Drive Results.

Case Study: Complex Systems Engineering

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Introduction

Purpose of the presentation: Will be to illustrate how applied systems engineering and project management go hand in hand in delivering engineering projects successfully.

“and of course having the tools set to enforce the collaboration needed across engineering teams and disciplines”

This is a case study of a Joint Industry Project in the Oil and Gas Industry who needed improved collaboration around the design and delivery of a complex asset

Engineering is a collaborative eco system of teams

We need to collaborate around the big picture design as one team.

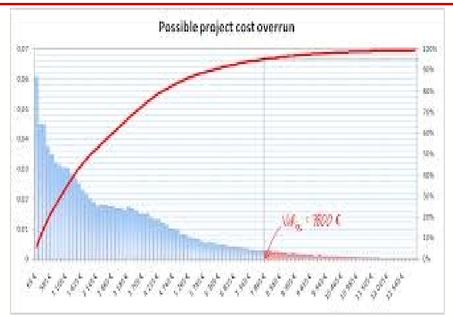
To secure the quality of delivery we aim for

The Oil and Gas Industry

Systems Engineering, highlighted that the embryo of all designs starts with requirements mgt

Get this wrong and there are risks we just cant take

Platform Explosion Environmental Disaster



Project Over runs

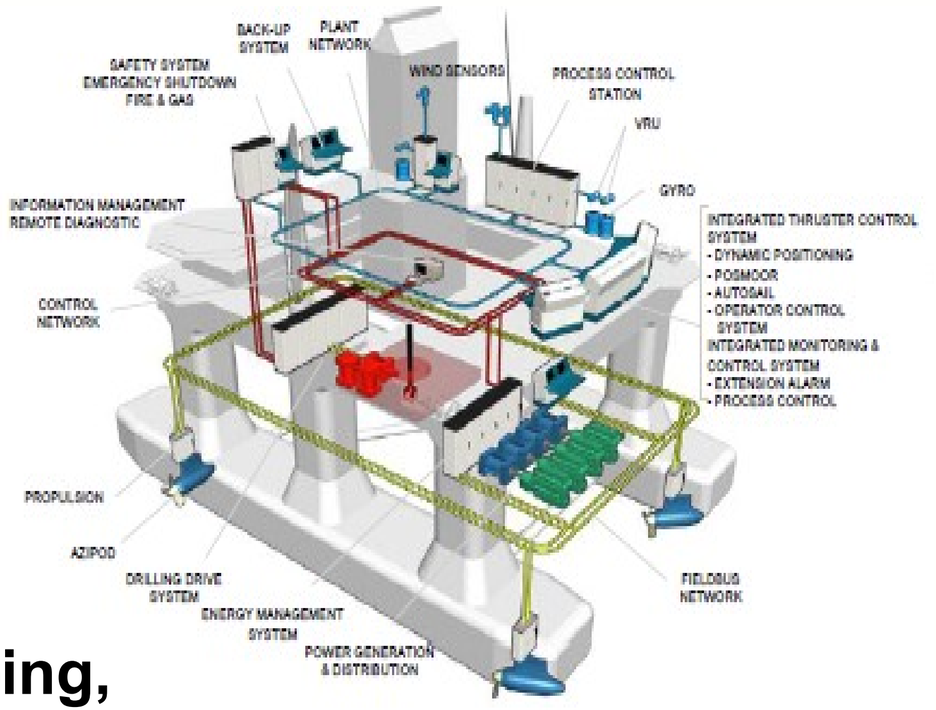
Production Down time

Complex Systems changes the risk picture for advanced platforms and sub sea production assets

+ Facts and Figures

- The **Blow out Prevention Control System** contains approx. 200,000 lines of code
- The **Dynamic Positioning System** contains 500, 000 lines of code
- The **Drilling Control System** has more than 500,000 lines of code
- The **Power Management system**, the safety systems and the **Integrated Automation Systems** have together more than 380,000 lines of code
- This is without the **SCADA** communication systems

An experienced programmer can program, test and verify 10-15 lines per day !



Direct Challenges:

- **Developing philosophies for Designing, Developing, testing and integration of complex systems**
- **Collaborating across engineering teams and having complete control over engineering data and artifacts.**
- **Increasing efficiency across the life cycle of a System and SW assets**

How can Systems Engineering reduce these impact areas

Cost Overrun Causes	Impact/severity
Frequent design & scope changes	23.9%
Incorrect planning & scheduling by EPCs	17.8%
Delay in material procurement	11.8%
Fluctuation in prices of materials	9%
Underestimation of project duration	7.5%
Contract mismanagement	7.5%
Lack of communication	4.5%

Source: The future of oil and gas amidst persistent cost overrun-presented at ICCE Ottawa, Canada, Evans Akwasi Gyasi, PhD Researcher at The University of Warwick

