Agreeing metrics for research
information management

The Snowball Project

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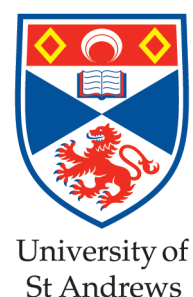
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Agreeing metrics for research information management: The Snowball Project

BACKGROUND

There is a growing recognition within universities of the need for research intelligence and performance management frameworks. These can focus institutional strategies on research quality, raise the profile of an institution's research, manage talent, and build a high-quality research environment. There is, however, considerable dissatisfaction with the data and tools available to integrate information from disparate systems, and a frustration that different stakeholders, including funders, demand similar information in differing formats with differing definitions. Institutions and funders have tended to implement their own bespoke solutions and examples of success from collaborative approaches are few and far between, whether within or outside the sector. This leads to duplicated effort, systems that are manually intensive, and inefficiency overall.

This situation exists in all research-intensive countries around the world. In the United States, for example, the recently launched STAR METRICS project addresses the need to establish and measure how higher education institutions spend government grants.[1] The project aims to create a repository of data and tools that will be useful in assessing the impact of federal R&D investments, a goal akin to that of the United Kingdom's research councils. Other, similar projects are underway in Europe. It is clear that there is an appetite for more detailed research intelligence and for more sophisticated data tools and systems that extends beyond the United Kingdom.

RESEARCH INFORMATION MANAGEMENT STUDY, 2010

To address some of these issues, during 2010 Imperial College London and Elsevier conducted a joint JISC-funded study of research information management within the higher education sector in England.[2] The study reviewed the sector's efforts and experiences of implementing research management systems, and evaluated and compared the tools that universities currently use to manage data related to research. It also aimed to identify problems with the approaches used and to publicise elements of good practice. The key conclusions were that:

- Institutions should work more collaboratively to harmonise their approach to research management processes and to minimise wasteful duplication of investment in research management systems
- Institutions and funders should work more collaboratively to identify commonality in systems and processes so they might share data in more cost-effective and less resource-intensive ways
- Institutions should develop stronger relationships with suppliers and work with them to define their needs more clearly
- A national framework for data and metric standards should be developed with stakeholders and used across the sector
- Suppliers should participate in the development of data standards with the sector in an effort to drive consistency in research systems
- Institutions, supported by funding organisations, should be encouraged to develop long-term system strategies focussed upon core research management processes and information needs

The study revealed that institutions and funders recognise data as an essential element in strategic management and decision making, but that there is a lack of consensus among stakeholders on the metrics that should be used for measurement and evaluation (Figure 1). The study showed that, without clear and shared metrics, institutions find that it is almost impossible to benchmark meaningfully and that as a result they are hampered in their ability to establish strategic direction.

The lack of a shared definition of metrics makes it difficult for institutions to measure performance against peer institutions and plan for the long term. It mitigates against suppliers developing data systems that could be used across the sector as each institution wants different data structures and metrics. In part, this inconsistency is driven by the different perspectives of

[1] More information on the STAR METRICS project is available at www.starmetrics.nih.gov

[2] John Green, Joy van Baren, et al., *Research information management: Developing tools to inform the management of research and translating existing good practice* (2010). Available at www.researchdatatools.com/downloads/2010-research-information-management-2.pdf
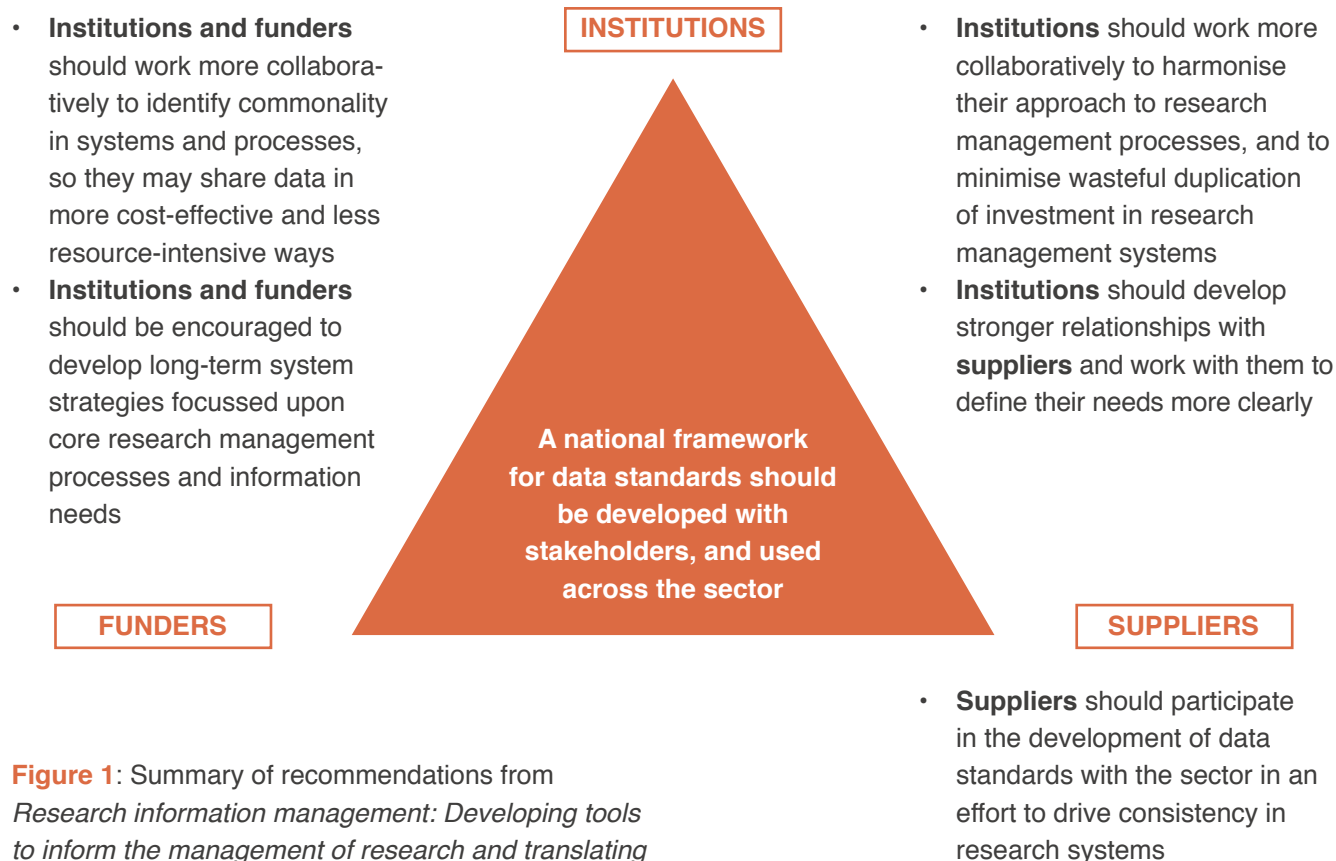
- **Institutions and funders** should work more collaboratively to identify commonality in systems and processes, so they may share data in more cost-effective and less resource-intensive ways
- **Institutions and funders** should be encouraged to develop long-term system strategies focussed upon core research management processes and information needs

