



FORTISSIMO

# Fortissimo Project Update

Professor Mark Parsons

EPCC Director

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I4MS

|epcc|

# Outline of talk

- Update on the Fortissimo project
- Some thoughts on HPC industry engagement and public intervention
- Some new industry projects at EPCC including a new focus on Data Driven Innovation

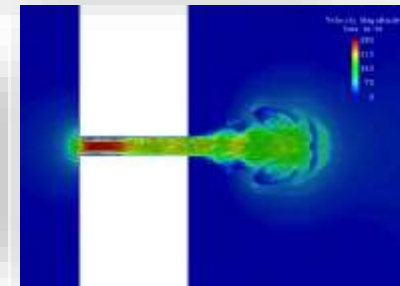
# Why is Fortissimo needed?

- Many new users of HPC and HPDA are put off due to the initial cost – particularly manufacturing SMEs
- A first project can easily cost €60K-100K
  - Particularly if they have never used HPC before
  - This is a lot of money for an SME
- A key objective for Fortissimo has been to challenge this
  - Solving real business challenges and developing a set of business-focussed case studies
  - Overall goal is to convince others to adopt

# Fortissimo Goal & Ambition

- **Goal:** provide easy and cost-effective access to advanced simulation services through a Cloud infrastructure consisting of hardware, software applications, and expertise,
- **Ambition:** become *the* portal of choice for HPC and HPDA expertise and service provision, delivered by Europe's major HPC technology providers

