Patterns of Information Use and Exchange Across Disciplines

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Fiesole Collection Development Retreat

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At our first sally into the intellectual world, we all march together along one straight and open road; but as we proceed further, and wider prospects open to our view, every eye fixes upon a different scene; we divide into various paths, and, as we move forward, are still at a greater distance from each other.

Samuel Johnson
The Adventurer, 1753

1. The tools you use to find what you want

Table 12: Rating by discipline

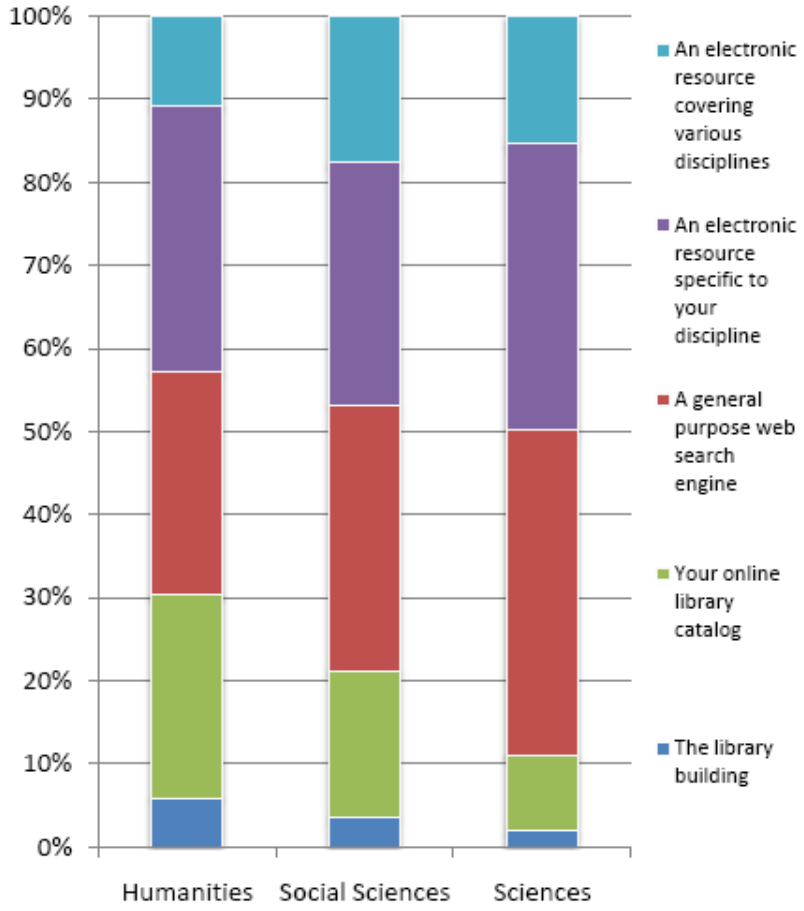
Research discovery service/source	Overall rating	PS rating	LS rating	SO rating	AH rating
1. General search engine	1.6	1.4	1.4	1.6	1.9
2. Internal library portal	2.0	2.4	2.1	1.9	2.0
3. Specialist search engine	2.1	2.1	1.8	2.2	2.5
4. Research colleague	2.2	2.3	1.9	2.2	2.3
5. Subject-specific gateway	2.4	2.3	2.3	2.4	2.5
6. A&I service, Bibliographic database	2.6	2.4	2.5	2.5	3.0
7. External library or library portal	2.7	3.1	3.2	2.7	2.3
8=. Browsing internal library shelves	2.9	3.2	3.2	2.9	2.6
8=. Citation index	2.9	2.7	2.7	3.0	3.4
10. Librarian	3.1	3.4	3.3	3.0	3.0
11. List-servs	3.3	3.5	3.5	3.3	3.3
12. Blogs	3.5	3.6	3.8	3.5	3.6

SO = Social sciences; PS = Physical sciences; LS= Life sciences; AH = Arts and humanities

Ratings in table: The overall ratings are calculated from the use frequencies described earlier, e.g. 1 = very often, 2 = regular, 3 = occasional, 4 = never. A lower overall score indicates a higher level of use.

