

The following presentation was given at:

SCAF Workshop
“The Impact of Brexit on the Costing Community”

Tuesday 7th February 2017

The Royal Institution of Naval Architects, London

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Forecasting challenges in a time of disruption:

BREXIT, Emergent and Disruptive Technology, Skills and Business

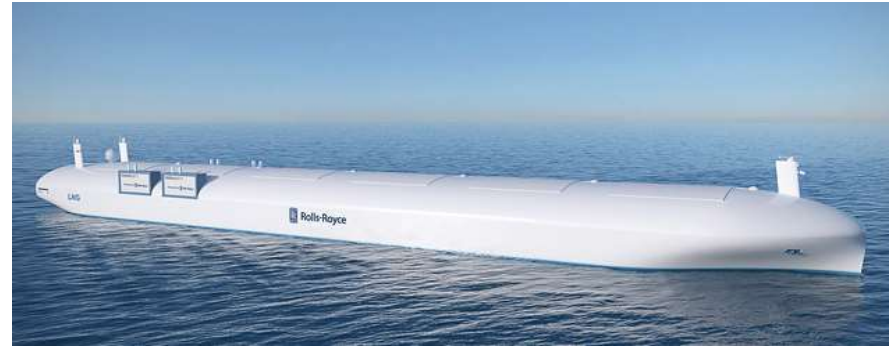


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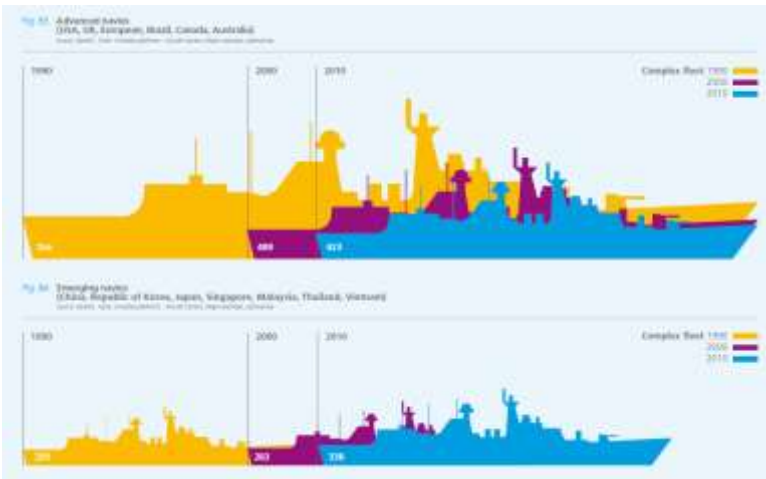
7th February 2017

Agenda

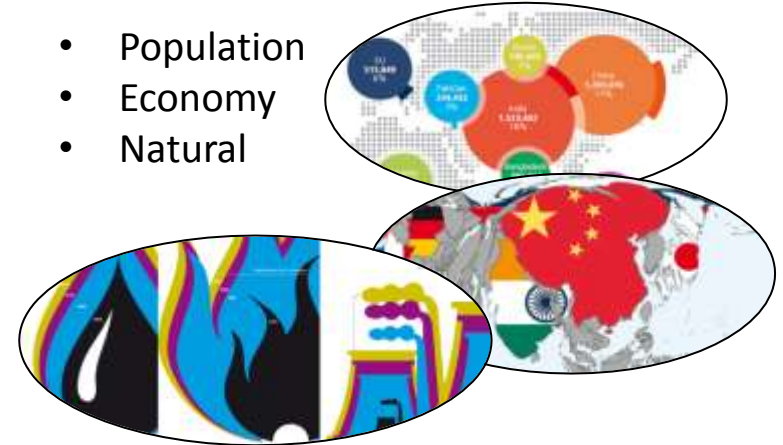
- Introduction
- A changing world
- BREXIT
- Emerging and disruptive technologies
- Future of Work
- Industry 4.0
- Challenges



A changing world

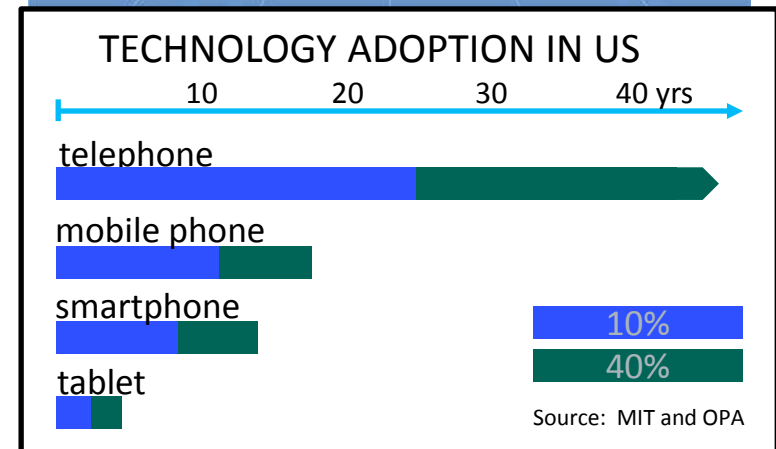


- Population
- Economy
- Natural



A Changing World

- **Changing balance of power**
- **New and emerging threats to security and safety**
- **Proliferation of consumer technologies**
- **Low cost of entry**
- **Non-traditional threats**
 - Cyber
 - System Denial eg GPS
 - The enemy within
 - Rogue systems
- **Global changes to trade and business and disruptive business models**
- **Changing regulation**



