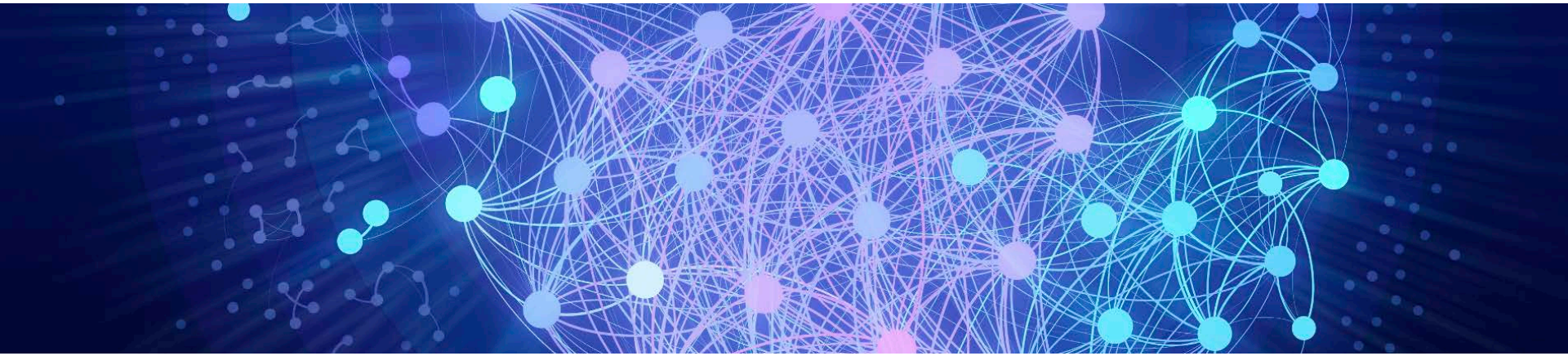
Hartree Centre
Science & Technology Facilities Council

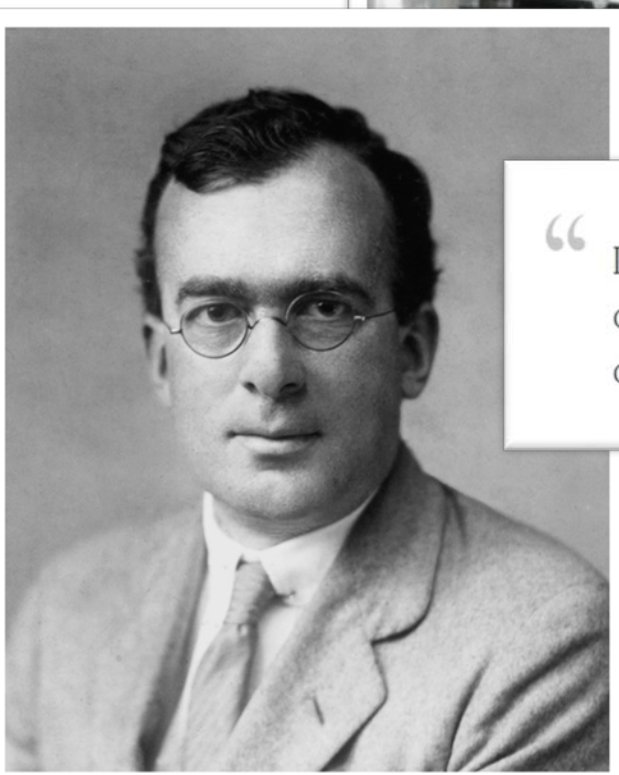
The Hartree Centre

Delivering competitive advantage to the Northern Powerhouse by accelerating the adoption of High Performance Computing, Big Data and AI technologies

Michael Gleaves
Deputy Director



Douglas Rayner Hartree



> It may well be that the high-speed digital computer will have as great an influence on civilization as the advent of nuclear power.

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Our mission

Transforming UK industry by accelerating the adoption of high performance computing, big data and cognitive technologies.

What we do

- **Collaborative R&D**
  Define a challenge in your business and we build a team to deliver a solution.

- **Platform as a service**
  Give your own experts pay-as-you-go access to our compute power

- **Creating digital assets**
  License the new industry-led software applications we create with IBM Research

- **Training and skills**
  Drop in on our comprehensive programme of specialist training courses and events or design a bespoke course for your team



Network of expertise

Government & public sector

Local business networks

Technology partners

Universities

Academia

International research communities

UK Research and Innovation

LCR4.0
Together for Manufacturing.