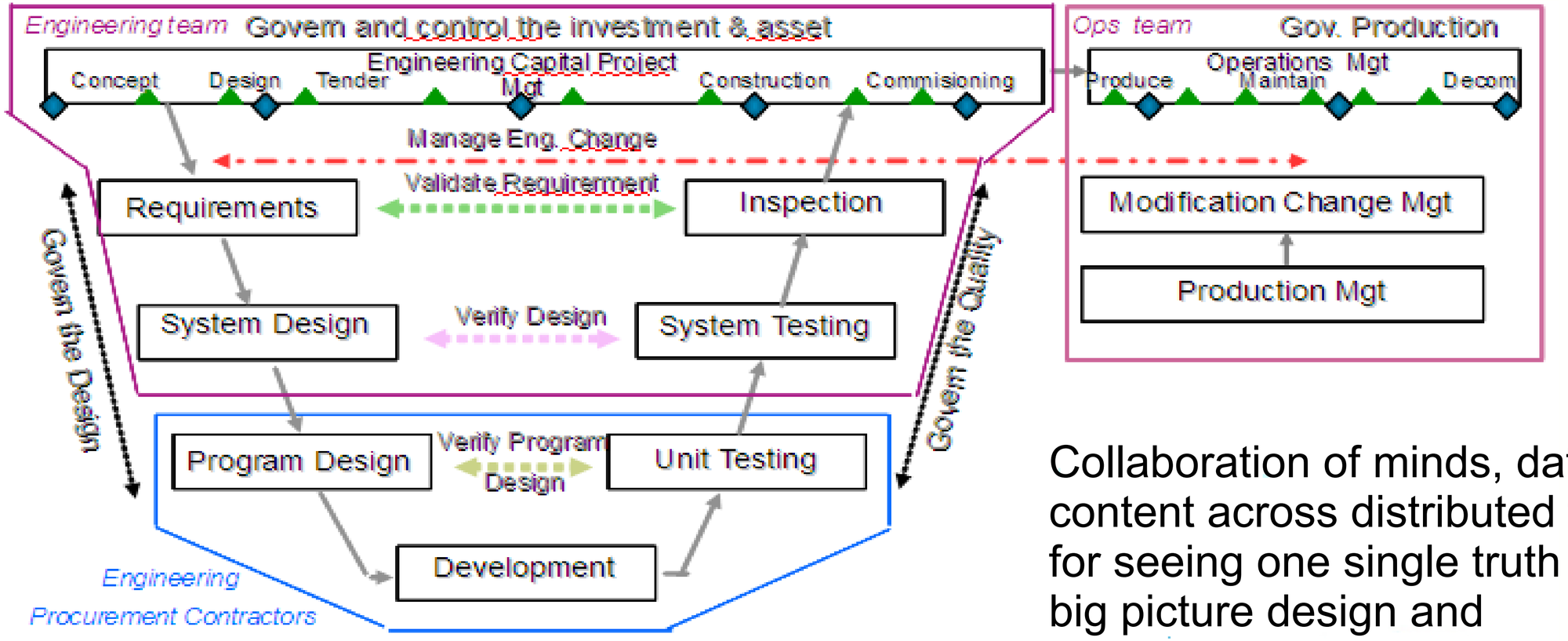
Caused by Incomplete Requirements Capture, Changing Government Regulations, Design Collaboration with WW distributed EPCs

Total Estimated Cost of Project	Potential Over run of estimated cost calculated at (35%) of the estimated project cost	Impact of poorly managed requirements (12%) of the (35%) of the over run cost	Approx. Investment cost in IBM Solution	Potential savings within the project
$ 650,000,000	$227,500,000	$27,300,000	$3,250,000	$24,050,000

