

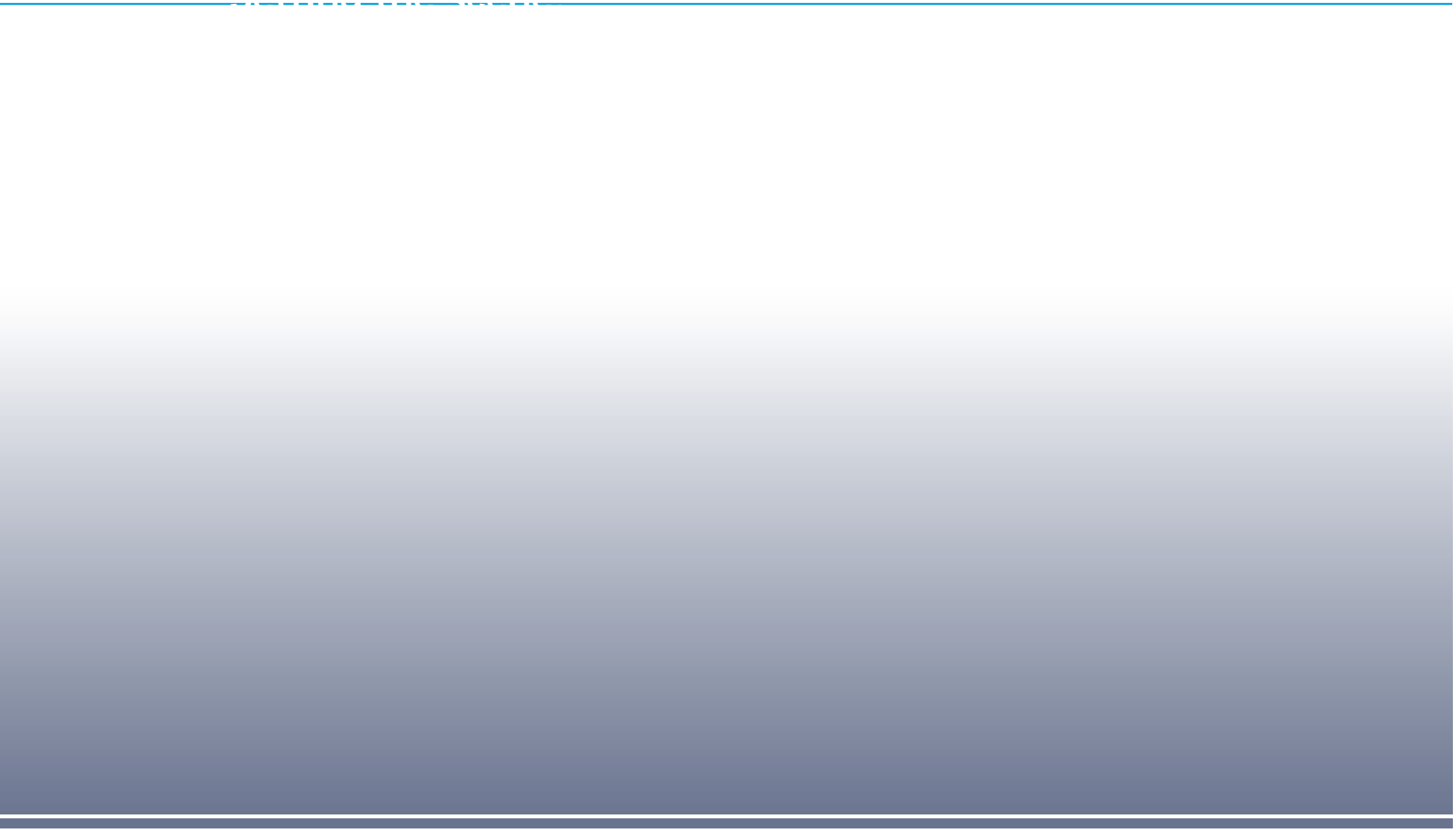
# What now - Innovation beyond cost cutting and standardisation

## Subsea Innovation Day

Bjørn Søgård, 26. April 2018



Global Centres of Expertise  
**GCE Subsea**





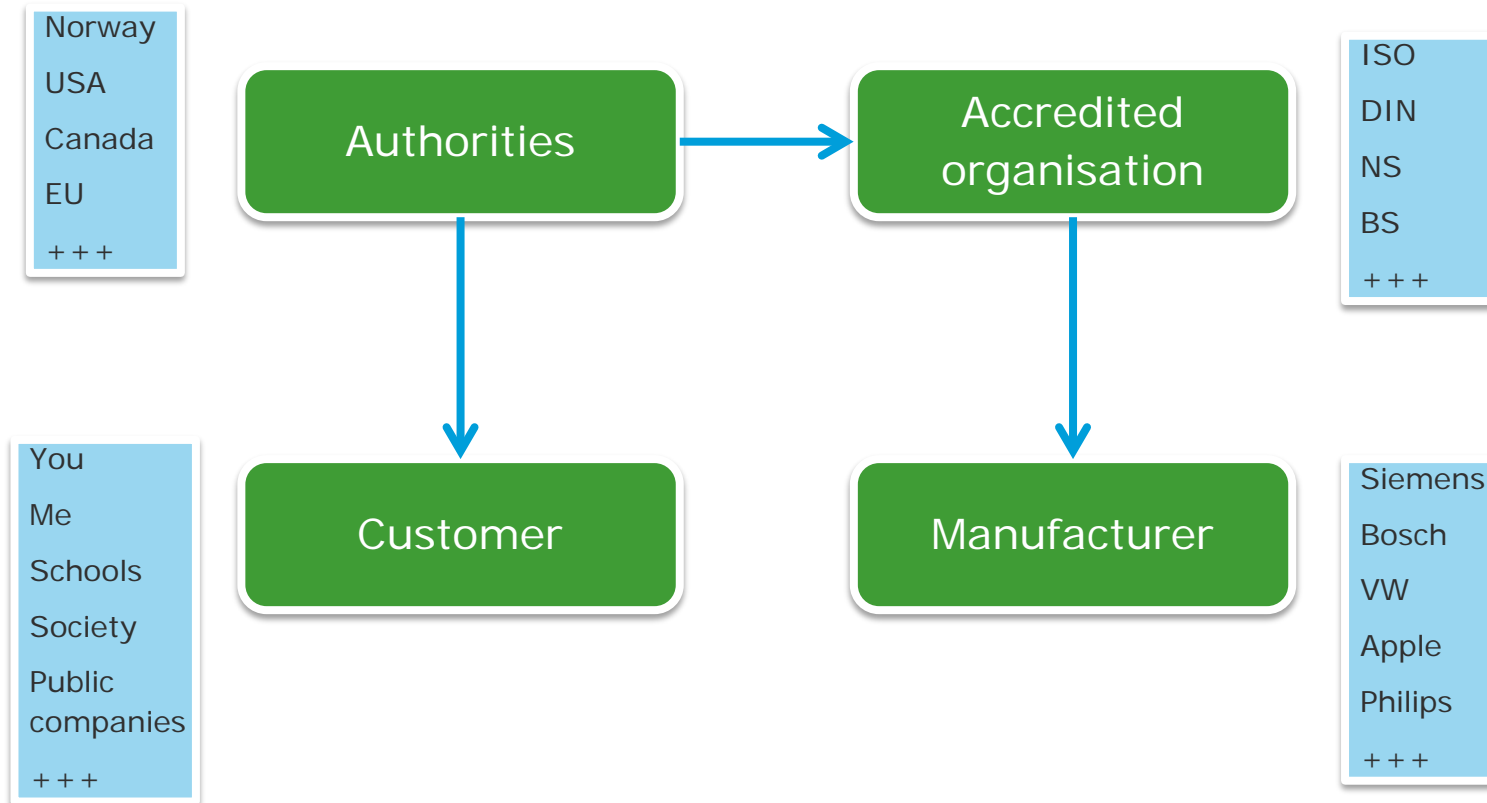
## Setting the scene:

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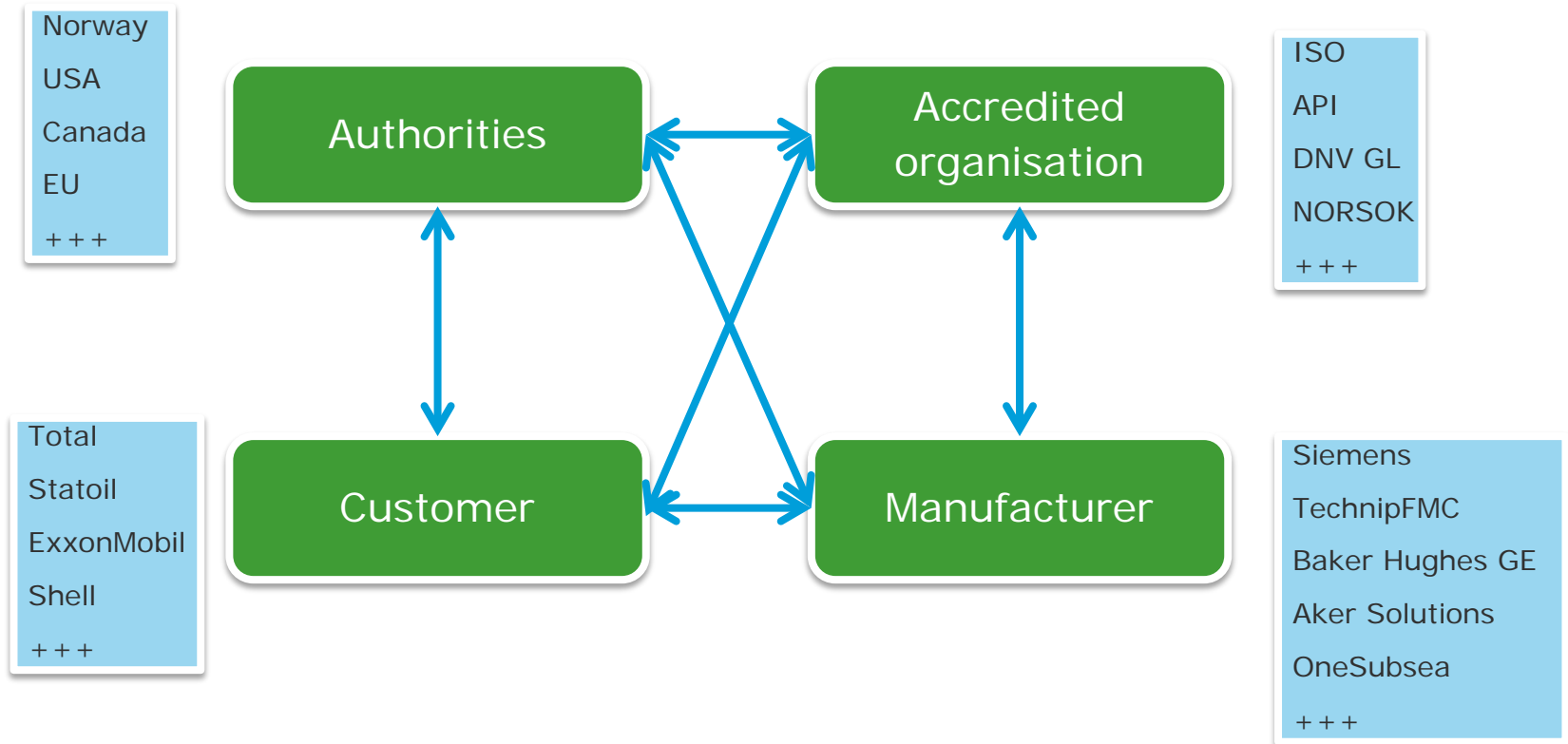
A bit of structures behind innovation