Tools to find what you want

Figure 4: Starting point for research by disciplinary grouping, with responses of "A specific electronic research resource" broken down based on the complementary question "Which of the following types of specific electronic research resources would you be most likely to start with?"



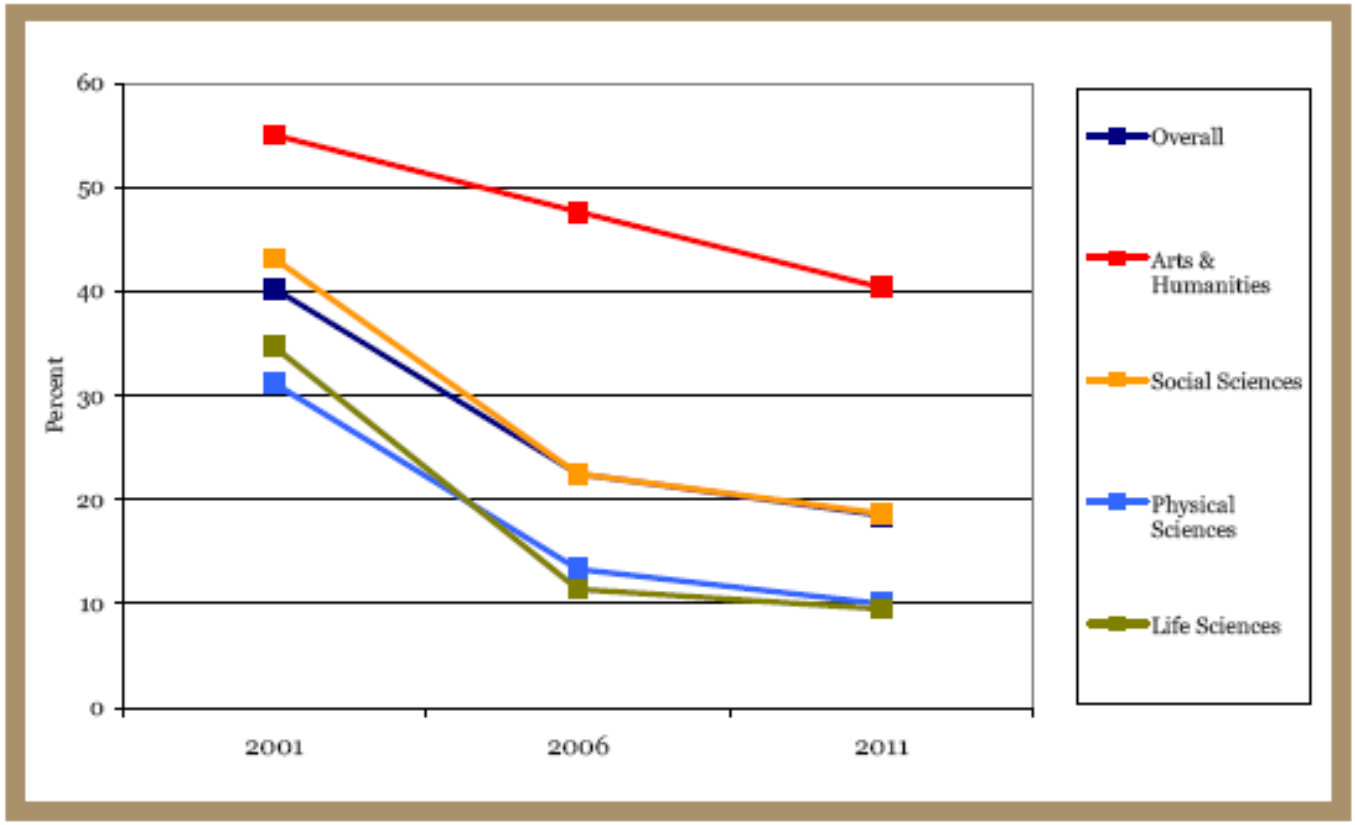
The tools you use to find what you want?