- **UK Position as Technology Innovator**
- **Science and Technology funding and participation in EU Programmes eg Horizon 2020 and Erasmus**
 - Horizon 2020 €74.8B
 - Erasmus €14.7B
- **Engineering Resources and Skills** ^{1, 2}
 - Need 182,000 engineers per year to 2022
 - Annual shortfall of 55,000 skilled workers.
- **Regulation and Legislation**
 - Alignment or Freedom
- **Defence Imports**
 - Impact of the value of the £ (down 21.4%) ³
 - £18.6B denominated in \$
 - £2.6B denominated in €
 - How much is “invisible” in the supply chain?

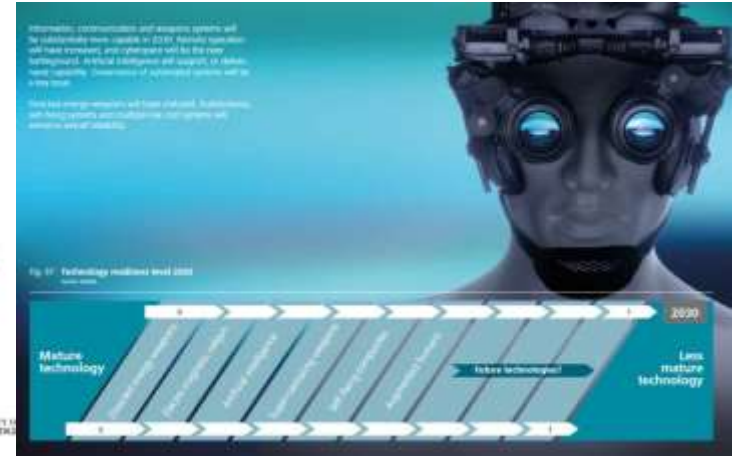
¹Engineering UK Report 2016

²Engineering a Future outside the EU Royal Academy of Engineering

³NAO Equipment Plan Report 2016 to 2026



Emerging and disruptive technologies

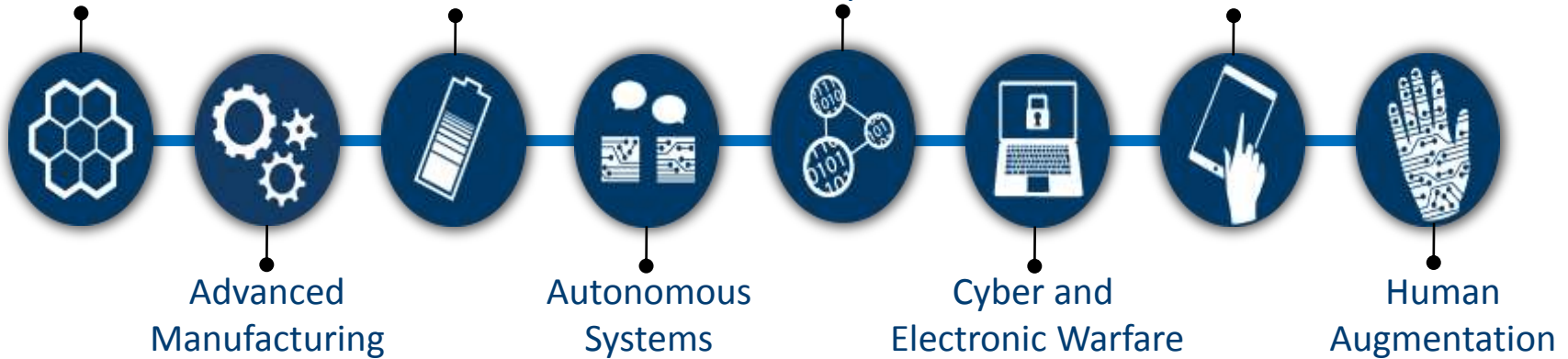


Advanced Materials

Energy Management

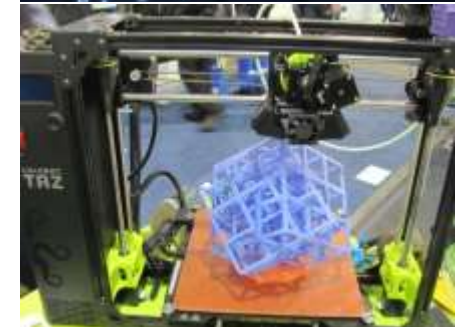
Big Data Analytics

Human Computer Interaction



Emerging and disruptive technologies

- **R&D budgets (in the order of \$1.62Trillion pa)** ⁴
- **Information explosion and data analytics**
 - Facebook users send on average 31.25 million messages and view 2.77 million videos every minute. (Forbes)
- **Autonomy and AI**
 - Connected Autonomous Vehicles
 - Unmanned Warrior, Rolls Royce Ships
- **Cyber System**
 - Communications and navigation
 - Infrastructure control and management
 - Human Augmentation and robotics
 - Sensors, wearable device
- **Biotech**
 - Major growth and Investment
- **Additive Manufacturing**
 - New supply chains and in situ manufacturing



