Project Management of Mega Petrochemical Projects - Challenges in Mega Petrochemicals Project Execution

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Agenda

- Market Outlook
- Market Challenges
- Client Challenges and Solutions
- Project Execution Challenges and Solutions

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Market Outlook

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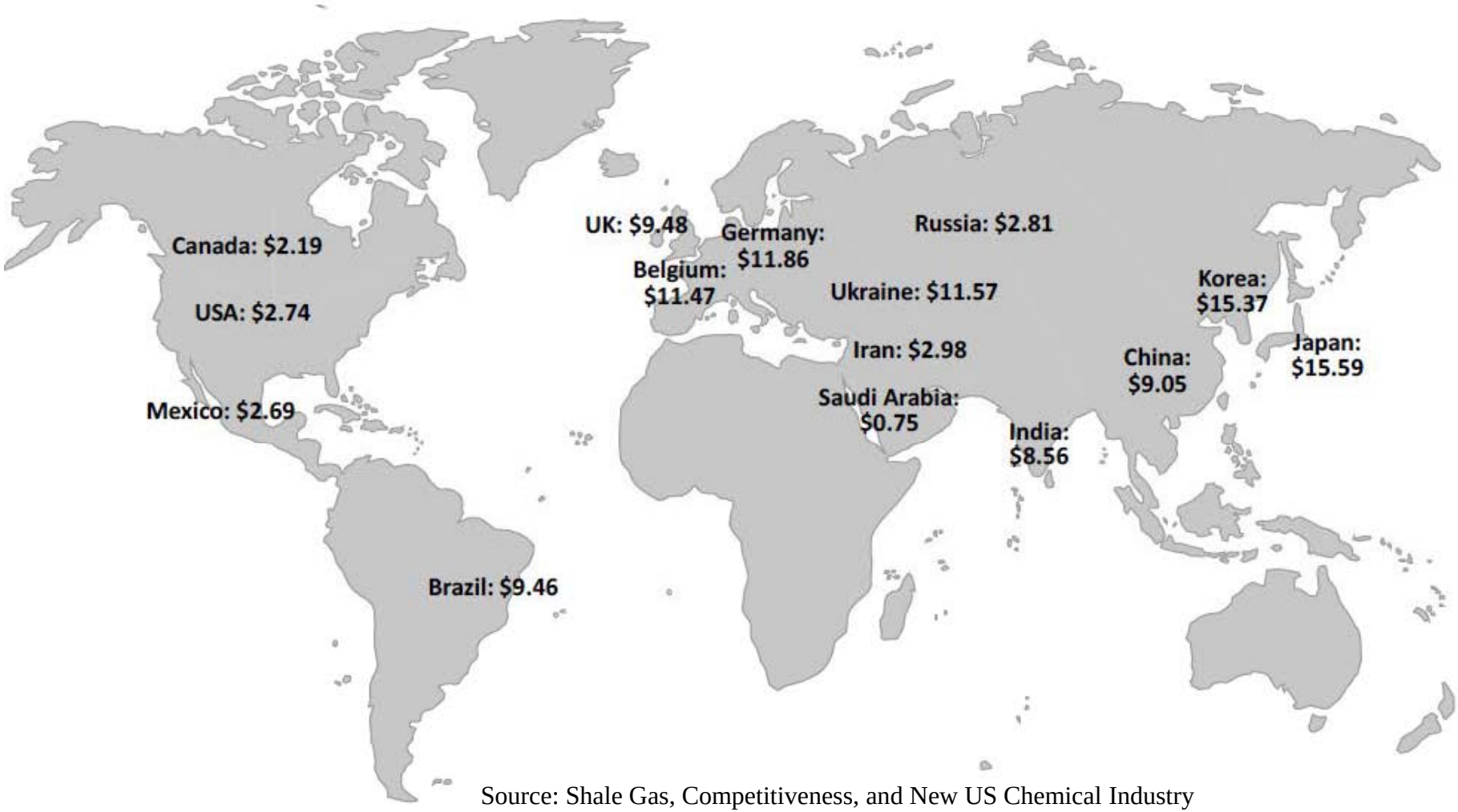
Average 2013 Natural Gas Prices by Nation
($ per million BTUs)



Source: Shale Gas, Competitiveness, and New US Chemical Industry Investment: An Analysis Based on Announced Projects Economics & Statistics Department
American Chemistry Council, May 2013

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Current US Market

- Ethylene plants and derivatives
- Propylene and aromatics
- Gas-to-liquids (GTL)
  - Conventional F-T
  - Liquefaction (LNG)
  - Methanol (MTO)
- Gas transportation and processing:
  - Pipelines
  - Treating
  - Fractionation
  - LPG
- Ammonia / Urea
- Capital Investments Increasing (Large to mega projects with USGC concentration)
- Resources (Demand for engineering and construction)

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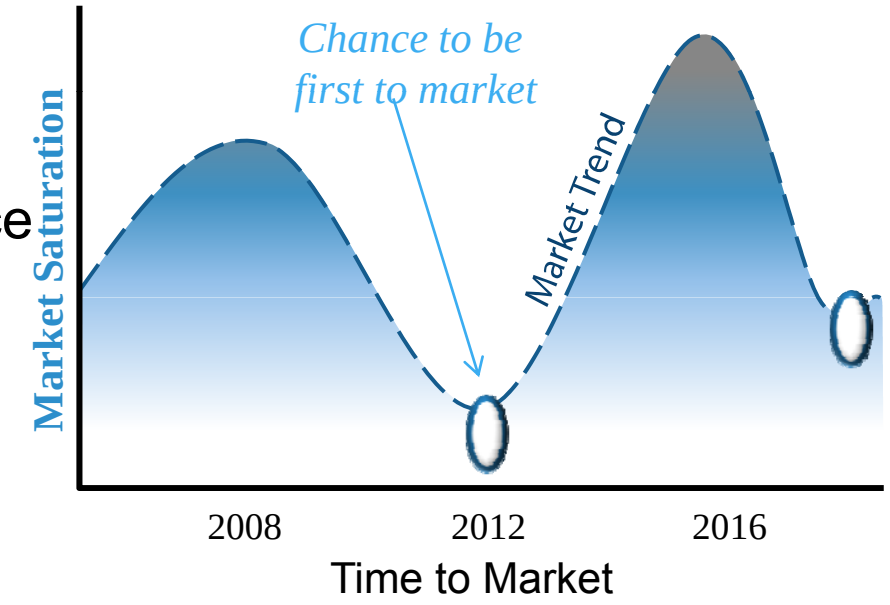
Market Outlook
Petrochemicals Trends

- Current events: responding to shale gas
  - 5 new ethylene cracker complexes
  - 3+ PDH units
  - GTL
  - Standalone derivative units
- Historical parallel to recent history: 2006-2008 market place
- Historical key differentiators to project success
  - Focused approach / straight through execution
  - Maintain team synergy throughout program
- History is preparing to repeat itself



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Market Outlook
Petrochemicals Trends *cont…*

- Opportunities for Ethane
  - Several cracker debottlenecking/revamp projects underway
  - 2 - 3 x 1,500 mtpa crackers on the USGC and North East in the next 2 - 5 years
  - Ethylene Derivatives projects: 4-5 PE plants, 2 EG plants, 1 PVC plant in the next 2-5 years
  - Awarded Gulf Coast EO/EG Project (FEED + EPC)
- Opportunities for Propane
  - PDH: 2 - 3 new plants are expected to bring on another 2 mtpa of PP
  - Awarded FEED + EPC phases of Dow PDH Project in 2011
  - Polypropylene plants: 3 - 4 new plants likely
  - Export facilities
- Opportunities for Butane
  - Export facilities

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Market Outlook
Methane Opportunities

- LNG
  - LNG Projects in British Columbia, Canada
  - Cheniere has received approval to approve LNG export from the existing LNG facility
  - Completed Talisman Shale Gas Monetization Study in 2011
  - Fluor is working on the Anadarko Mozambique LNG Project (JV Partner: JGC)
  - Significant activity in Canada around small scale LNG for vehicle fuel, drill rig fuel, and remote power plant fuel.
- GTL
  - Supporting pre-FEED phase of Shell's GTL Project (GTL Loading Facility – Civil/Structural Design)
  - Awarded Feasibility Study for Gulf Coast GTL Facility
  - Awarded Flint Hills North Slope GTL Project – Economic Evaluation

