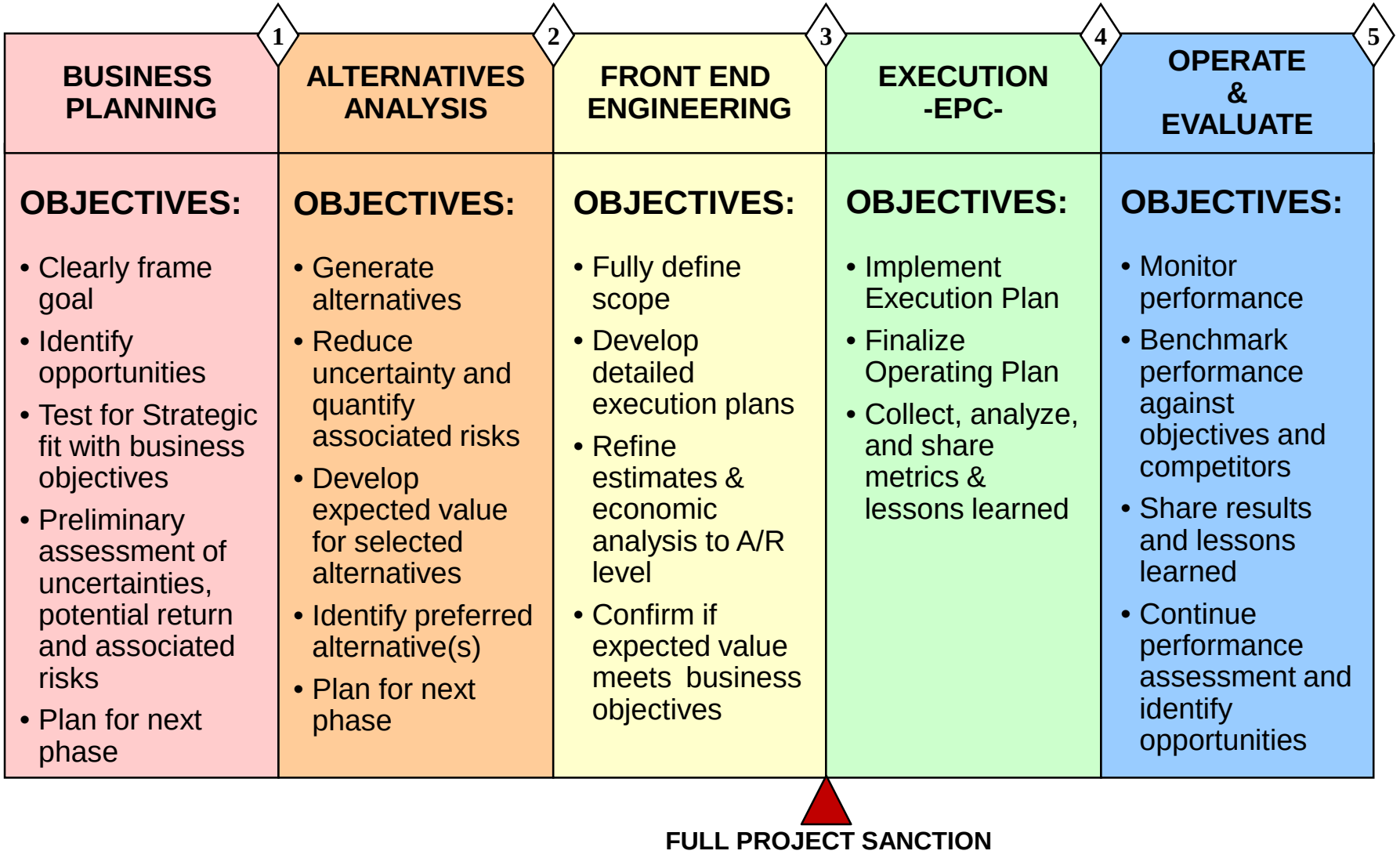
# Quality Issues - ECC

3. Owners set unrealistic project completion deadlines – less time to complete engineering efforts
   - Leads to poor decision-making
   - Projects fail to meet target dates
   - Projects don't satisfy operability goals
   - Root cause - lack of communication regarding schedule achievability
     - Management/public target date notice released without comprehensive analysis

# Quality Issues - ECC

4. How do we measure engineering effectiveness?
   - Current Focus is mainly on cost & timeliness of engineering deliverables
     - Less time spent on how system/facility operates after commissioning & startup
   - Ensuring efficient, trouble-free operations is true measure of engineering quality
     - Project may last a few years but asset will keep going, and going

