



# Scotland / Japan Subsea Research & Development Programme

**Nippon Foundation Symposium - 02<sup>nd</sup> October 2018**

Tony Laing – Director of Research and Market Access

# Agenda

Introduction

An brief introduction to Subsea and NSRI  
Supporting the Subsea sector (Blue Economy)

Programme

Programme Call 1  
Subsea opportunities within Oil and Gas Sector Industry

Projects

Projects  
Projects that have been awarded

Way Forward

Future Opportunities  
Exploring the wider subsea opportunities – opening the wider blue economy

# NSRI – Innovation and Technology

- ❑ Founded in 2013, based in Aberdeen Scotland

- ❑ Industry led focal point for subsea

- ❑ Not for profit organisation

- ❑ Impartial and independent

- ❑ Direct links with Subsea UK & industry

- ❑ Strong links academia, industry bodies



**Accelerating industry led research,  
innovation and technology**



**Supporting business enabling  
market acceleration**



**Enabling opportunities  
across the blue economy**

# Subsea – Blue Economy



**£140bn**

Global subsea  
markets are  
predicted  
to grow from  
**£50bn to £140bn**  
by 2035...

Ref; Scottish Enterprise reports



Oil & Gas



Offshore Wind



Tidal



Defence



Wave



Ocean Science



Subsea Mining

# NSRI – Innovation and Technology

## Commercialisation Roadmap



## Technology Readiness Levels (TRL) scale



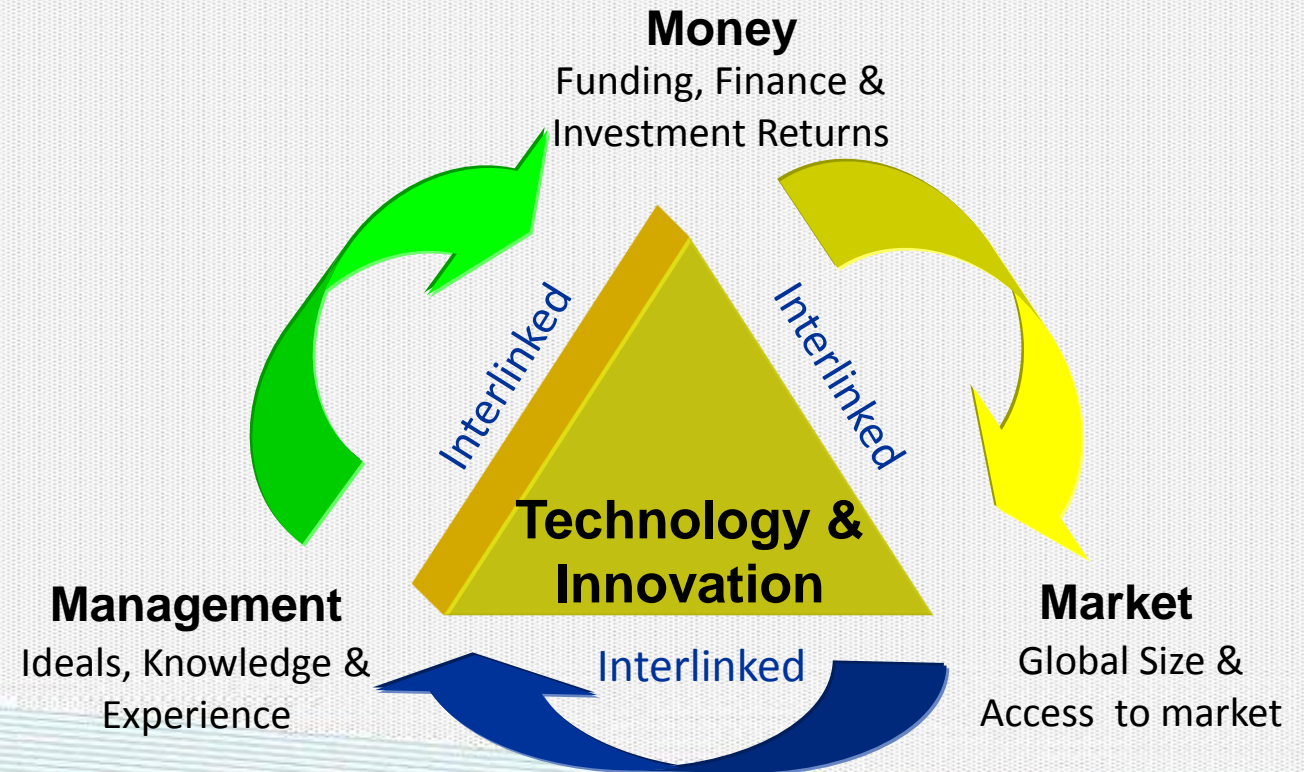
NASA - (TRL) scale



Matchmaker™ – ‘a hub for industry research and testing’  
visit: [matchmaker.nsri.co.uk](http://matchmaker.nsri.co.uk)

# Technology Enables Business

## Equation: $M^3 = C$



# Subsea UK – Trade Body

- ❑ Founded in 2004 as an industry partnership with government, supporting the supply chain
- ❑ Self-sustaining, not-for-profit trade body, owned and governed by its members
- ❑ Champions for the UK subsea supply chain through:
  - ❖ Supporting business development
  - ❖ Innovation, technology & commercialisation
  - ❖ Skills & future talent
  - ❖ Diversification
  - ❖ Exports & International Business



# Subsea Expo 2019 – 5<sup>th</sup> to the 7<sup>th</sup> Feb



The Subsea  
UK Awards



DIT Drinks  
Reception

Subsea Springboard



Energise  
Your Future



International  
Business  
Exchange



Conference  
Plenary  
Session



[www.nsri.co.uk](http://www.nsri.co.uk)  
[@NSRI\\_Subsea](https://twitter.com/NSRI_Subsea)