Three examples

# Standardisation in society

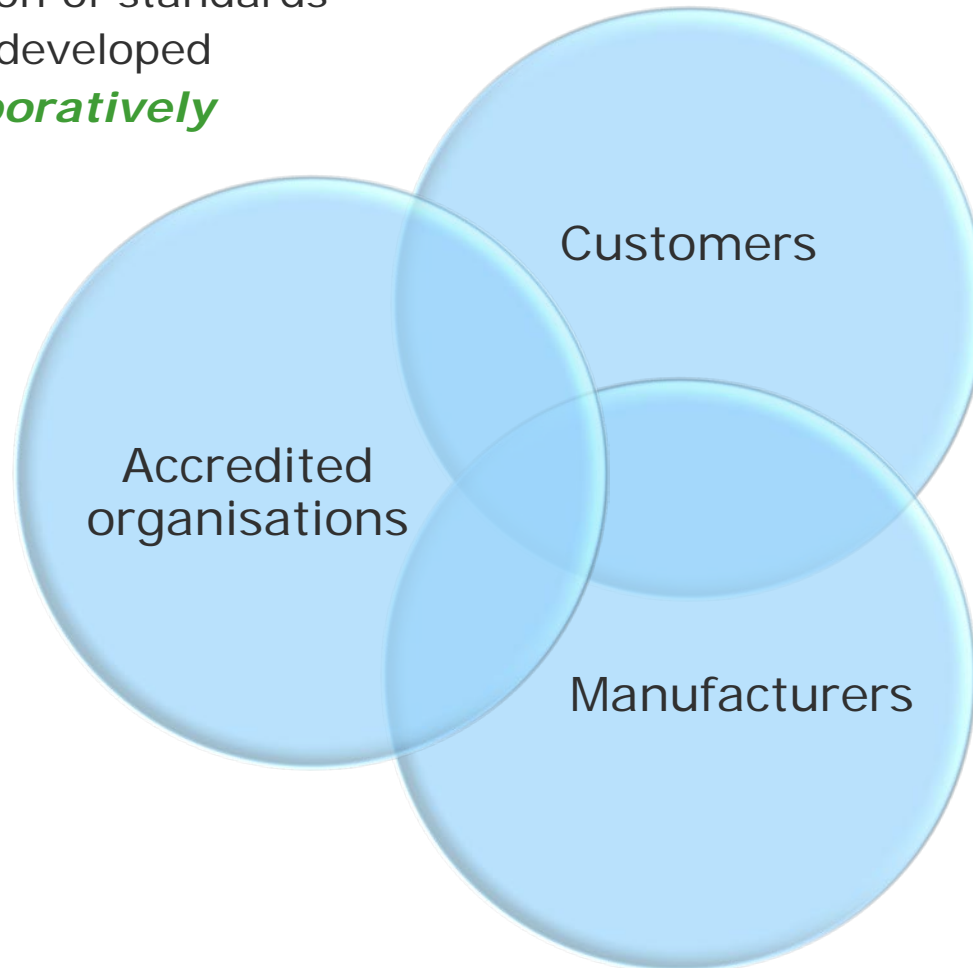


# Standardisation in our industry

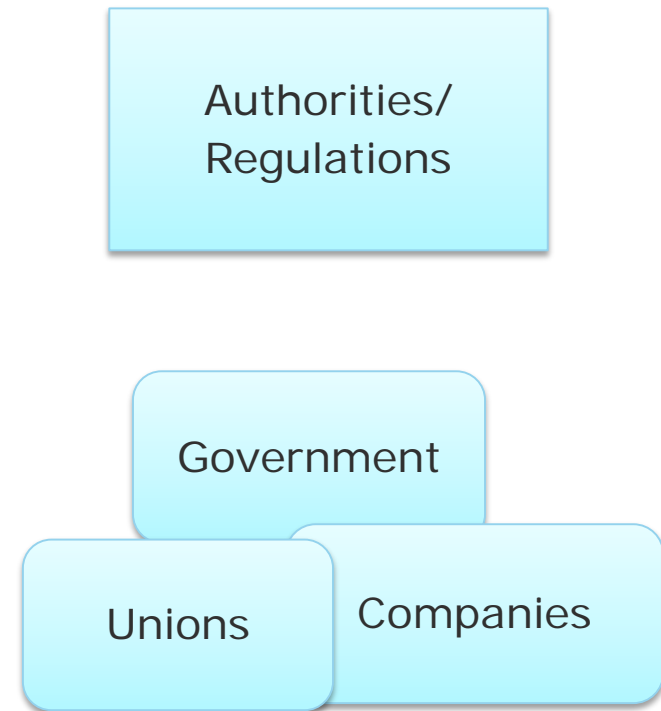


## Where are standards being developed in our industry?

Tradition of standards  
being developed  
*collaboratively*



Tripartite collaboration





Setting the scene:

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A bit of standardisation mechanism

Three examples

# Where is technology innovation happening?

Long time ago

Defence  
(Combat)

- Not price sensitive
- Urgency
- Technological edge
- Quality
- Rigid processes



Industry/Business

- Business to business
- Customer influence
- Rational objectives



Consumer tech.  
market

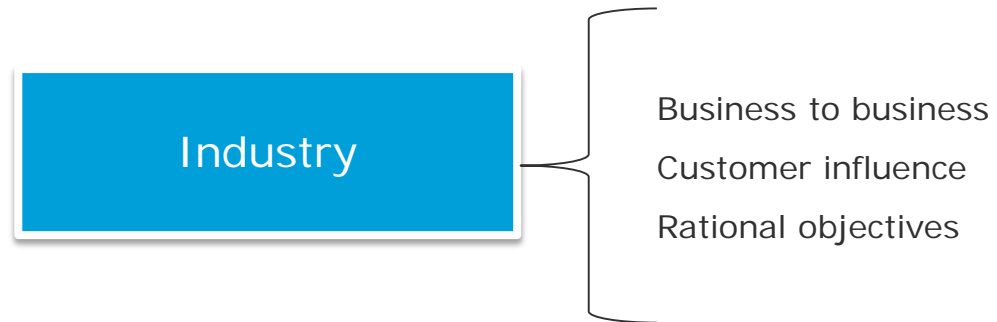
- Price
- Consistent Quality
- Customer does not care as long as it works
- Attraction and brand

Today

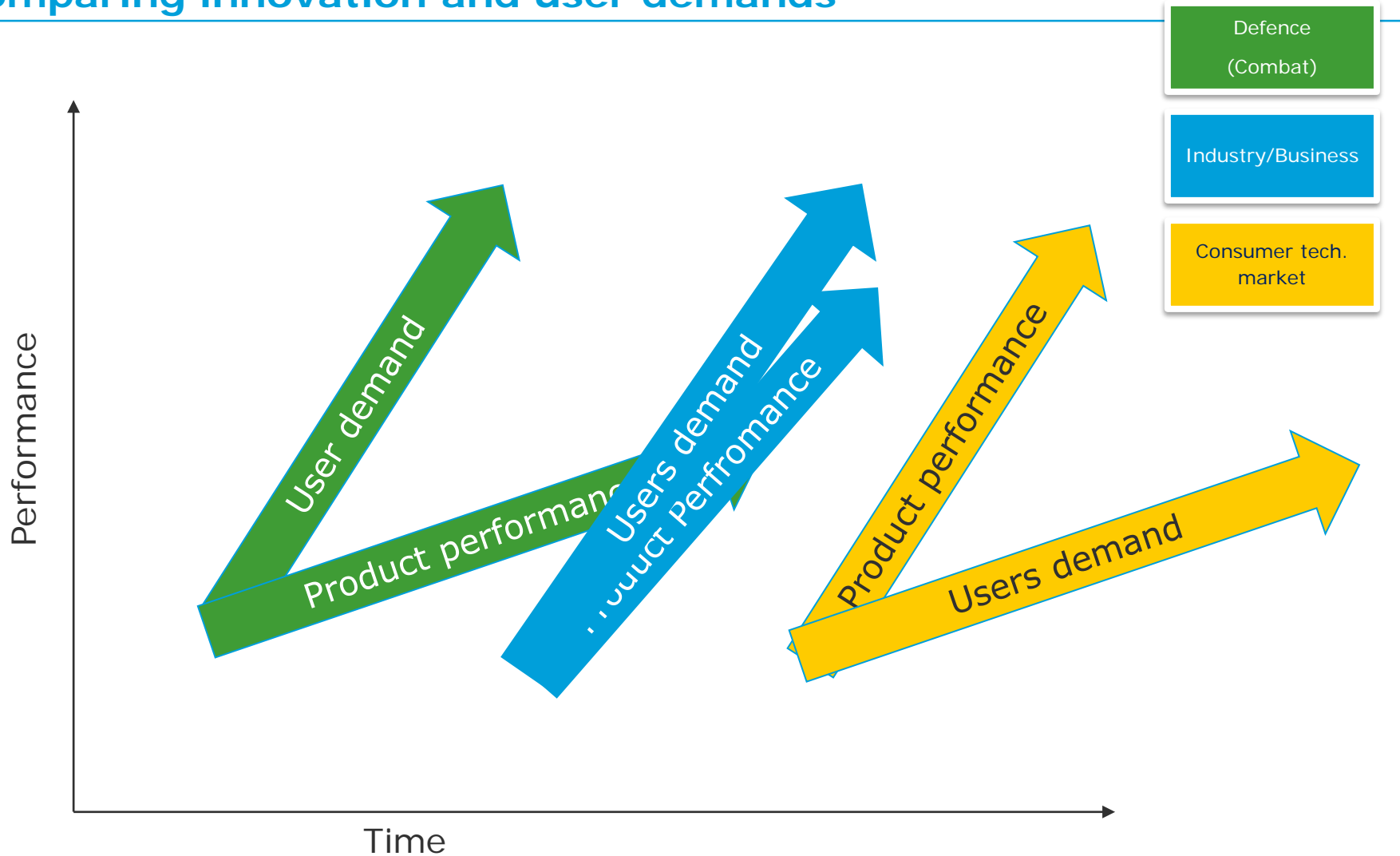


## In this picture, where do we fit in?

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# Comparing innovation and user demands



## Innovation - differences to be aware of (I)

- In the consumer industry, manufacturers develop new features to attract market
- The consumer doesn't care about standards as long as the product works and it complies with the law
- The customer doesn't care about the innovation processes by the manufacturer
- The customer doesn't know what will come next.....