# *OWNER PROJECT DELIVERY PROCESS*



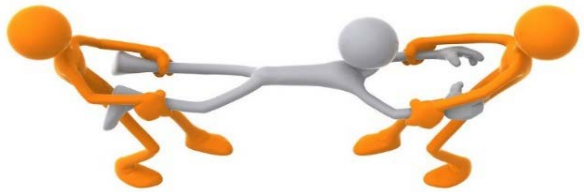
# Quality Issues - ECC


## 5. Timeliness of "good ideas"

- Owner's Project Delivery Process must promote creative thinking/innovation during pre-execution Front-End Loading phases
- Once project is authorized and full funding sanctioned, changes become problematic
  - Project team executes scope defined in accordance with execution strategy & agreed to in authorization package
- When is change in scope acceptable? – blurred lines
  - Can't meet target cost/schedule expectations if scope is constantly changing
- "Good ideas" adopted after authorization can turn into "bad ideas" = disruptive impact on project execution

# Quality Issues - ECC

6. Contractors aren't free from fault – Need to **honestly** assess what they can handle & not overtax resources
   - Increased project activity causes capabilities/skills of staff to be stretched beyond effective limits
   - Limited supply of engineering talent entering marketplace



   - Demand for engineering & construction resources has spurred aggressive recruitment tactics
     - Some are stealing from each other!
   - Drawing talent back into industry to address this problem demands concerted action!

# THE WAY FORWARD

# The Way Forward

## Take steps to address quality issues!

- Independent Project Analysis (IPA) recently announced that the Classes of Facility Quality (CFQ) Value Improving Practice (VIP) is now recommended for all projects
  - ➢ Was optional - now standard practice
  - ➢ If executed correctly, ensures alignment among Owner's:
    - Business representatives
    - Engineering group
    - Operations staff

# The Way Forward

## Classes of Facility Quality (CFQ) - Cont.

- When implemented, documented and authorized properly, CFQ effort will minimize/eliminate late changes in scope due to misaligned project-quality expectations
- Is structured, decision-making process used to establish/manage scope development
- Historically has demonstrated project costs savings of up to 20% within industry
- Can reduce schedules by eliminating engineering recycle

# The Way Forward

## Classes of Facility Quality (CFQ) - Cont.

- CFQ must be effectively communicated to Contractor
- Contractor must execute efficiently & to industry-accepted standards
- Owner should plan spot-checks to ensure contractor is meeting quality expectations
  - ➢ If Owner lacks this internal capability - should consider external Independent Project Review (IPR) effort

# The Way Forward

- Owners should hold facilitated scope clarification meeting to address issue of end-of-phase-gate required engineering scope deliverables
  - More detailed than kickoff meeting
  - Done early - at contract award
  - Ensure 100% alignment of scope issues between Owner team's expectations and Contractor's understanding of Owner's stage-gate requirements
  - Project-specific deliverables/details about quality are clearly defined & communicated
    - Done during bidding process so contractors bid effort correctly

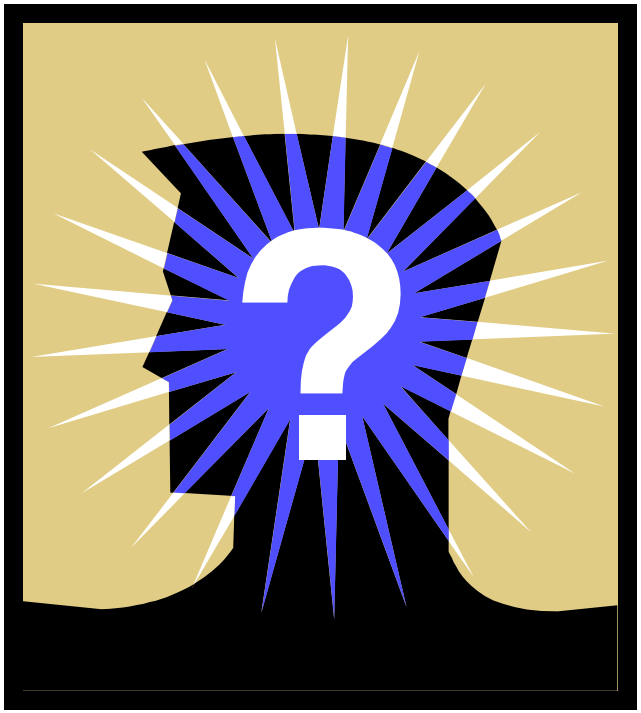
# Conclusions

# Conclusions

- To improve predictability of capital projects/realize better business value - boost quality of capital project delivery process
- Improvement depends on ability to define what quality means from the Owner's view
  - Communicates quality through engineering deliverables
  - Allows project team to purchase effectively/execute in field with minimal changes
  - Results in more efficient/effective use of human resources, capital and time
    - Better business value for Owner
    - More profitability for contractors

# Conclusions

- Other industry best practices that can assist in improvement:
  - Effective use of Value Engineering techniques
  - Clearly defined work-breakdown structures (WBS)
  - Application of peer reviews/Independent Project Reviews



# Question and Answer

# Contact Information


**Jim Cravens**

**Pathfinder, LLC**

**11 Allison Drive**

**Cherry Hill, NJ 08003**

**(856) 424-7100**

**consulting@pathfinderinc.com**

**www.pathfinderinc.com**


*Cherry Hill* *Calgary* *Houston* *Mexico City*