Fortissimo 2 also focusses on coupled simulations

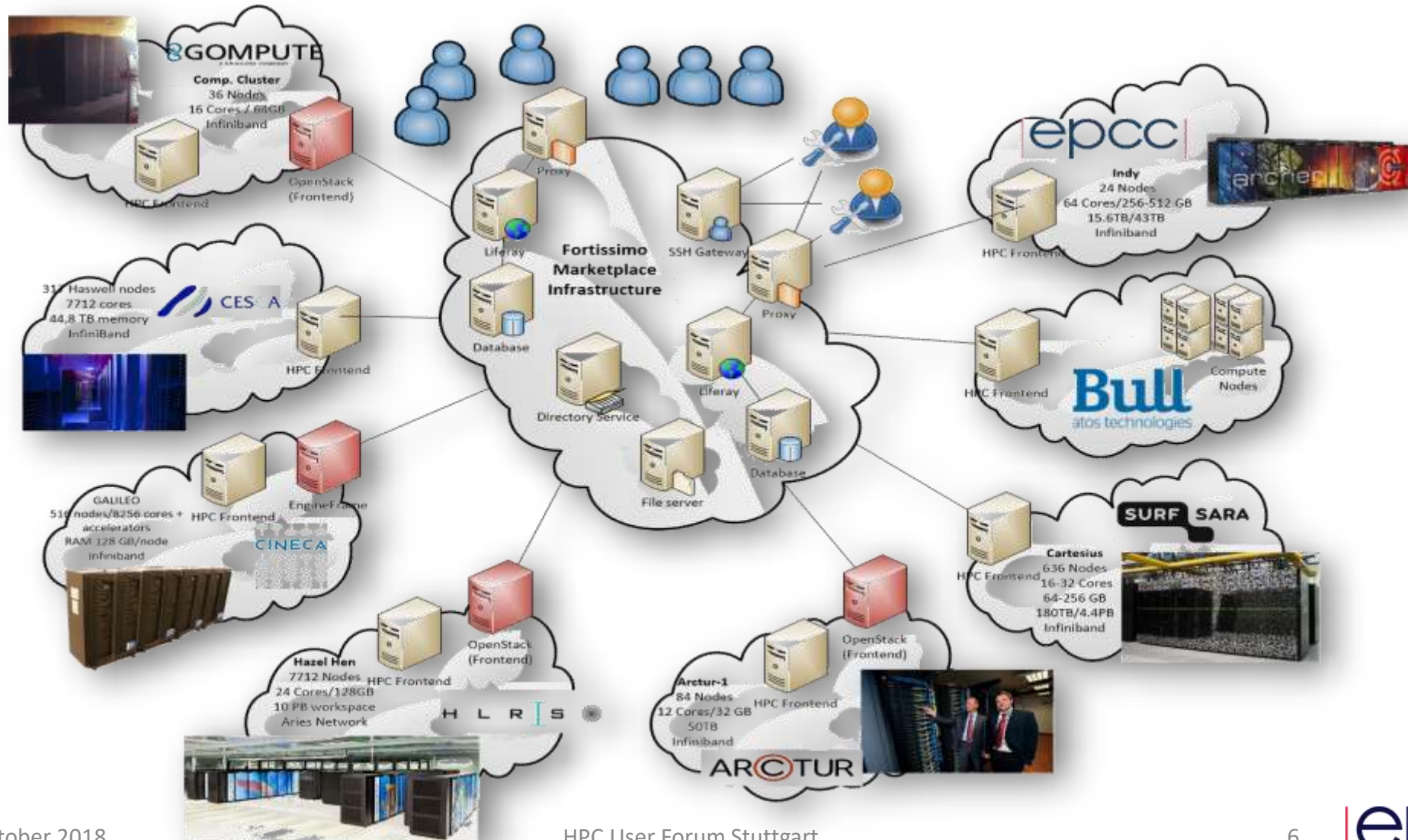


# Industry HPC across Europe

- Although most HPC capacity is currently being used by academia, it is not working with industry only a small fraction of capacity is being used by industry
- Key requirement to kick-start industry HPC projects is to actively engage with industry
- Fortissimo has both public and commercial HPC service providers and commercial HPC service providers
- Its focus is on building a **Cloud of HPC Resources** to support **European Manufacturing SMEs**

But we're not competing with Amazon, Google and Microsoft – we're much higher up the value chain

# The FORTISSIMO HPC-Cloud infrastructure



# Why is uptake of HPC so limited by SMEs?

- There are many barriers to uptake:
  1. First use may be expensive
  2. Target is
    - E.g. R&D
  3. Access to ...
  4. Access to ...
  5. Lack of success stories from other companies
- Fortissimo targets (3), (4) and (5) to help (2) make the case for (1) ...

The perfect opportunity for public intervention ...

