Research Management Information: Analytics & Visualizations for Informed Decision Making

Lorna Thomson
Outline

• Who we are
• What we measure and why?
• How we present and use our data
• What we would like to do in the future
University of Edinburgh

A global top 20 University (QS)
- 3 colleges - 5 locations in Edinburgh area
- 20 thematic schools
- Interdisciplinary focus - research without boundaries
- 4th (Research Power) in UK
- 23 Nobel prizes
- £550m City Deal in ‘data-driven innovation’

Shape
- 42,000 students - 43% non-UK nationals from >140 countries
- ~2.8 million enrolled on MOOCs
- ~4,650 academic FTEs - 33% of our staff come from 105 nations
- >£1.2bn turnover
- >£400m in new grants 2018 (8% pa growth since 2012)
- Investing £1.5bn in estates over next decade
£307m
The amount of research funding awarded in 2018/19

£1.1bn
The value of research funding applications we supported in 2018/19

£402m
Awarded in 2017/18. Highest award total to date

#5
In the UK for research income

2491
Research funding applications submitted by us for the University in 2018/19
Research Excellence Framework
Economic Impact 2017-18

University of Edinburgh impact on the UK

- £3.5bn GVA for UK economy (£5.2bn globally)
- 46,000 UK jobs
- £9.60 for every public £1 invested

And plugged into our local economy

- Scotland: £2.2bn GVA and 32,000 jobs
- City of Edinburgh: £1.7bn GVA and 26,000 jobs
- 2.51 jobs in Scotland for every person directly employed
Metrics

- Idea
- Proposal
- Submission
- Project
- Outputs
- Impact

Research Professional
Worktribe
eFinancials
Core HR
Pure / SciVal / ResearchFish
Local

Apps, awards (£ / #), success (School/PI), gender, funder distribution, income, trials, Studentships

# Pubs, FWCI, # top 10%, OA

Case study, PE, KE, media

- Investigator
- Faculty
- Library
- Research Office

Edinburgh Research Office | www.ed.ac.uk/research-office
The Virtuous Data Cycle

Data quality is an ongoing challenge – only users understand the limitations and myriad business processes behind the data.

We are developing training on understanding and using our data, and use cases for our colleagues.

By developing dashboards, we are providing a ‘single version of the truth’. Opening up the data creates a culture of trust, and ensures errors can be fixed quickly, and once.

We need users at all stages – whether Pre-Award support or Academic, to understand the data in order to be able to understand performance, risk and opportunities. Helping others to pull in same direction.

The final part is looking to the future:

- Modelling ‘what-if’ scenarios.
- Forecasting
- Measuring impact of interventions

The diagram shows:
- Data Quality
- Data Training
- A Common Language
- Understand Performance
- Understand Opportunity
- Measure Impact

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What we provide

Alongside our traditional monthly KPIs, the Edinburgh Research Office produces a range of research data analysis and intelligence to inform decision-making and guide resource allocation across the University. This uses a variety of resources, including Worktribe and a range of both internal and external datasets.

Have a browse of our traditional KPI reports, data analysis, and briefings below. Please note that KPI briefings and reports are normally produced within 15 working days of month end.

We work closely with College and School level analysts to develop research analysis to support research development at the University. Our analyses are designed to be compatible with the University’s stance on Responsible Research Metrics, and we ask all users to ensure they are familiar with the policy before using data for any decision-making about individuals.

Note that dashboards marked restricted access are available on request only and on condition of clear business need. This is an area of active development for us, please get in touch with any suggestions.

Note that our KPIs and dashboards are available for internal staff use only. They should not be shared externally.

Explore our dashboards

- **Research Applications & Awards**
  - Explores the detail behind the KPI reports, by School/Centre

- **Success Rates & High Value Awards**
  - View application success rates and high value awards

- **University Research Court KPIs (Restricted Access)**
  - View Court and Executive Research Measures

- **Run a Worktribe Report (Restricted Access)**
  - Run your own Worktribe data report for apps & awards

- **HESA Research Income**
  - Benchmark Unit Income Across the UK by Subject

- **UKRI Awards**
  - Explore successful awards to UK Universities from UKRI

- **Research Office Staff Internal Access Only**
  - Link to checking reports for ERO Funding Teams

- **College/School Research Reports (Restricted Access)**
  - This currently includes CAHSS PURE reporting

EDINBURGH RESEARCH OFFICE Insignts & Intelligence

Published 03/10/2019
Award Portfolio

Research Application and Awards Dashboard

[Graph showing historical month-by-month trends in award portfolio, with interactive options for College, School, Sponsor Type, and Academic Year from 2013 to 2019.]
Impact Metrics – what are we trying to capture?