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Market Challenges

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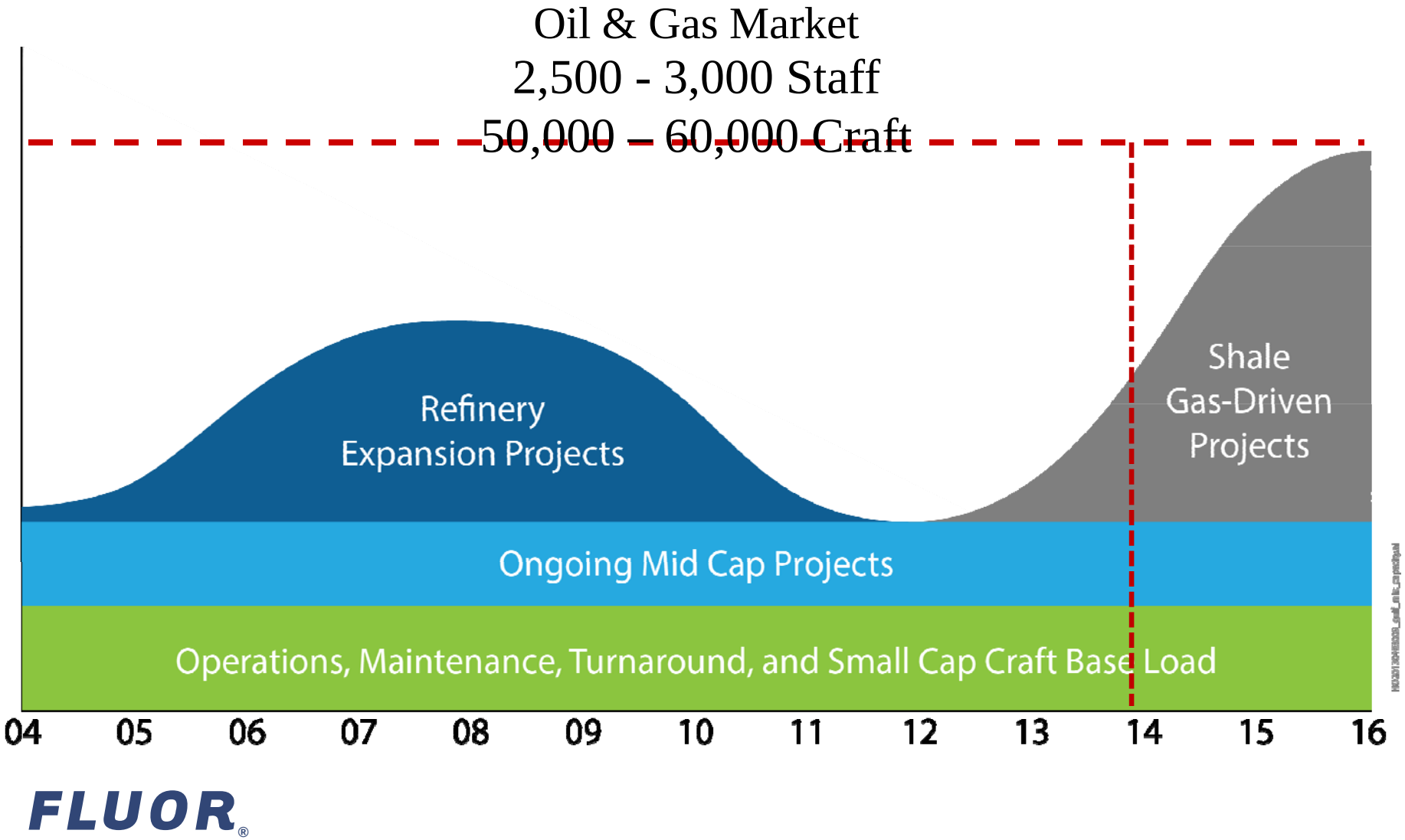
Market Overview
Gulf Coast Market – Craft Capacity



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Market Challenges

- Local shop space will likely be full starting in mid 2014
- Surplus natural gas causing sustained low gas price (< $4.00 / MMBtu)
- Attractive supply market for natural gas fed businesses
  - Capital investments are increasing in all O&G market sectors
    - Chemicals- Ethylene and Derivatives, Propylene and Aromatics, Fertilizers (Ammonia / Urea)
    - Downstream - Gas to Liquid (GTL)
    - Upstream - Liquefaction (LNG) (mega $3B+ Facilities)

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Client Challenges

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Common Capital Investment Issues

- Time to market
  - Capture current favorable product price window
  - Increase market share
- Confidence in investments
  - Cost and schedule certainty
  - Leverage familiar suppliers
- Market activity is changing Client's strategies
  - Fast track projects and Linkage between phases
  - Continue to push lump sum and Negotiated Contracts
- Major Risks:
  - Permitting issues and financing
  - Increased competitive pressure – LS EPC
  - Resources Availability and wage rate escalation
  - Construction productivity in a fixed price execution

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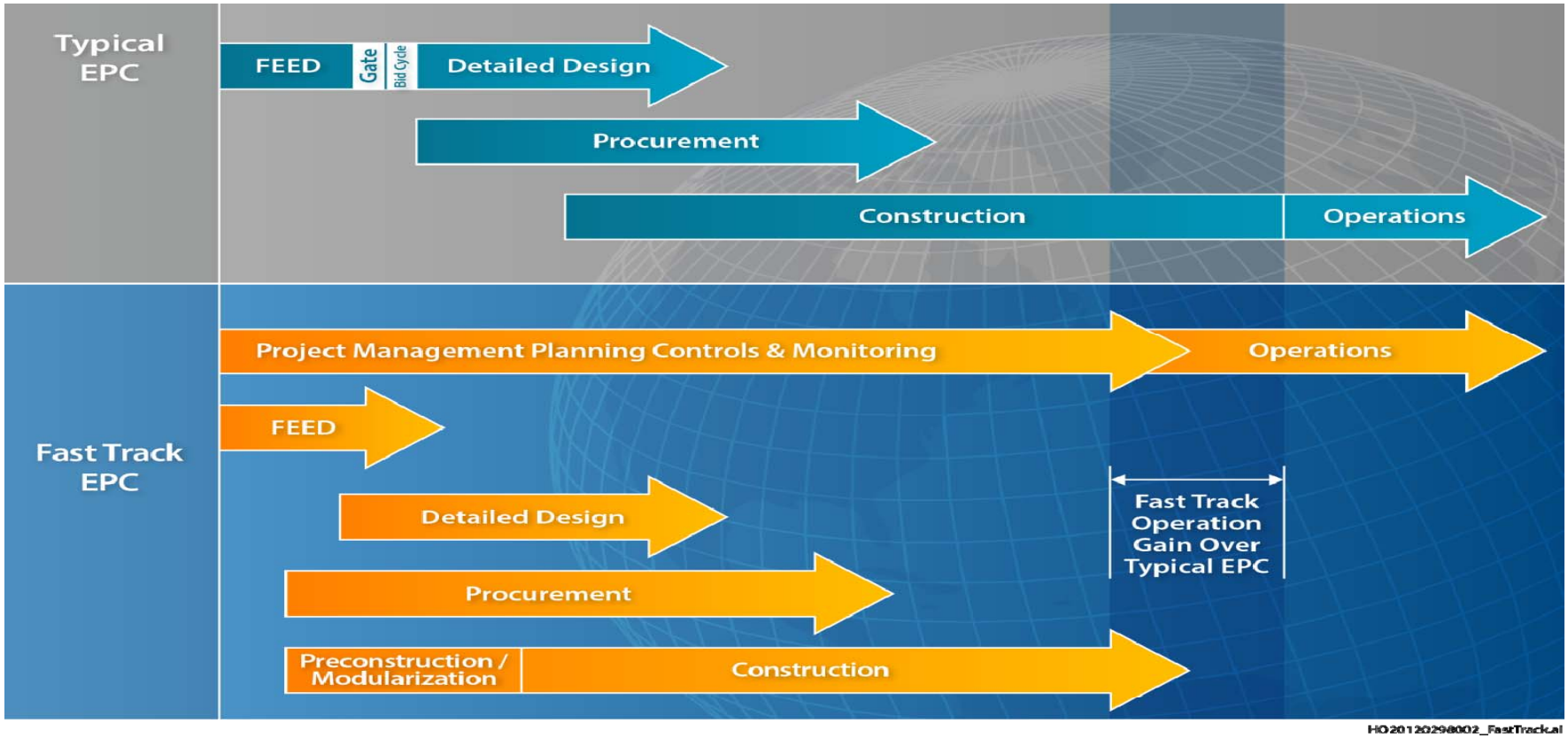
Contracting Strategies