- *Everyone* uses Google and Google Scholar
- Different patterns of use related as much to the kinds of services that are available in different disciplines as to differences in modes of research

2. Using libraries

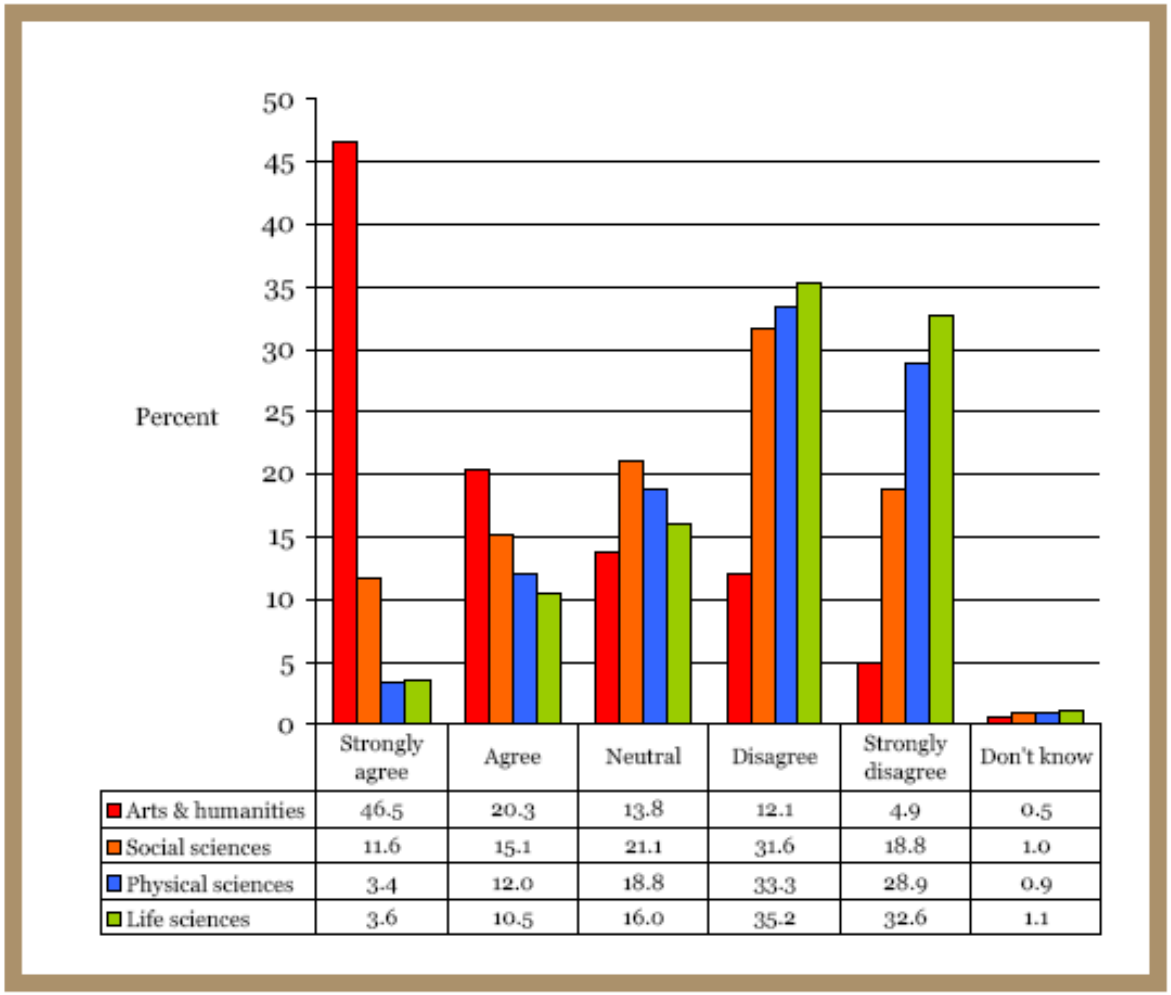
'A man will turn over half a library to make one book'

