



Alignment for Large Engineering Projects: Architecting Distributed Leadership

April 19th
Nick McKenna



Thunder Horse: A Large Project

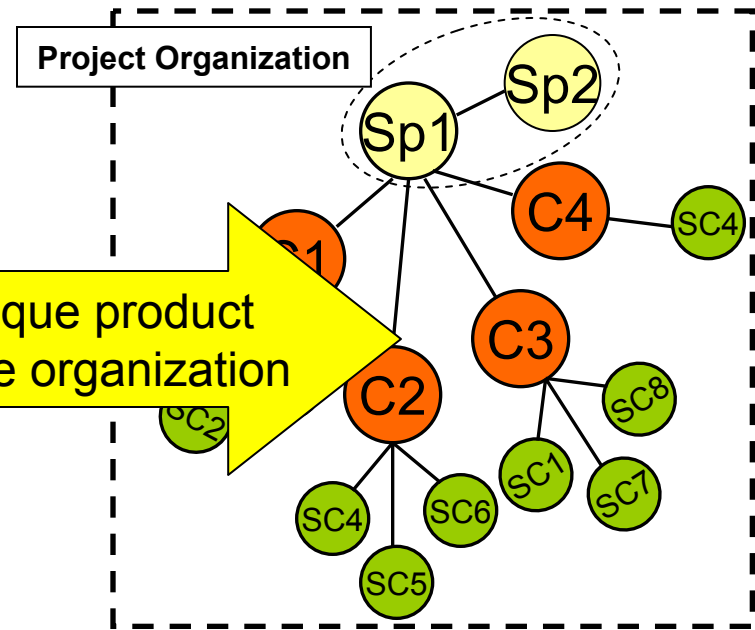
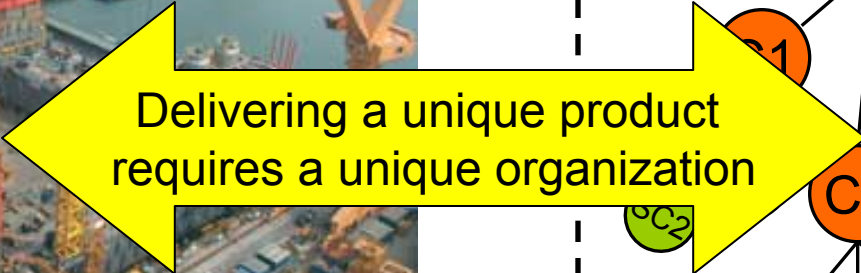


Ownership: BP (75%); Exxon (25%)
Output: Oil: 200,000 b/per day
Gas: 200 mil cubic feet/ day
Location: 125 miles SE New Orleans
Water Depth: 6000ft
Product: 15,000psi, 270 degF
Hull: DW 60,000t, Displ 130,000t
Topsides: 20,000t
Power generation: 100MW
Accommodation: 185 persons
Cost: \$2 billion
Completion: 2006



The challenge of energy projects

Large Engineering Projects are unique, dedicated, and usually one-off products with intensive interactions between sponsors and contractors¹.



1. Miller R., Lessard D., 2000, pg 7.



Different firms, different contracts

	FPSO			PIPELINES AND RISERS			SUBSEA EQUIPMENT			CONTROL	
	HULL	TOPSIDES	MOORING	FLOWLINES	TRANSFER LINES	RISERS	UMBILICALS	MANIFOLDS / JUMPERS	TREES	SYSTEM	
PROJECT MANAGEMENT	BP plus E&P (Reimb)										
FEED	F1(Reimb)									CS1 (LS)	
E&P	POTENTIAL DESIGN COMPETITION (LS)										
DETAILED ENGINEERING	H1(LS)	EP1 (Reimb)			RF1 (LS)			SPS1(LS)			
PROCURE EQUIPMENT											
PROCURE MATERIALS											
FABRICATION											
TRANSP. HULL TO TOPSIDES	TS1			RF1 (LS)			SPS1(LS)				
INTEGRATION SITE	(BoQ convert to LS)										
INSTALL	TS1			RF1 (LS)			SPS1(LS)				D1 (DR)
OFFSHORE HOOK UP											
COMMISSION	BP										
DRILLING	D1(DR)										





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?



