Beyond Serendipity: Networks of Research at Cambridge

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How can we Support Researchers to Navigate an Evolving Research Landscape?

1. Grants are getting **fewer in number.**

E 5k

10k

2. Research collaborations are becoming increasingly important in securing funding. The composition of the REF2014 submission indicates that interdisciplinary research already forms a key constituent of research practice at the University.

Network analysis offers an opportunity to use data characterised by competing priorities and complexity, and mould it into something that is *useful* for the researcher, rather than simply another obligation.

Network Analysis is a toolbox of techniques that deals well with data that is characterised by complexity and co-dependence.
Network Analysis is concerned with connectivity.



Network Analysis can be visual or metrical (or both).

Collaborations between REF2014 UoAs in the Research Information Management System (RIMS).

The REF2014 Submission visualised as connections between UoAs. The left panel describes the raw numbers of collaborations between UoAs in raw numbers. The right panel describes collaborations as a proportion of the total collaborations of the UoA on the right.

Which Researchers Share Interests or Approaches?

A network diagram of publications from the Research Information Management Systems for one of our research groups and their co-authors. Colours indicate the home department.

- Points or **nodes** represent researchers.
- Connections or **edges** represent an instance of co-authorship.



The same data re-organised to impose the University's departmental structure. Departments are collapsed to one node, and edges link to other departments with which a collaboration has taken place. The same data reorganised using a clustering algorithm, in this case the Clauset-Newman-Moore algorithm. This algorithm assigns nodes to groups based on their behaviours and allows clusters to form around those nodes that are more inward facing in their final set than outward facing.





Those researchers who have yet to author a paper together, and yet exhibit many of the same traits, can be matched with each other.

When combined with contextual knowledge from our research support staff with specialist area knowledge, we can use this type of knowledge to:

- Provide introductions to people with similar interests.
- Model which topics lend themselves to extensive or intensive groups.
- . Identify individuals who may be ready to collaborate on a bid.



Connections span across the entire graph, indicating that researchers' collaboration behaviours are not manifesting within departments but across them.

Superimposing the **departmental structure** on to the data indicates the extent to which:

- Departmental boundaries have broken down.
- Conceptual spaces are delineated by interest, not by subject
- This analysis can also identify **nascent groups** that have yet to achieve recognition, from the centre, allowing us to focus support on their needs.

Allowing the data to self-organise using **clustering algorithms** lets us identify those researchers who have common interests, or operate in a similar conceptual space without consideration of disciplinary boundaries.

Clusters emerge from the data

Extending Analysis Beyond Collaboration

Using "collaboration" as a linking factor is of limited use in contexts where expected disciplinary practise does not naturally result in

co-authored publications, such as the Arts and Humanities.

	Journal Concentration - REF2014 Submission by Main Panel
1 —	
0.9 —	
0.8 —	
0.7 —	
0.6 —	
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0.3 —	
0.2 —	

- By choosing the optimum publication destination for their work, researchers indicate the subfields to which they are contributing.
- Researchers from **disparate fields publish alongside one another** in journals with a high degree of specialism.
- Frequently these researchers can be **unaware of each other**.

Analysing the intergroup edges and the extent to which individuals are inward or outward facing has allowed us to:

• expand research groups,





• find speakers for seminar series,

- help PIs to find collaborators,
- help to find co-supervisors for ECRs and Doctoral Students.

Because of the more fragmented publishing environment in areas like the Arts and Humanities, specialisms manifest in the publishing destinations chosen by each of the researchers.



Intergroup edges in the Arts, Humanities and Social Sciences. Nodes and links coloured by home department.

Outcomes

- Network analysis has provided valuable support to interdisciplinary research groups and researchers:
 - helping to get pump-priming funding bids to application stage;
 - identifying researchers peripheral to the core, and integrate them with the activities and goals of the initiatives;
 - finding nascent research groups and allowed research support staff to pre-empt and prompt funding bids between groups.

Conclusions

- Data reporting exercises provide a valuable opportunity for institutions to gain self-knowledge, and are much more powerful than a basic bench-marking tool. **WE SHOULD TAKE ADVANTAGE OF THE DATA WE ARE OBLIGED TO PROVIDE.**
- It is both rewarding and interesting to move away from measurement and towards understanding. Network analysis allows research support to gain insight into the needs of their researchers. **INSIGHT IS MORE USEFUL THAN MEASUREMENT.**

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Graphics constructed using the D3.js library and Gephi

