Alignment for Large Engineering Projects:
Architecting Distributed Leadership

April 19th
Nick McKenna
Thunder Horse: A Large Project

Ownership: BP (75%); Exxon (25%)
Output: Oil: 200,000 b/per day
          Gas: 200 mil cubic feet/day
Location: 125 miles SE New Orleans
Water Depth: 6000ft
Product: 15,000psi, 270 degF
Hull: DW 60,000t, Displ 130,000t
Topsides: 20,000t
Power generation: 100MW
Accommodation: 185 persons
Cost: $2 billion
Completion: 2006
Large Engineering Projects are unique, dedicated, and usually one-off products with intensive interactions between sponsors and contractors\(^1\).

Delivering a unique product requires a unique organization

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Different firms, different contracts

CONTRACT DIAGRAM
NEW BUILD FPSO

<table>
<thead>
<tr>
<th>FPSO</th>
<th>PIPELINES AND RISERS</th>
<th>SUBSEA EQUIPMENT</th>
<th>CONTROL</th>
</tr>
</thead>
<tbody>
<tr>
<td>HULL</td>
<td>TOPSIDES</td>
<td>MOORING</td>
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<tr>
<td>FLOWLINES</td>
<td>TRANSFER LINES</td>
<td>RISERS</td>
<td>UMBILICALS</td>
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<tr>
<td>MANIFOLDS</td>
<td>JUMPERS</td>
<td>TREES</td>
<td></td>
</tr>
<tr>
<td>PROJECT MANAGEMENT</td>
<td></td>
<td></td>
<td>BP plus E&amp;P (Reimb)</td>
</tr>
<tr>
<td>FEED</td>
<td></td>
<td>POTENTIAL DESIGN COMPETITION (LS)</td>
<td>F1 (Reimb)</td>
</tr>
<tr>
<td>E&amp;P</td>
<td>DETAILED ENGINEERING</td>
<td>EP1 (Reimb)</td>
<td></td>
</tr>
<tr>
<td>PROCURE EQUIPMENT</td>
<td>H1 (LS)</td>
<td>RF1 (LS)</td>
<td>SP5 (LS)</td>
</tr>
<tr>
<td>PROCURE MATERIALS</td>
<td>TS1 (BoQ convert to LS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FABRICATION</td>
<td></td>
<td></td>
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<tr>
<td>TRANSP. HULL TO TOPSIDES INTEGRATION SITE</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>INTEGRATION</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>TRANSP. TO FIELD / LUANDA</td>
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<tr>
<td>INSTALL</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>OFFSHORE HOOK UP</td>
<td></td>
<td></td>
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<tr>
<td>COMMISSION</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>DRILLING</td>
<td></td>
<td></td>
<td>BP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>D1 (DR)</td>
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</table>
Contracts are Incomplete

- Project sponsor assembles the required skills and assets through formal contracts.
- Contracts for development projects are incomplete (can’t *a priori* specify a complete scope).
- Much of the behavior that is required amongst firms is non-contractible:
  - Efficient provision of information
  - Knowledge building
  - Joint problem solving/decision making (joint consequence awareness)
- Projects featured dispersed decision making under uncertainty.
- Should we expect dispersed decision making to provide coherent outcomes?
Contracts are Incomplete

- Projects frequently become adversarial amongst firms (Schedule delay, budget creep).
  - Multiple firms, multiple shareholders, stakeholders
- Design the Formal Contracts:
  - Allocate Scope (Boundaries)
  - Allocate Risk
  - Metrics
  - Incentives, etc
- To generate/support the development of successful “distributed leadership”.

Where do we find successful examples of distributed leadership?
High Uncertainty, High Reliability

Distributed Leadership in Action - High Reliability Organizations:
- Nuclear Power Plants
- Aircraft carrier Flight Operations
- Offshore Operations

Build trust, based on repeated interactions, situational awareness (shared consequences) – Distributed Decision Making

However, usually within one organization.

How do we achieve it across firm boundaries?

By building “alignment”.

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1. What constitutes alignment amongst firms executing large engineering projects?
2. What policies or actions facilitate the generation of alignment?
Definitions of Alignment

The correct position or positioning of different components with respect to each other or something else, so that they perform properly.²

Alignment can be defined as the condition where appropriate project participants are working within acceptable tolerances to develop and meet a uniformly defined and understood set of project objectives.³

Formal and informal patterns of interaction within and across inter-dependent stakeholders that serve to advance the separate and the collective interests of these stakeholders.⁴

Emerging theory of alignment

A six factor model of alignment:

- System design
- Organizational design
- Contract design
- Risk
- Metrics
- Incentives

Aligned firms build reinforcing trust-based mechanisms.

“Trust based relationships are critical for success”. VP Engineering
How can we architect alignment?

• **ALIGN** is a process that assists Project teams in generating alignment with contractors.

