Track Two: Deepwater Developments: Increasing Demand While Maintaining Quality & Reliability

**Offshore Megaprojects - Why we fail and how to fix it**

Roy Robinson – Global Contracts Manager for Development and Production
D. E&P COMPRAS
rrobinson@repsol.com

Co-authors:
Natalia Gonzalez Serrano – Contracts Manager, Repsol
Alfredo Salcines Tudela – Project Engineer, Repsol
World Class Project Performance is Achievable

- There is a historically high failure rate among projects classed as Megaprojects, and the numbers are bad across all industrial sectors; offshore oil and gas is no exception.

- E&P megaprojects suffer failure* rate of between 35% and 65% or more.

- The root cause of offshore oil and gas project failure is the standard Development Management Gate Process which ensures uncertainty; not project complexity and/or lack of project controls. At least for offshore oil and gas developments it is the search for the “best alternative” that creates much of the uncertainty, and therefore risk.

- Incremental Design Optimization (IDO) is a proven method to increase project quality while simultaneously reducing uncertainty, shortening schedules, and increasing NPV.

- In the simplest terms IDO is applying standard industrial engineering techniques to Offshore Development, changing only what must be changed from one project to the next and prioritizing quality and flexibility over “optimal” design.

- Implementing the changes required to implement IDO is not complicated but it requires commitment at the highest levels of a company.

*Using the IPA definition of failure: as +25% cost and/or schedule, and/or production targets missed for first two years.
Reasons Given for E&P Megaproject Failures
(taken from Schlumberger Business Consulting study)

1. Lack of Front End Loading - Poor project definition (based on IPA FEL Score)
2. Optimistic scheduling
3. Changes during execution; placing orders before engineering was completed
4. Overbooking of capacity by contractors
5. Lack of contractor or operator experience
6. Poor documentation transfer between project phases and members
7. New technology or selection of the wrong technology
8. Poor design basis and/or poor reservoir definition
9. Interfaces not properly identified and understood
10. Integration of software or control system incompatibility
11. Lack of management experience, skills, and/or systems
12. Cultural or political conflicts between partners and/or stakeholders
13. Poor use of lessons learned – repeating the same mistakes
14. Risk analysis that is poorly performed (Political, Economic, Social, and Technical)

MOST COSTLY: “Black Swans” – events outside of the project for which the project is not prepared, “Unknown-unknowns”
The Real Reason for Megaproject Failure?

The reasons most projects fail is the traditional Project Cycle, shown below, which guarantees that the complexity will be beyond our ability to manage.

- The real killer of megaprojects is uncertainty; by definition prototypes are full of uncertainty. **You don’t know what you don’t know….the infamous “Black Swans”**
- Examine any manufacturing industry and prototypes are always expensive and late, yet in a short time the exact same design is being built in much less time, for much less money, and with a higher quality of product.
The Myth of Field Complexity and the Dreamliner® Syndrome.

The common response to proposals to unify offshore development design concepts is that offshore oil and gas projects vary too much to allow a one size fits all approach.

Within limits, that statement is wrong, and in fact the best mitigation for the risks inherent in the differences from one field to the next is revise the facility as little as possible.

The issue is that to ensure flexibility the CAPEX of the standardized design will appear higher than an optimized design but our industry seriously underestimates the negative effects of building “prototype projects”.

The Dreamliner® Syndrome

If every time Boeing went to build a jet liner they started from a functional specification what would happen?

The first Dreamliner® was 5 years behind schedule and $7 billion over budget. As Boeing intends to build 600+ of them, Boeing depends on getting better at building them. Dreamliner’s do not become less complex, but the design becomes familiar to the managers and to the workers building them; they now produce them at less than $200 million each at a rate of 75/yr.
Incremental Design Optimization - How

The eight steps to long term project portfolio success.

1. **Change the PM Process**: Focus the Project Management System on **selecting the most adaptable and broadly applicable design**.

2. **Bid Once/Award Long Term** - Standardize equipment and services to the extent possible/practical. Start the process to build long term relationships with fewer total contractors by Category; and develop key local contractors in each market.

3. **Central Control/Distributed Management** – Within an E&P Company the projects should be under the direction of a central group, but the fabrication and execution of the system components should be under **fully empowered and qualified line managers**.

4. **Incrementally improve the design**, **Use Lessons Learned to improve performance at each execution**. IDO does not limit technological innovation it encourages it by allowing focus on developing new systems instead of re-designing new combinations of old ones.

5. **Proactively Manage HSE** – Continuously strive to make the construction and operation incident free – **NEVER repeat a mistake or incident**.

6. **Build long term relationships with Partners, governments, and communities**; familiarize them with the selected concepts. When Operator insist on IDO, when a partner offer it.

7. **Leverage Documentation, Cost, and Schedule data** – automate **collection of data in a form that allows continuous improvements** in operability, and cost/schedule and prediction.