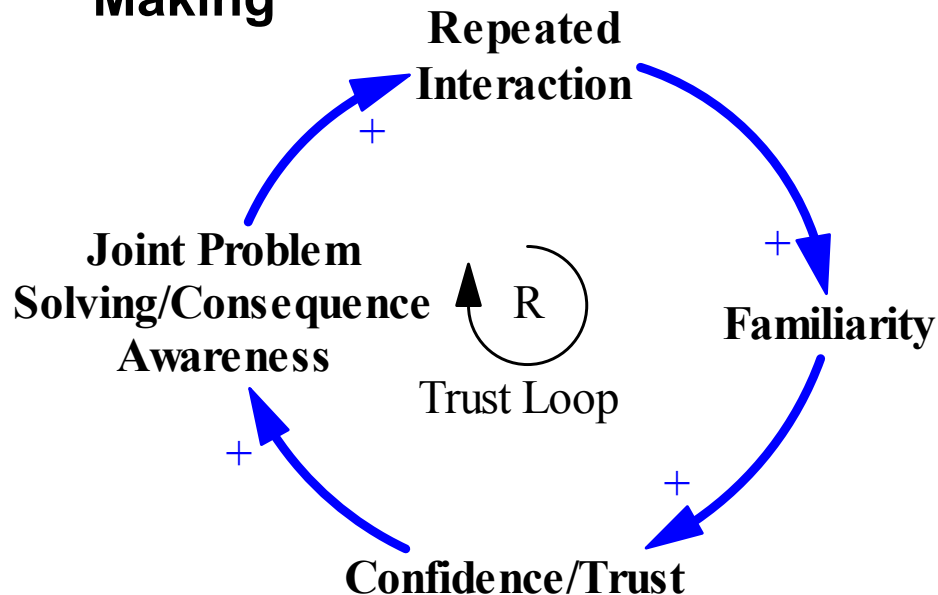
High Uncertainty, High Reliability

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”.



Project Enterprises: Product Systems

Research Question in two parts:

- 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

2. http://encarta.msn.com/dictionary_/Alignment.html

3. Griffith A, F., Gibson G, E., 2001, Journal of Management in Engineering., pp 69

4. Cutcher-Gershenfeld J., Moses J., MIT Working Group on Alignment, Slide Deck March 2005.



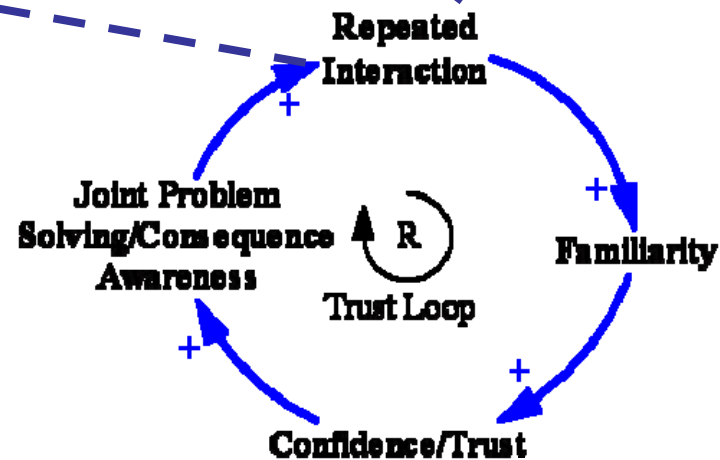
Emerging theory of alignment

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**.

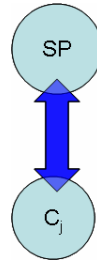


The Goals of Alignment

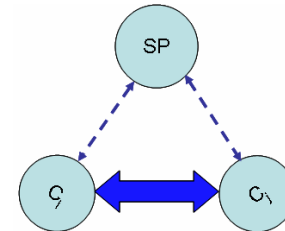
- **ALIGN** delivers the **goals of alignment**

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?