INSTITUTIONS

A national framework for data standards should be developed with stakeholders, and used across the sector

FUNDERS

SUPPLIERS

- **Institutions** should work more collaboratively to harmonise their approach to research management processes, and to minimise wasteful duplication of investment in research management systems
- **Institutions** should develop stronger relationships with **suppliers** and work with them to define their needs more clearly

- **Suppliers** should participate in the development of data standards with the sector in an effort to drive consistency in research systems

Figure 1: Summary of recommendations from *Research information management: Developing tools to inform the management of research and translating existing good practice* (2010)

different stakeholders; each regards their own way of interpreting the data through specific metrics as critical, rather than considering it as one particular view on what could essentially be a common set of metrics shared by all stakeholders. With no holistic approach, it is not unusual for institutions to submit different values for the same data point in various external data-gathering exercises in order to maximise the benefit to the institution (for example, by interpreting the definitions of specific data points, such as the precise meaning of 'researcher', to suit the purpose at hand).

The focus on and pressures of external data requests have meant that institutions have allowed the demands of other stakeholders to determine the data and the data-definitions they collect and measure, rather than considering what would be best suited to their own purposes. The study suggested that an agreed framework of metrics that could be shared and used across the sector would ensure cost-effectiveness in the long run and, it was hoped, increase the competitiveness of the UK as a whole.

The results of the study were presented at a sector-wide workshop held at Imperial College London in August 2010. Stakeholders at this workshop agreed that it was essential that the issues and opportunities for improvement identified by the study be addressed, and that the recommendations made in the study should form the basis of further work. Many who participated in either the study or the results workshop voiced their belief that work needed to be done to harmonise research information systems, and that the joint Imperial College/Elsevier study should not gather dust on the shelf and have no practical application.

SECOND PHASE PROJECT: SNOWBALL

Following the completion of the JISC-funded study and the publication of the final project report, the Imperial College/Elsevier team set about planning a second phase of work that would address and build on the recommendations. This was launched as a

self-funded, voluntary project in November 2010. The project objectives were agreed as:

- Define a set of metrics needed for effective and long-term institutional research information management and reach a consensus on how these metrics should be calculated
- Define all possible sources of the data elements of the metrics calculations
- Establish a three-year roadmap to enable the adoption of that vision within the higher education sector and across key stakeholder groups (HEIs, funders, research councils, government departments and other agencies, private funding bodies, suppliers, and other administrative entities)

The initial JISC-funded study found that the ways in which institutions hold research-related data and perform calculations based on that data differ across the sector, and that because of this lack of consistency, making meaningful comparisons between institutions is difficult. The focus of the second phase project is to address these issues by enabling institutions to benchmark against key research performance and activity metrics on a like-with-like basis.

The Snowball team is aware that there are several commercially available benchmarking products, including Elsevier's SciVal Strata, Thomson Reuter's InCites, and Academic Analytics' Faculty Scholarly Productivity database. Nevertheless, the team considers it important to reach consensus on a common set of metrics and comparisons that could be adopted in the UK, regardless of the more customised work being done elsewhere. It is expected that this consensus will enable leaders of research and research strategy within institutions to better monitor and manage their research activities, and, in turn, that it will inform decisions (e.g. by key funders and government) that have the potential to increase the efficiency and effectiveness of the UK research base as a whole.
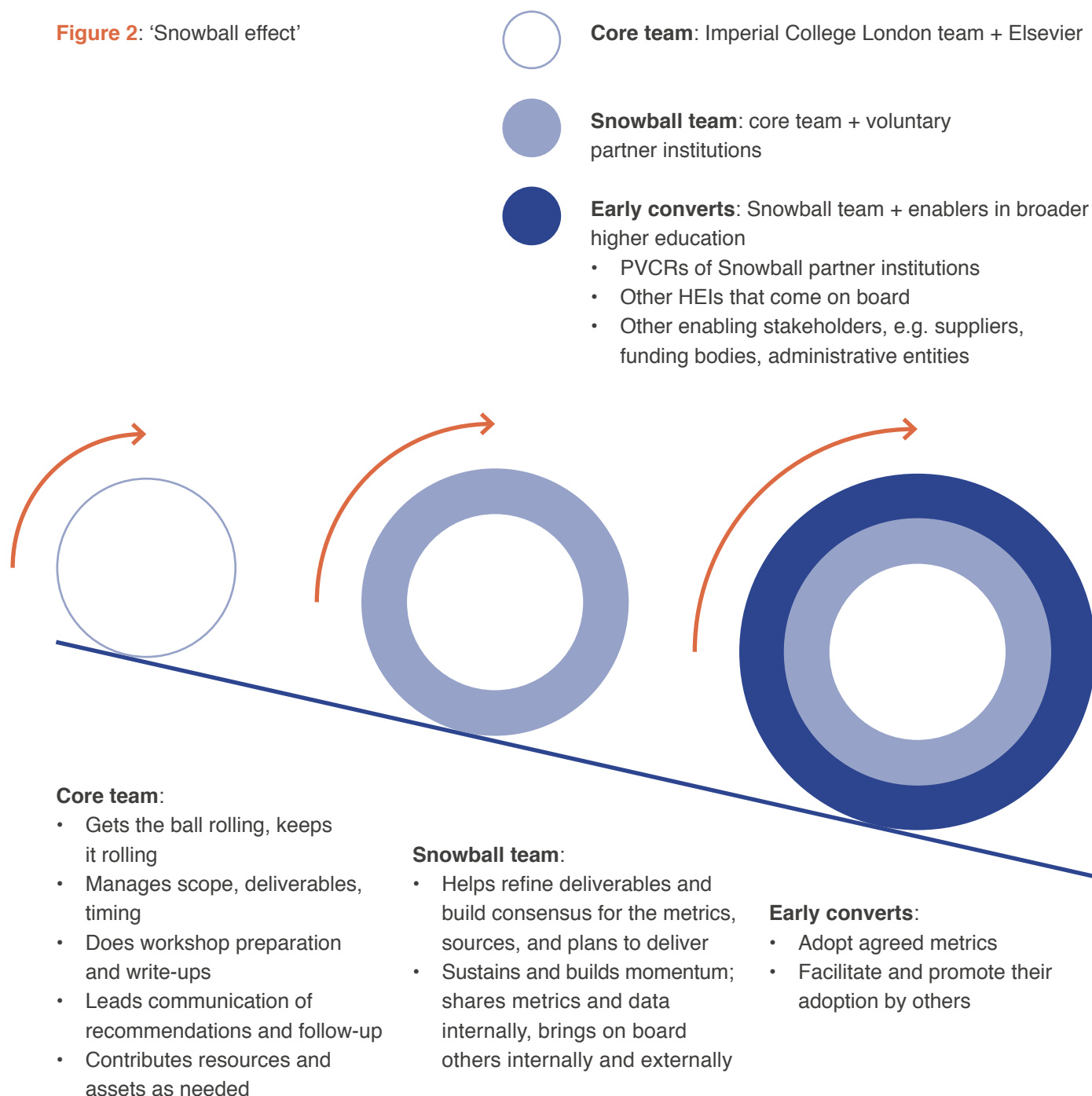
The JISC-funded study also found that many of the research information systems specified by universities in England tried to meet the needs of multiple, often competing, stakeholders. These attempts to satisfy as many internal stakeholders as possible often resulted only in widespread disillusionment and dissatisfaction with the systems eventually implemented. The lessons of this have been applied to the second phase project as a whole, which does not attempt to address all the issues faced by the sector. For example, the project will address some of the needs related to the