8. **Focus on Quality and Delivery** – **Improving delivery and while maintaining quality** is a central goal of industrial production and how to avoid the Dreamliner Syndrome.
Incremental Design Optimization - Why

<table>
<thead>
<tr>
<th>Failure Causes (From Slide 3)</th>
<th>IDO Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Poor Project Definition / Lack of FEL</td>
<td>Each project progressively more defined at sanction</td>
</tr>
<tr>
<td>2 Optimistic Scheduling</td>
<td>Delivery and construction schedules, and risks known after first execution.</td>
</tr>
<tr>
<td>3 Changes During Execution</td>
<td>Designing for flexibility from the start minimizes these impacts</td>
</tr>
<tr>
<td>4 Overbooking of contractor capacity</td>
<td>Long term partnerships mean capacities known</td>
</tr>
<tr>
<td>5 Lack of contractor experience</td>
<td>With each successive build, experience grows.</td>
</tr>
<tr>
<td>6 Poor information management</td>
<td>Like all interface activities this will improve at each execution</td>
</tr>
<tr>
<td>7 New/wrong technology</td>
<td>Errors in the previous system corrected; where new tech or more flexibility is needed it is designed in.</td>
</tr>
<tr>
<td>8 Poor basis and/or reservoir definition</td>
<td>The use of Early Production Systems will help mitigate this, and a broadly applicable design will be less impacted.</td>
</tr>
<tr>
<td>9 Poor Interfaces</td>
<td>Long term relationships smooth out interfaces</td>
</tr>
<tr>
<td>10 Integration of systems</td>
<td>Key objective of a Lessons Learned system and IDO is deep integration.</td>
</tr>
<tr>
<td>11 Lack of management experience, skills, and/or systems</td>
<td>Over time the Project Teams and Contractors will become experts in the system, providing the basic design is the same.</td>
</tr>
<tr>
<td>12 Conflicts between partners and/or stakeholders</td>
<td>Nothing builds camaraderie like success. The ability to deliver in less time with higher quality smooths out conflicts.</td>
</tr>
<tr>
<td>13 Poor use of lessons learned</td>
<td>If a project shares 80% of its design with the previous one 80% of the Lessons Learned are directly applicable.</td>
</tr>
<tr>
<td>14 Poor Risk Analysis</td>
<td>Political, Economic, Social, and Technical (PEST) Risks</td>
</tr>
</tbody>
</table>

“Black Swans” don’t go away, but with each project you know where more of them live……and how to avoid those particular ones.
IDO is Proven (outside of Oil & Gas) and Companies are Moving There

Kerr McGee – pre Anadarko - was the closest to using this model. Of the 22 SPARS in world 6 of the top 7 performing projects were KMG. One went from sanction to production in less than 20 months – on budget and achieved its production goals.

BP has gone to a centralized project group model since 2010 and it is already showing positive results.

Shell is reducing the number of approved vendors and moving to more uniformity across their various projects.

Exxon and Chevron both reportedly are moving in the same direction as BP and Shell to one extent or another.

Petrobras uses aspects of the IDO system, but not directly as a policy, and with some critical differences from what is proposed here. For example building 12 identical FPSO for use in similar fields (subsalt plan) fits with IDO. Trying to build more than one at the same time does not and is likely to reduce overall performance, not improve it.
Main Obstacles to IDO

**Internal**
- Project Management Inertia – the tendency to want to do things the way “they always have”
- “Silo-itis” – the system can be perceived as reducing line managers authority
- “IDO Not” – the temptation to change the majority of a system while labeling it the same concept

**External**
- Local Content laws may limit a global procurement approach and/or ability to use preferred contractors
- Partner’s Project Cycle Systems for approval may conflict with IDO
- Reduced cycle times will put permitting and Environmental Impact Studies on the critical path
What can we do, the short version?

1. Create Central Offshore Development groups to concentrate the best talent in a company.
2. Make it policy that any new project starts with the premise of repeating as much of the previous one as possible.
3. When selecting the model concept shift the selection criteria to:
   • Which system best matches my companies overall portfolio in terms of field types and characteristics?
   • Where practical which systems will allow fabrication to occur locally if required?
   • Which system offers the most robust and flexible production capacity?
   • Which contractor aligns our probable needs in terms of their capacity and experience.
4. Select Global Contractor partners for each major component and stick with them unless disallowed by local law or they perform badly. Where local content issues arise support your key contractors in becoming “local”.
5. “SIMCITY” every offshore project. Full 3D modeling of a system is an underutilized tool, in part because it is expensive to build a model integrating components from various contractors. Using IDO means once the model is built it is applicable across projects.
1. **Division of work.** Work should be divided among individuals and groups to ensure that effort and attention are focused on special portions of the task. Fayol presented work specialization as the best way to use the human resources of the organization.

2. **Authority.** Managers must be able to give orders. Authority gives them this right. Note that responsibility arises wherever authority is exercised.

3. **Discipline.** Employees must obey and respect the rules that govern the organization. Good discipline is the result of effective leadership, a clear understanding between management and workers regarding the organization's rules, and the judicious use of penalties for infractions of the rules.

4. **Unity of command.** Every employee should receive orders from only one superior.

5. **Unity of direction.** Each group of organizational activities that have the same objective should be directed by one manager using one plan.

6. **Subordination of individual interests to the general interest.** The interests of any one employee or group of employees should not take precedence over the interests of the organization as a whole.

7. **Remuneration.** Workers must be paid a fair wage for their services.

8. **Centralization.** Centralization refers to the degree to which subordinates are involved in decision making. Whether decision making is centralized (to management) or decentralized (to subordinates) is a question of proper proportion. The task is to find the optimum degree of centralization for each situation.

9. **Scalar chain.** The line of authority from top management to the lowest ranks represents the scalar chain. Communications should follow this chain. However, if following the chain creates delays, cross-communications can be allowed if agreed to by all parties and superiors are kept informed.

10. **Order.** People and materials should be in the right place at the right time.

11. **Equity.** Managers should be kind and fair to their subordinates.

12. **Stability of tenure of personnel.** High employee turnover is inefficient. Management should provide orderly personnel planning and ensure that replacements are available to fill vacancies.

13. **Initiative.** Employees who are allowed to originate and carry out plans will exert high levels of effort.

14. **Esprit de corps.** Promoting team spirit will build harmony and unity within the organization.