Future of Work Trends



- **Demographic change**
 - Ageing workforce and multi generational working
- **Changing work environments**
 - Virtualisation and flexibility
- **New business ecosystems**
 - Networks and collaboration
- **Digitalisation**
 - Digital solutions and advanced manufacturing
- **Two tiered labour market**
 - High skilled minority versus low skilled and the decline of middle ground jobs



So let's not forget the people

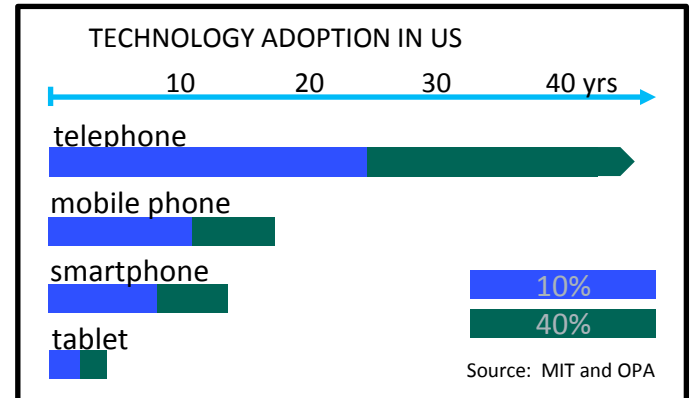


An Ageing Demographic



Industry 4.0

- **The fourth industrial revolution**
 - 1700 – 1800 Steam and propulsion
 - 1800 – mid 1900s Mass Production
 - 1960's- - 2000 Computers and digital
 - 2000 - ? Cyber Systems / AI / IOT
- **Driven by technology – digitisation**
- **Catalysing new business models**
 - UBER, Amazon.....
- **New currencies**
 - Bitcoin, Blockchain
- **New businesses and Supply Chains**
 - TESLA, etc
- **Gig Economies**
 - Non traditional workforce
- **Manufacturing**
 - Additive Manufacturing
 - Robotics

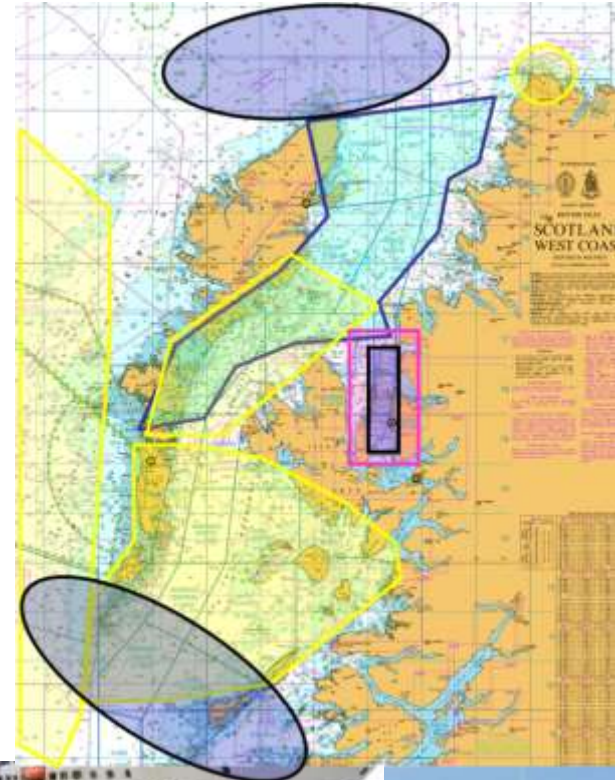


Innovation: Unmanned Warrior



Unmanned Warrior Themes:

- ASW
- ISTAR
- GEOINT
- C2
- MCM
- Over 50 Vehicles (Air, Surface, Sub-Surface)
- 40 Organisations
- 5 Nations + multinational observers
- 4 Operating Bases



- **BREXIT**
 - Loss of technology funding, exchange rate uncertainty, access to markets
- **Proliferation of technology at low cost**
 - Accessible to all, including adversaries both traditional and non traditional, new concepts will emerge challenging long term programmes
- **High Speed of change**
 - Consumer driven technologies, systems and equipment will be more dynamic, evolving and changing to exploit emerging technologies against lengthy procurement timescales
- **Application of intelligent systems and sensors**
 - Will provides opportunities for improved capabilities, but what new techniques will be required to forecast costs?
- **Changing nature of workforce and use of robotics**
 - Automation etc. will force change to existing structures, people, career paths
- **Will need to address training and development**
 - Creating the required new skills and organisations and demographics
- **New Industrial and supply chain models**
 - Business performance, emergent disruptive suppliers

“Advances in robotics and AI also hold the potential to reshape, fundamentally the way we live and work”



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