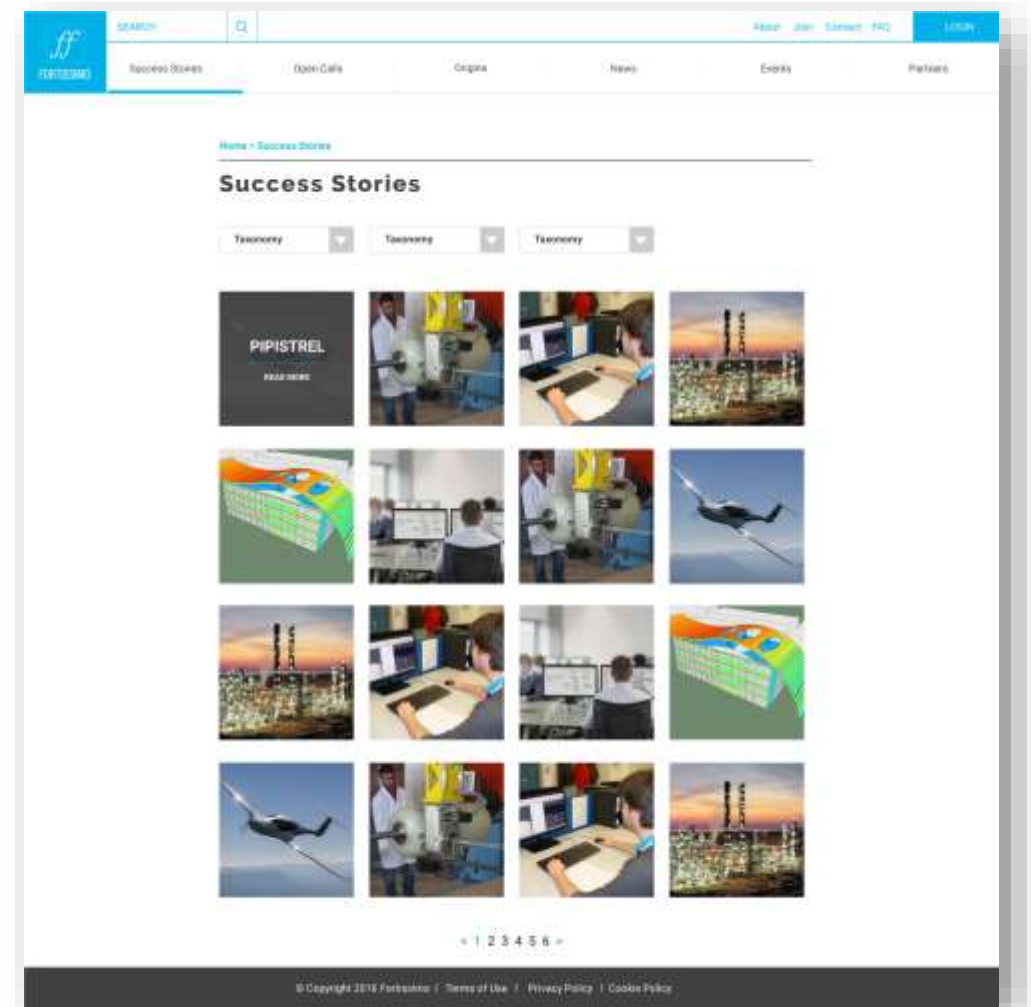
# Fortissimo projects in numbers



- Fortissimo - €22m FP7 project – ended 12/2016
  - 122 partners
  - 53 ‘experiments’ in three tranches **delivering real impact**
  - Focus on **HPC enabled modelling and simulation** for **manufacturing SMEs and Mid Caps**
- Fortissimo 2 - €11m H2020 project – ends 12/2018
  - 93 partners
  - 39 ‘experiments’ currently running
  - Fortissimo focus plus **High Performance Data Analytics**
- Lots of effort to help SMEs take part
  - Particularly with respect to IPR management and finance

# Similar model for both projects

- Small set of core partners
  - Almost identical for both projects
- Initial set of ‘experiments’
- Two Open Calls for experiments
  - At Month 6 and Month 12
- Experiments last 18 months and involve 3-5 partners and funding up to circa. €200,000



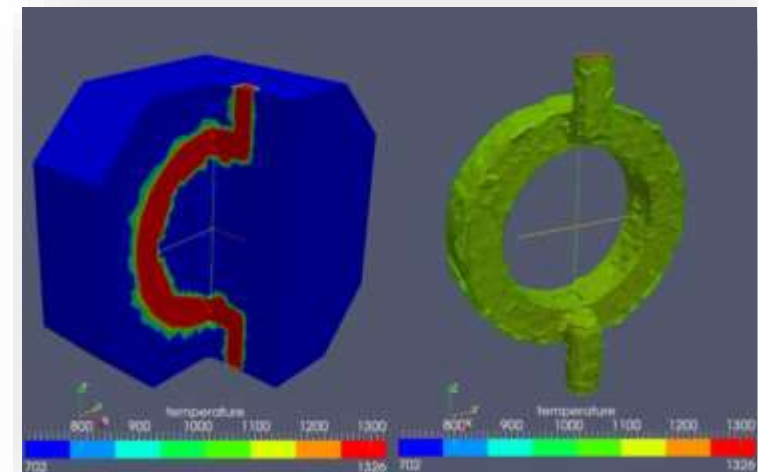
# Fortissimo CFD simulation for hypercars