# Sector - Working Together

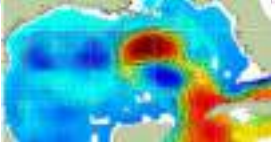
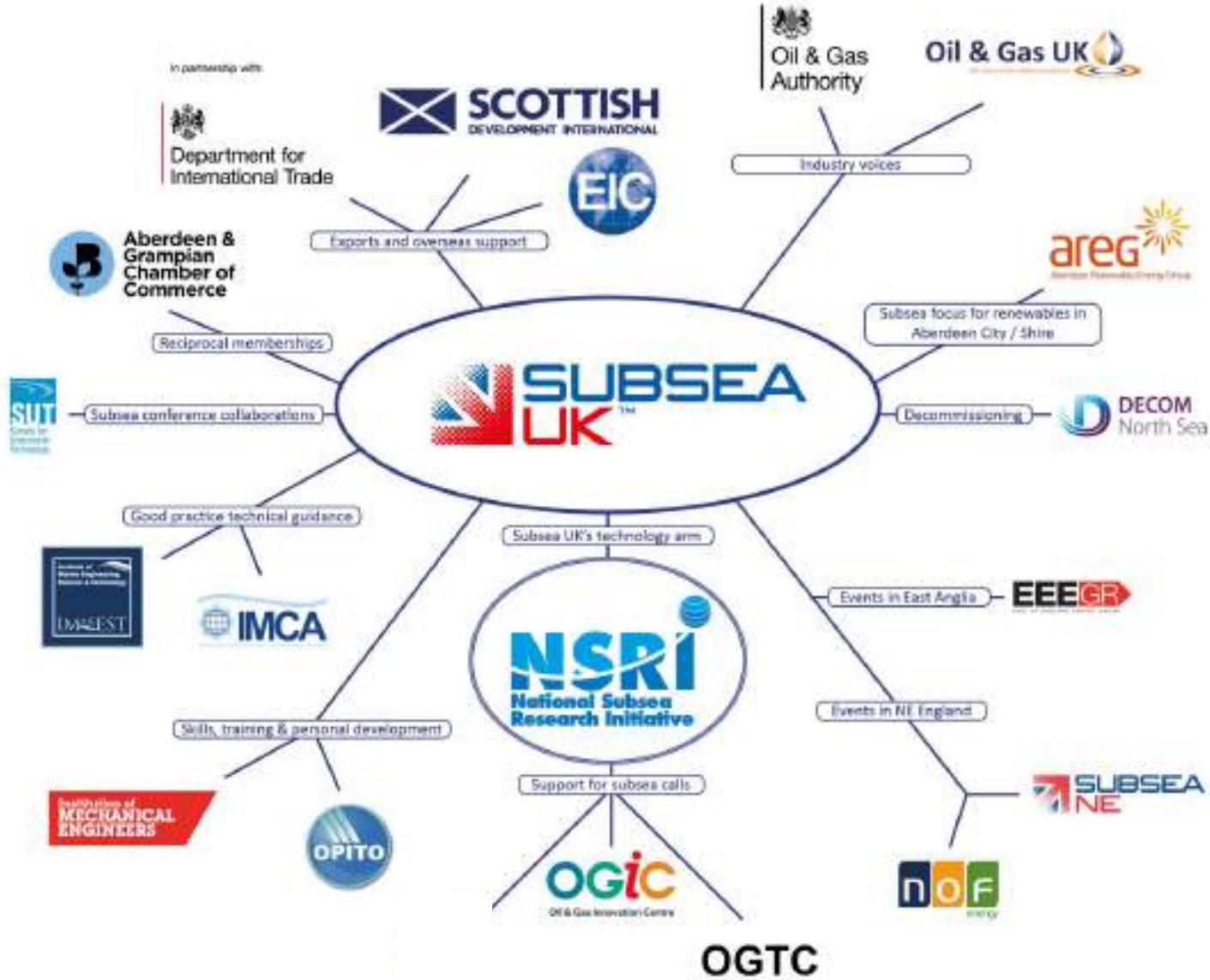


Photo: courtesy of The Underwater Centre – Fort William



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# Theme 1 – Digital Oil Field

## ❑ Vision - intelligence operations on the seabed

❖ Mid-1980's.

## ❑ Data vision

❖ Internet mid 1990's.