Figure 8: The percentage of researchers who visit their library at least once per week and predicted percentage for 2011



Using libraries

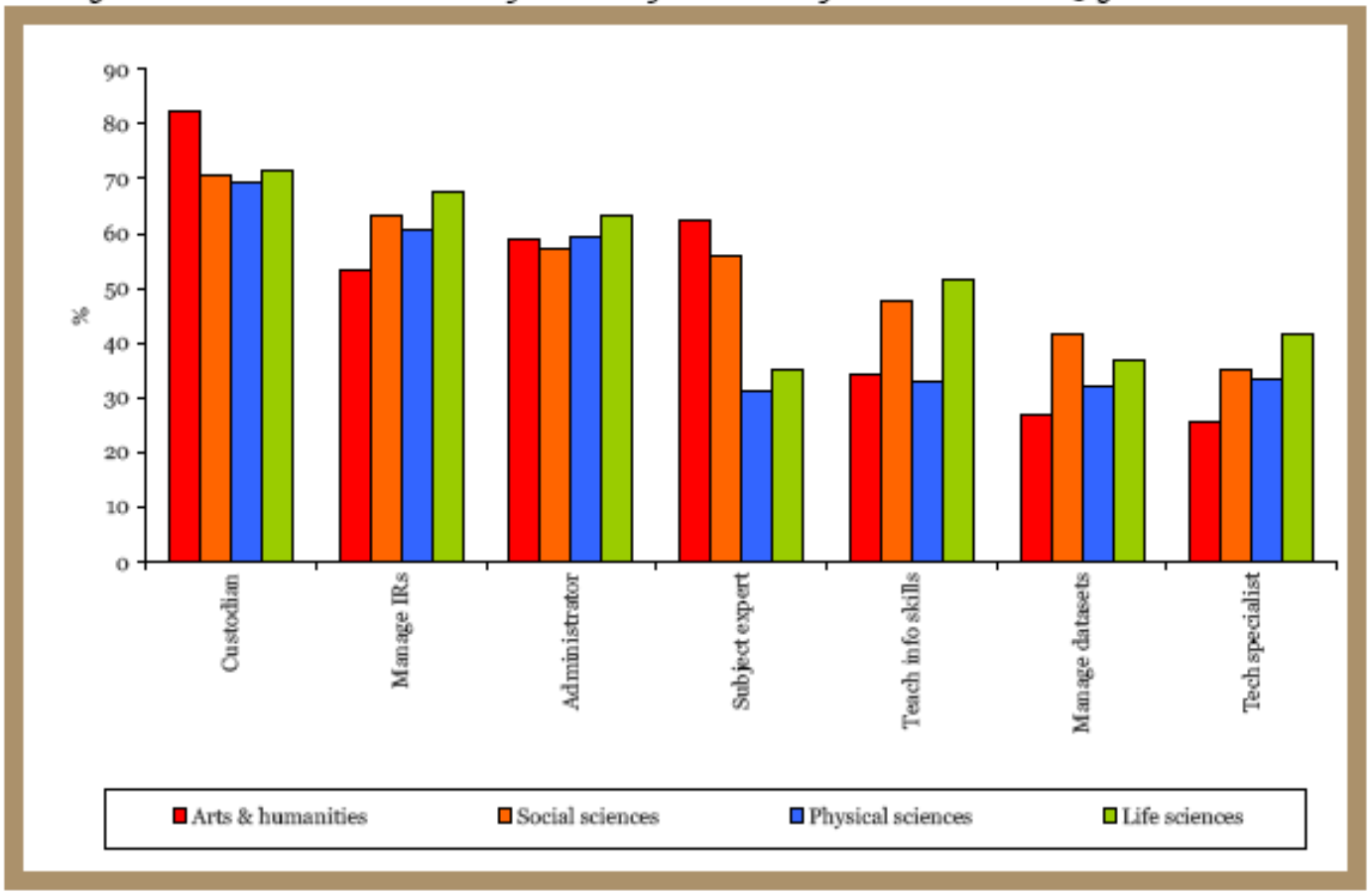
Figure 9: Researchers for whom "the main objects of my research are located in libraries"