Fast track projects and linkage between phases



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Execution Challenges

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Construction Craft and Staff Demands

- Between 2014 and 2017 shale gas driven projects in the US Gulf Coast only could demand
  - 50,000 to 60,000 craft
  - 2,500 to 3,000 field staff
- Wage rates could escalate between 10% to 20% annually based on location and type of work
- Local shop space will likely be full starting in mid 2014
- A significant reduction in construction craft can be achieved by using **3rd Gen Modular Execution**[SM]

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Project Management:
Risk Identification and Mitigation

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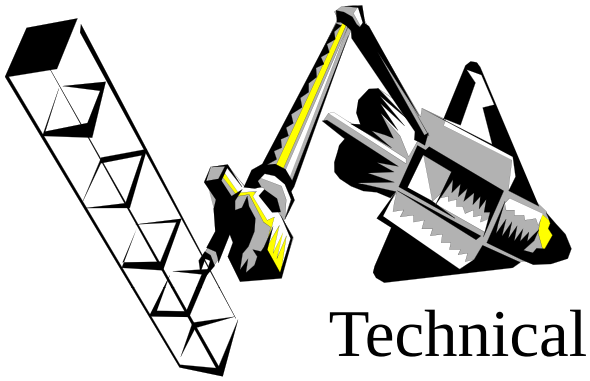
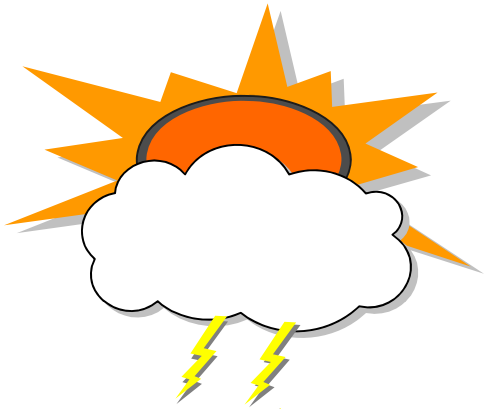
Risks



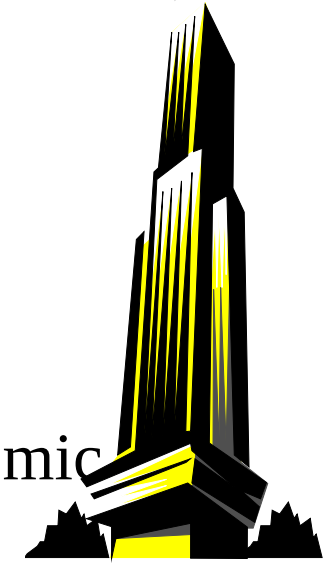
Technical

Financial

Weather



Market Conditions



Socio-Economic

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Risks

- Weather
  - Sakhalin or Alberta based Project (Cold Weather)
  - Middle East based Project (Hot Weather)
  - Dabhol Power Project India (Rainy Weather)
- Market Conditions / Financial
  - Inflation
  - Interest Rates
  - Currency Fluctuation
  - Tax
- Socio-Economic
  - Political
  - Cultural
- Technical
  - New Technology
  - Environmental Compliance

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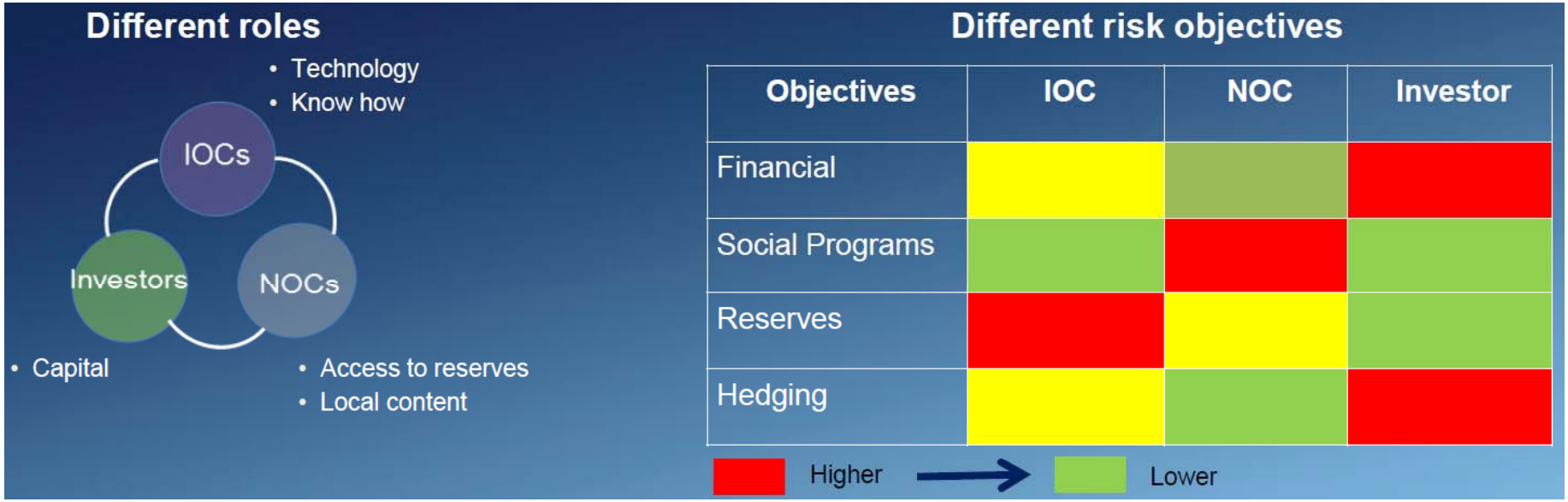
Stakeholders have varying views on risks – example E&P



- Differences in capabilities and objectives drive differences in risk tolerance - drive potential conflicting decisions (e.g. selection of suppliers, permitting delays, asset strategy)
- Differences in priorities can jeopardize the project success and expected returns

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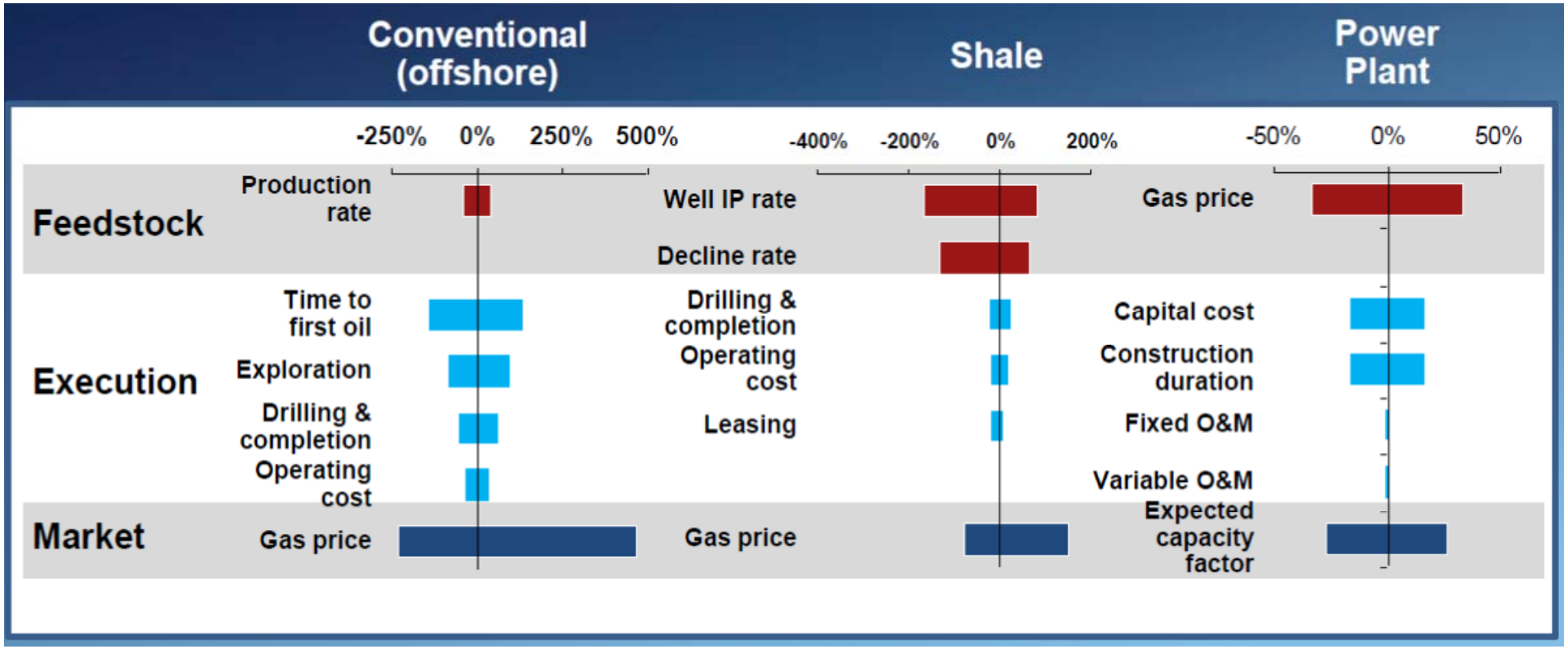
Source: A.T. Kearney research