2014 Research Excellence Framework (REF) where they coincide with broader aims, but these are not the project's primary objectives and it does not seek to create the optimal REF management tool. Similarly, the project does not aim to replicate, redesign or replace internal research management systems (including operational systems such as research costing or finance systems) or metrics whose value is primarily internal within individual institutions.

Rather, the project has a tightly defined overall goal: to facilitate external benchmarking by ensuring that institutions can confidently compare research data in a like-with-like manner. It aspires to facilitate and drive the storage and provision of meaningful data for use by higher education institutions and other stakeholders. By building on the results of the initial JISC-funded study to develop and share an understanding of the needs of higher education institutions for metrics and for the data elements needed to calculate them, the project aims to make the practice of research information management easier and more efficient. Achieving a consistent understanding of metrics will simplify interaction between institutions, suppliers and funders, enable more effective benchmarking, and improve the efficiency of data management.

The scope of the second phase project was expanded beyond England to ensure that consensus was as broadly relevant as possible. Eight universities have been approached and have agreed to collaborate on the project. These are: Imperial College London, Queen's University Belfast, University College London, University of Bristol, University of Cambridge, University of Leeds, University of Oxford, and University of St Andrews. Of these, six had participated in the initial JISC-funded study and were supportive of acting on its recommendations (St Andrews and Queen's University Belfast were not included in the initial project as its scope was limited to English institutions). The Snowball team is comprised of the core Elsevier/Imperial College team that conducted the initial JISC-funded study and a representative from each of the Snowball partner institutions, typically directors of research offices or senior staff responsible for research management and strategy. By linking institutions with a supplier and by bringing in funders' perspectives wherever possible, it is hoped that a holistic view of the system will be realised. Starting in November 2010, a series of regular workshops – held at UCL and facilitated by the core team – were organised. These have allowed the Snowball partner institutions to shape the project's objectives, to agree definitions of metrics and sources of data, to

Figure 2: 'Snowball effect'

Core team: Imperial College London team + Elsevier

Snowball team: core team + voluntary partner institutions

Early converts: Snowball team + enablers in broader higher education
- PVCRs of Snowball partner institutions
- Other HEIs that come on board
- Other enabling stakeholders, e.g. suppliers, funding bodies, administrative entities

Core team:
- Gets the ball rolling, keeps it rolling
- Manages scope, deliverables, timing
- Does workshop preparation and write-ups
- Leads communication of recommendations and follow-up
- Contributes resources and assets as needed

Snowball team:
- Helps refine deliverables and build consensus for the metrics, sources, and plans to deliver
- Sustains and builds momentum; shares metrics and data internally, brings on board others internally and externally

Early converts:
- Adopt agreed metrics
- Facilitate and promote their adoption by others

share experiences and knowledge, and to discuss and determine the project's progress and outcomes.

The second phase project has been named 'Snowball' because it aims to create a 'snowball effect' across the sector. In 2009-10 the eight universities within the Snowball partnership accounted for 37% of the value of competitive research proposals awarded by the UK research councils and were responsible for over 37% of UK-authored articles and 38% of UK citations. Taken together, they therefore provide a strong and influential core from which to enlarge the sphere of

influence across the sector. It is hoped that the eight Snowball partner institutions will drive momentum and build support for a set of standardized metrics, sources and methodologies shared across UK higher education institutions, funding bodies, and other stakeholders (Figure 2), and that by developing a consensus on defined metrics, data sources, and an implementation roadmap, the sector as a whole will be encouraged to adopt standardised metrics. With this framework defined and agreed, it will allow institutions to develop their own tools that can benchmark consistently in the external context.

DEFINITION OF THE LANDSCAPE OF RESEARCH ACTIVITIES

Previous research has shown that university research management offices are asked to perform a multitude of functions.[3] The first task of the Snowball team was therefore to define the landscape of research activities that would be included in the project's scope. This included consideration of inputs, throughputs, and outputs of the research process, and identified broad sets of measures that were associated with each. Inputs, throughputs, and outputs were further distinguished in three ways: those connected to research grants, postgraduate education, and enterprise activities. The Snowball team also identified a common set of denominators that could be applied to metrics at various levels of aggregation, such as principal investigator, unit of assessment, or funding body categories and themes.

Within this landscape of research activities and denominators, the Snowball team decided to prioritise and develop metrics for a subset of core research (as opposed to educational) activities. It was similarly decided to focus on a subset of denominators that would be agreed by the Snowball team as the most useful and practical, and ones for which there could be agreed and robust data sources (Figure 3).

DEFINITION AND PRIORITISATION OF SNOWBALL PROJECT METRICS

The primary goal of the project was to deliver a set of consistently defined metrics that could be used by institutions for external benchmarking. Within the prioritised areas of research activity, the Snowball team identified sixty-six separate metrics. These reflected Snowball team members' experience and knowledge of internal and external stakeholders' demands for information, and their understanding of the type of information that is, or could be, collected internally and externally.

The Snowball team is aware that a variety of stakeholders collect very similar data but that the definitions they use vary considerably; 'grant success rates' and 'researcher', for example, are calculated and defined in a variety of ways by different institutions. Discussions in the Snowball team workshops have been invaluable in exposing these differences and exploring how core terms like these can be aligned across the sector.