- Koenigsegg are EU Hypercar manufacturer ... and an SME
- In-house CFD too expensive
  - Cloud is compelling option
- Impressive results
  - 250% increase in downforce with only 15% increase in drag at 250kph
- 30% saving in design costs plus 50% reduction in wind tunnel and physical testing
- Development savings of €90K per year PLUS 30% decrease in time to market
- **€4m benefit to company over 5 years**



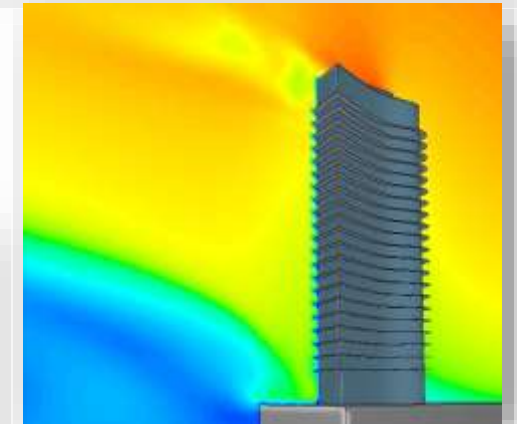
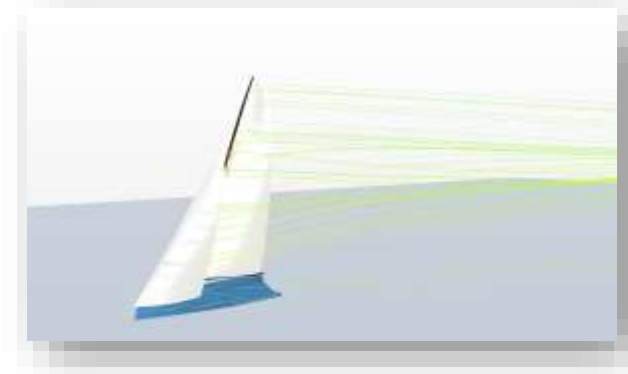
# Fortissimo simulation of low-pressure die-casting of copper alloys

- Focus on optimisation of copper alloy moulds
- Costs of testing a new mould are high - €40K per mould
- Simulation saves around €6K per mould – fewer failures
- Annual savings of around €50K already accruing to IMR



## Further examples

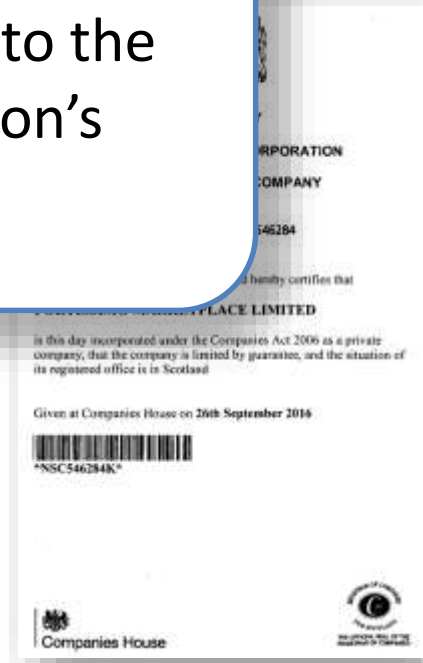
- Cloud based design of yacht sales (Cape Horn Engineering)
- Additive manufacturing simulation (HPE and Exemplar)
- Small wind turbine microsite design (Kliux Energies)
- Crankshaft machining HPDA (ETX)