## Innovation - differences to be aware of (II)

- In our industry the manufacturers are responding to customers' needs
- Innovation often happens as a collaboration between the players
- Innovation is often joint financed between the manufacturer and customer
- Customers care about what standards are being used and applied
- Customers interact in the innovation processes.



# What's the motivation for Innovation? A company perspective

- Why do companies invent?
  - To be better positioned in the market
- Two routes!
  - To have products with better performance than competitors
  - To make things more efficient than competitors to gain market share or being cost competitive

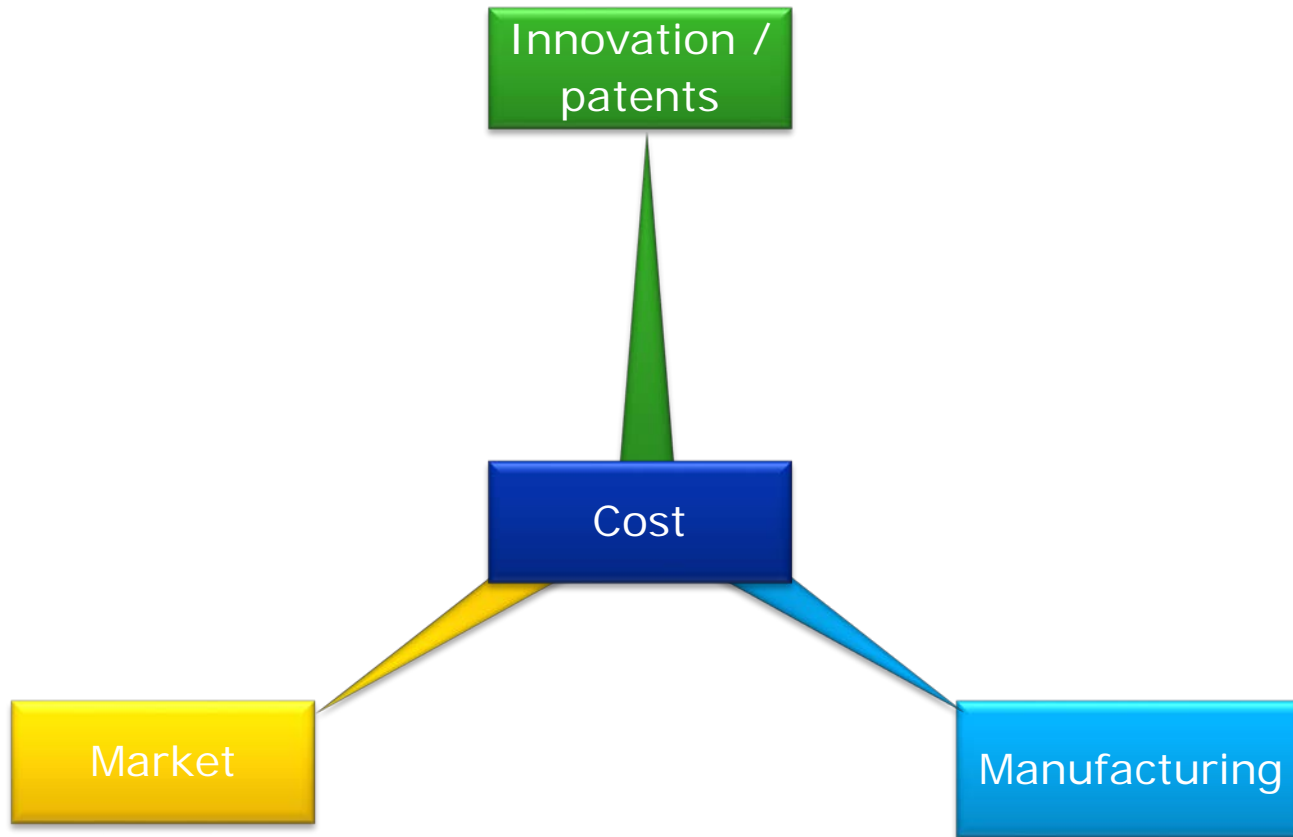


- Innovation cannot be 'Charity', important to maintain mechanism for motivation.



## A nation's technology leadership

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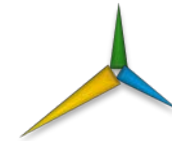


## Example from PV Industry



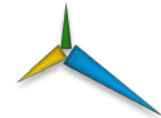
What is the dominant factor here?

Energy/m<sup>2</sup> ?



What is dominant factor here?

Energy/NPV ?



By Proudgreenhome  
Sun&Wind energy



## Setting the scene:

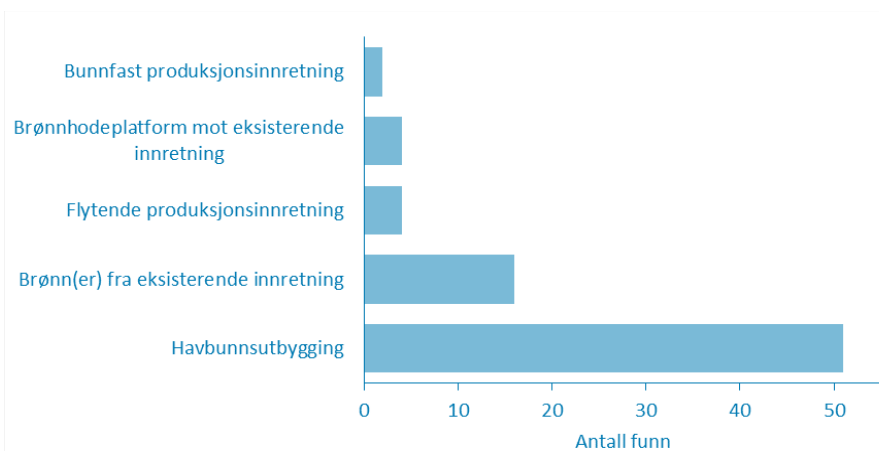
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A bit of standardisation mechanism