Risks vary along the value chain



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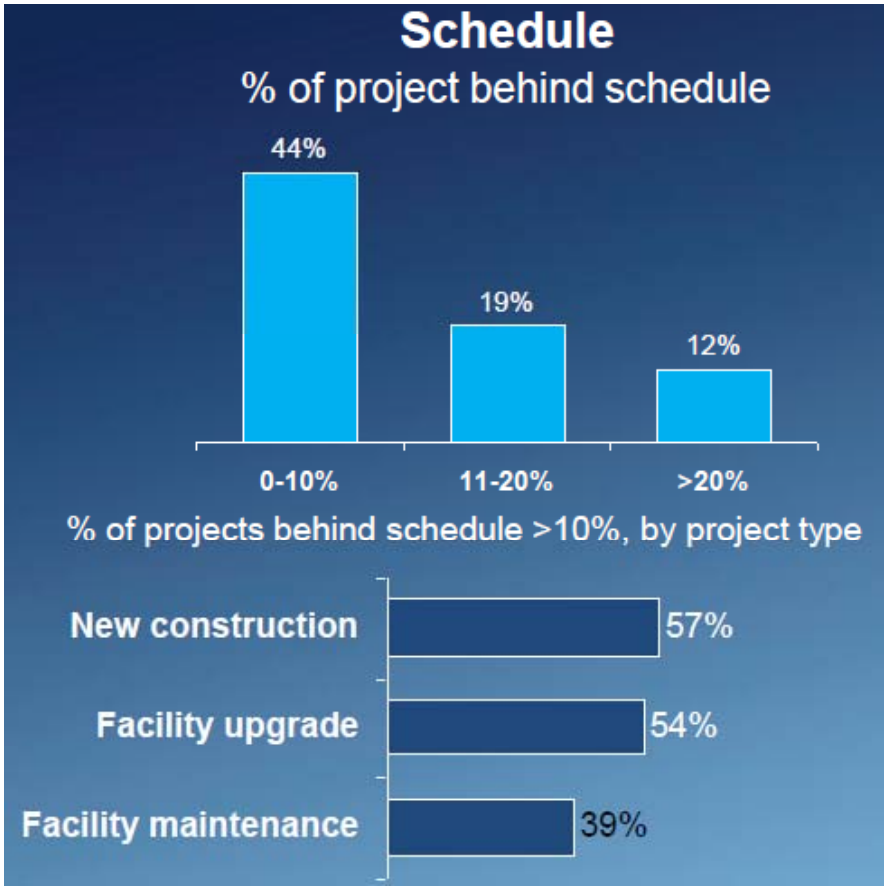
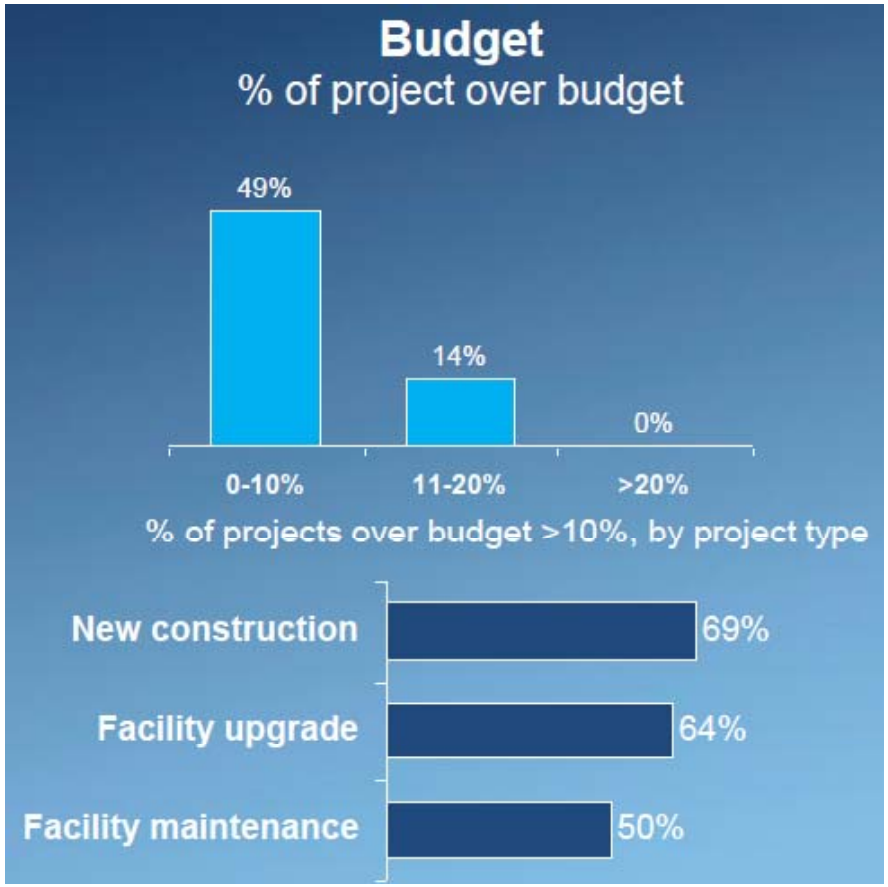
Slack Project execution has a significant Impact