## ❑ 2020 vision

❖ Big data – deep understanding

## ❑ 2035 vision

❖ Effective output from the data world –  
Artificial Intelligence

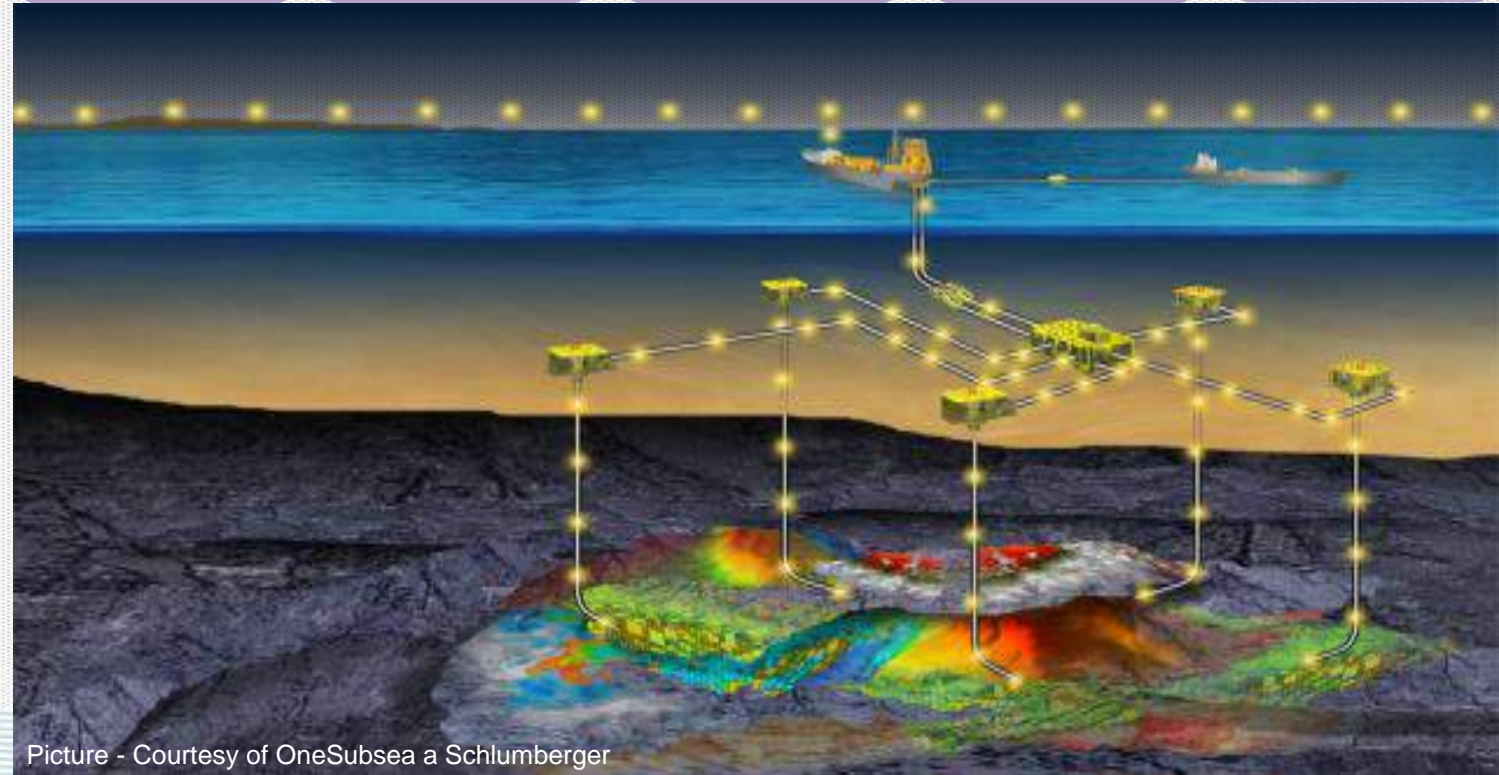
Artificial  
Intelligence

Big Data

Internet Of  
Things

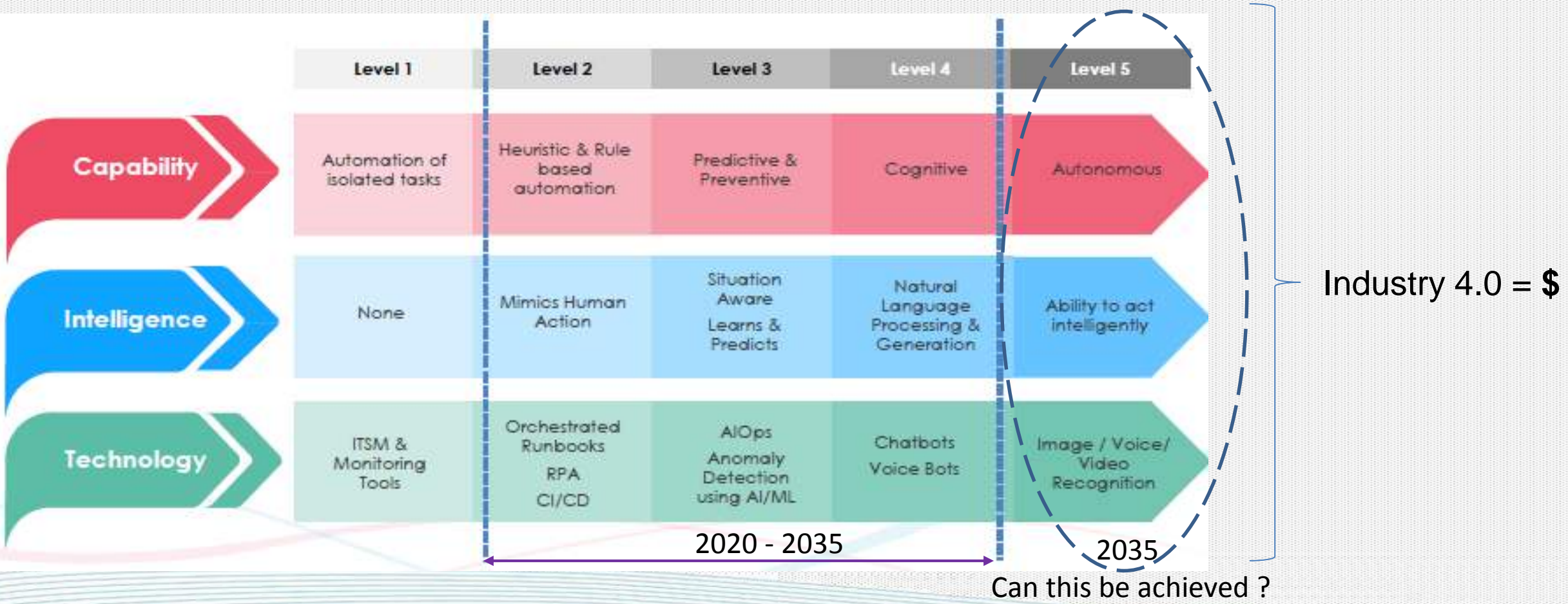
Machine  
Learning

Augmented &  
Virtual  
Reality

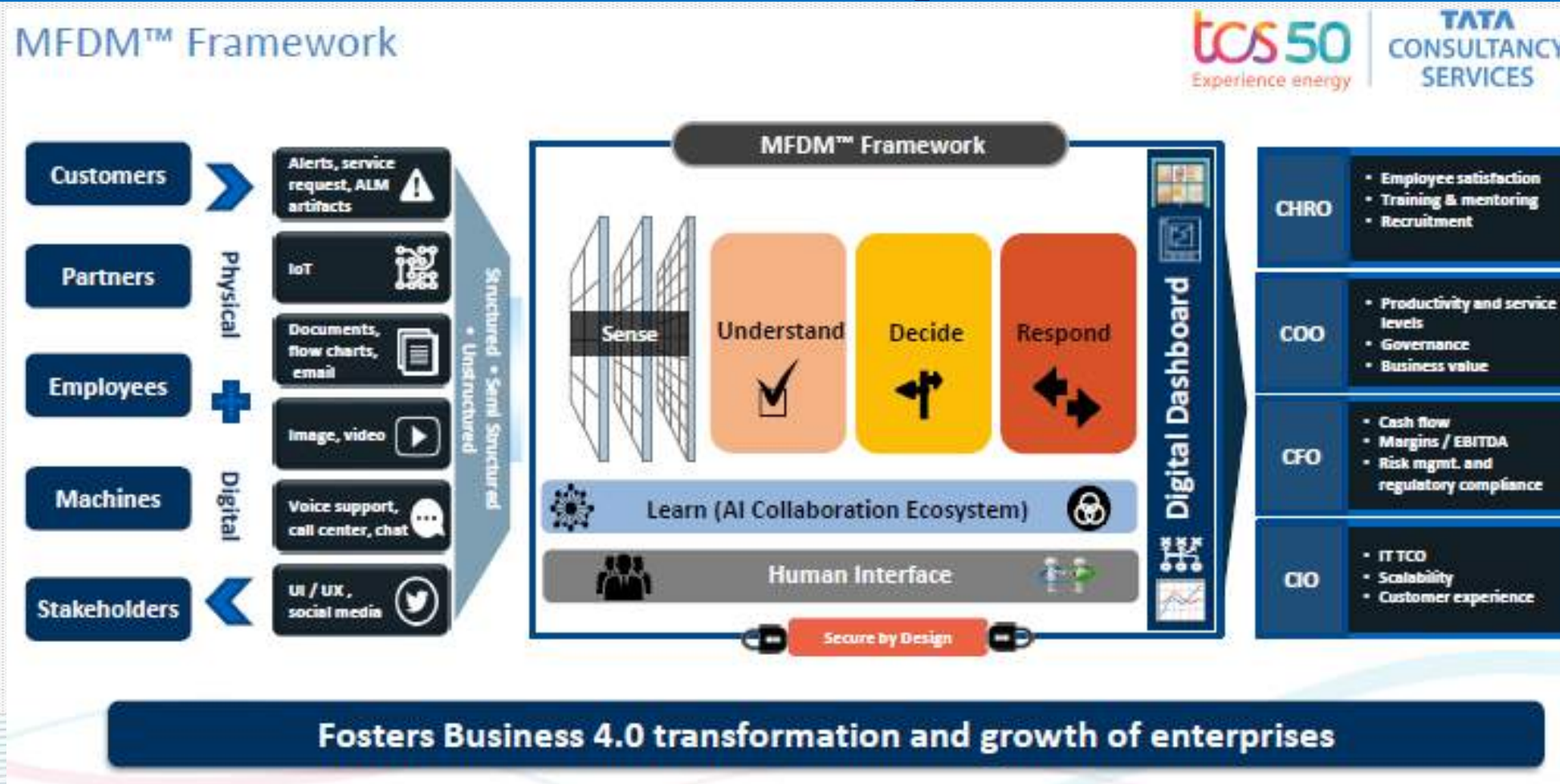


Picture - Courtesy of OneSubsea a Schlumberger company

# Data Transformation Journey

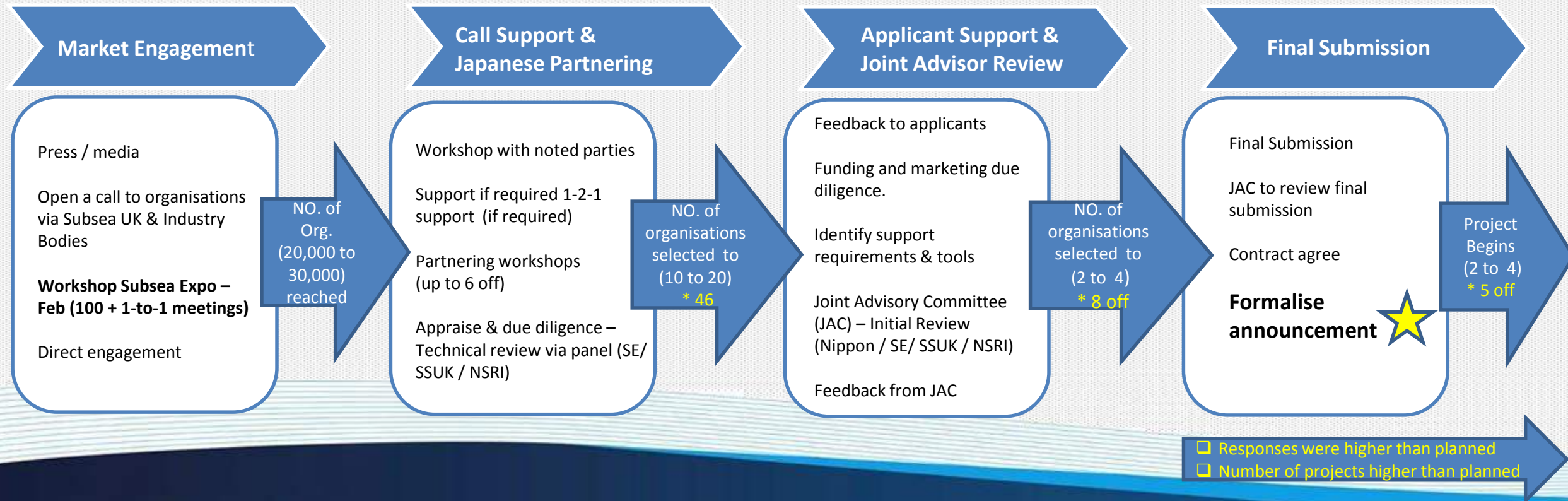


# Automation – Maturity Model & Transformation Journey



# Project Call – ‘Scottish’ Process

|                               |  |                        |  |                                    |  |                |
|-------------------------------|--|------------------------|--|------------------------------------|--|----------------|
| 4 DEC                         | 9 MAR  | 7 MAY                  | 13 JUL   | 19 SEP                             | 2 OCT  | OCT-NOV        |
| Funding call officially opens | Company profile and proposition document submitted | Feedback to applicants | Closing date for submission of final application | Feedback to applicants for funding | Formal announcement of results to the public | Projects begin |
| ✓                             | ✓  | ✓                      | ✓  | ✓                                  | ○  | ○              |