IBM

STFC
Scientific Computing Department

Sci-Tech DARESBURY

intel

HALTON BOROUGH COUNCIL

Science & Technology Facilities Council

NVIDIA

Atos

Horizon 2020
European Union funding
for Research & Innovation

VIRTUAL ENGINEERING CENTRE

Liverpool City Region
Local Enterprise Partnership

Hartree Centre
Science & Technology Facilities Council

Our platforms

Our track record

Case study | Building the cognitive hospital

Collaborative R&D

Transforming the patient experience using cognitive technology and data analytics

"Helping our patients and their families prepare properly for coming into hospital will really reduce their anxiety and could mean they spend more meaningful time with doctors so we are able to get them better faster."

− Iain Hennessey, Alder Hey Children's Hospital

Alder Hey CHILDREN'S CHARITY

Alder Hey Children's NHS Foundation Trust

IBM Watson

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Case study | Cognitive waste water treatment

Creating digital assets

Using artificial intelligence (AI) to dynamically manage the waste water treatment process with the potential to:

- Adapt responsively to environment conditions e.g. weather forecast
- Make water treatment plants more efficient
- Minimise costly regulatory violations

IBM

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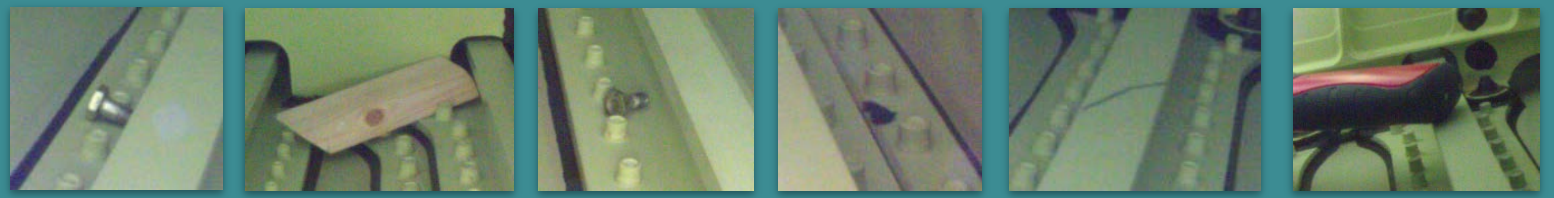
Visual Inspection

- Initial results focus on the lower surface inside wing only
- Train a convolutional neural network based on AlexNet
  - 117 Images of clean production wings from
  - 50 images of wings with Foreign objects
    - Foreign Objects (FO) of various shapes and sizes are photographed inside the wing which could be found at this stage of the wings production



- Dataset is split into 75% training and 25% validation to test the models accuracy
  (validation step occurs once every 10 epochs to reduce overfitting)

Atos

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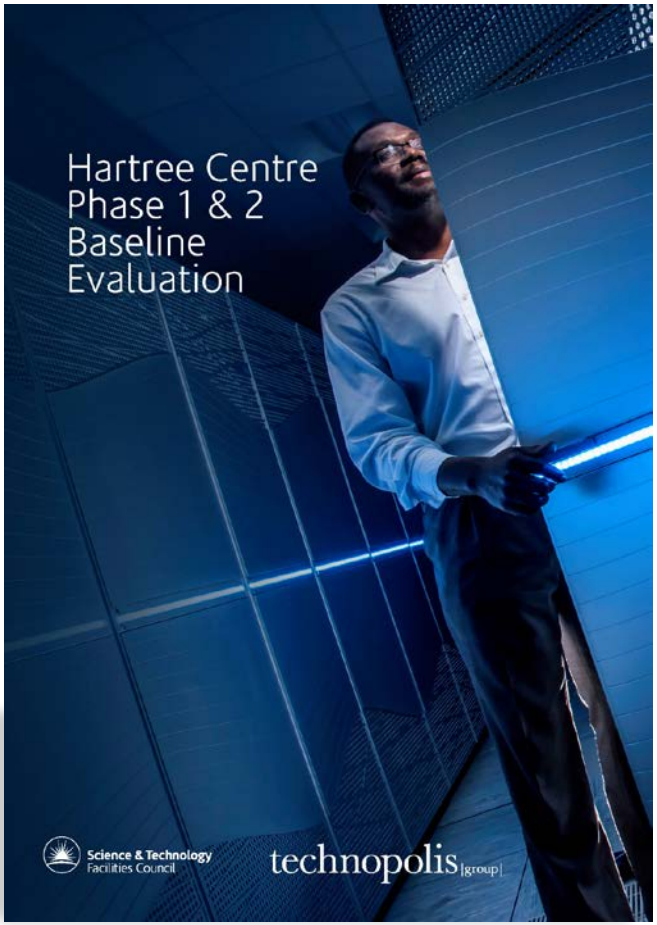
Demonstrating Impact

- Independent baseline impact evaluation of our first four years of operation (2013-2017) to explore the early benefits to UK industry and the economy.