A bit of structures behind innovation

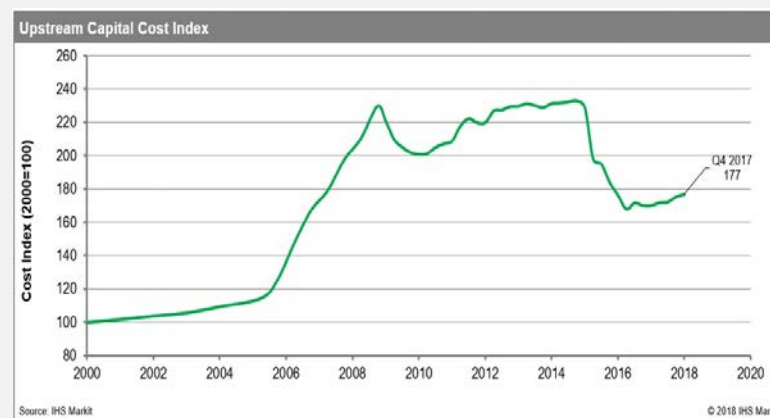


# DNV GL Industry Outlook: Subsea is important going forward

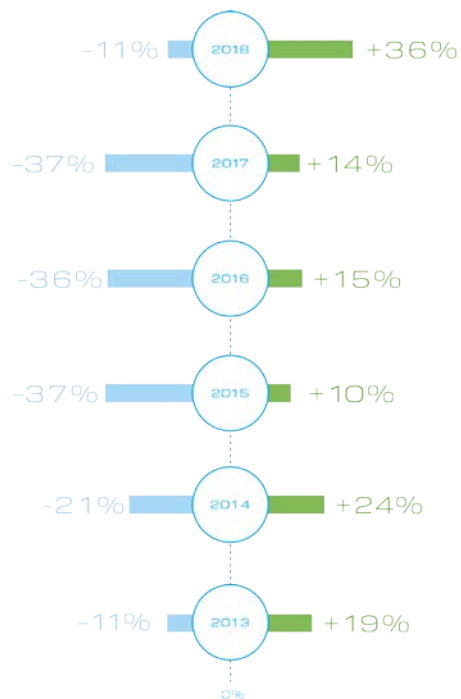


Source: NPD

## IHS CERA Upstream Capital Cost Index

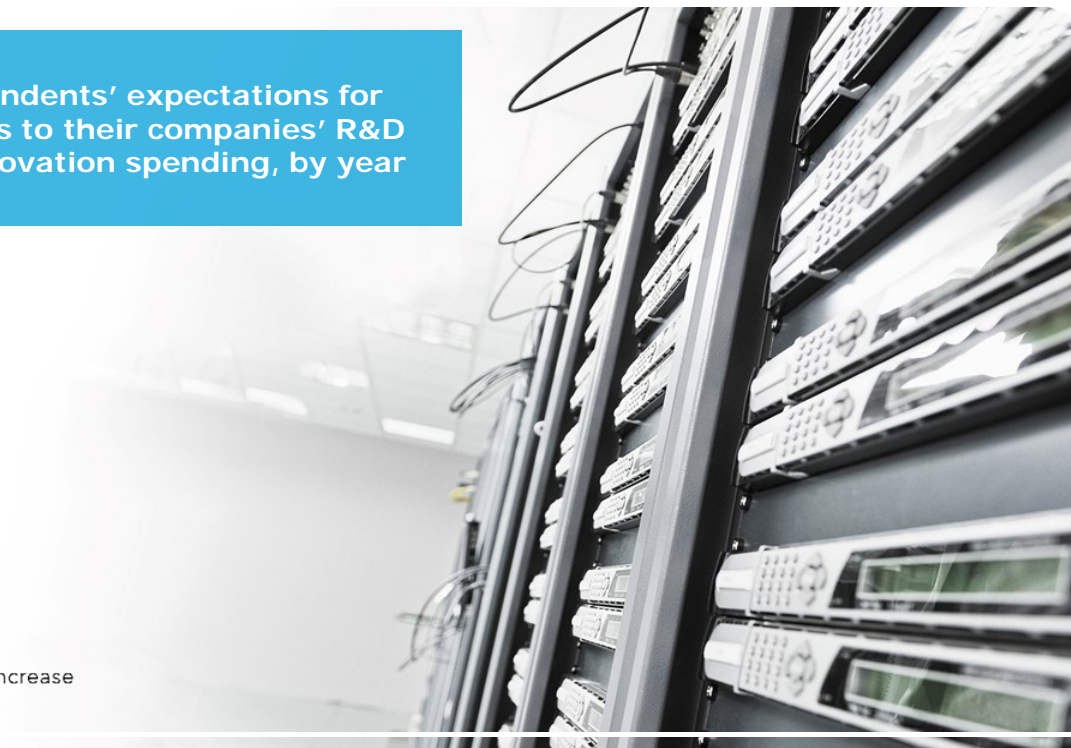


# The largest increase in R&D spending in four years

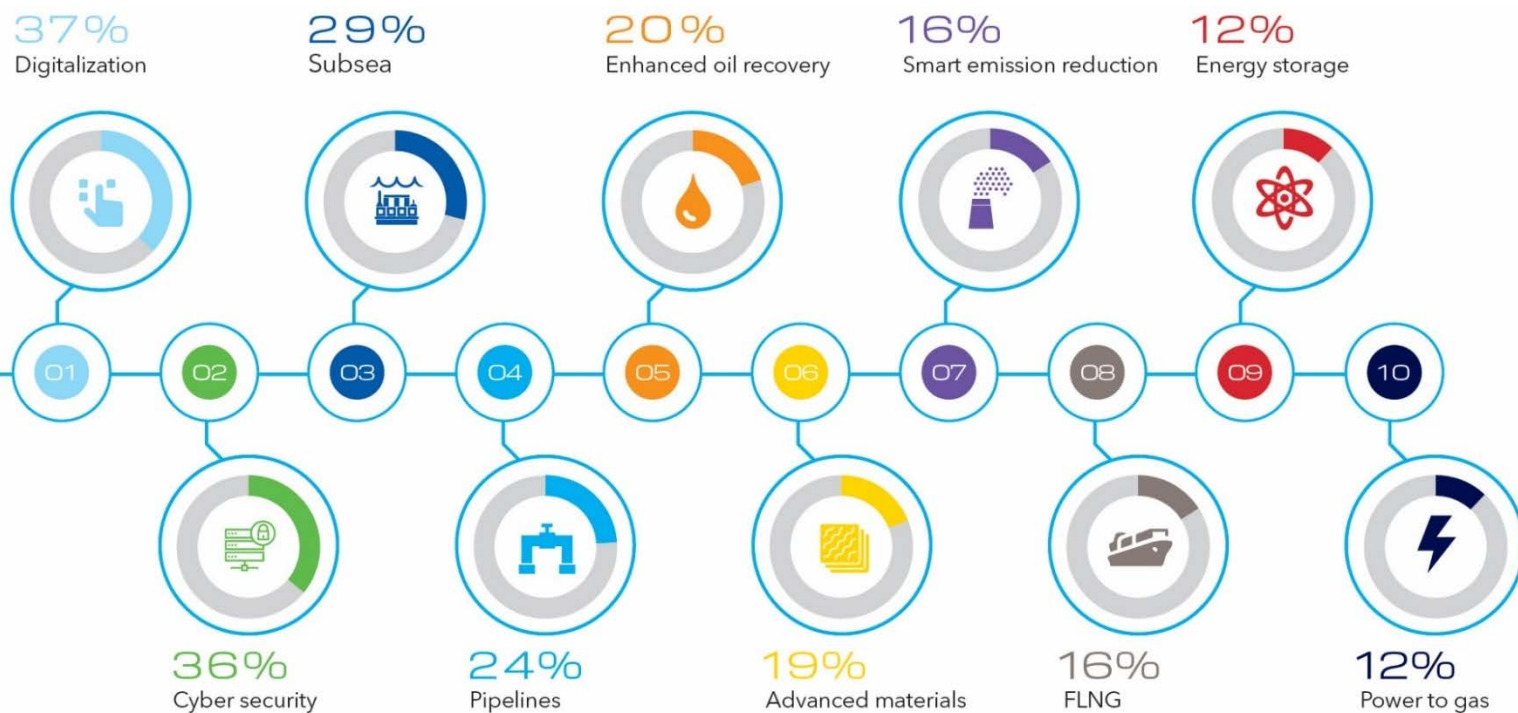


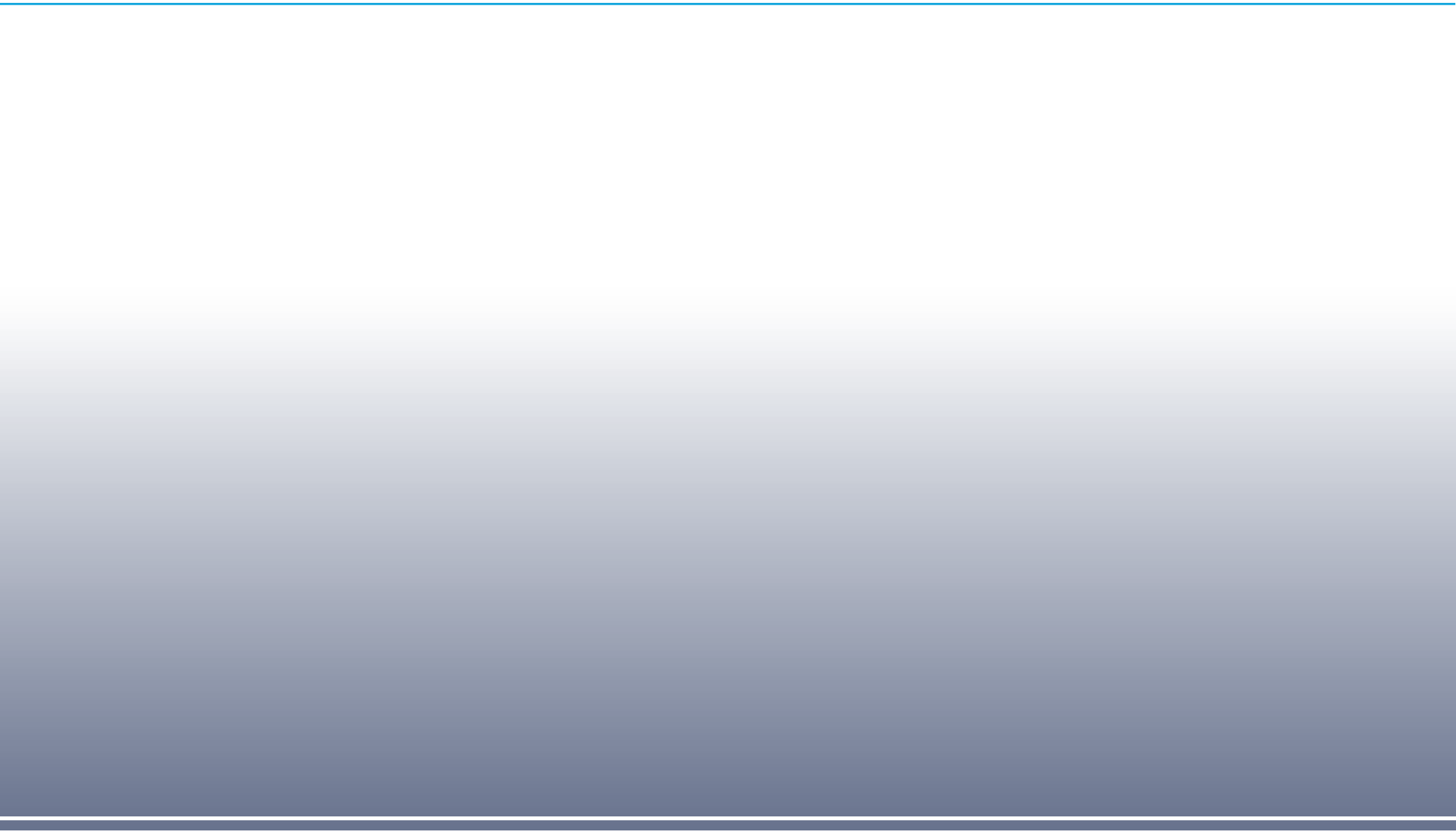