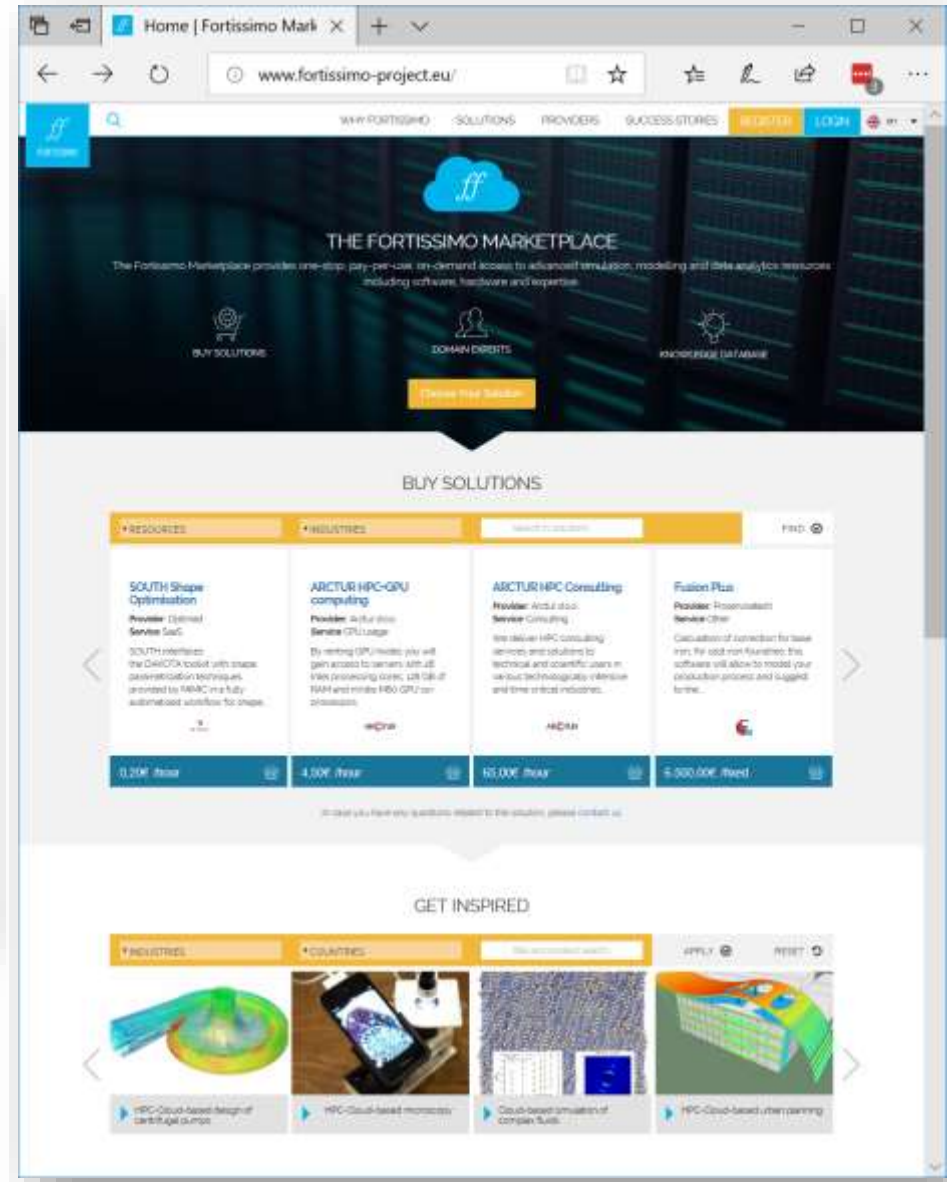
# Fortissimo Marketplace Ltd

- Long term Fortissimo
- Not for
- A marketplace for HPC and HPDA services
- 2m+ manufacturing SMEs still to engage