	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Don't know
Arts & humanities	46.5	20.3	13.8	12.1	4.9	0.5
Social sciences	11.6	15.1	21.1	31.6	18.8	1.0
Physical sciences	3.4	12.0	18.8	33.3	28.9	0.9
Life sciences	3.6	10.5	16.0	35.2	32.6	1.1

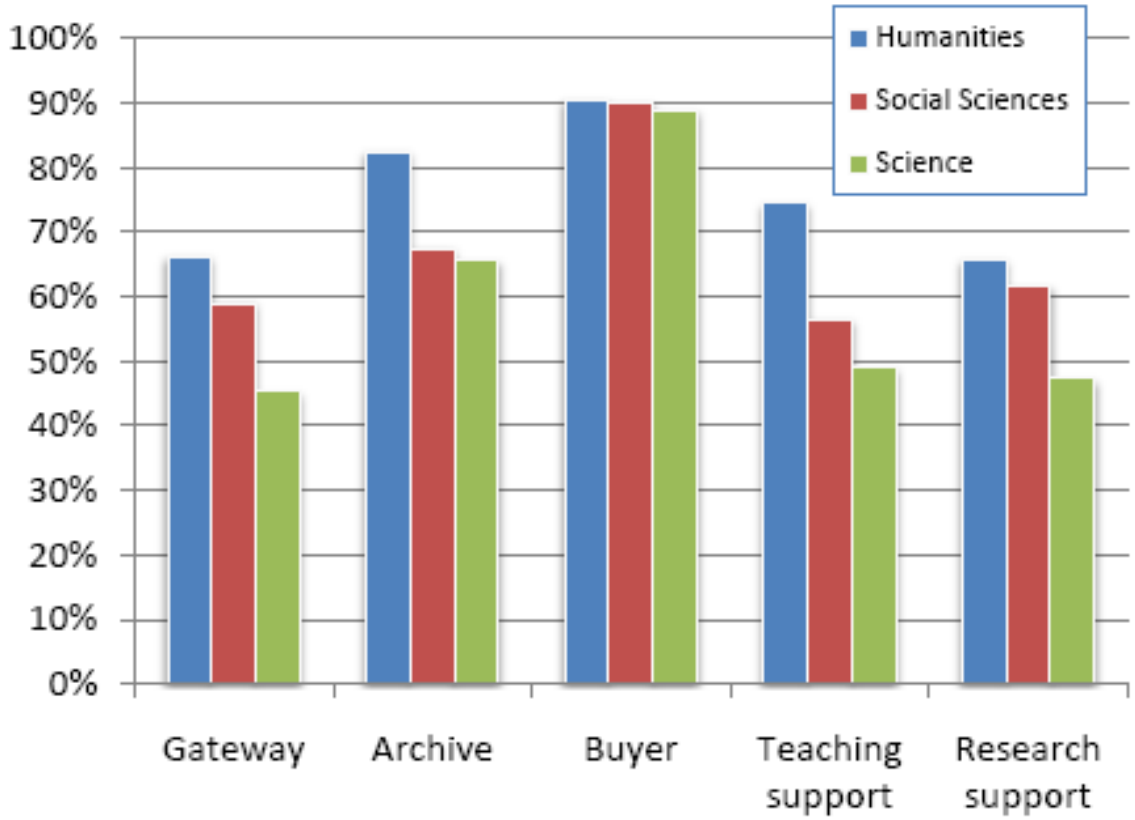
Using libraries

Figure 22: Researchers' identification of core roles for librarians in 5 years' time



Using libraries: the US

Figure 9: Percent of faculty rating these roles of the library as important, by disciplinary grouping



Using libraries?