ALIGN Workshop

Sample Agenda for 2 day workshop

DAY1

- 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



Green indicates complete or substantial compliance with the expectation.
 Amber indicates that the expectation is addressed but not formally and/or rigorously.
 Red indicates gaps and areas identified for improvement.



ALIGN Assessment Tool	Rating			Comments
System Design:				
1. A project FEL assessment has been completed.				
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).				
3. Project technology has been assessed re novelty, increased complexity, and/or system scale (size, weight, water depth).				
4. Scopes of work have been identified for potential contractors/suppliers.				
5. Interfaces and dependencies amongst these scopes of work have been identified.				
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.				
7. Detailed schedules for the individual scopes/sub-systems have been develop 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 tool)				
Organizational Design:				
1. A project staffing plan has been developed, including staff numbers, responsibilities, reporting structures.				
2. The staffing plan is appropriate for project's complexity, novelty and scale (i.e. the novel areas of the project are appropriately staffed).				
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 <i>managing</i> the interdependencies, not just <i>tracking</i> information).				
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).				
5. The drivers for each project/BU function are consistent with the project goals and objectives (e.g. PSCM and the project execution team agrees on the drivers, their hierarchy, and trade-off points).				
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).				
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.				

Page 1



ALIGN Template



ALIGN	Development Matrix		
Project :	Phase:	Sponsor :	Contractor:

"The success of any project depends on healthy supplier and contractor markets and sound contractual relationships."

Alignment Goals			
Shorter Term (The Project) Goals			Longer Term Goals
Sponsor - Contractor: Motivate Efforts towards Mutually Advantageous Outcomes (Advance separate and collective interests). 	Collaborative Project Environments amongst Contractors (Foster lateral alignment among contractors) 	Long Term Trust and Mutual Respect	Build Sponsor Position as the "Customer of Choice"

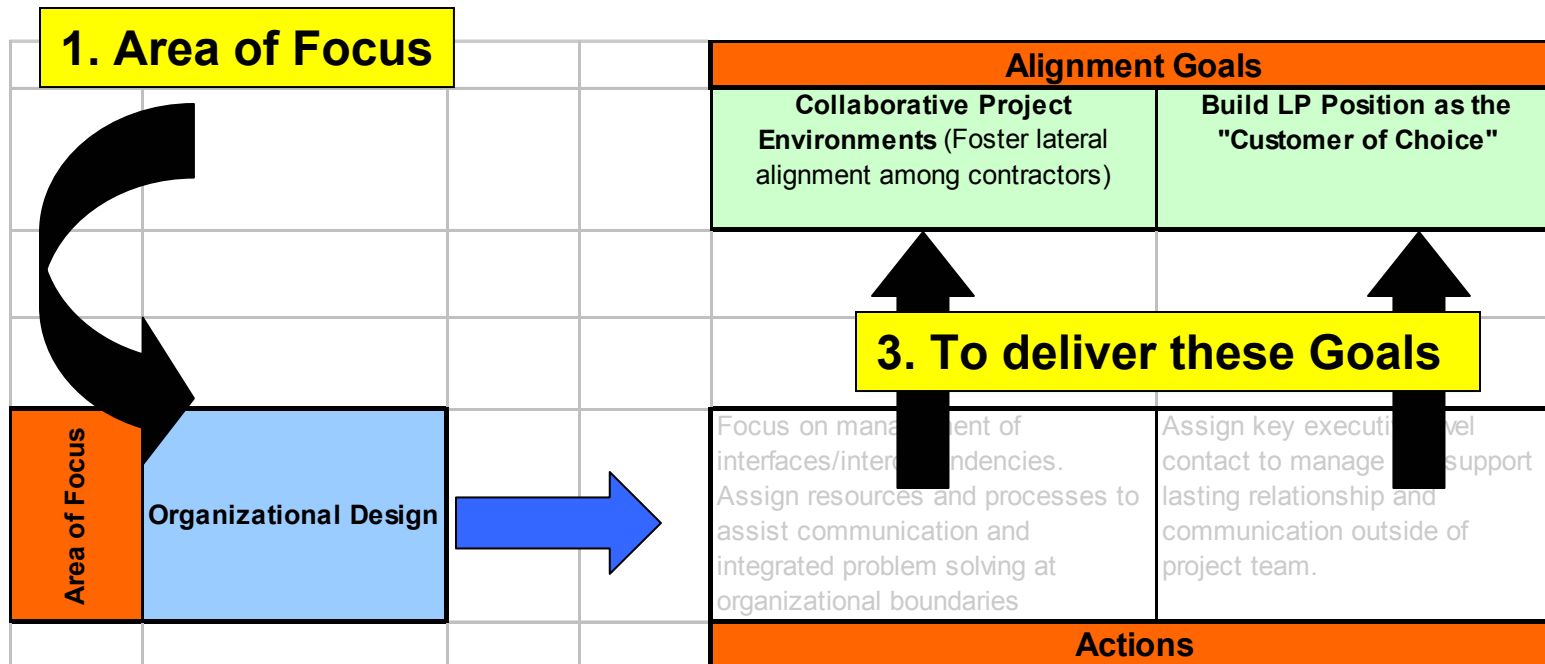
Areas of Focus	System Design	↑ Resp:	↑ Resp:	↑ Resp:	↑ Resp:
	Organizational Design	↑ Resp:	↑ Resp:	↑ Resp:	↑ Resp:
	Contract Design	↑ Resp:	↑ Resp:	↑ Resp:	↑ Resp:
	Risk	↑ Resp:	↑ Resp:	↑ Resp:	↑ Resp:
	Metrics	↓ Resp:	↓ Resp:	↓ Resp:	↓ Resp:
	Incentives	↓ Resp:	↓ Resp:	↓ Resp:	↓ Resp:
			Actions		