Who contribute €750 billion annually to the European Union's economy



<http://www.fortissimo-marketplace.com>



# Let's play the "Top 7 Global R&D spenders in 2017" game

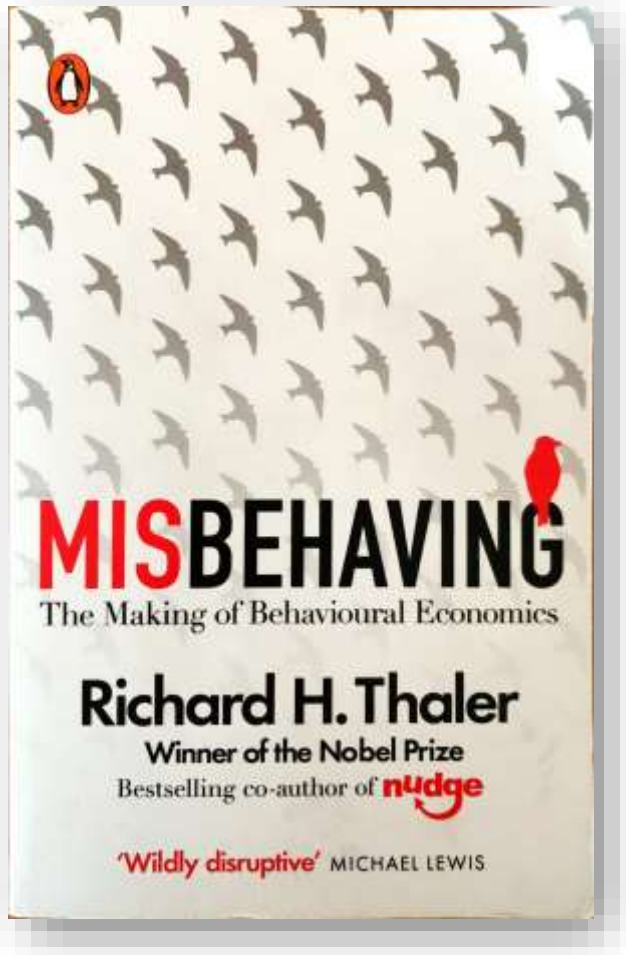
1. Amazon \$17.4 billion
2. Volkswagen \$15.1 billion
3. Alphabet \$14.5 billion
4. Intel \$12.8 billion
5. Samsung \$12.8 billion
6. Microsoft \$12.7 billion
7. Roche \$11.7 billion

- Automotive?
- Search?
- Pharma?
- Wintel?
- Mobile
- Who is No 1?



- These seven companies are investing the whole of the EC's Horizon 2020 funding in **one year** on their own R&D
- Innovation policy, albeit in limited verticals, is being driven by a private tax on consumption

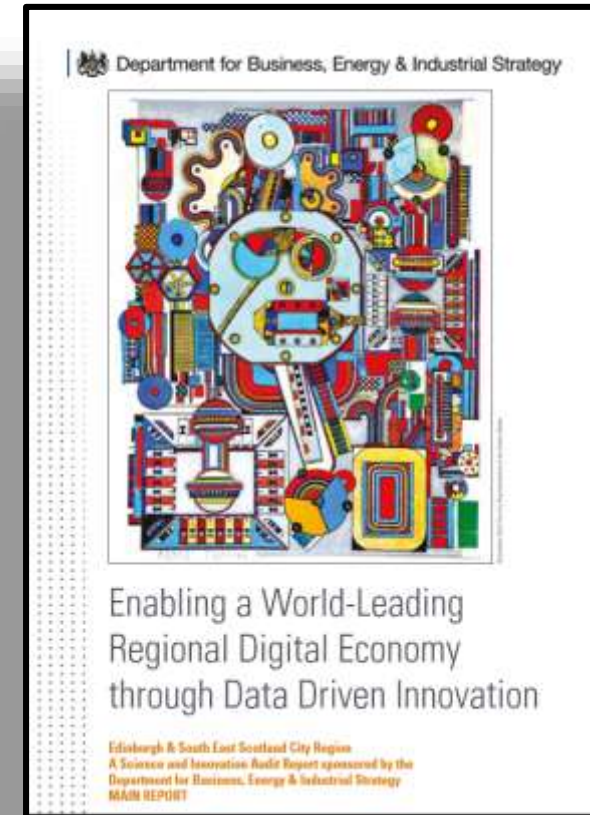
# What does this mean for public intervention?