• Measures of impact seek to demonstrate and evaluate an *end point* in the process;

• Measures of open science cover the ability to *facilitate* pathways towards impact;

• *Academic* and *societal* impact should be captured using different metrics.
Impact Metrics – Learning from REF

• ‘The way impact metrics were presented did not lend itself to easy synthesis’
  • inconsistencies in the way that numeric data were presented, such as financial or patient impacts, made summary figures such as economic impact difficult; and inconsistent use of referencing such as to parliamentary committees made a summary of the ways in which impact occurred all but impossible.

• Two key conclusions of this study were:
  • That standardising the way information is presented –especially numerical – would make future analysis of total impact and development of indicators easier; and
  • The strength of the exercise is that it allows institutions to select the most appropriate evidence rather than requiring a top down approach to types of impact.
Impact Metrics – Knowledge Exchange Framework

• KE used to derive Higher Education Innovation Funding in England

• Research England is currently piloting KEF - compiled a set of metrics against which to measure success in knowledge exchange.

• Largely based on Higher Education Business Community Interaction Survey (HEBCI) but institutions will be asked to submit additional narrative evidence.
<table>
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<tr>
<th>Perspective</th>
<th>Proposed metrics</th>
</tr>
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| Research partnerships                           | • Contribution to collaborative research (cash and in-kind) as proportion of public funding (HE-BCI table 1a)  
                                                | • Co-authorship with non-academic partners as a proportion of total outputs (data provider TBD) |
| Working with business                           | • Innovate UK income (KTP and grant) as proportion of research income (Innovate UK)  
                                                | • Contract research income with businesses per academic FTE (HE-BCI table 1b)  
                                                | • Consultancy income with businesses per academic FTE (HE-BCI table 2) |
| Working with the public and third sector        | • HE-BCI contract research income with the public and third sector per academic FTE (HE-BCI table 1b)  
                                                | • HE-BCI Consultancy income with the public and third sector per academic FTE (HE-BCI table 2) |
| Skills, enterprise and entrepreneurship          | • HE-BCI CPD/CE income per academic FTE (HE-BCI table 2)  
                                                | • HE-BCI CPD/CE learner days delivered per academic FTE (HE-BCI table 2)  
                                                | • HE-BCI Graduate start-ups rate by student FTE (HE-BCI table 4) |
| Local growth and regeneration                   | • Regeneration and development income from all sources per academic FTE (HE-BCI table 3)  
                                                | • Additional narrative/contextual information |
| IP and commercialisation                        | • Research resource (income) per spin-out (HE-BCI table 4)  
                                                | • Average external investment per formal spin-out (HE-BCI table 4)  
                                                | • Licensing and other IP income as proportion of research income (HE-BCI table 4) |
Metrics – what should we have?

• An Open Science system should be grounded in a mix of expert judgement, quantitative and qualitative measures;
• Transparency and accuracy are crucial;
• Make better use of existing metrics for Open Science;
• Next-generation metrics should be underpinned by an open, transparent and linked data infrastructure;
• Measure what matters
Who’s looking at our research?

Edinburgh Research Explorer
July 2019: 88,520 downloads

Downloads per month (per academic year)

- 2016-17
- 2017-18
- 2018-19

- 46%
- 66%
- 86%

Edinburgh Research Explorer doesn’t take holidays anymore:
- 65% increase on July last year, & the 4th highest monthly visits ever, for one of the quieter months.
- 17.8k in the year to August, a 30% increase, missing the million mark by less than 2 weeks.

TOP 5 downloads [D/Ls] for July 2019

1. Politics legacy continued to the west of Scotland?... Kelly John • 1237 D/Ls [•]

2. Turnbull, A. J. M. (2019). Calculating the finite... [1203 visits]


4. Personality Structure in the Domestic Cat... Gartner, Powell E Weiss • 833 D/Ls [•]

5. The Reform of the Law of Directors’ Duties... Cabrelli, David • 662 D/Ls [•]

6. Picture-Book Professors... Terras, Melissa • 566 D/Ls [•]

SOURCE: RUS-UK download statistics portal

https://edin.ac/2OVPOeM

Edinburgh Research Office | www.ed.ac.uk/research-office
Global reach

1.64 million downloads since May 2017

COUNTER-conformant usage statistics from IRUS-UK service https://irus.jisc.ac.uk/
Research Opportunities & Activities Graph (ROAG)

• Integration of three separate open datasets, using text mining and fuzzy entity matching, to build a relationship graph:
  • Gateway To Research – all UK government funded research projects
  • Companies House – summary of all registered companies
  • UK Patents – summary of patents registered in the UK
Scope of the ROAG system

3 key linked public datasets: Gateway To Research, Companies House, UK Patents

- 10.5m Nodes, 5.5m Relationships in the generated graph
  - 4.2m Companies
  - 0.5m Patents
  - 84k GTR Projects + 69k GTR Persons + 42k GTR Organizations

- Linking is rules/rank based “fuzzy” combination of name and address
  - All source data is messy to varying degree, mix of structured and unstructured data

- Specific keyword collections can be defined (and potentially auto-derived…)

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The Graph
Figure 4 shows the geographical location of the funding from GTR database funds for projects based in the infrastructure sector. Each data point shows a single institution.
Spirit Aerosystems all projects graph
How do we use this?