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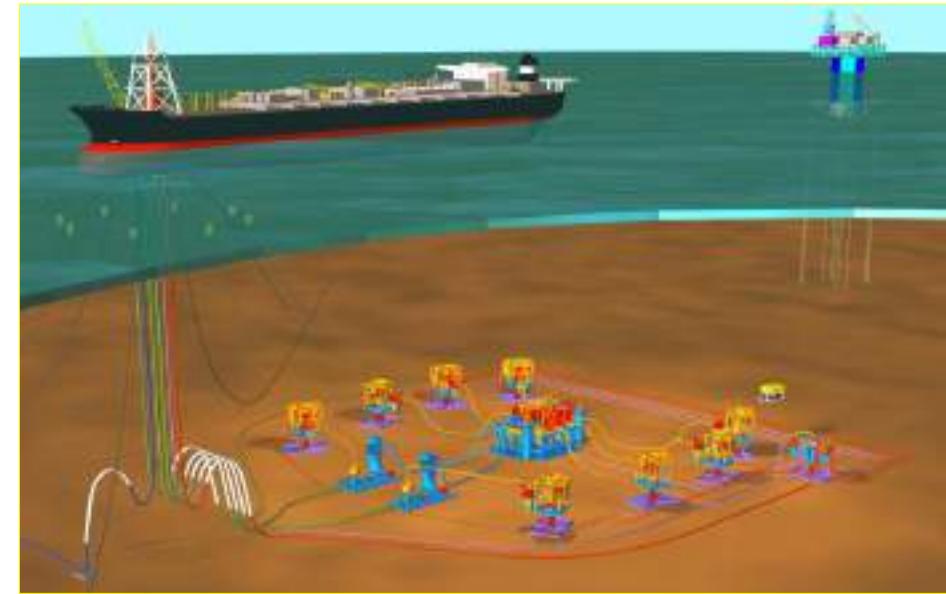
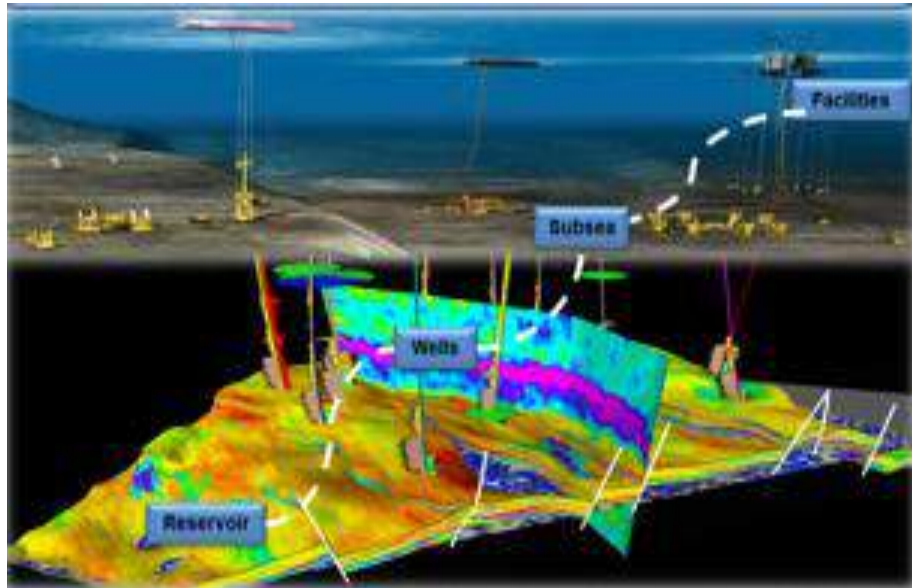
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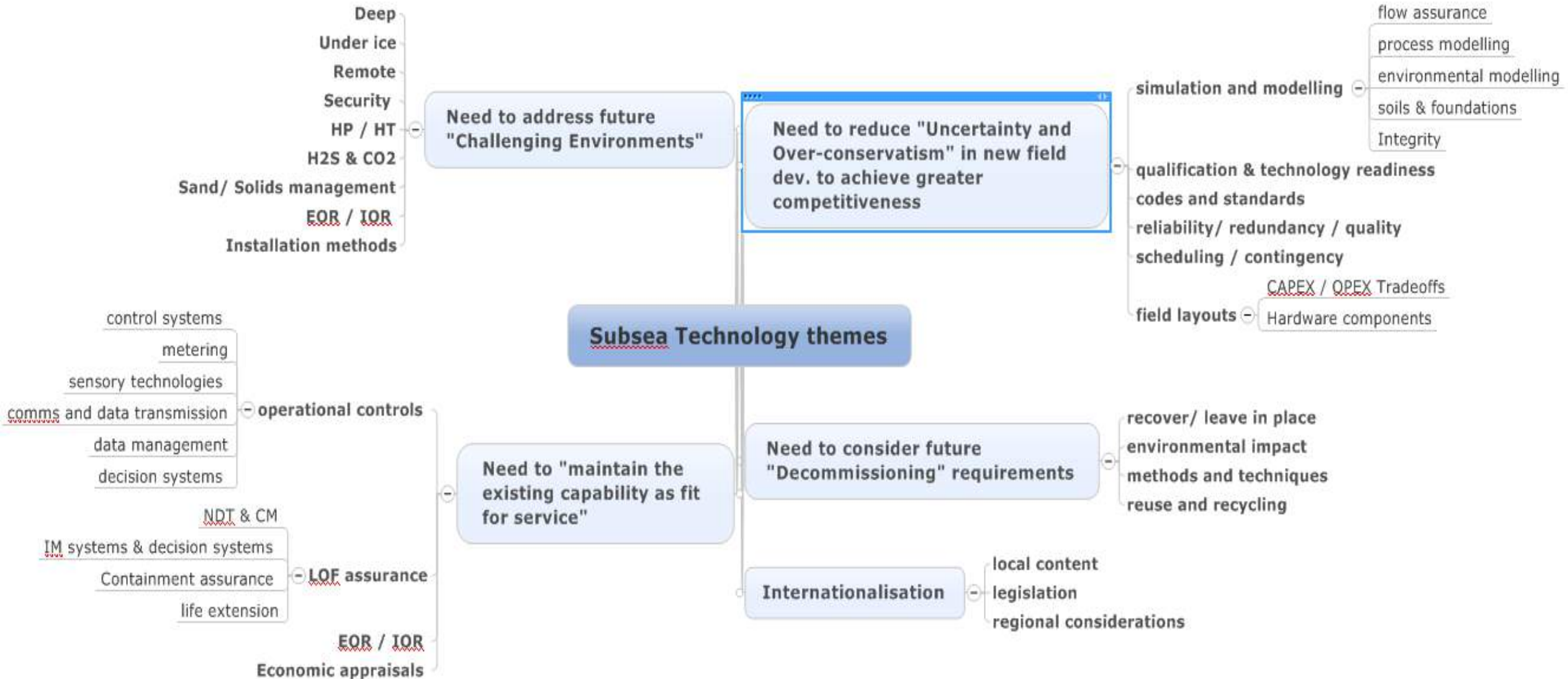
# Subsea – complex technologies

- ❑ Reservoir complexity
- ❑ Host type (cost and environmental options)
- ❑ Pipeline infrastructure – commingling, buried, covered, varied types and sizes
- ❑ Subsea trees, controls and manifolds