Actions are Inter-dependent






How does ALIGN Development Matrix work?



2. Using these actions



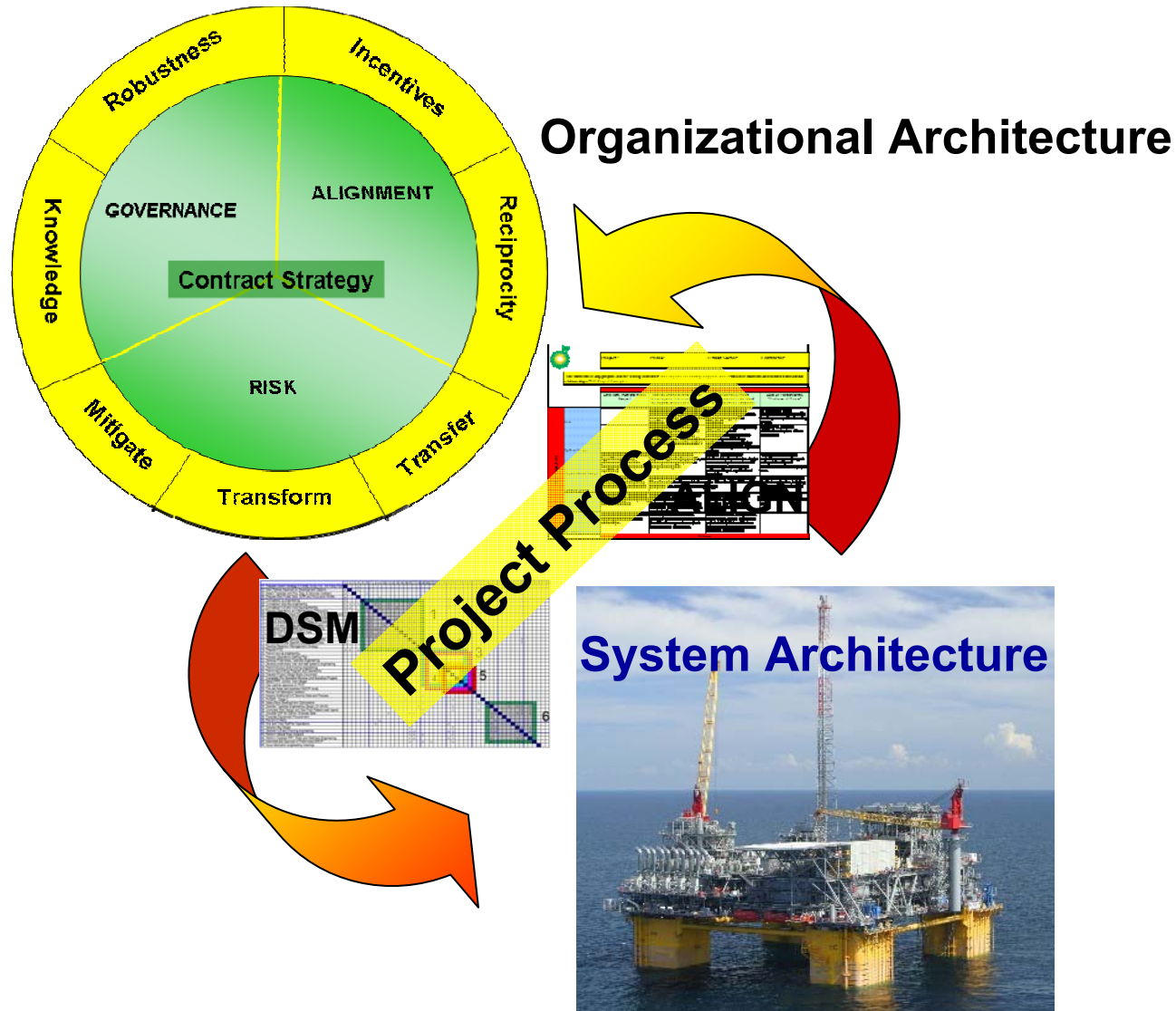
How can we build a robust relationship?