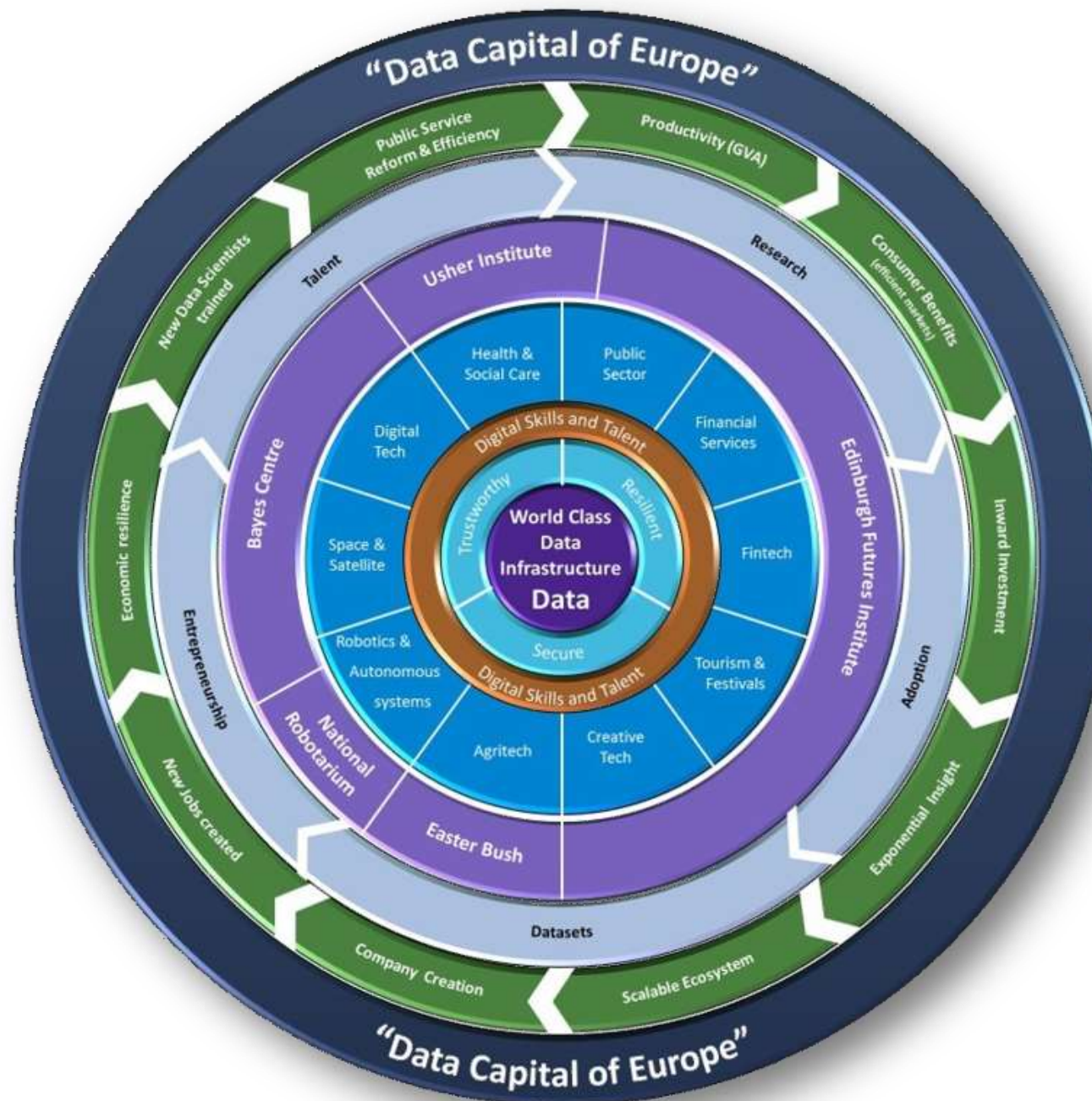
- With limited resources we need to target carefully
- The left and right can't agree on how to intervene
  - Left wing economists take Keynesian view that Governments should **invest in growth**
  - Right wing economists believe **tax cuts will stimulate** growth
- But in truth nobody knows – and Governments are very poor at measuring the impact of their choices
- We need to
  - *Observe*
  - *Collect data*
  - *Learn how to learn from that data*
  - *Speak up*
- The I4MS projects should be properly reviewed so we can learn from their impact