** An example of potential conservative cost savings within a project**

Turning a process model and standard, Into day to day workting methodologies…

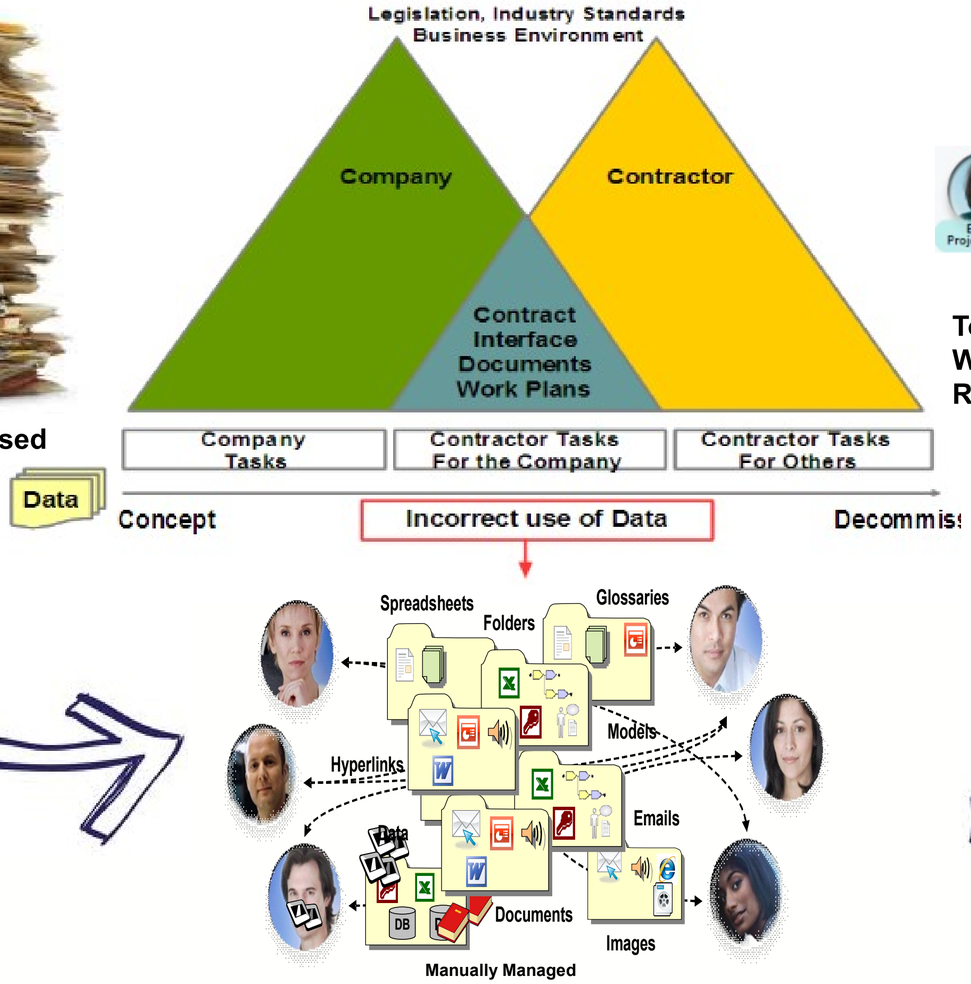
Systems Engineering across the lifecycle of an asset



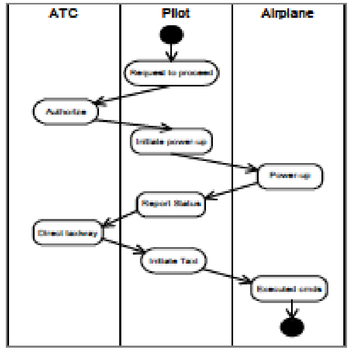
Collaboration of minds, data & content across distributed teams for seeing one single truth of the big picture design and controlling change

Engineering is becoming a data centric task

Today: Document Based



Tomorrow:
Web based Data Repository



MODEL BASED SYSTEMS ENGINERING
And SysML is the way to go

Putting theory into practice “DEMO”

Offshore Drill Unit 1.0 (CM)*

Auto-save | Save

Project Information | Project Phase - Basic Engineering | Project Phase - Engineering | Technical Queries | Add Widget

Owner-Operator-Integrator Members (3)

Fred Olsen
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HHI
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Statoil
statoil@jip.com

Supplier - EPC Members (2)

Kongsberg
k@jip.com

RollsRoyce
rolls@jip.com

Offshore Drill Unit 1.0 (CM) Plans (2)

Current Iteration: **Engineering**

Engineering Phase [Engineering]

Basic Engineering [Basic Engineering]

Offshore Drill Unit 1.0 (CM) Events

[3] Failing Test Case "Test Heave Compensation" (78) Yesterday
[3] Design Heave Compensation (73) Last Week
[15] Design the Top Side system (67) Last Week
[11] Design Drilling Drives (72) Last Week

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My open Tasks (1)

70: Supplier Activities - Engineering Phase

My Work Item Changes

[3] Failing Test Case "Test Heave Compensation" (78) Yesterday
[10] Design the Top Side system (67) Last Week
[5] Design Drilling Drives (72) Last Week
[5] Update detailed signals on D-119 to D221 (75) Sep 26, 2014