- researchers across all disciplines using the physical library less and less
- humanities use of texts as research objects
  - but Google Books, Hathi Trust, ECCO, EEBO.....???
- all disciplines tend to have traditional view of role of libraries and librarians
- scientists especially sceptical about role of library subject specialists

3. Using e-journals

	Journal titles viewed	Most popular 5% of journals accounted for % use	Page views *(average per session)*	Abstract views *(% sessions)*	Gateways *(% page views arriving via gateways)*
Chemistry	196	39.5	3.2	23.3	49.2
Environmental sciences	248	29.6	3.6	22.7	41.4
Economics	132	46.9	3.8	30.4	19
Life sciences	531	38.1	2.0	19.5	65.9
Physics	204	26.6	2.5	20.1	57.8

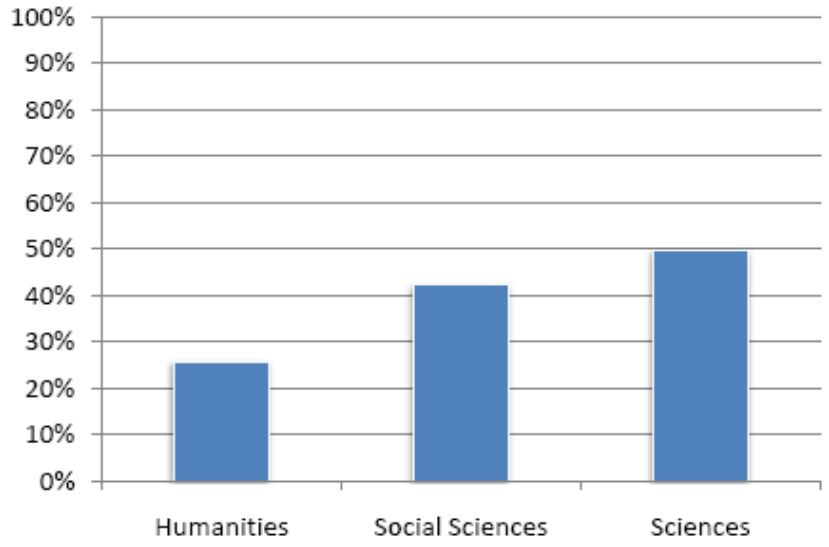
Using e-journals

Content viewed per session

Subject	Volume			Form		Age/currency		Impact	
	Ave. no. of pages viewed	Ave. no. of articles viewed	Ave. no. of journals viewed	% viewing an abstract	Ave. age of article viewed (days)	Alerts %	% viewing an AIP	Ave. impact factor of journal viewed	Relative impact factor
Life Sciences	2.1	1.5	1.2	19.30	859	0.1	7.1	4.4	1.15
Chemistry	3.6	1.9	1.5	23.30	1176	0.1	8.2	2.5	1.15
Earth Sciences	3.8	2.0	1.5	22.50	1078	0.1	9.3	2.1	1.17
Economics	3.9	1.5	1.2	30.20	1552	0.1	5.9	1.4	1.24
Physics	2.6	1.7	1.4	20.10	1157	0.1	7.4	1.6	0.97
All case study subjects	2.4	1..5	1.2	20.30	1022	0.1	6.7	2.9	

Using e-journals: the US

Figure 14: Percent of faculty agreeing strongly with the statement: "I am completely comfortable with journals I use regularly ceasing print versions and publishing in electronic-only form," by disciplinary grouping



Using e-journals?