## Edinburgh & SE Scotland City Region Deal

- In 2016 EPCC helped develop a “Science and Innovation Audit”
- Identified strengths in our region for Data Driven Innovation
- City Deals are funding from UK and Scottish Governments
- Aim is to stimulate economic growth in UK regions
- £1.1 billion Edinburgh Region City Deal signed in August 2018

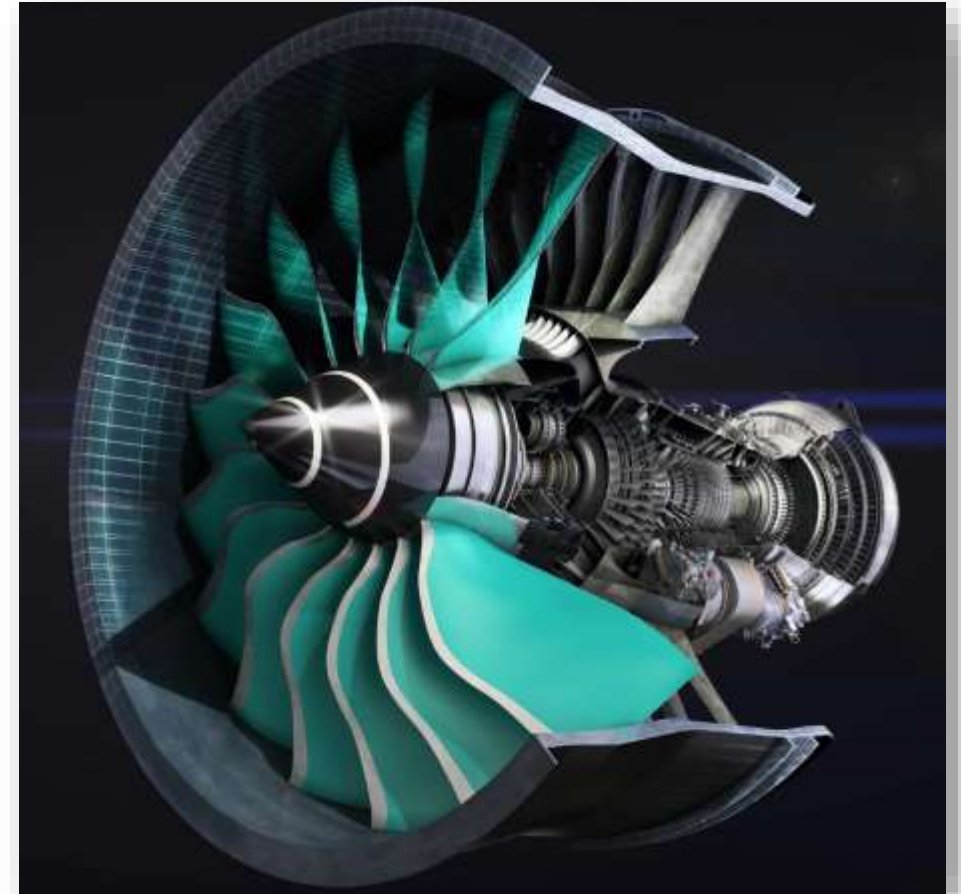


# City Deal outline



## Announcing £14.7m EPSRC Prosperity Partnership with Rolls Royce

- 5 year programme
- World's first high-fidelity simulation of a gas turbine engine in operation
- Structure / Thermomechanics / Fluid dynamics / Electromagnetics
- A trillion degrees of freedom
- An engineering challenge for the Exascale era
- Partners
  - Rolls Royce, Edinburgh, Warwick, Oxford, Cambridge, Bristol, Zenotech and CFMS





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# Questions?