• **ALIGN** is:
  – The **ALIGN Implementation Guide** (describes the process)
  – A set of **ALIGN Workshops** (Sponsor stakeholders, contractors)
  – The **ALIGN Assessment Tool** (tests extent of alignment and readiness)
  – The **ALIGN Development Matrix** (provides focus and captures actions)

• **ALIGN** engages internal and external stakeholders and focuses on the need to **design the organization** along with **designing the facility**.
The Goals of Alignment

• **ALIGN** delivers the **goals of alignment**

1. Project Goals:
   – Motivation towards advancing separate and collective interests
   – Collaborative project environments
   – Robust relationships based on trust and mutual respect

2. Longer Term Goals:
   – Sponsor positioned as the “customer of choice”
How does ALIGN work?

• By generating **specific actions** tied to specific **Areas of Focus**
  – System Design
  – Organizational Design
  – Contract Design
  – Risk
  – Metrics
  – Incentives
• Using **ALIGN** tools to **identify the actions**
How does ALIGN work?

**Sample Agenda for 2 day workshop**

**DAY 1**
- 08.00-08.45  Introduction to ALIGN Workshop, ALIGN Goals and ALIGN Tools
- 08.45-09.15  Summary background to Development: key drivers, requirements, issues.
- 09.15-10.00  Review of contractor market place.
- 10.00-10.15  Break.
- 10.15-11.30  Initial ALIGN Assessment Tool session.
- 11.30-12.30  Lunch.
- 12.30-12.45  Recap and assign breakout sessions.
- 12.45-14.45  Breakout sessions with ALIGN Development Matrix.
- 14.45-15.00  Break.
- 15.00-17.00  Resume breakout sessions with ALIGN Development Matrix.
- 17.00-17.30  Wrap up for the day and set expectations for Day 2.

**DAY 2**
- 08.00-08.30  Copies of completed ALIGN Development Matrices from breakout sessions circulated.
- 08.30-10.30  Breakout Teams review Matrices for conflicts and misalignments with their groups & modify as appropriate.
- 10.30-10.45  Break.
- 10.45-12.30  Feedback from Breakouts (Revised Actions)
- 12.30-13.30  Lunch.
- 13.30-15.30  Review of proposed ALIGN Plan using ALIGN Assessment Tool (changes and gaps are captured, Actions assigned accountability).
- 15.30-16.00  Review of Workshop (including Feedback Questionnaires)
- 16:30  Wrap-up
  (Following Workshop Lead Facilitator provides electronic copy of Initial ALIGN Assessment Tool results
  Completed ALIGN Development matrices for each sector addressed.
  Copies of responsibility/accountability listings for each action item.
  List of Attendees
  Copies of Feedback Questionnaires.)
**ALIGN Assessment Tool**

<table>
<thead>
<tr>
<th><strong>ALIGN</strong> Assessment Tool</th>
<th>Rating</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System Design:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. A project FEL assessment has been completed.</td>
<td>Green</td>
<td></td>
</tr>
<tr>
<td>2. The critical project goals and objectives have been identified, complete with a hierarchy and clear trade-offs amongst them (i.e. at what point do we choose between cost v schedule, optimization v standardization, operability v CAPEX).</td>
<td>Red</td>
<td></td>
</tr>
<tr>
<td>3. Project technology has been assessed re novelty, increased complexity, and/or system scale (size, weight, water depth).</td>
<td>Amber</td>
<td></td>
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<tr>
<td>4. Scopes of work have been identified for potential contractors/suppliers.</td>
<td>Green</td>
<td></td>
</tr>
<tr>
<td>5. Interfaces and dependencies amongst these scopes of work have been identified.</td>
<td>Red</td>
<td></td>
</tr>
<tr>
<td>6. Interface dynamics have been assessed i.e. Dynamic interfaces involve a substantial degree of revision and redesign as the associated elements of the scope progress, whereas Static interfaces can be defined early in terms of geometry, materials, performance envelope etc. and fixed for the duration of the design of associated scope.</td>
<td>Green</td>
<td></td>
</tr>
<tr>
<td>7. Detailed schedules for the individual scopes/sub-systems have been developed and an overall integrated schedule defining the interdependencies between major contractors has been completed. (An aid to identifying interdependencies amongst components/processes of the project is the use of a Design Structure Matrix (DSM) or other engineering system evaluation tools)</td>
<td>Green</td>
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<table>
<thead>
<tr>
<th><strong>Organizational Design:</strong></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. A project staffing plan has been developed, including staff numbers, responsibilities, reporting structures.</td>
<td>Green</td>
<td></td>
</tr>
<tr>
<td>2. The staffing plan is appropriate for project’s complexity, novelty and scale (i.e. the novel areas of the project are appropriately staffed)</td>
<td>Red</td>
<td></td>
</tr>
<tr>
<td>3. The staffing plan has a focus on the needs of the critical project interfaces (e.g. the interfaces amongst contractors are properly attended to in terms of managing the interdependencies, not just tracking information).</td>
<td>Green</td>
<td></td>
</tr>
<tr>
<td>4. The organizational plan supports the needs of the standardization approach being considered (e.g. for a program of projects a single point of accountability has been identified to resolve conflicts amongst the projects).</td>
<td>Red</td>
<td></td>
</tr>
<tr>
<td>5. The drivers for each project/SU function are consistent with the project goals and objectives (e.g. PSCM and the project execution team agree on the drivers, their hierarchy, and trade-off points).</td>
<td>Green</td>
<td></td>
</tr>
<tr>
<td>6. The organizational design is consistent with the contract design (e.g. staffing levels appropriate for the following type of contract – lump sum vs reimbursable, the experience of the contractor, the complexity and novelty of their scope – more novelty requires more direction from sponsor, etc.).</td>
<td>Red</td>
<td></td>
</tr>
<tr>
<td>7. Executive level sponsorship, external to the project team, has been identified and is in place for facilitating relationships, dispute resolution with key contractors etc.</td>
<td>Amber</td>
<td></td>
</tr>
</tbody>
</table>
The success of any project depends on healthy supplier and contractor markets and sound contractual relationships.