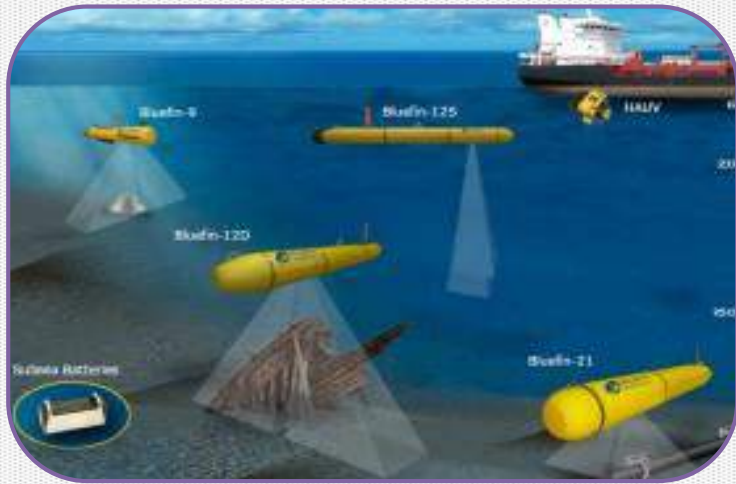




# Oil and Gas - Challenges



# Production & Asset Management

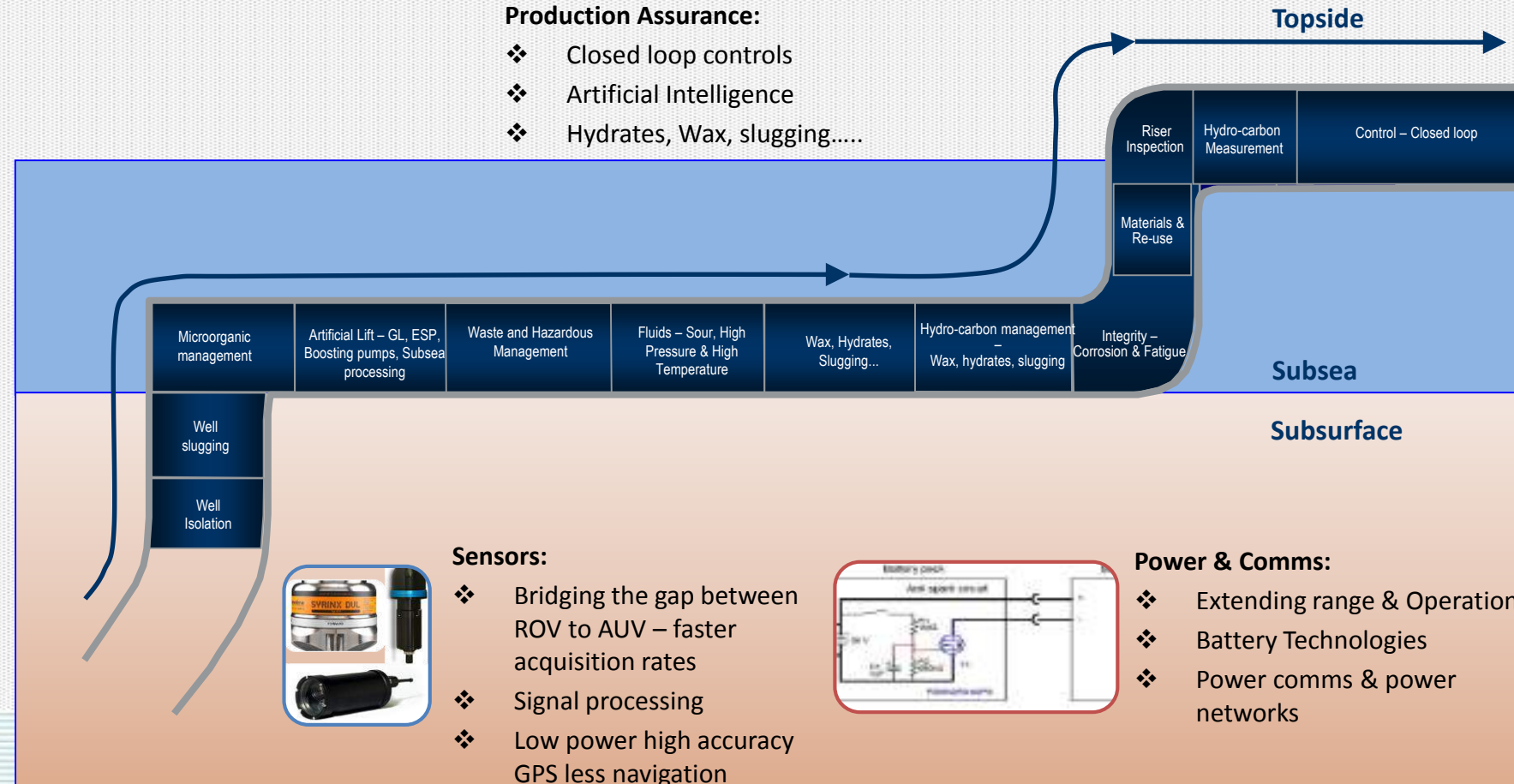


## Remote Operations (ROV's/ AUV's and Drone's) Deployment:

- ❖ Launch & recovery
- ❖ Subsea repowering
- ❖ Autonomous operations
- ❖ Artificial intelligence

## Production Assurance:

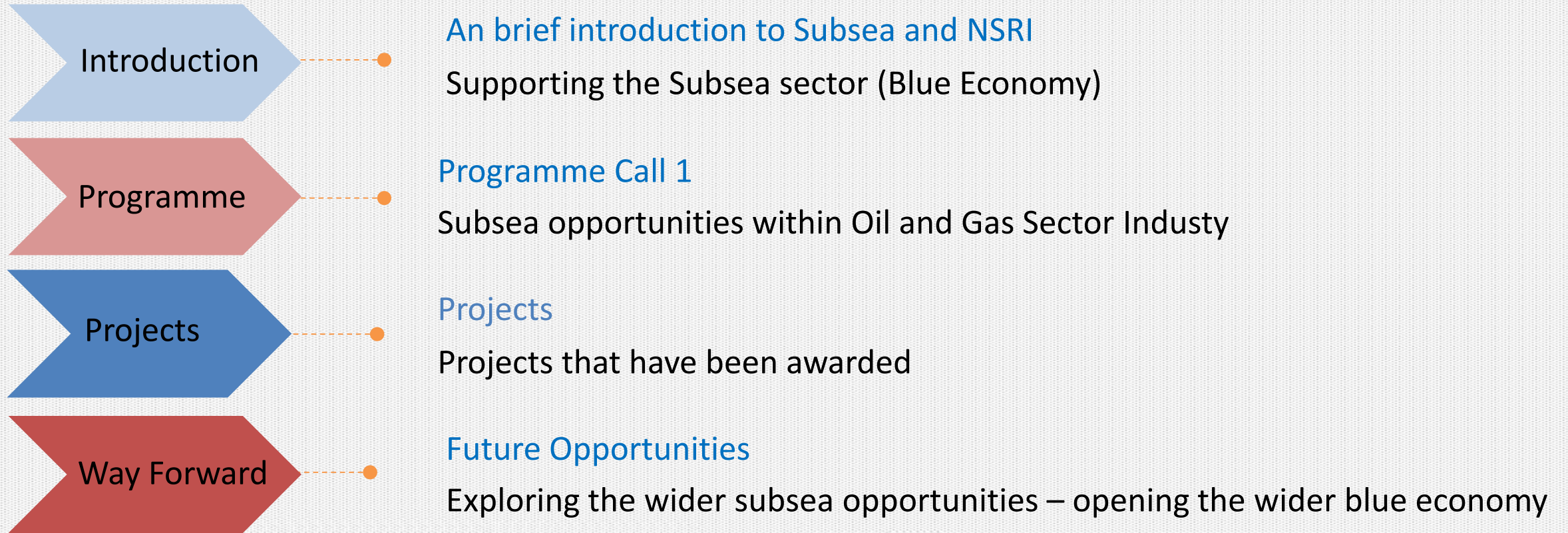
- ❖ Closed loop controls
- ❖ Artificial Intelligence
- ❖ Hydrates, Wax, slugging....