Respondents' expectations for changes to their companies' R&D and innovation spending, by year

■ Decrease ■ Increase



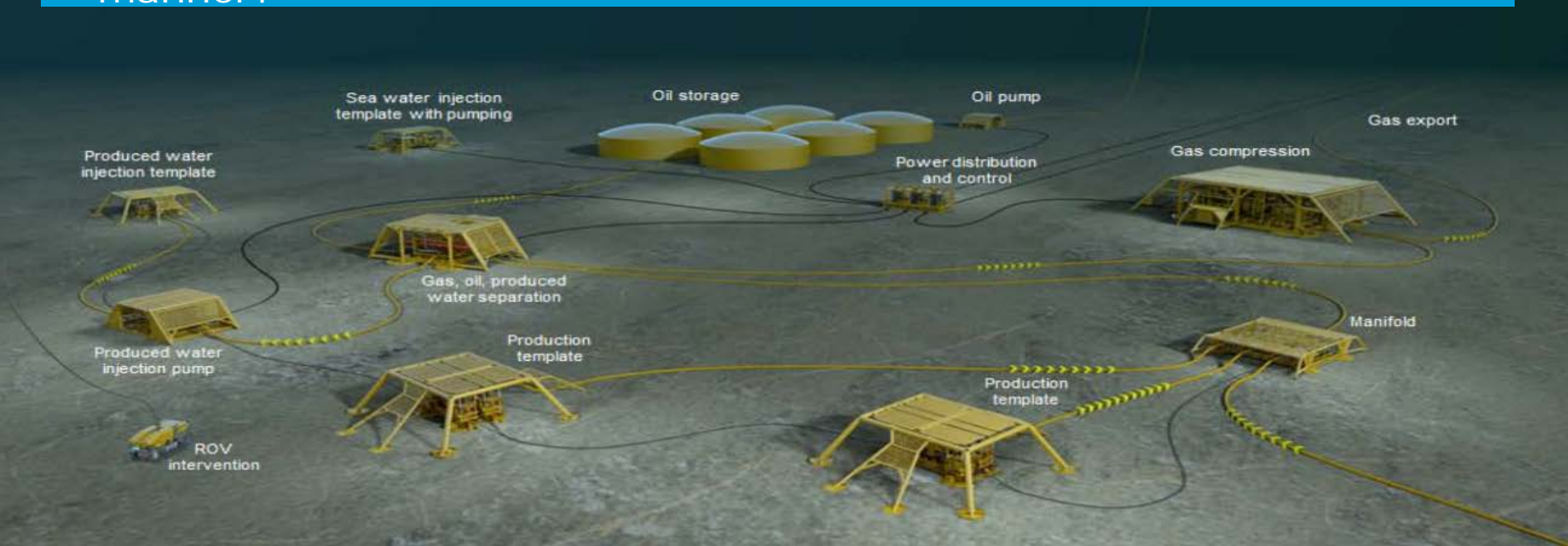
# DNV GL Industry Outlook: Top 10 priorities for R&D and innovation in 2018





## Towards a standardized approach for qualifying subsea systems

- How can confidence in new subsea technology and **systems** be demonstrated faster and more efficiently?
- How can already qualified technologies be re-qualified in an effective manner?