On average at least ~23% of projects fail to meet the required return threshold

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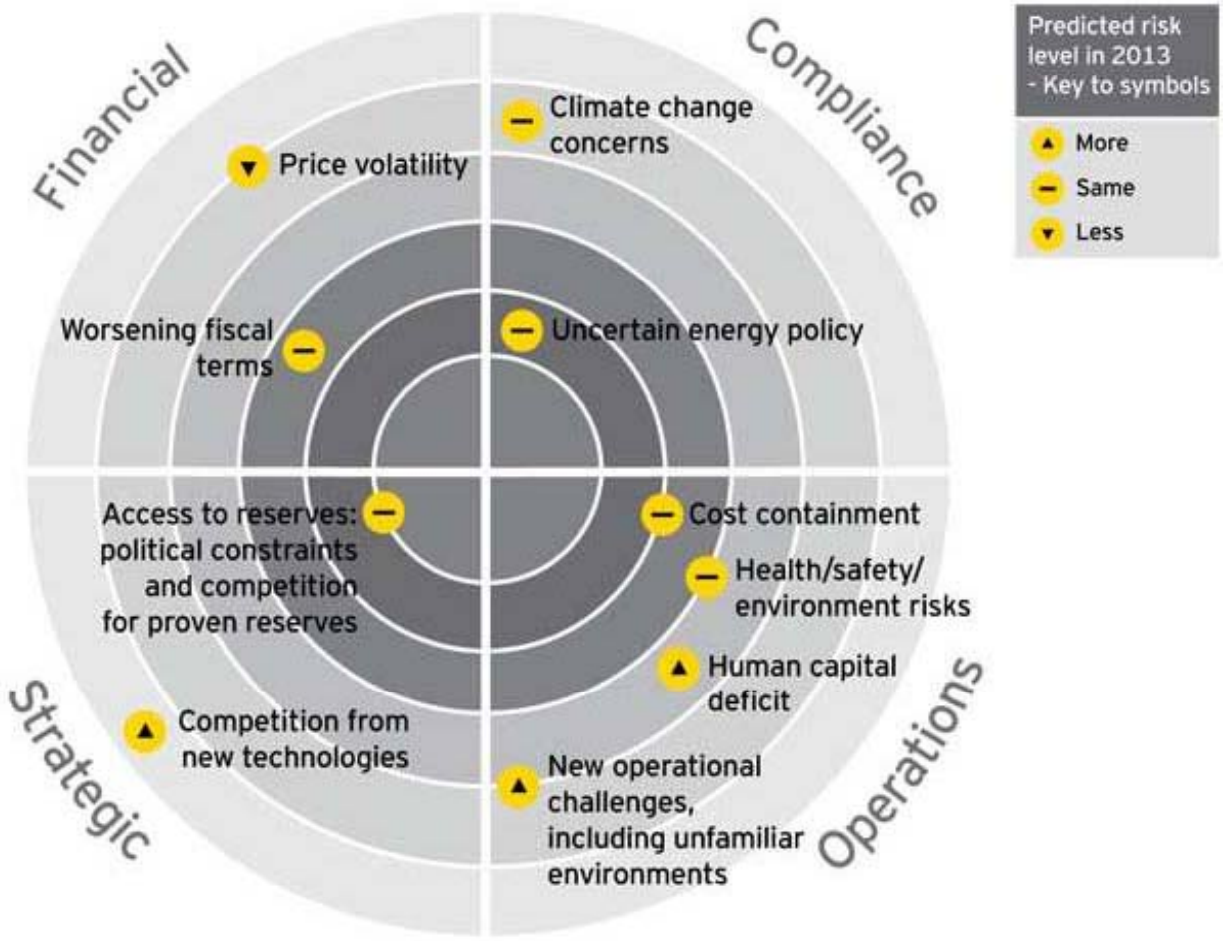
Source: A.T. Kearney Excellence in Capital Projects II Study, 2012, SEC fillings

Risk Radar



Source: E & Y

Over the last three decades, the E&C industry has adopted riskier business models

Risk Level Development in the E&C industry

	Golden Era 1970s	Globalization 1980s	Full Service 1990s	At-Risk Business 2000-2003	Potential Future: Slaves to Risk? 2004 -
Pricing and Profitability	• Cost Plus Pricing	• Commencing productivity increases through CAD and communication technology • Collapse of oil prices	• Introduction of fixed price work • High cost overruns from risk management • Fluctuating commodity prices, e.g. metals	• Commoditization pressure on margins • Weak global economy - slowing demand • Increased insurance costs	• Minimal perceived differentiation and more commodity-like pricing? • Zero or negative economic profits?
Customer and Contract Trends	• Heavy investment in infrastructure	• Customers start to become more aggressive in procurement • Litigation crisis peaking in late 80's	• DB, DBO models taking hold • Popularization of penalty clauses		• Little to no bargaining leverage remaining? • Continually increasing risk exposure without compensation?
Risk Management	• Low risk as focus is mostly on engineering		• Taking on higher risk due to 3rd party project financing	• "Construction at risk" becomes prominent	• Risks growing faster than risk management capabilities?
Geographic Impact	• Focus on national markets	• Geographic expansion into risky developing nations		• Main growth from politically instable regions	• Risks/instability growing abroad and at home?

Risk

Developed in conjunction with AT Kearney and the World Economic Forum

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ECRI- An Industry Response to Ensure Superior Value Creation for Our Clients

- The ECRI (Engineering and Construction Risk Institute) is a group 17 global E&C companies organized under the guidance of the World Economic Forum in Geneva, Switzerland
- ECRI's objective is to create better project outcomes by:
  - Better identifying, allocating and mitigating project related risks
  - Strengthening the analytical skills of the E&C industry so that the impact of risk assumption is better understood
  - Strengthening the E&C industries ability to serve our Clients over the long term

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Capital Project Success Factors

- Risk Management is a key factor in major Capital Project Success
- The three characteristics of the capital project leaders that separate them from the rest of the pack are:
  - A bigger role for senior management: senior management at leading companies play active roles in capital projects, at all stages and in all aspects of the projects
  - A Portfolio view of projects: the leaders look at their projects as a portfolio, rather than taking one project into account at a time
  - Advanced risk management: leading companies stand out based on how they identify, prioritize and manage risks
- Study shows that 63 percent of capital projects are over budget and 75 percent are not meeting their schedules.

Source : AT Kearney

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Effective Risk Management Outcome

- Effective Risk Management helps achieve:
  - Cost Certainty
  - Schedule Certainty
  - Consistency of Execution across Projects
  - Increased Client Confidence
  - Improved Profitability

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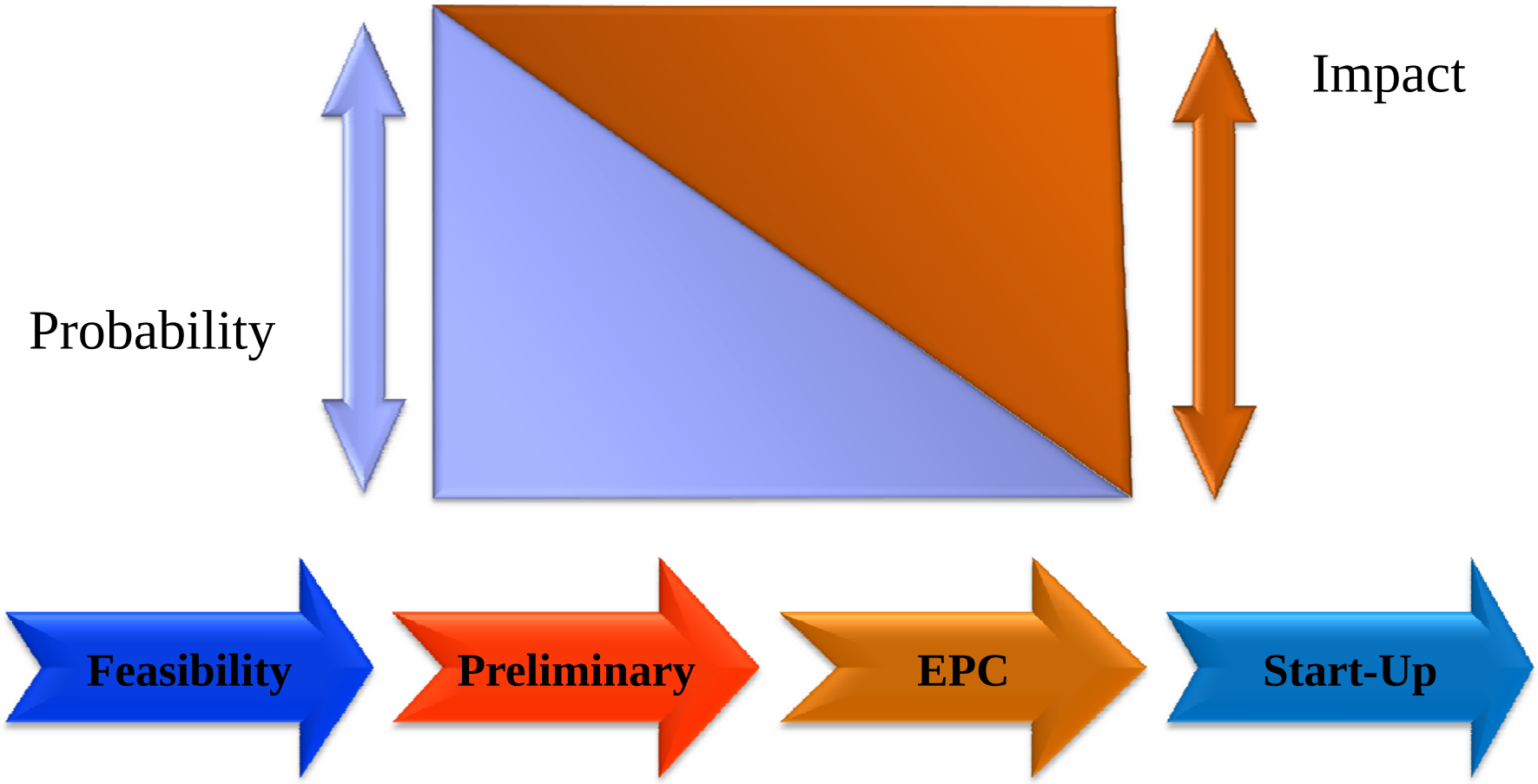
Risk versus Time



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Risk Assessment Frequency

- Milestones Throughout a Project Life Cycle
  - Bid / No Bid
  - Proposal
  - Contract Negotiations
  - Project Execution
  - Trigger Events
    - Addition of scope
    - Reallocation of resources
    - Changes during execution
  - Close out
- Regular Reviews

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Project Life Cycle
Representative Risks

- Risks are prevalent through each stage of the project life cycle.