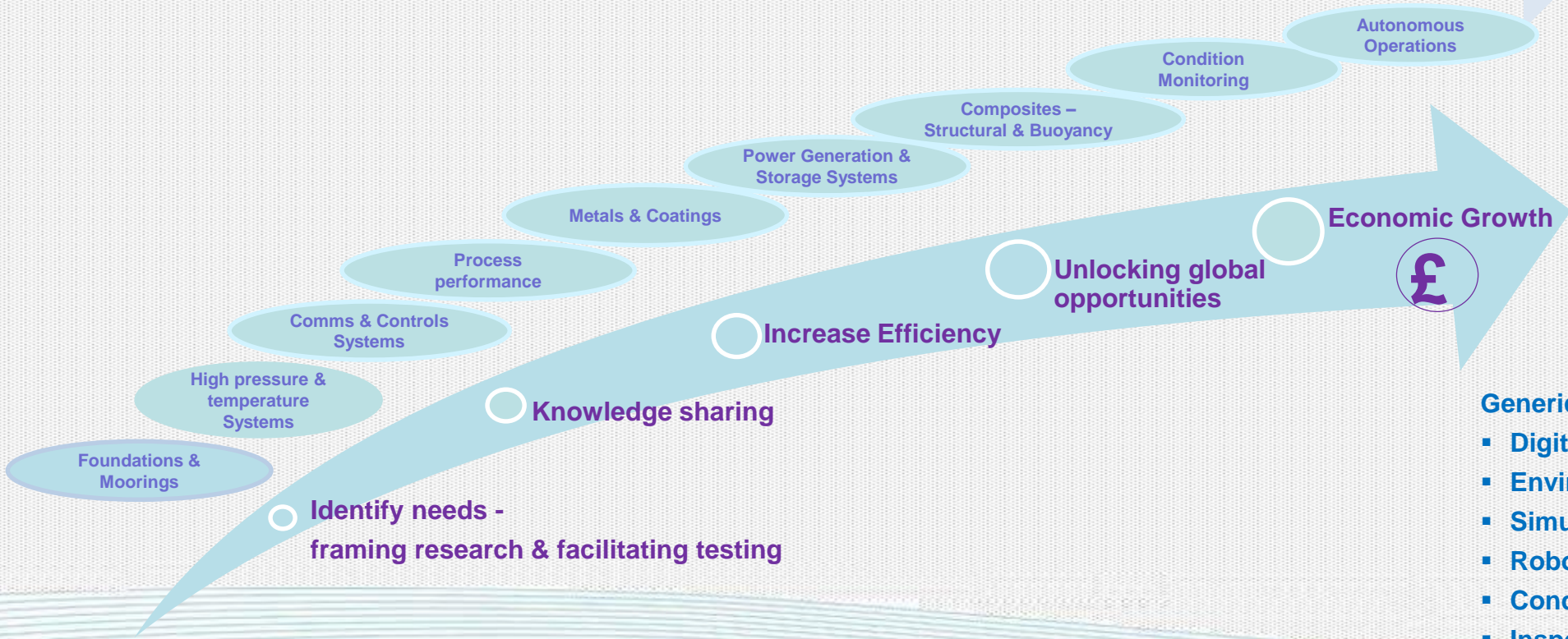
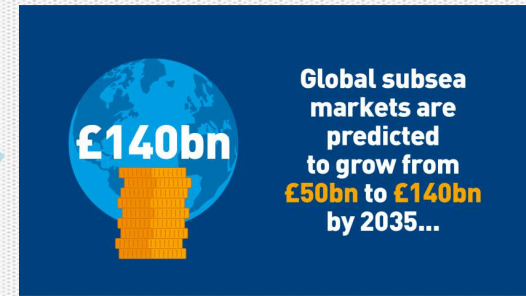
# R and D – Call 1 Projects

| Japanese Organisations   | Scottish Organisation  |
|--|--|
| <p>Mitsubishi Heavy Industries: AUV “3D docking technology” and subsea cable detection technology”</p>                                   | <p>Coda Octopus: 3d imaging sonar</p> <p>Hydrason: Unique wide band width sonar</p> <p>The Underwater Centre: Partner for open water testing</p>   |
| <p>Kawasaki Heavy Industries (KHI): AUV for auto-decking and tracking of objects ie pipelines</p>  | <p>Hydrason: Develop a tracker sensor for surveying</p>  |
| <p>Networks &amp; System Integration Corporation (NESIC): Seabed cabling and observation system</p>                                      | <p>Tritech: Develop a 360 degree swathe coverage</p>   |
| <p>Japanese Drilling Company (JDC): Development of a multi-purpose drilling work boat with all-electric workover and P &amp; A stack</p> | <p>Enovate (AKER company): develop an all electric metal-to-metal sealing and cut device</p>   |
| <p>Yokogawa: develop a Subsea Internet Of Things platform from high speed sensors and remote communications</p>                          | <p>WFS: specialist wireless communications</p> <p>SMS: Development of sand sensors and flow assurance</p> <p>Hydrofact: Specialist in flow assurance management and particular hydrates</p> <p>EC-OG: Development of a localised current power turbine system</p> <p>The Underwater Centre: Partner for open water testing</p> |

# Scope



# Blue Economy – subsea transition

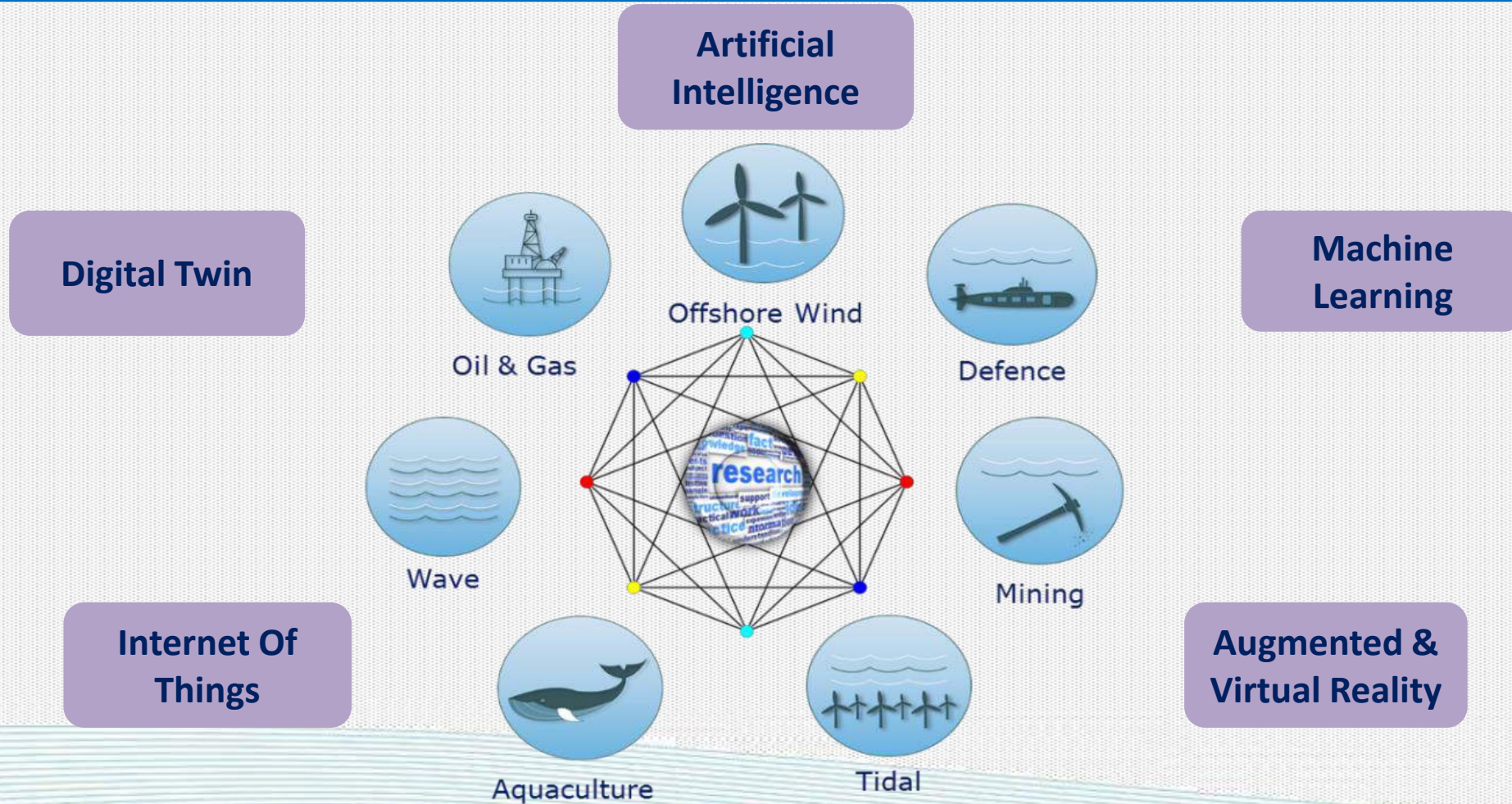
**£140bn**

Global subsea markets are predicted to grow from **£50bn** to **£140bn** by 2035...