# Round-table workshops with industry players: Industry TQ user forum



## Doing TQ more effectively and faster

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Improve technology qualification with **systems-** and **software**

Standardise the TQ approach for allowing re-use of

Uniform industry understanding and knowledge sharing between the stakeholders

Increase the integration of TQ with the project and product engineering development / systems engineering activities



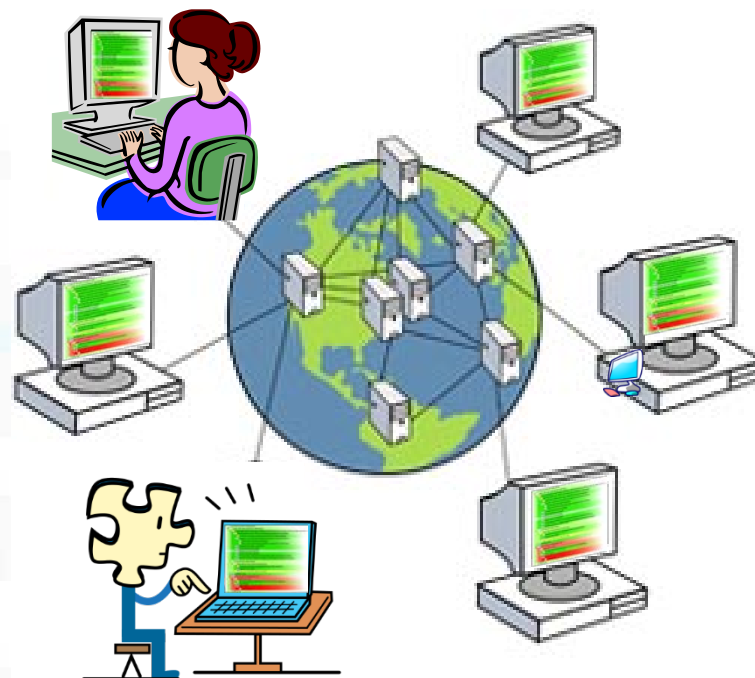
# TQ 4.0 – Web based tool for qualifying new technology

REASON in TQ  
Can you trust the conclusion?

Efficiency through digital collaboration

The screenshot displays a web-based tool interface for technology qualification. It features a checklist of criteria, each with a status icon (green checkmark, red X, or yellow warning triangle) and a corresponding icon (gear, document, or magnifying glass). The criteria are organized into sections, with some sections highlighted in green and others in red. A magnifying glass icon is overlaid on the interface, focusing on the 'It is safe to use' section. The criteria include:

- Cup can be used for drinking coffee
- Apply technology qualification methodology
  - Correct application of technology qualification methodology assures nothing critical has been overlooked
  - Backing argument over correct use of technology qualification methodology
  - Criteria for acceptable technology qualification have been considered
    - Guidance: TQ process requirements and required involvement by DNV GL
      - DNV-RP-A203 Technology Qualification
      - DNVGL-SE-0160 Technology qualification management and verification
  - The qualification basis is acceptable
  - Critical parameters are stated
  - Hazards have been identified
  - Failures have been registered
  - The technology qualification plans addresses failures and hazards of concern
  - Evidence has been presented of mitigation of the hazards and failures of concern
- It is suited for coffee drinking
  - Demonstrate functionality and performance
    - All relevant functions are considered with the critical parameters
      - Contains 3 dl of coffee
      - Cup can be held with boiling hot content
- It is safe to use
  - It is not likely to malfunction in use
    - Address each failure
      - All failure mechanisms and causes of concern have been addressed
    - It won't break
    - It won't leak
      - Leak test report

- References






## Project Idea

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# Safety 4.0 – Responding to industry needs



## Subsea is important



Many projects  
Large export industry



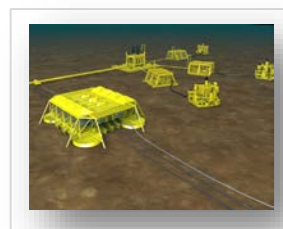
## New technologies



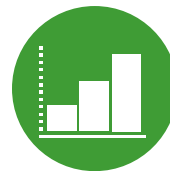
All-electric ++  
Novel process ++



## Demonstrating safety



No personnel  
Non-explosive



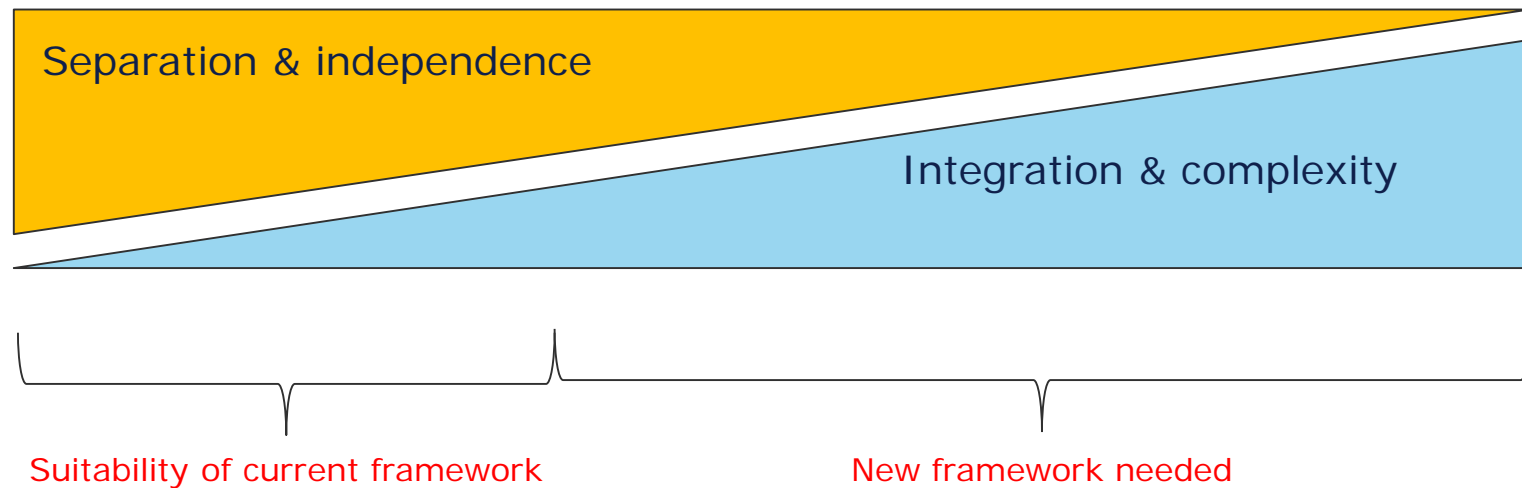
## Value creation



Enable new concepts  
Efficient and relevant

## Example: Assuring safety for more integrated complex systems

- Traditional safety philosophies are BASED upon separation between the production- and safety systems
- New solutions may call for more integration and require supplement to existing safety philosophies



# All-electric subsea technologies – improvements at lower costs

## The all-electric technology

- Replacing wellhead, sub-surface safety valve and associated command system with all-electric technology
- Simpler assembly – less complex solution
- Different failure modes

## Environmental and safety improvements

- Hydraulic pipes replaced by power cables with less risk of spills
- Removal of high-pressure equipment topside improves safety

## Cost reductions\*

- Replacing hydraulic pipes with an electricity cable over a distance of 30 km reduces costs by 15%.
- An electrical version of the well's own equipment is expected to generate additional savings of 10%.
- Enabling further digital innovations may generate total cost savings of 30-40%

\*Source: <http://www.ep.total.com/en/total-launches-first-ever-all-electric-subsea-well>



Cameron XT (picture source: Oil & Gas Journal)



# Shaping the future of digital standards, requirements- and information management

Initiated by the Sector Board Petroleum



# Background

- Responding to '**NORSOK Analysis project**', KonKraft, Standard Norway's Sector Board Petroleum has engaged DNV GL to establish a Joint Industry Project (JIP) aiming at revising and digitalising NORSOK's Z-standards for Technical Information.