- We commissioned our baseline study to ensure that we are ahead of the game in terms of evaluating our work. It forms the start of a long term measurement and evaluation process which will continue to highlight and record the benefits of the work that we do.



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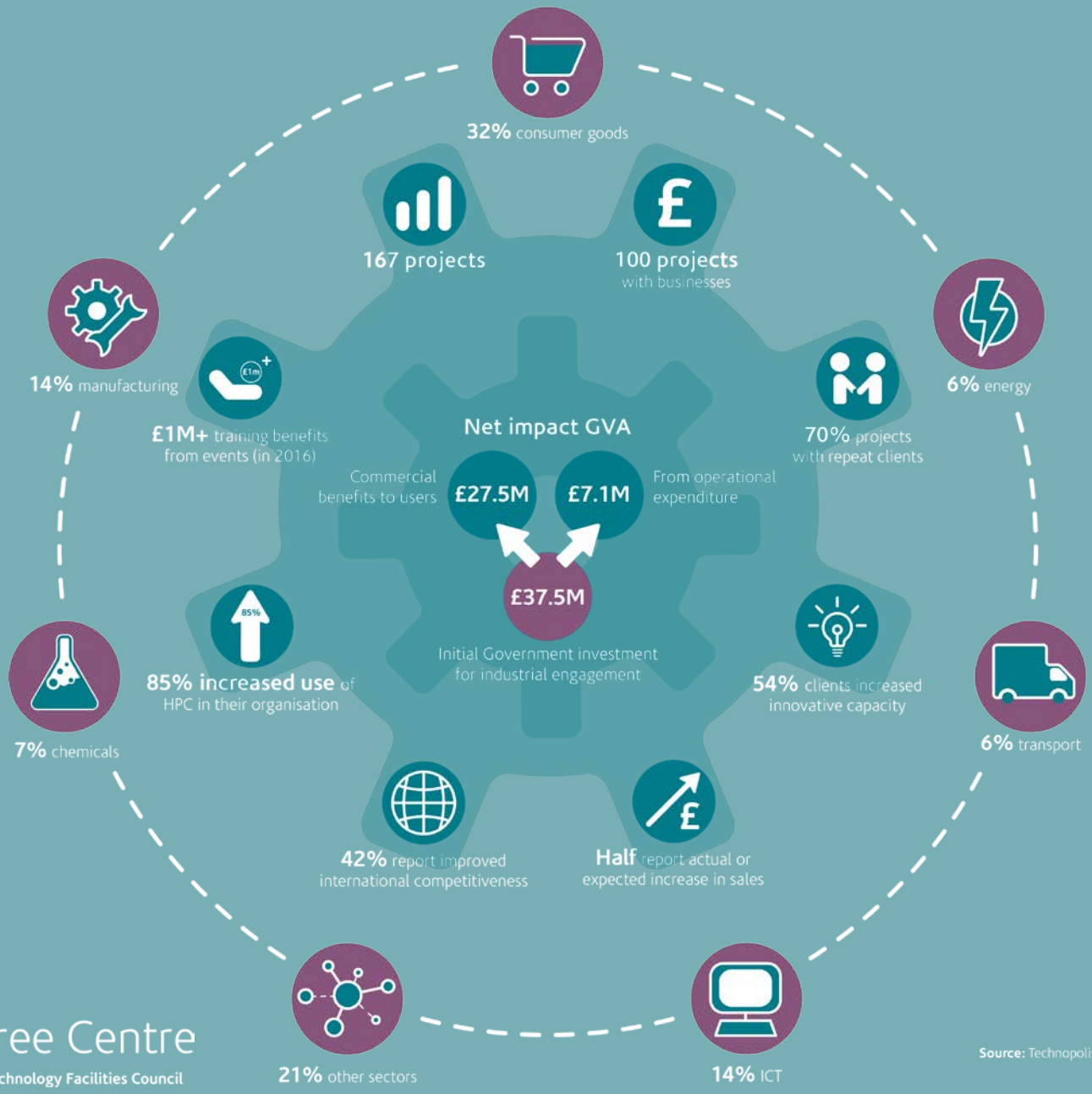
Hartree Centre – Impact from phase 1 & 2



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Source: Technopolis, 2018

Thank you

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Hartree Centre

Science & Technology Facilities Council

Find out more:

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 hartree.stfc.ac.uk

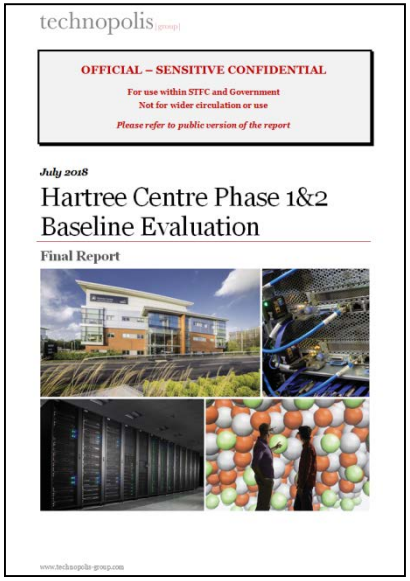
 /company/stfc-hartree-centre

 @hartreecentre

Hartree Centre Baseline Impact Evaluation

The first 4 **years** of operation

- Early view of **benefits** being delivered to **industry** & **economy**
- Services are *"highly relevant to businesses in all sectors of the UK economy"*
- Hartree provides *"a quality and breadth of services that goes beyond anything the market will provide"*
- Most businesses continue return because of the combination of facilities and specialist skills



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Evaluation participants

55 UK-BASED CLIENTS

- 25 High-tech SMEs
- 12 Multinationals
- 13 Universities
- 5 Other public bodies

INDUSTRY PROJECTS

167 Projects developing new tools & data for application in key sectors across the economy

60% with commercial companies

70 projects with repeat clients

BROAD SPREAD OF SECTORS INVOLVED

- 32% consumer goods
- 14% ICT
- 14% manufacturing
- 6% transport
- 6% energy
- 7% chemicals

plus transport, health, pharma, defence, finance, oil & gas

Skills and Awareness

80%
Of users report improvements to modelling and simulation capabilities

93%
Of users report increased understanding of the potential value of HPC to their organisation

OVERALL ECONOMIC IMPACT

£7.1M from centre's operational expenditure

GVA *net* impact

£27.5M in commercial benefits to phase 1&2 users (upper bound estimate)

INCOME 2013/14 - 2016/17

£3.5M industry sales from 37 customers

£1M in grant and other income
including Horizon 2020 & Innovate UK grants

TRAINING & EVENTS

Organising, hosting or contributing expertise to 30 events per year (2016)

950+ people

3,760 training days

£1M/yr (equivalent market price)

RESEARCH

Pre-competitive research

Internal R&D

Energy Efficient Computing research programme

DARESBURY CAMPUS

HPC collaborations with **5** tenant companies

"The Hartree Centre was recognised consistently as being the key asset in terms of securing the Campus' future success"

(Campus Impact Study, 2017)

Total net economic impact the Hartree Centre will generate in commercial benefits among the Hartree Centre's phase 1 /2 users

Total Net Impact = **Total Gross Impact** x **Discounting factors**

Upper Bound £27.5M

£83.5M

Direct Impact (£46.6M)
Turnover* growth, attributable to the centre (and sustained for three years):
Large (0.05%) / SME (5%) clients
+
Induced Impact (£6.1M)
From spending by (attributable) employees of client organisations in the wider economy
+
Indirect Impact (£30.8M)
Activity supported across the client's supply chains as a result of additional sales

Lower Bound £7.4M

Direct Impact (£12.6M)
Large (0.01%) / SME (1%) clients
+
Induced Impact (£1.6M)
+
Indirect Impact (£8.3M)

33%

100% - Attribution (0%)
(Attribution to the centre is already accounted for in turnover growth estimates)
x
100% - Deadweight (40%)
Based on user feedback on whether work / benefits would have occurred otherwise
x
100% - Displacement (55%)
Because of reduction in benefits (sales) elsewhere in UK (amongst non-assisted competitor companies)
- *Large clients tend to operate in highly competitive UK/global markets (70% displacement)*
- *Small clients tend to provide niche goods / services, with few direct competitors (0% displacement)*

x
100% - Leakage (0%)
(Leakage from UK already accounted for by using UK-only turnover growth estimates)

**Figures shown are really Gross Value Added (GVA), rather than turnover. GVA is a better measure because it discounts the added value generated along the supply chain and avoids double counting. We have used standard GVA:turnover ratios published by ONS to convert.*

Total net economic impact to the UK from the operational expenditure of the Hartree Centre during the first 2 phases (4 years)

Total UK Net Impact (£7.1M) =

Total Gross Impact (£74.6M)

Direct Impact (£10.2M)
From the centre paying salaries to its employees
+
Induced Impact (£1.3M)
From employee spending in the wider economy
+
Indirect Impact (£63.1M)
Through the centre's purchase of goods and service

x

Discounting factors (9.5%)

100% - Deadweight (90%)
Because Government would have invested capital funding elsewhere
x
100% - Displacement (0%)
Because of (no) reduction in benefits elsewhere in UK economy due to centre's services
x
100% - Leakage (5%)
Because a small number of suppliers to the centre are based outside the UK