There are also difficulties and some resistance to the use of any kind of metrics in the arts and humanities. Reasons for this include the poor coverage of the major databases, differences in referencing behaviour, and the speed of publication. While recognising that some metrics will be more relevant in some fields than others, the project aims to be inclusive across all subject fields represented within an institution. Differences across disciplines were kept in mind during discussions.

Snowball partner institutions were clear in their commitment to identifying a shared framework for research metrics, but were also keen that any presentation of the data should allow for flexible interrogation. By its nature, institutional benchmarking requires users to 'slice and dice' data in a number of ways to answer key questions. To ensure this was possible, the pivotal units – the denominators – through which data could be manipulated were identified by the Snowball team. All the Snowball partner institutions expressed a desire to measure performance and activity through volumes of research grant applications and awards over time, for example, and wanted to interrogate this metric from a number of perspectives, including by department, by funder type, by Unit of Assessment, or by a specific research theme. Denominators like these would enable detailed interrogation of key benchmark measures and give users the flexibility to perform meaningful analysis of the data.

Snowball team members were asked to rate each metric in terms of importance and perceived ease of capture in an attempt to identify a manageable number for the purposes of the project. The responses showed that almost all the metrics identified were thought to be important but that team members felt ill-equipped to make a fully informed judgement on the effort that could be required to capture each metric. As a consequence, it was agreed to work on all the metrics that scored highly for importance. The result was a list of around fifty metrics that were agreed to be crucial for the purposes of research management (Figure 4).

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[3] John Green and David Langley, *Professionalising Research Management* (2009).
Available at www.researchdatatools.com/downloads/2009-professionalising-research-management-2.pdf

Figure 3: Definition of the landscape of research activities

	Measures in scope for Project Snowball (current phase)

	1. RESEARCH INPUTS	**2. RESEARCH PROCESS**	**3. RESEARCH OUTPUTS/OUTCOMES**
• **Research Grants**	1a) Research applications 1b) Research awards • Price / Overhead recovery • Philanthropy	2a) Research spend (income) • Space utilisation • Staff recruitment • Start / end date slippage	3a) Publications and citations 3b) Esteem measures 3c) Collaboration (co-authorship) • Socio-economic impact
• **Post Graduate Education**	1c) PGR volumes • PGT volumes • International PGT volumes • UG to PG conversion rates	• PG Experience – contact time • PG Experience – facilities	• Alumni / destination of leavers 3d) Completion rates • Skills development (impact)
• **Enterprise activities**	1d) Industrial income • Industry engagement	• Contract turnaround times • Industry research spend (income) • UG to PG conversion rates	3e) Patenting 3f) Licensing income 3g) Spin-out generation / income • KTPs numbers • Consultancy income

4) DENOMINATORS	**4A. (NUMBER OF) PEOPLE**	**4B. ORGANISATIONS**	**4C. THEMES/ SCHEMES**
	• Researcher, authors • Principal / Co-investigators • Academic staff by category • Research assistants • PGR Students • UG / PGT Students • Post doctoral staff • Support staff	• Institution • Faculty • Department / School • Unit of Assessment (UoA) • HESA cost centre • Groups / clusters • Funders by type: RC etc. • Centres / Institutes	• Standard grants • Strategic initiatives (Calls) • Grand challenges • Subject areas • Keywords

DATA COLLECTION EXPERIMENT

With fifty or so metrics and a set of denominators identified, the Snowball team decided that to test the concept, it would try to gather the data and calculate and deliver metrics to the Snowball partner institutions. As a result, the Snowball team set about testing the viability of data collection and metrics calculation by calculating the metrics for a small number of researchers at each partner institution. It was agreed that each of the Snowball partner institutions would collect and contribute data on ten anonymised researchers in chemistry, and that Elsevier would contribute Scopus data on each identified researcher to enable the completion of publication, citation, and collaboration metrics.[4] Snowball partner institutions were asked to complete an Excel-based template of data components for each metric, which was fed to the product development team at Elsevier, who constructed a simple prototype analytical benchmarking tool in the form of a basic dashboard. Confidentiality was a concern: partner universities adhered to confidentiality agreements and it was agreed that metrics calculated for individual researchers (as opposed to aggregated data) would only be accessible by the university with which the researcher was connected and which had supplied the relevant data.

The exercise was informative and revealing. Providing data on just ten researchers within an agreed three week timeframe proved to be a huge challenge for the Snowball partner institutions. Estimations of ease of capture proved to be way off mark; information on publications, citations, and collaboration that was initially thought to be difficult to find proved to be readily obtainable through Scopus, while other information that had been thought easy to capture remained elusive. None of the Snowball partner institutions were able to provide all the data agreed upon, and all found this method of data collection time consuming and labour intensive. One institution could not provide any data in the required timeframe. Institutions submitted the data to the Elsevier product development team in different formats that reflected their different approaches and systems, and as a result significant data cleansing was necessary before any form of cross comparison could

be made. The key challenges institutions faced when they attempted to collect the agreed data included:

- Data were not readily available
- The request had to be completed manually
- Data were spread across multiple departments and/or systems with different ownerships within the institution and therefore permissions were needed to access it
- The time period to gather the data was too short
- Some concerns about confidentiality remained, especially in relation to third stream (i.e. commercial) activity; spin-out, patenting, and licensing information was viewed as commercially confidential
- Engagement with industry was difficult to report as some of these activities were not mapped to the researchers involved

A further challenge, encountered when the development team began to combine the data to calculate the metrics, was that some institutions had preferred to provide the data as information aggregated for all ten chemistry researchers, as opposed to individually. As a result of these challenges, the metrics that could be calculated for each institution were patchy and incomplete (Figure 5). It was quickly concluded that it would not be possible to scale-up the approach used, and that it was unrealistic to think that it would be possible to populate pre-defined templates of data components even for a larger subset of researchers within an institution, and certainly not across the whole sector.

Key lessons that were taken from the data collection experiment included:

The availability of data
- Snowball partner institutions were mostly able to provide application and award data, postgraduate research volumes, and completion rates, but data on industrial consultancy, patenting and licensing, and esteem measures were either not readily available within their research management systems, or institutions were not prepared to share this potentially sensitive information.
- *Implication*: The Snowball team agreed that alternative methods and sources to capture and reflect patenting and licensing, and esteem measures needed to be sought.

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[4] Seven of the eight Snowball partner institutions participated in the data collection experiment and prototype benchmarking tool; St Andrews had not formally joined the project when the experiment commenced.