## Deliverables

Name	Type of delivery	Description
Digitalized Z-TI requirements (Z-018, Z-001)	Software (Machine understandable)	Proposal for Z-TI requirements understandable to computers. Available in web based services
	Documents (Human readable)	Proposal for Z-TI requirements readable to human beings. Z-TI for.
Digital vocabularies for equipment, assets and documents. (Z-CR-002, Z-DP-002)	Software (Machine understandable)	Proposals for discipline vocabularies for equipment, assets and documents*. Understandable for computers. Available in web based services.
	Documents (Human readable)	Proposals for discipline vocabularies readable to human beings. Generated from digital content in web based services.
ISO/TR 15926-14	Document	Develop an ISO 15926-2 Data model adapted for OWL 2 Direct Semantics as an ISO Technical Report (TR)

\* Will be fed into relevant international standards in ISO/IEC (For example ISO 15926)

# Responding to industry needs



«Jeg vil også nevne NORSOK-styrets prosjekt for å digitalisere og effektivisere arbeidet med dokumentasjon og krav i designprosessen. Dette initiativet er viktig for å oppnå varige forbedringer. Jeg vil oppfordre næringen til å slutte opp om prosjektet.»



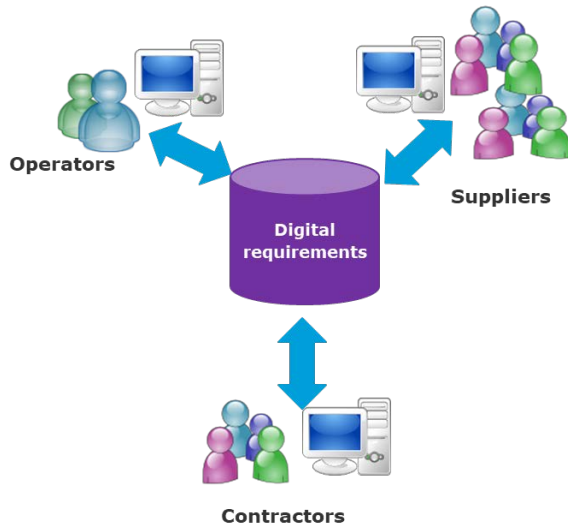
«Jeg vil også nevne NORSOK-styrets prosjekt for å digitalisere og effektivisere arbeidet med dokumentasjon og krav i designprosessen. Dette initiativet er viktig for å oppnå varige forbedringer. Det legges opp til et spleiselag for å få til dette og jeg vil oppfordre næringen til å slutte opp om prosjektet.»



## ANBEFALING FOR DIGITAL FELTUTVIKLINGSPROSESS

- Aktørene i feltutviklingsprosessen bør etablere et målrettet samarbeid for hurtigst mulig å hente ut effektene av digitalisering og datautveksling (se også anbefalingen om initiativ for digitalisert samhandling).
- Standardisert digital anleggsinformasjon bør tas i bruk, slik at hele verdikjeden kan kommunisere gjennom 3D-modeller og databaser og på sikt på digitale tvillinger. I arbeidet bør man bruke erfaringer fra bygningsindustriens samarbeid om digitalisering – buildingSMART.
- **En del av arbeidet bør bidra til å akselerere den pågående digitaliseringen av NORSOKstandardene – spesielt NORSOK Z-TI.**

# Significantly contributing to reaching the goal of a break even price below USD 20 per barrel



**Lower transaction cost**

**Fewer transactions**

**Increased quality**

**Improved safety**

## Linking technical information through the value chain to digital requirements enables:

- Digital work process
- Automatic generation of requirement sets
- Automatic check of requirements (Verification)
- Increased information quality through common industrial vocabularies
- Improved common logistics and shared storage
- Re-use of information between different players and project life cycle phases
- Common digital twins

**Exploration**

**Drilling**

**Feed**

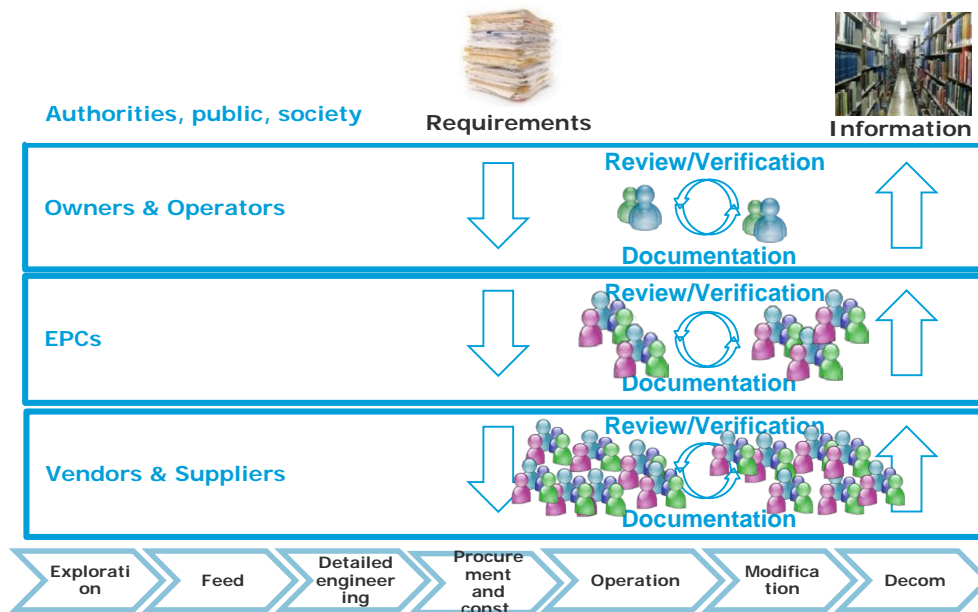
**Detailed engineering**

**Procurement and const.**

**Operation**

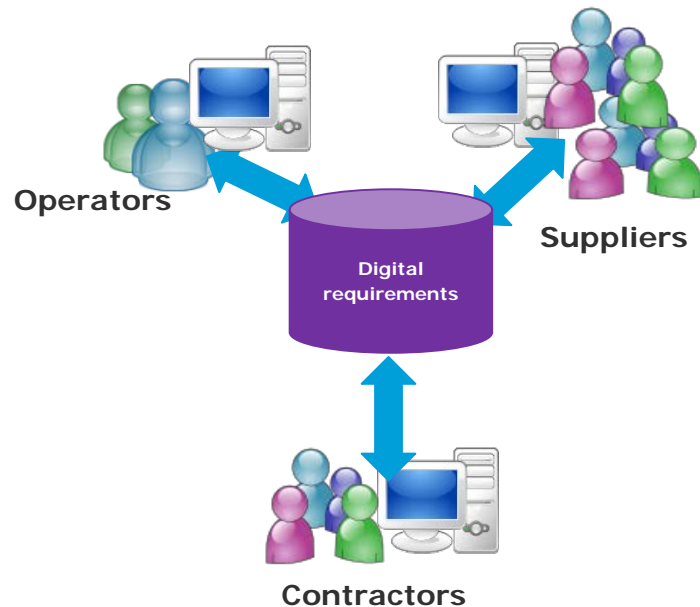
**Decommissioning**

# The problems are.....



- Requirements are analogue and company specific
- Documentation is company specific
- Software solutions are proprietary
- Verification of requirements are manual
- Re-use of concepts and solutions are analogue

## Solution: Common digital requirements for Technical Information



- Requirements represented in a language understandable to computers and humans
- Individual requirements are uniquely referable and identifiable.
- Digital Information can be linked directly to digital requirements
- Complete consistency checks using automated reasoning.
- Enable automated verification.

## Summary

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- *Standardisation* and *innovation* can go hand in hand
- *Regulations* and *standards* are best made as a collaborative effort
- Our *innovation power* are dependant on playing together.



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