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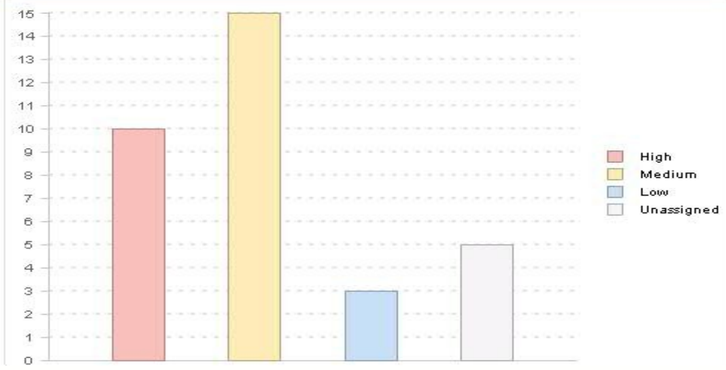
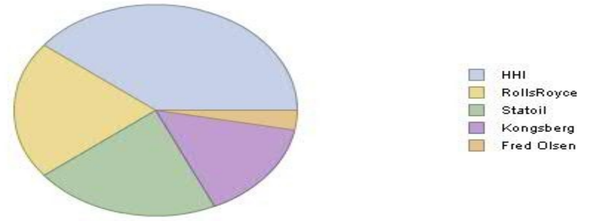
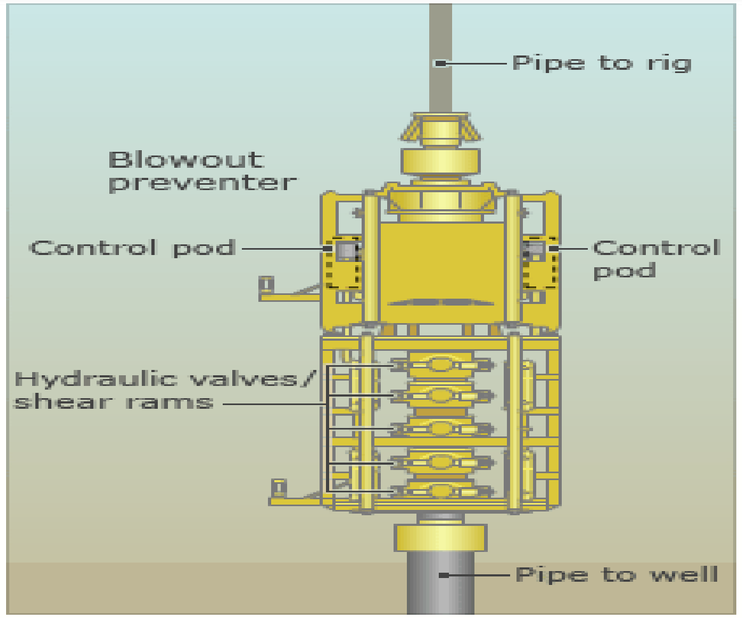
All Work Items (33) Priority



All Work Items (33) Owned By



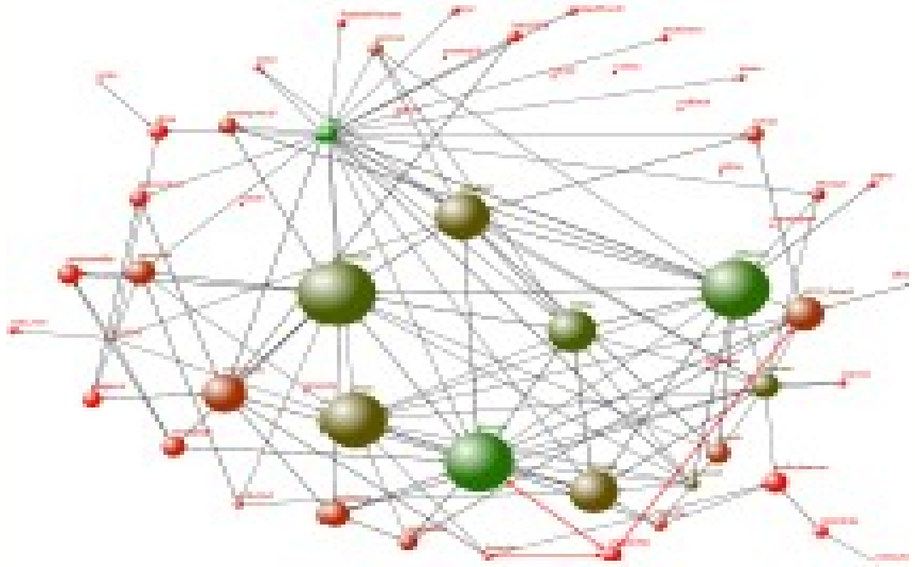


The Future of Systems Engineering ?

Systems engineering and **Project Management have to become more interlocked disciplines within the enterprise and across the eco system of the supply chain.**

Systems Engineering needs to become a strategic role within the Enterprise and a focus on enablement, process development and tooling is a must

The Internet of Things



As systems of systems, open API, connected devices and intelligent solutions becomes actual, Systems Engineering will take a new focus.

Modelling a larger system of system and finding the needed interoperability across an eco system of technology is going to be key !

Who will do this in your organisation !