- print survives as a comfort blanket
  - some real barriers to e-only, but they are diminishing
- significant differences between science
  - levels of concentration
  - age of articles and JIF
  - use of abstracts and of gateways
- *but* differences between *institutions* just as significant

4. Doing research: life sciences

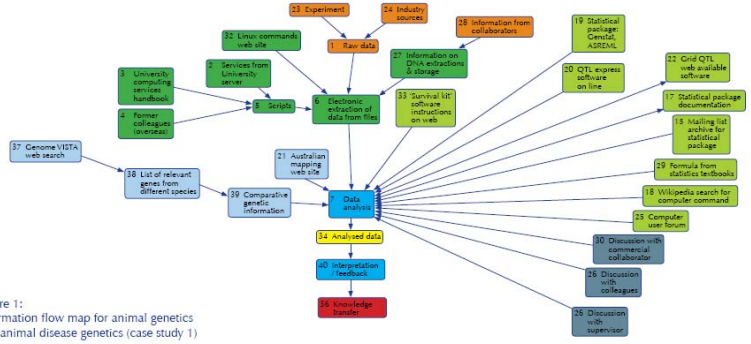


Figure 1:
Information flow map for animal genetics and animal disease genetics (case study 1)

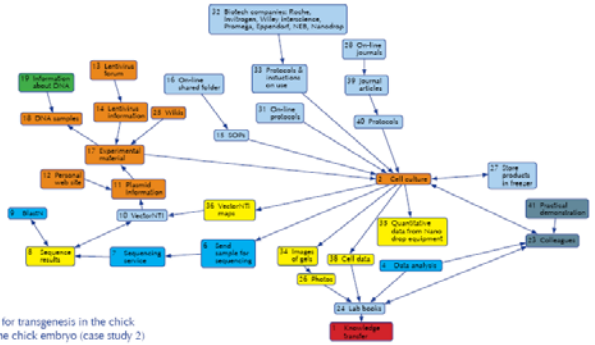


Figure 2:
Information flow map for transgenesis in the chick and development of the chick embryo (case study 2)

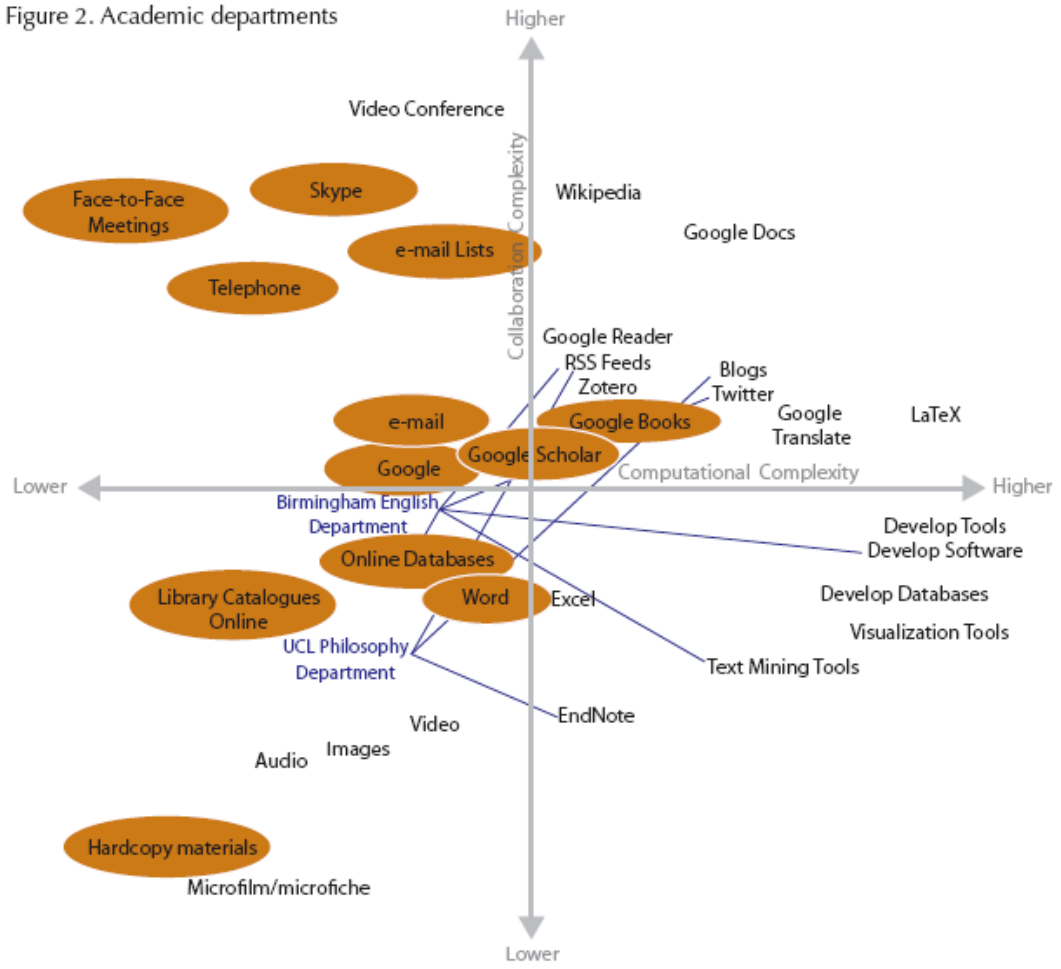
Figure 3:
Information flow map for epidemiology of zoonotic diseases (case study 3)