• Which domains of research are most funded or trending
• Who is most successful at attracting funding
• Who is the most collaborative
• Who is working with who (HEI, Company, Person) doing what

These queries can all be focused:
• by person and organization (HEI/Company)
• to a particular research domain/funder
• over a specific period
• for a geographical area or location
Current status of ROAG

• Now integrated with University of Edinburgh PURE
  • Person identity and Project linking between GTR and PURE
    • Total linked (PURE, GTR) projects: 2545
    • Linked Projects with linkable people: 2193
    • Total people across linked Projects: 11542 (PURE: 3871, GTR: 7671)
    • 83.52% of distinct Pure people on linked projects matched someone in GTR
  • Significantly expanded research portfolio information for University of Edinburgh academics

• Fully operational system with new graph generated daily from nightly update of external and internal data sources
Case Study 1: Interdisciplinary Research

Evidence Base

Panel A & B
1700 Co-authored Outputs

SciVal

College Culture

Key Funders

Insights

Case Study 1: Interdisciplinary Research

THE UNIVERSITY of EDINBURGH

Worktribe.™

211 Organisational Unit Webpages

6500+ Applications £600m Awards

External PI/Co-I Success Rate

<table>
<thead>
<tr>
<th>Multidisciplinary Applications</th>
<th>No</th>
<th>xx%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interdisciplinary Applications</td>
<td>Yes</td>
<td>xx%</td>
</tr>
</tbody>
</table>

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Case Study 2: European Strategic Partnerships

Existing Collaboration
- Number of co-authors at each institution
- Number of co-authored outputs
- Change in number co-authors/outputs
- Citation performance

Research Themes
- = Applications of Computer Vision
- = Diagnostic techniques for bovine tuberculosis

Potential Collaboration

Exemplar – ‘Hypoglycaemia in diabetes’
- World rank based on output volume:
  - Edinburgh = 3rd
  - University X = 2nd
- University X collaborates with Company Z

If we were to collaborate in this area:
- Could we target a world number 1 position?
- Can we develop links across the broader theme of regenerative medicine?
- Could we benefit from secondary relationships e.g. with Company Z?
Case Study 2: European Strategic Partnerships
Case Study 3: University-Industry Interaction

- **ingenza** Biotechnology
- **INTEGRA** Contract Research
- **COSTAIN** Construction & Civil Engineering
- **Voysis™** Co-authored Papers
- **AstraZeneca** Consultancy
- **BARCLAYS** Contract Research
- **Costain** Studentships
- **AstraZeneca** Co-authored Papers
- **INTEGRA** Citing Patents
- **Barclays** Mobility
- **AstraZeneca** Mobility
- **INTEGRA** Philanthropy
- **Barclays** Artificial Intelligence
- **INTEGRA** Co-authored Papers
- **AstraZeneca** Consultancy
- **INTEGRA** Contract Research
- **AstraZeneca** Studentships
- **INTEGRA** Mobility
- **INTEGRA** Philanthropy
- **INTEGRA** Artificial Intelligence
Case Study 3: University-Industry Interaction

**Approach**
- Prestige
- Infrastructure
- Research Outputs
- Studentships
- Intellectual Property
- Impact
- Philanthropy

**Indicators**
- Services & Facilities
- Researcher Mobility
- Research Funding
- Procurement
- SME Engagement
- Learning & Teaching

**Data**

**Mapping**

**Analysis**

**Strategy**

- Number of companies?
- Key partners?
- Key sectors?
- SME interaction?

**External benchmarking**

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What Next?

• Combined dashboards – quantity, quality and impact
• Understanding and accountability
• Forecasting and resourcing decisions

• Next generation metrics - sharp growth in recent years in various commercial services.
  • Spikes in activity may come if a piece of work is particularly contentious, timely, or simply on a topic that catches the public imagination.
  • Much harder to gather standardised and comprehensive data in this environment than citation data.
Looking to the Future

We are a data driven University.

We want to provide the very best research environment for our academics, to produce the best

We want to get better not just at understanding our own performance, but in identifying opportunities, and measuring the impact of the interventions we make.

Tools we have for doing this are getting better all the time...

...but it’s people using the data as part of their day to day that matters.

For fun.. Some machine learning telling us what we already know..

Principal Investigators currently most likely to be successful are:

• Age 55+
• Male
• UoE Grade 10

• Let’s change this!
Thank You
Growing your idea together

• Lorna Thomson
• Director, Edinburgh Research Office
• lorna.thomson@ed.ac.uk