		ALIGN		Development Matrix			
		Project :	Phase:	Market Sector:	Contractor:		
"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							
		Long Term Trust and Mutual Respect	Motivate Efforts towards Mutually Advantageous Outcomes. "Advance the separate and collective interests"	Collaborative Project Environments (Foster lateral alignment among contractors)	Build BP Position as the "Customer of Choice"		
Areas of Focus	System Design		Rigorous FEL with DSM/QFD of system. Clearly defined scopes with integration at scope boundaries carefully considered. Consistent drivers across system elements (i.e. quality v cost)	Clear understanding (through DSM) of the critical system interdependencies. Well defined scopes and interface management systems to ensure effective integration of complex and dependent systems	Rigorous FEL with clear identification of system drivers c/w hierarchy	Actions are Inter-dependent	
	Organizational Design	Use minimal BP oversight needed to provide assurance of performance (i.e. <i>Trust</i> the contractor to deliver, <i>respect</i> their capabilities)	Design organization around team approach: Co-locate where possible, no us/them, 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.		
	Contract Design	Use standard pre-qual/contract T&Cs, and requirements. Enter new negotiations in good faith and look for "win-win" arrangements.	Examine where different contract forms (Lump Sum v Reimb) deliver diff drivers to contractor. Manage interfaces when different contract forms interact. i.e. (Lump Sum Fab, and Reimbursable Eng design). Refer to PSCM Navigator & PM Virtual College: Project Contracting Strategy Module		Use standard contracts that are familiar to contractors, including standard pre-qual formats and requirements.		
	Risk		Award risk based on capacity to absorb downside and capability (knowledge) to manage uncertainty. These may not be congruent.	Design contracts that allow/enable contractors distribute risk amongst themselves as appropriate. (Alliancing?)	Assign risk to contractors based on their willingness to accept, and their capacity to handle downside consequences		
	Metrics	Metrics to be selected and designed in conjunction with contractors and incorporating their business drivers	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.		
	Incentives	Use future work and preferred contractor relationships as the basis for incentive arrangements.	Use transparent and consistent incentives focused on project outcomes (in addition to scope outcomes) and mutually agreed KPIs/targets.	Design incentives that are: 1) Positive 2) Self funded, 3) Flow down to key project staff, 4) Address interface needs (reward scope management rather than scope defense)			
Actions							





Integrating System Architecture and Organizational Architecture





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?