Permitting	Environmental and land use issues
Financing	Competition for limited capital
Site	Development Easements, rights of way
Engineering	Scope control
Procurement	“Overheated” market impacts on price
Construction	Resource availability
Commissioning	Insufficient integration and training
Operations	Talent availability
Asset	Decommissioning On-going environmental monitoring

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Procurement Challenges

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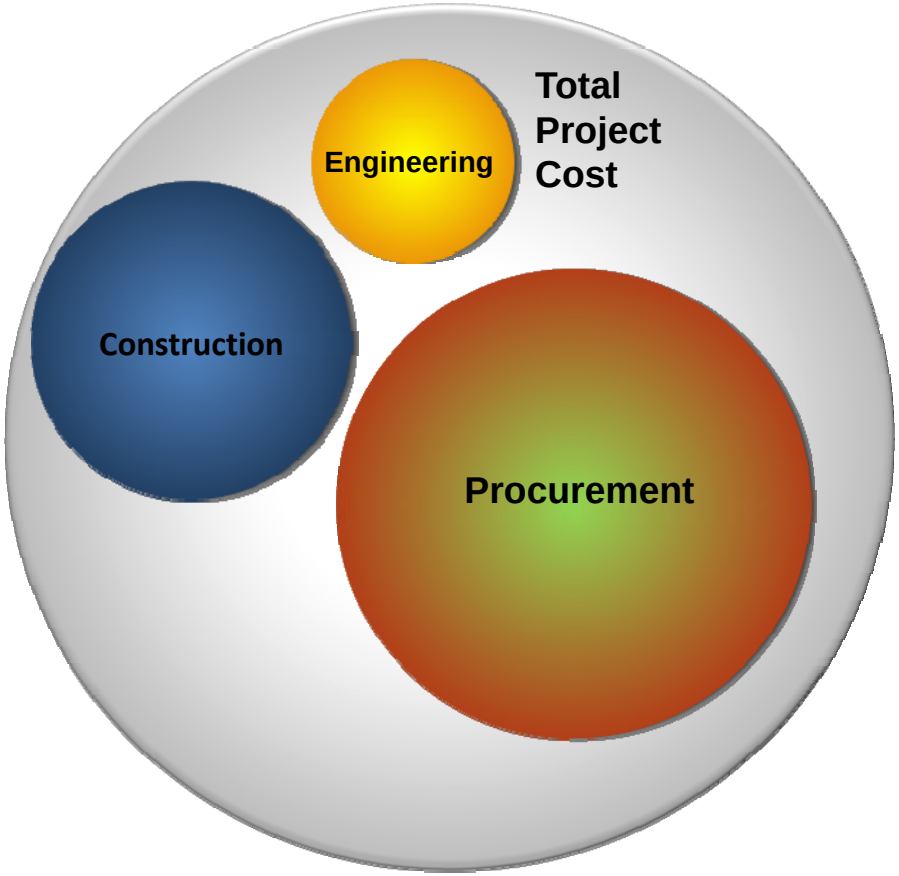
EPC Project Cost Distribution

- Procurement accounts for 50-70% of the value for EPC projects



- **Materials are Approximately 50 Percent of a Capital Project**
- **Labor 20%, Engineering 7%, Indirect Field Costs 10%, Other 13%,**

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Procurement Challenges

- Financial viability of suppliers
- Supplier resources
- Supplier shop loads
- Price volatility
- Impact of design changes
- Dispersed execution

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Procurement Challenges contd....

- Procurement strategies with aggressively negotiated lowest prices result in:
  - Poor, off-the-shelf design
  - Cash-strapped vendors cut corners and do not adhere to project codes and standards
  - Inexperienced vendor engineering teams incapable of understanding project design and safety requirements
  - Poor supplier integration
  - The project, therefore, needs to have (Fluor has one) a Global Procurement Strategy and process to secure the best price, quality and timely supply by:
    - Increased due diligence and monitoring of vendors for quality and liquidity
    - Time tested online platform such as Projects Online for seamless management of supplier document integration
    - Aggressive, proactive management and expediting of suppliers

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Procurement Risk Types and Impacts

- Schedule Risk
  - Missed Contract Deliveries
  - Increased Program Costs
  - Contractual Penalties
  - Client Dissatisfaction

- Financial Risk
  - Supplier financial distress
  - Price volatility
  - Cost to Qualify New Source
  - Loss in revenue

(Supplier's Non compliance --- Procurement Risks on Contractor)

- Quality Risks
  - Rework Costs
  - Site disruptions
  - Contractual Penalties
  - Client Dissatisfaction
  - Counterfeit Parts

- Technical Risk:
  - Lower efficiency, Cost overruns
  - Deteriorating input/output ratio of plant
  - Emission standards not met
  - Input consumption over budget
  - Client Dissatisfaction

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Effect of Mismanaged Procurement Risks

- Contractor
  - Brand impact
  - HSE and technical issues at project site
  - Quality/schedule non conformities
  - Productivity loss due to delayed supplies
  - Additional costs
  - Additional logistics to expedite shipments
  - Lost revenue
  - Penalties / litigations
- Owner
  - Delays
  - Brand and reputation loss
  - Revenue Loss
  - Unplanned shutdowns / site disruptions
  - Potential liability from clients
  - HSE and operational issues

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Procurement – Then and Now

Then	Now
In-country ▪ Limited suppliers	Geography is History ▪ Best Country Sourcing ▪ Multiple suppliers
Primarily focused on ▪ Lowest Cost ▪ Schedule ▪ Quality	Value to the Project ▪ Life cycle cost ▪ Shorter schedules ▪ Global Quality ▪ Financing ▪ Technology ▪ Intellectual property
Adversarial Relationship with vendors	Focus is on Partner Relationship