Figure 4: Results of metrics prioritisation

Important, perceived as hard to get

1.b.i	Percent of grants won vs percent of grants available
1.b.ii	Amount of grants won vs amount of grants available
1.e.i	FEC versus amount awarded
1.f.i	Number of academics involved in enterprise activities
3.a.ii	Total number of articles authored over lifetime
3.a.iv	Total citations per article
3.a.vi	Average citations per article
3.a.vii	Field Weighted Citation Impact
3.a.viii	FWCI per article
3.a.x	Field normalized h-index
3.a.xi	Percentage of articles in top X percentile of citations received
3.a.xii	Number of books authored in prior year
3.a.xiii	Total number of books authored over lifetime
3.a.xiv	Number of book chapters authored in prior year
3.a.xv	Total number of book chapters authored over lifetime
3.a.xvi	Number of conference proceedings authored in prior year
3.a.xviii	Number of [X] authored in prior year
3.a.xix	Number of [X] authored over lifetime
3.b.i	Number of specific, high quality (competitive) awards
3.b.iii	Number of memberships to high quality organisations / learned societies each year
3.b.v	Number of prestigious awards / medals by year
3.b.vi	Number of national honours awarded
3.b.x	Number of outreach activities (public lectures, exhibitions, workshops etc.)
3.b.xi	Contributions to public policy
3.b.xii	Number of visits to policy-makers
3.b.xiv	Journal editorial board membership
3.c.i	Percent of articles co-authored with a non-home HEI author
3.c.ii	Percent of articles co-authored with a non-UK author, 2009
3.d.i	Percentage pass rate for research masters
3.d.ii	Percentage pass rate for research doctorates
3.d.iii	Percentage research doctorates completed within three years
3.e.i	Number of patents granted per year
3.e.ii	Income from patents per year, before internal distribution
3.f.i	Number of licenses granted per year
3.g.ii	Number of spin-outs lasting three years
3.g.iii	Income from spin-out activity per year

Less important, perceived as hard to get

2.a.iv	Percentage of actual spend versus budgeted spend by month
3.a.ix	h-index
3.a.xvii	Number of meeting abstracts authored in prior year
3.b.ii	Number of prize 'placings'
3.b.iv	Number of major industrial advisorships each year
3.b.vii	Number of speaker invitations per year
3.b.viii	Number of conferences participated in / organised per year
3.b.ix	Number of media appearances per year
3.c.iii	Percent of articles co-authored with an author ex-discipline
3.c.iv	Number of distinctive competencies per HEI
3.c.v	Percent of books co-authored with a non-home HEI author
3.c.vi	Percent of books co-authored with a non-UK author
3.c.vii	Percent of books co-authored with an author ex-discipline

Important, perceived as easy to get

1.a.i	Percent of grant applications per year that are successful
1.b.iii	Number of grants won per year, identifying ad hominem
1.b.iv	Amount of grant funds won per year, identifying ad hominem
1.c.ii	Number of postgraduates registered for research doctoral degrees by year
1.c.iv	Number of research doctoral degrees awarded/year
1.d.i	Volume of industrial income year on year
1.d.ii	Volume of industrial income per year versus 3 year average
1.d.iii	Top 10 industry funders over time
2.a.i	Volume of research spend by month
2.a.ii	Volume of research spend by year
2.a.iii	Ratio of research spend from government: vs. non government sources
3.a.i	Number of articles authored in prior year
3.a.iii	Total citations per article
3.a.v	Average citations per article
3.b.viii	Number of conferences participated in / organised per year
3.f.ii	Income from licensing activity per year before internal distribution
3.g.i	Number of spin-outs formed per year

Less important, perceived as easy to get

1.c.i	Numbers of postgraduates registered for research masters degrees by year
1.c.iii	Number of research masters degrees awarded/year

Legend:
- Red — Not provided
- Orange — Provided, some work needed
- Green — Provided in a consistent way

Data request	Section	Corresponding metrics	Measure category	HEI 1	HEI 2	HEI 3	HEI 4	HEI 5	HEI 6	HEI 7	
1		1.a.i-1.b.iv	Identifying researchers	Green	Green	Orange	Green	Green	Green		*
2			Research applications and awards	Orange	Red	Red	Orange	Orange	Green		*
ad 2			Metrics per funder	Orange	Orange	Red	Orange	Red	Orange		*
3		1.c.1-1.c.iv	PGR volumes	Green	Orange	Red	Orange	Red	Orange		*
4		1.d.i-1.d.iii	Industrial income	(Included in other categories)							*
5		1.e.i	Price / Overhead recovery	Green	Red	Orange	Green	Red	Red		*
6		1.f.i	Industry engagement	Green	Green	Green	Orange	Green	Green		*
7		2.a.i-2.a.iv	Research spend (income)	Orange	Green	Red	Red	Red	Green		*
		(provided by Elsevier)	Publication and citation data	Green	Green	Green	Green	Green	Green		
8		3.b.i-3.b.ix	Esteem measures	Red	Green	Red	Orange	Orange	Red		
9		3.d.1-3.d.iii	Completion rates	Green	Green	Red	Green	Green	Green		
10		3.e.i	Patenting	Red	Red	Red	Red	Red	Red		**
11		3.f.i-3.f.ii	Licencing	Red	Red	Red	Red	Red	Red		**
12		3.g.i-3.g.iii	Spin-out generation / income	Red	Red	Red	Red	Red	Red		**

* Data available to capture, but a lot of labour involved

** Difficult to capture due to unaligned systems and commercial confidentiality

Manual labour in data collection

- Where data were available, it often took considerable effort to provide it in the requested format. Most Snowball partner institutions found it difficult and labour-intensive to gather all funding data for just ten researchers.
- *Implication*: The Snowball team agreed that on a larger scale an automated or decentralized approach would be necessary and that where possible the group should consider working directly with potential central data providers (e.g. funding bodies).

Definitions

- The Snowball partner institutions have in-depth knowledge of research administration and engaging with industry through patenting, licensing, and spin-outs, but mechanisms need to be identified so that data can be reported in a suitable way.
- *Implication*: The Snowball team agreed to form a working group of experts to refine and agree definitions, and to eliminate inconsistencies.

Confidentiality

- Some Snowball partner institutions chose not to link funding data to researchers despite a confidentiality agreement that information on individual researchers would only be available to the institution with which that individual was connected.
- Commercial confidentiality prevented universities from reporting on patenting and licensing metrics.
- *Implication*: The Snowball team agreed that they should consider strengthening legal assurances, while continuing to gather metrics on an opt-in basis.