ALIGN Template

### Development Matrix

<table>
<thead>
<tr>
<th>Project:</th>
<th>Phase:</th>
<th>Sponsor:</th>
<th>Contractor:</th>
</tr>
</thead>
</table>

"The success of any project depends on healthy supplier and contractor markets and sound contractual relationships."
How does ALIGN Development Matrix work?

<table>
<thead>
<tr>
<th>1. Area of Focus</th>
<th>Alignment Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaborative Project Environments (Foster lateral alignment among contractors)</td>
<td>Build LP Position as the &quot;Customer of Choice&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Using these actions</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus on management of interfaces/interdependencies. Assign resources and processes to assist communication and integrated problem solving at organizational boundaries.</td>
<td>Assign key executive level contact to manage and support lasting relationship and communication outside of project team.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. To deliver these Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action 1: Area of Focus</td>
</tr>
<tr>
<td>Action 2: Organizational Design</td>
</tr>
<tr>
<td>Action 3: Alignment Goals</td>
</tr>
</tbody>
</table>

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How can we build a robust relationship?

**ALIGNED Development Matrix**

<table>
<thead>
<tr>
<th>Project:</th>
<th>Phase:</th>
<th>Market Sector:</th>
<th>Contractor:</th>
</tr>
</thead>
</table>

“The success of any project and BP’s long-term interests depend on healthy supplier and contractor markets and sound contractual relationships.” BP Project Principles.

**Alignment Goals**

<table>
<thead>
<tr>
<th>Long Term Trust and Mutual Respect</th>
<th>Motivate Efforts towards Mutually Advantageous Outcomes: “Advance the separate and collective interests”</th>
<th>Collaborative Project Environments (Facilitate lateral alignment among contractors)</th>
<th>Build BP Position as the “Customer of Choice”</th>
</tr>
</thead>
</table>

**System Design**

- Use minimal BP oversight needed to provide assurance of performance (i.e., trust the contractor to deliver, respect their capabilities).
- Design organization around team approach: Co-locate when possible, no gut feel, no blame policy towards changes and disputes. Align BP internal SCM and project teams around common drivers/policies.
- Design management process for interfaces/interdependencies. Assign resources and processes to assist communication and integrated problem solving at organizational boundaries.
- Assign key executive-level contact to manage and support lasting relationship and communication outside of project team.

**Organizational Design**

- Use standard pre-qual/contract TCOs, and requirements. Enter negotiations in good faith and look for “win-win” arrangements.
- Examine where different contract forms drive contract management. Designate roles and responsibilities. Establish interfaces (i.e., Lump Sum and reimbursable contracts). Use PSCM and PM Virtual College.
- Design contracts that allow contractors to distribute risk amongst themselves as appropriate. (Allocation?)
- Assign risk to contractors based on their willingness to accept, and their capacity to handle downside consequences.

**Risk**

- Award risk based on capacity to absorb downside and capability (knowledge) to manage uncertainty. These may not be congruent.
- Design metrics for Project Managers that are consistent with organizational design and system requirements (i.e., aligned with KPIs, program approach, standardization, etc.).
- Design key metrics that focus on fabrication, standardization, operability. Use QFD to deliver aligned design requirements.
- Use clear, simple metrics that relate to the contractors’ business needs.

**Metrics**

- Use transparent and consistent incentives focused on project outcomes (in addition to scope outcomes) and mutually agreed KPI targets.
- Design incentives that are: 1) Positive 2) Self-funded. 3) Flow down to key project staff. 4) Address interface needs (toward scope management rather than scope defense).

**Incentives**

- Actions are inter-dependent.
Integrating System Architecture and Organizational Architecture

Organizational Architecture

System Architecture

Project Process

GOVERNANCE

Contract Strategy

ALIGNMENT

Robustness

Knowledge

Incentives

Mitigate

RISK

Transfer

Reciprocity

Transform

DSM
Architecting Distributed leadership

A 6 Factor ALIGN Model proposed to assist in identifying *uncertainty* and *interdependence* with respect to:

Enterprise Decision Rights:
- Objectives of System
- Form of System
- Utilization of Assets
- Actions in response to measurement
- Mitigation of Risk

Leadership implies decision making. Distributed decision making requires a cohesive framework.
Questions?