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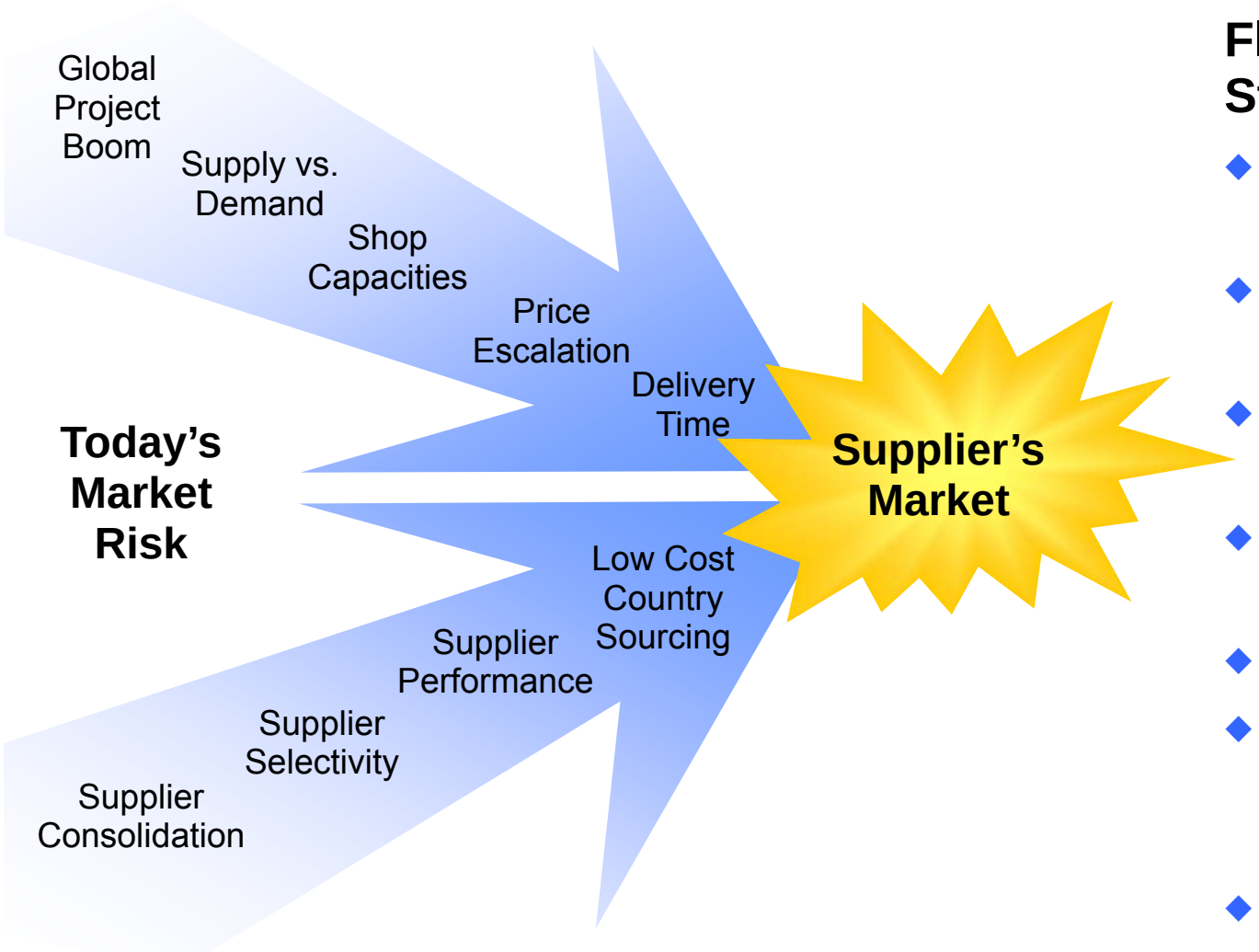
Fluor's Mitigation Strategies for Procurement Risks



Fluor's Mitigation Strategies

- Market / Sourcing Intelligence
- Supply vs. Demand Forecasting
- Low Cost Country Sourcing
- Logistics & Export / Import Compliance
- Supplier Inspection
- Escalation, Delivery, and Shop Load Forecasting
- PEpC Process

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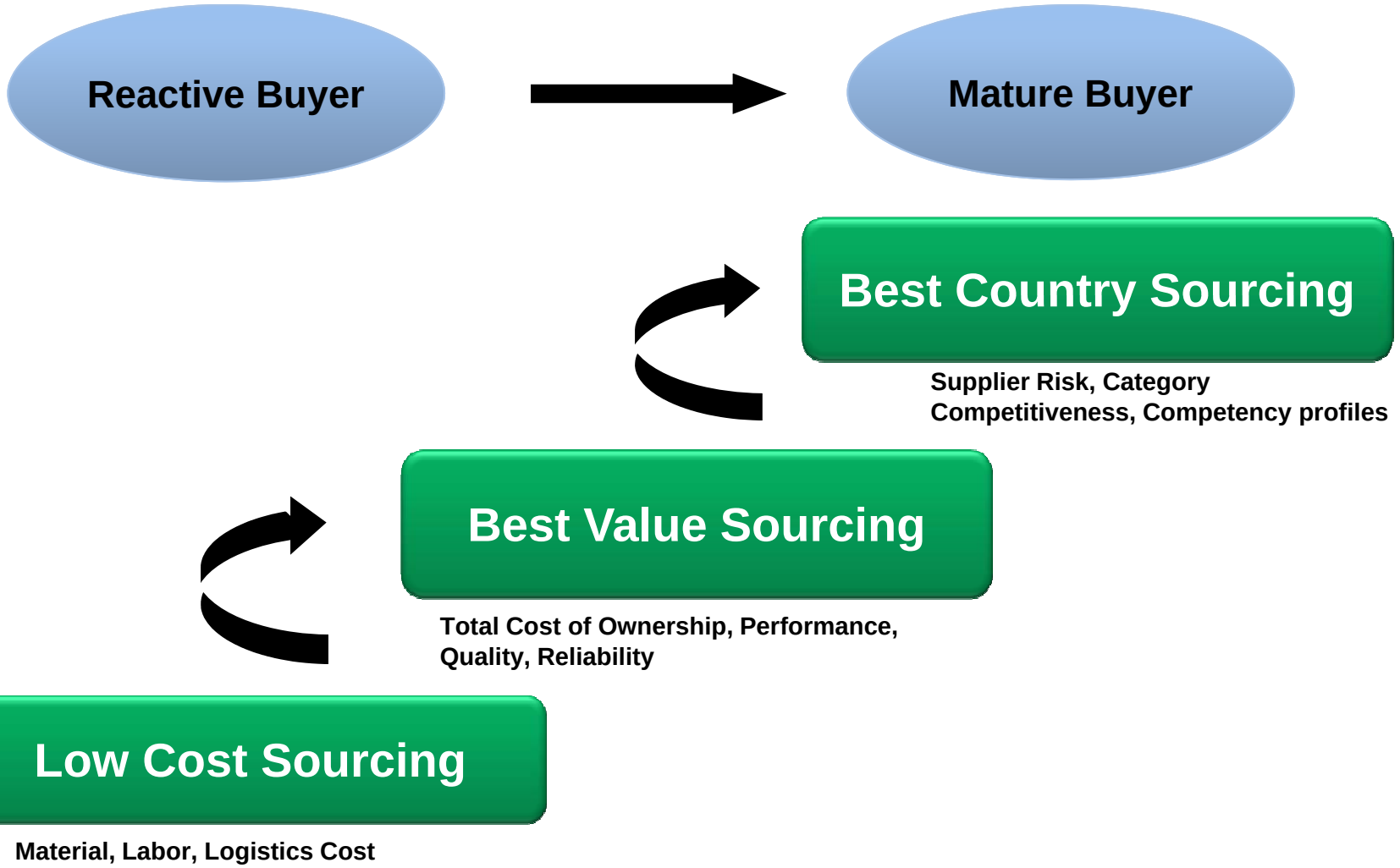
Best Country Sourcing - A Paradigm Shift



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Early Supplier Integration

Fluor has adopted the PEpC model based on concepts and research performed by the Construction Industry Institute (CII). This demonstrated that by modifying the traditional Engineer, Procure, Construct (EPC) model with Early Supplier Integration of strategic suppliers, significant savings in the time and cost of the entire project delivery process can be realised whilst still ensuring that long term Total Life Cycle objectives of a project are met