PROTOTYPE BENCHMARKING TOOL

Despite the considerable challenges of gathering and cleaning the data, the Elsevier product development team was able to create a simple analytical benchmarking tool (Figure 6). This dashboard was shared among the Snowball partner institutions, who were able to compare and interrogate the data that had been collected. The prototype allowed basic benchmarking against a series of metrics with two denominators: all Snowball partner institutions could access a basic

aggregation of ten chemistry researchers at each institution, and the institution with which the researchers were connected could view individual data for each of their researchers. The prototype tool included basic drag-and-drop functionality and provided links to the underlying data to allow users to drill down into data sets. Publication, citation, and collaboration data were linked directly to Scopus to allow the abstracts of relevant articles to be viewed. No attempt was made at this stage, however, to link the input (e.g. awards) and output (e.g. publications) data.

Feedback from the Snowball partner institutions on the prototype was extremely positive. Despite its limitations and restricted nature, it was regarded as a powerful affirmation of the vision for an external benchmarking tool based on consistently defined and sourced metrics. All agreed that the tool was "very worthwhile", "the right thing to be doing", and "hugely valuable". It was felt that the tool could be extremely helpful with the REF, even though all reaffirmed that Snowball's remit was broader than the REF, and that it was an important first step on the way toward the holistic, sector-wide, standardised metrics needed by universities to proactively manage research. Subsequent feedback from other stakeholders, especially funders, within the sector has been equally positive.

The key conclusions from the data collection experiment and the development of the prototype were:

- There is strong support for the concept of consistently defined, standardised metrics to enable cross-institutional benchmarking from common data sources, with analytical tools on top
- There is a strong need to integrate data from different sources to increase the scope of the metrics that can be generated
- The method of data collection employed was a struggle and not scalable
- Despite the significant challenges identified, all involved strongly endorsed the concept of an analytical tool that enables comparison and benchmarking between institutions and across denominators
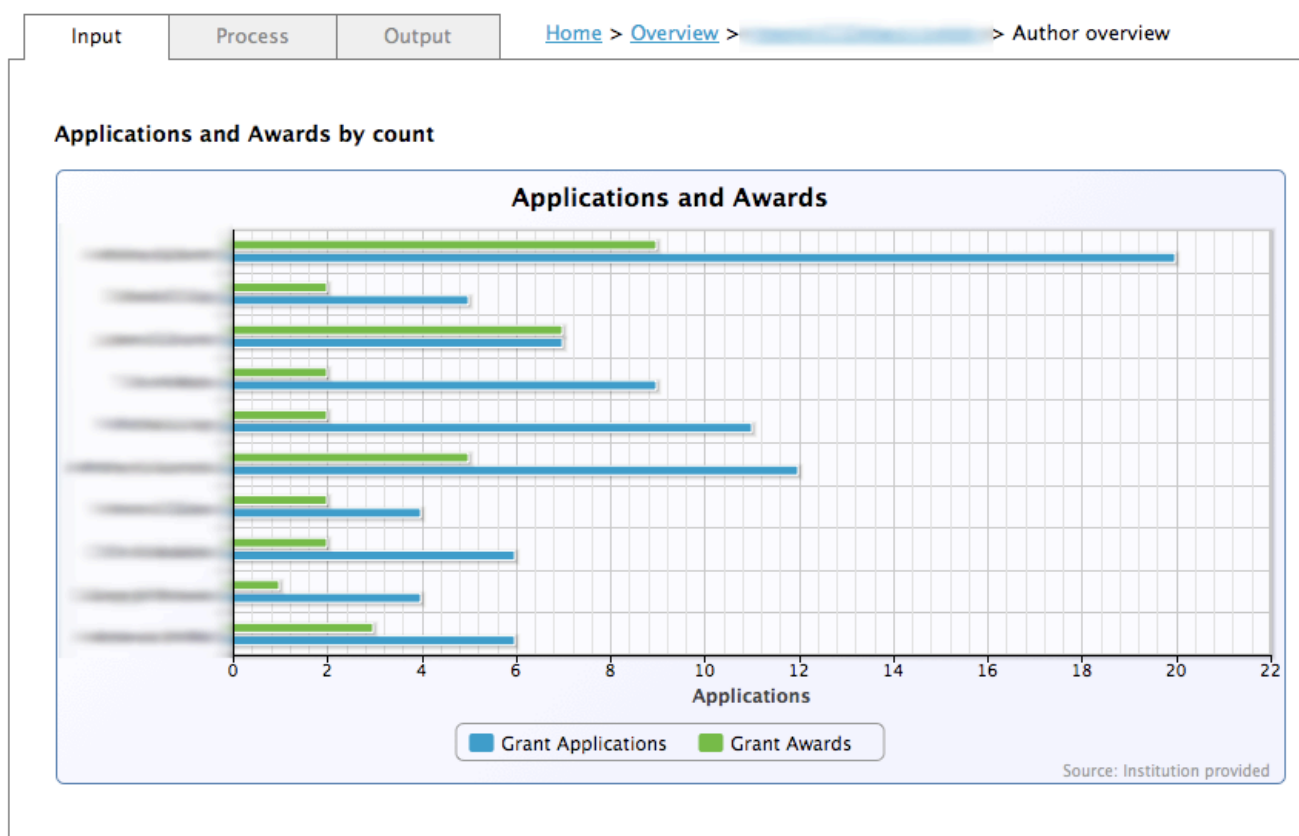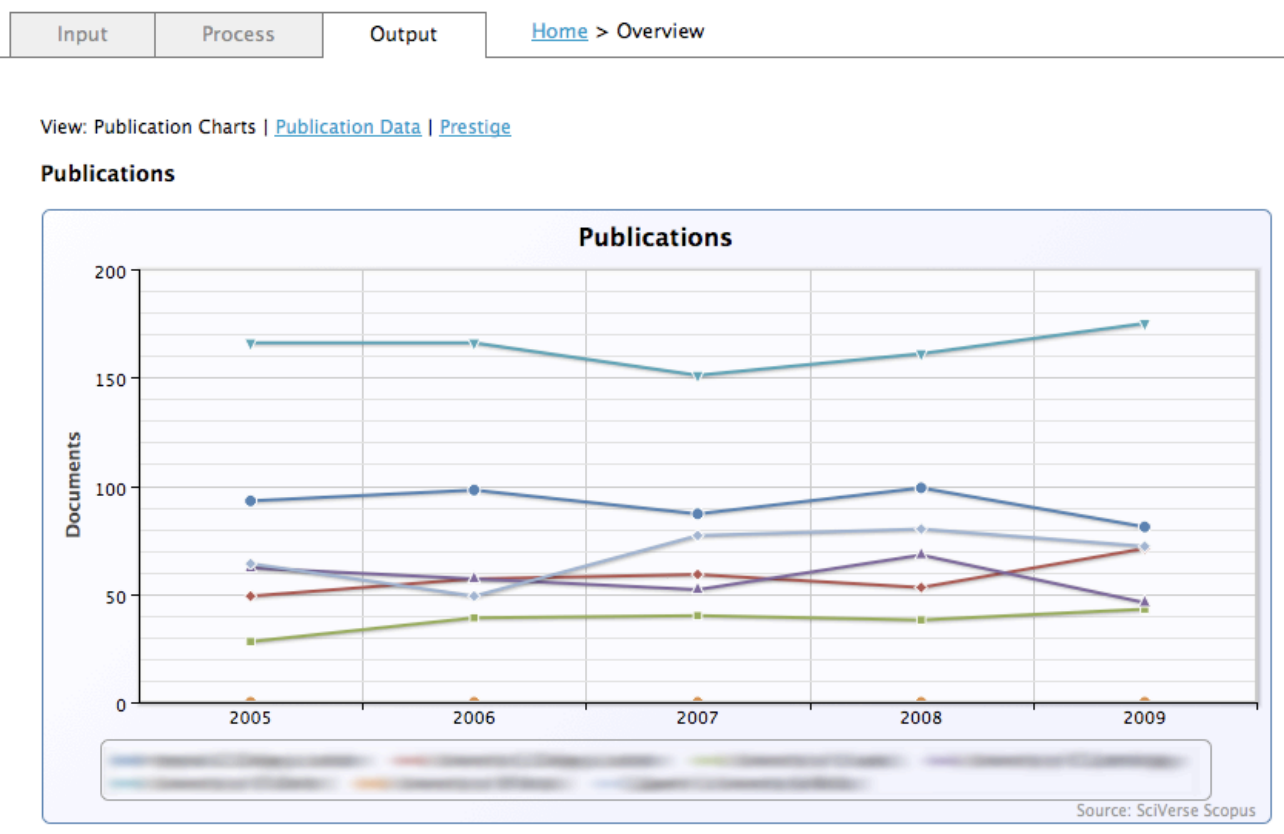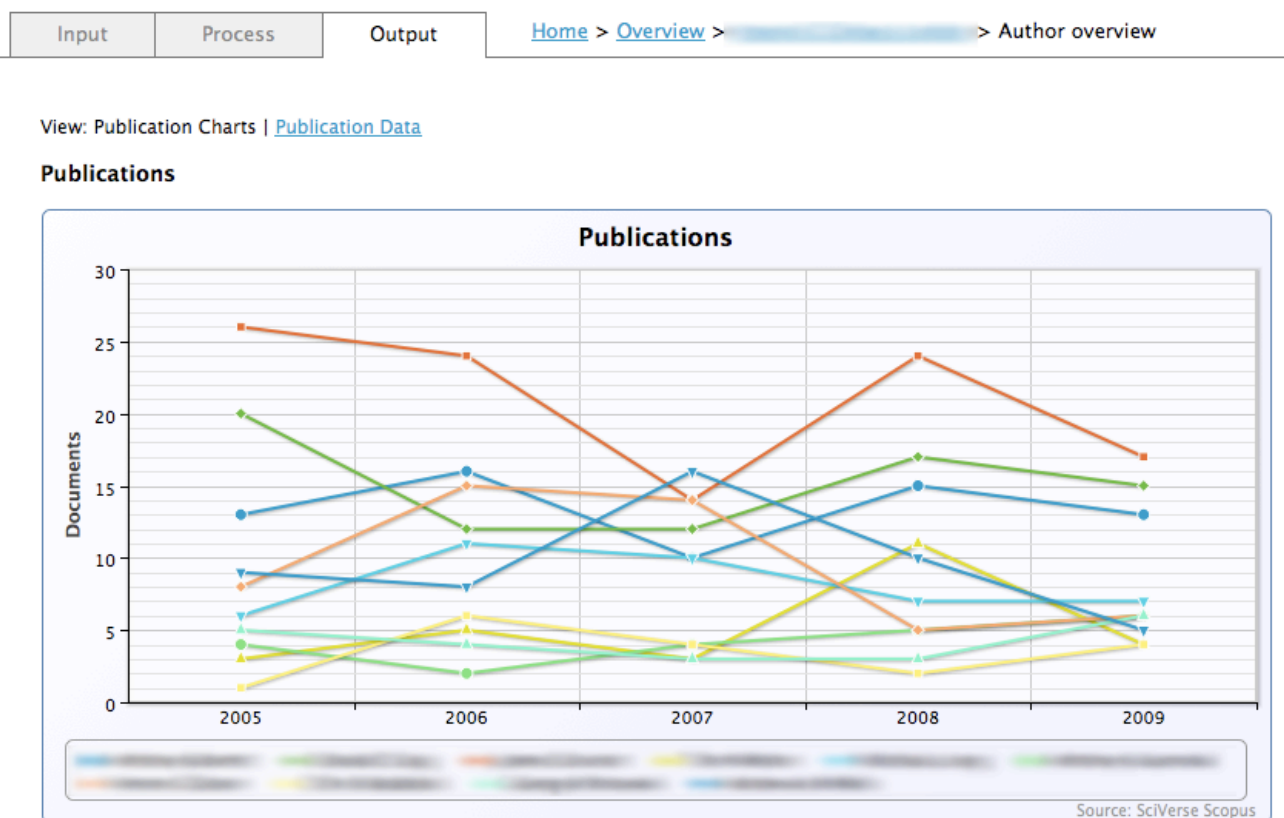
a) Application count by year (of request) by institution
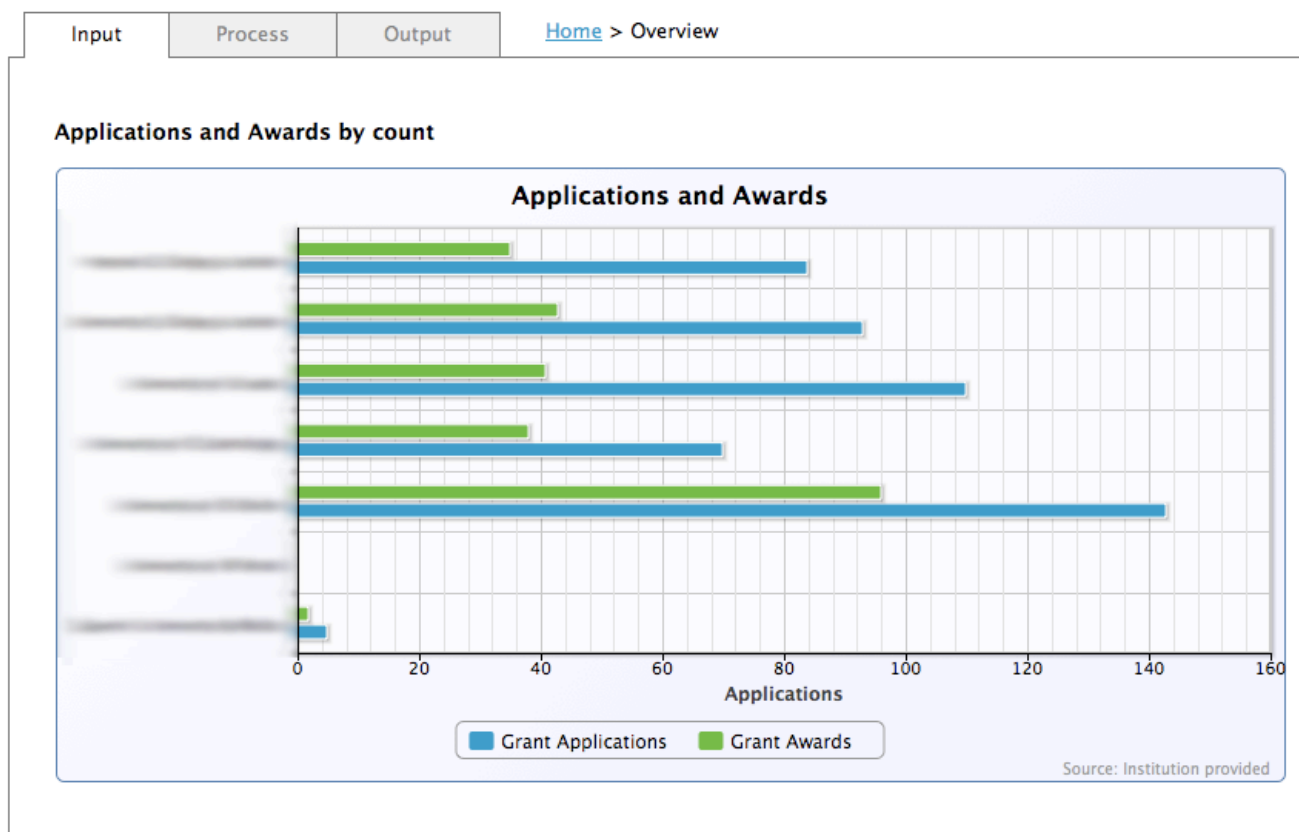
b) Application count by year (of request) by researcher