## Generic Themes (typ):

- Digital / IOT
- Environment
- Simulation & Modelling
- Robotics & Automation
- Condition and Operational Monitoring
- Inspection Repair and Maintenance
- Advanced Manufacturing

# Digital world – wider opportunities



# Clean energy –energy balance

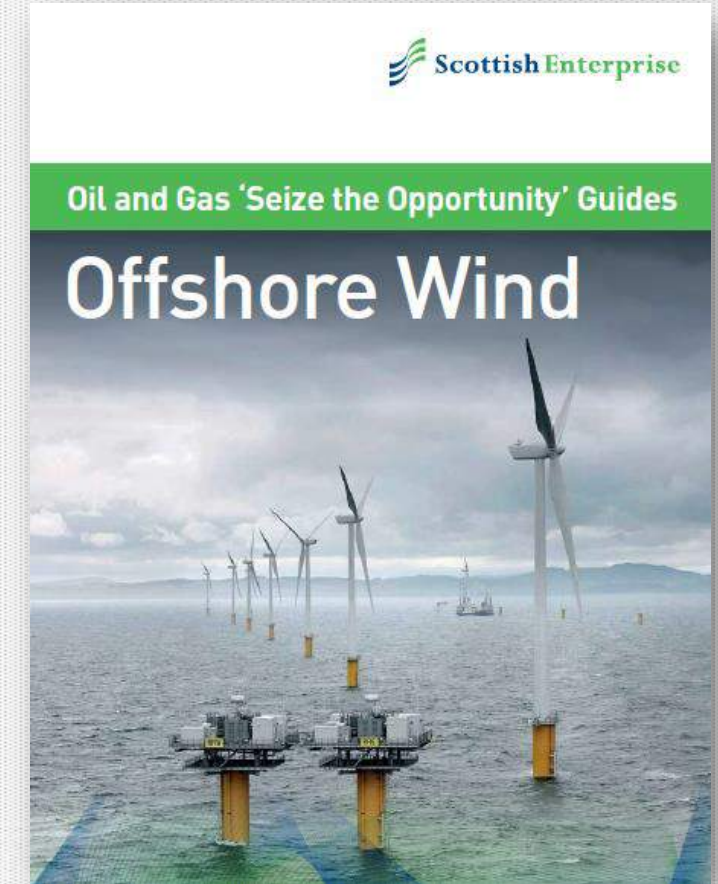
## Offshore Wind opportunities;

- Going deeper (floating)
- Array cables
- Foundation and moorings
- Materials management
- Cable array and seal activation
- Conditioning Monitoring



### Offshore Wind:

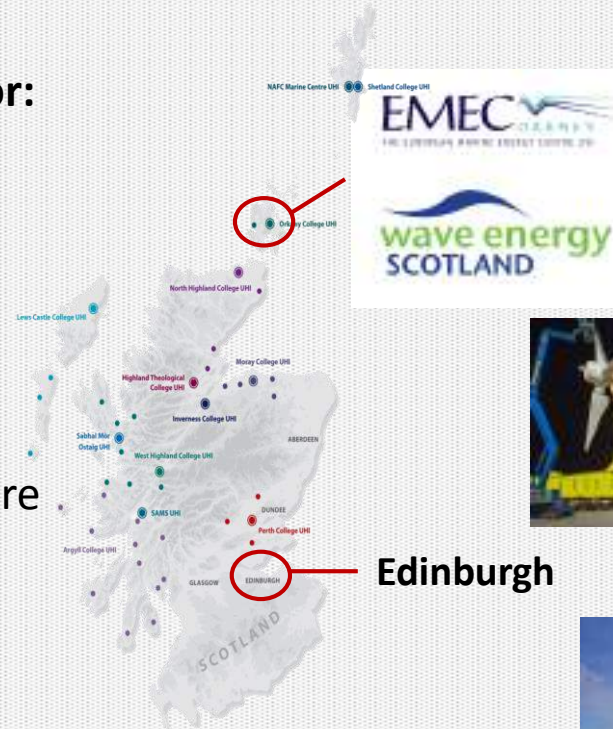
- ❖ World wide acceptance
- ❖ Going deep water & floating
- ❖ Skills transfer



# Clean energy – energy balance

## UK (Scotland) Wave, Tidal and Current – Marine Sector:

- ❑ Recognised leading technology developers;
  - ❖ Scot Renewables
  - ❖ Nova Innovation
  - ❖ SIMEC Atlantis Energy
  
- ❑ Unique test centre – European Marine Energy Centre
  - ❖ Wave
  - ❖ Tidal
  - ❖ Hydrogen
  
- ❑ Marine Science Environmental focus
  
- ❑ Research facilities through Highlands and Islands



Edinburgh

### UK (Scotland) Wave and Tidal:

- ❖ A leading technology developer
- ❖ Unique test centre
- ❖ Sector focused





# Clean energy – wave & tidal

## Offshore wave and tidal opportunities;

- Corrosion management
- Array cables
- Foundation and moorings
- Materials management
- Conditioning Monitoring

Ref; NSRI Wave and Tidal report –endorse  
by the marine energy sector, supported by  
Scottish Government -

<http://www.nsri.co.uk/news>



# Subsea - the blue economy

## Typical industry led challenges

Cable Arrays and Distribution

Autonomous Operations

Condition Monitoring

Construction & Installation

Composites – Structural & Buoyancy

Power Storage Systems

Metals & Coatings

Process performance

Comms & Controls Systems

Foundations & Moorings

Wind

Solar

Wave

Tidal

Current

Aquaculture

## Subsea Renewables & the Blue Economy;

- Clean Energy Growth - global strategies in reducing carbon
- “Wind to Aquaculture” – growth market
- Challenging Environments - deep water, turbulent water or shallow water
- Resolve market led technical challenges – unlocking value across the common themes

*Championing the UK subsea sector across the world*  
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Thank You

Tony Laing – Director of Research and Market Access

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