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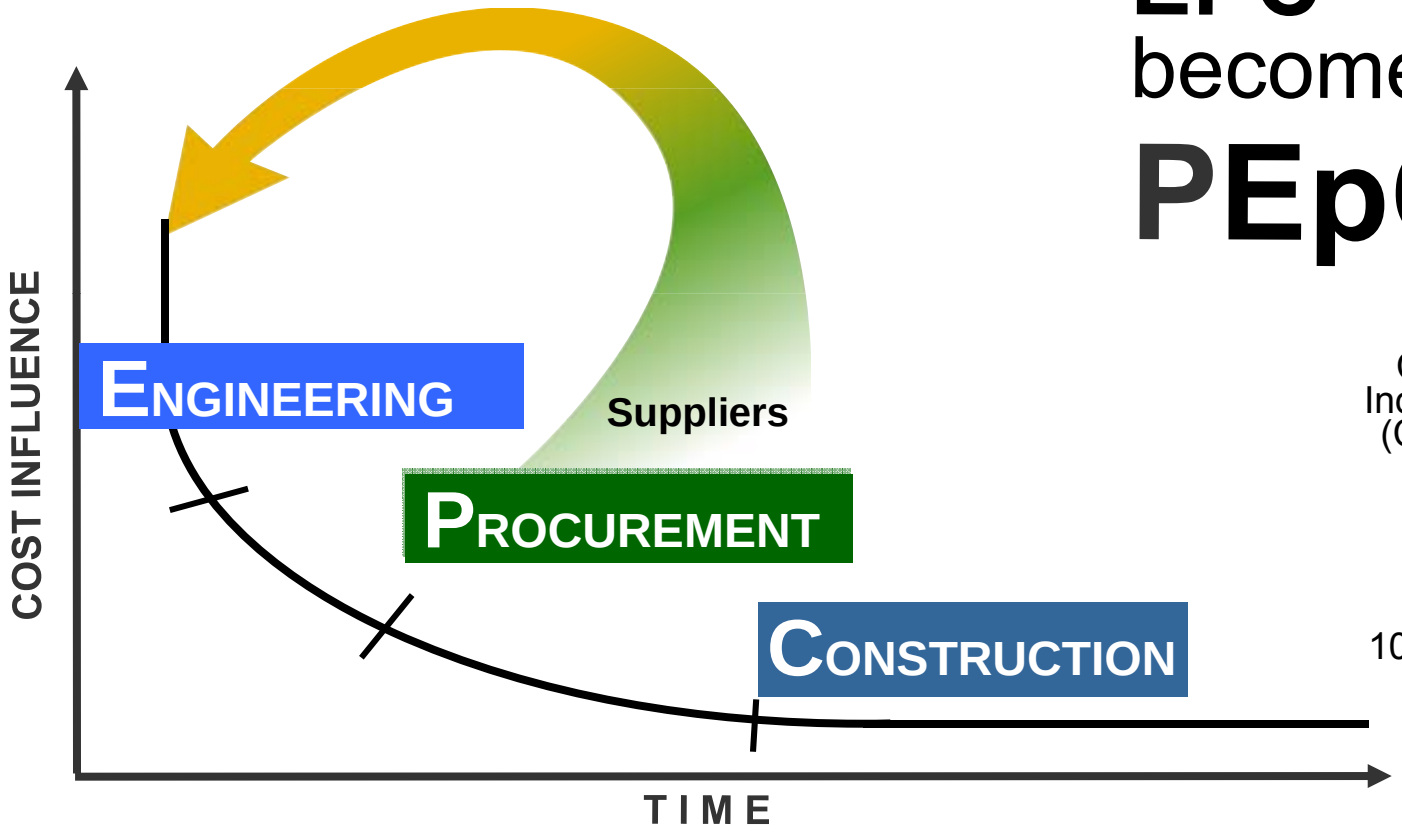
Supplier Integration: The PEpC Process

EPC
becomes
PEpC



Construction Industry Institute (CII) indicates:

4-8% cost savings

10-15% savings in time

The ability to influence the cost of a project is greatest at the beginning of a project - bringing key suppliers in early is essential to success.

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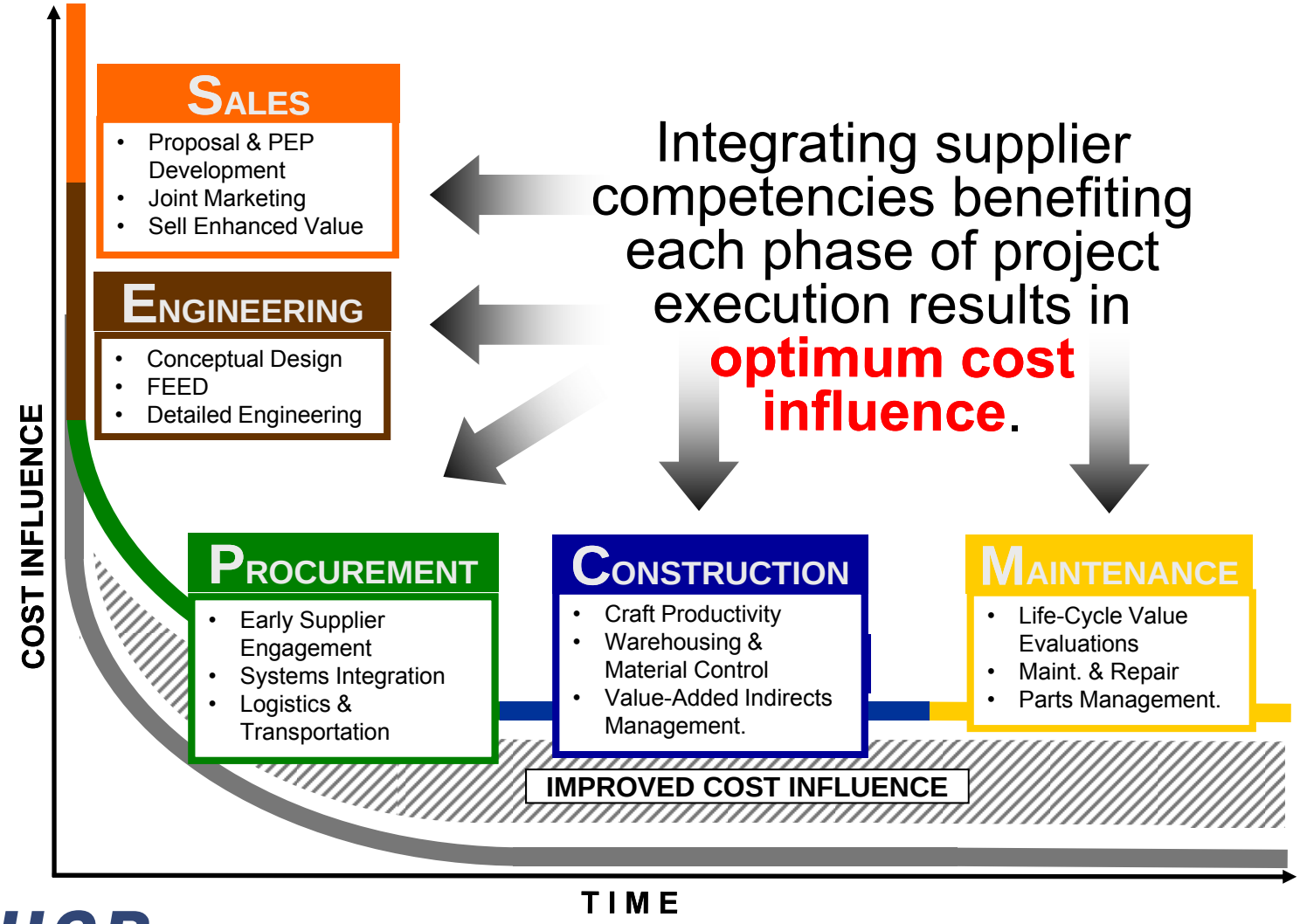
Supplier Integration: The Next Level



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Procurement Risk Summary

- Procurement is a significant component of EPC projects, critical procurement activities need to occur early in the project lifecycle
- Risk management will become an embedded part of supply management
- The need for effective risk management will force companies to look past tier one suppliers
- Risk management approaches will rely more on prevention and less on mitigation
- Internal and external alignment is critical
- Transparency and real-time data updates will increasingly replace reactive and batch-data updates
- Continuous improvement of risk management capabilities will be a major corporate priority model to an enterprise-wide excellence model
- Effective risk management strategies will help achieve a competitive advantage rather than simply providing a defence

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Construction Challenges

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Construction Challenges

- Modular vs Stick build construction
- Plan construction activities ahead of time
- Identify key constraints and mitigate related issues such as
  - Availability and Productivity of Construction Labour
  - Site Accommodation / Temporary Facilities
  - Logistics (integration with supply chain), Laydown Areas
  - Heavy Lifts
  - Lack of construction assets
  - Lack of maintenance of construction assets
  - Poor construction safety culture
- Projects need to employ innovative work processes such as the 3rd Gen Modularization that Fluor advocates for compressing plot area, building size, material quantities; reduction of field work, congestion and improved productivity.

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Conclusion

- Risk management = PROFIT management
- Risk is the partner of Opportunity
- Risk Management = Project Management

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Questions and Answers

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