c) Publication count by institution

d) Publication count by researcher

NEXT STEPS

Since the launch of the Snowball project in November 2010 the scope of its work has grown well beyond the original agreed objectives, for example by the calculation of some metrics and the creation of the prototype benchmarking tool. The Snowball team has felt that the partnership approach is working well and has already been valuable and productive.

As a result of the project's success so far, the Snowball team has therefore agreed that work will continue and that the project should broaden its focus. It will now look to identify and implement scalable and less labour-intensive methods to integrate data from different sources and increase the scope of metrics that can be generated, for entire institutions. As it moves forward, the project aims to establish a UK sector-wide standard for metrics, with consensus on definitions and institutional performance metrics. The Snowball project aims, ultimately, to enable all UK HEIs and other key stakeholders to develop the capability to deploy a set of standardised metrics for benchmarking and reporting purposes. Dashboards that enable external benchmarking against identified and defined metrics will be created for Snowball partner institutions.

A central repository that is open to everyone will ensure that project documentation and reports such as this one are readily available to everyone facing the challenges of, and/or interested in, external benchmarking. This will be accompanied by the consensus definitions, identified data sources, and a roadmap to enable the adoption of the project's vision across the sector with guidance on how others can use this roadmap to achieve the Snowball vision themselves. By enabling Snowball partner institutions to define a standard for metrics, their method of calculation, and the relevant denominators, it is hoped that the project will be able to secure the support of funders and government agencies.

The Snowball team recognised that as the project proceeds, a more detailed knowledge of the data is needed. A subgroup of data and systems experts familiar with day-to-day questions about data and systems requirements, with members from each of the partner universities, was therefore created, with the aim of establishing a consensus on the methods by which each metric should be calculated and by which denominators it should be displayed. Over a series of meetings between May and August 2011, this group consolidated and refined the list of priority metrics, and defined with complete clarity how they should be calculated and sourced. As a result, by the end of August 2011, agreement had been reached on almost all of the metrics identified as priorities by the Snowball team. As data are collected for entire institutions and the priority metrics are calculated, this group will continue to advise the Snowball team and will revisit the definitions of metrics as necessary. When the lessons from the next phase of work have been incorporated, the consensus definitions will be published. The group will also serve to bridge inconsistencies across the sector and will ensure that, wherever possible and sensible, existing national standards – such HESA cost centres and CERIF – will be adopted within the Snowball project.[5]

The prototype benchmarking tool was a milestone for the Snowball partners, all voluntarily contributing their time and expertise. It delivered a strong proof of concept, and the core Imperial/Elsevier team is now working directly with a subset of Snowball partner institutions to gather data and implement as many of the metrics across as many researchers in all subject fields as possible. This will require data to be accessed, aggregated, and integrated from institutional, public, and proprietary sources, and combined in such a way that it can be implemented in a scalable manner at each of the institutions involved. To help deliver this, the core team will also work with entities that hold data on multiple institutions, most notably funding and administrative bodies. Elsevier has committed to generating these metrics free-of-charge, on an ongoing basis for the subset of Snowball partner institutions, subsequently to scaling it up to all of the current Snowball partner institutions who are advising in this phase of activity. The methodology for calculating metrics and the framework that they sit in will be made freely available across the sector to enable other institutions – or suppliers – to develop systems and tools based on the Snowball specifications if they wish.

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[5] More information on CERIF is available at www.eurocris.org/Index.php?page=CERIFintroduction&t=1

CONCLUSION

In the past, institutions and other stakeholders have been guilty of 'reinventing the wheel': creating individualised metrics and systems of measurement without realising that similar objectives are shared across the sector. Furthermore, suppliers as a whole have not taken the necessary time to understand the complexity of data needed to drive strategic research management. By coming to a shared, agreed understanding of what institutions, funders, and other stakeholders wish to measure and benchmark against, it is hoped that the Snowball project will lead to easier collaborations with suppliers and more effective and efficient data management across the board, and that ultimately, this will increase the efficiency and competitiveness of the sector as a whole.

In the meantime, the Snowball team plans to continue to provide updates on progress and intends to publish outputs with practical value for the sector. If you are interested, would like to comment, or want to be involved with the project, please contact either John Green or Nick Fowler.

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