Figure 4:
Information flow map for neuroscience (case study 4)

Doing research: life sciences?

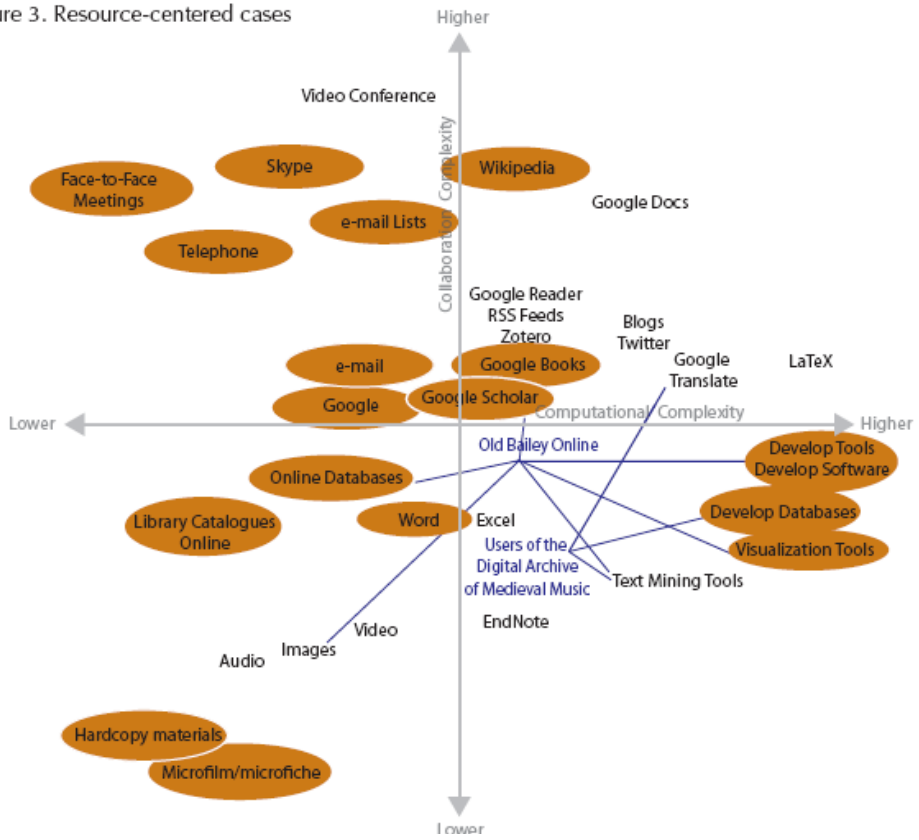
- the process differs even in apparently similar areas of work, and also between teams.....
- big science and small science
  - *"primary research engagements tend to be local"*
- divisions of expertise, labour and information exchange
  - principal investigator/leader, senior researchers/lecturers, associates, computational specialists, postdocs, PhDs, technicians.....

Doing research: humanities

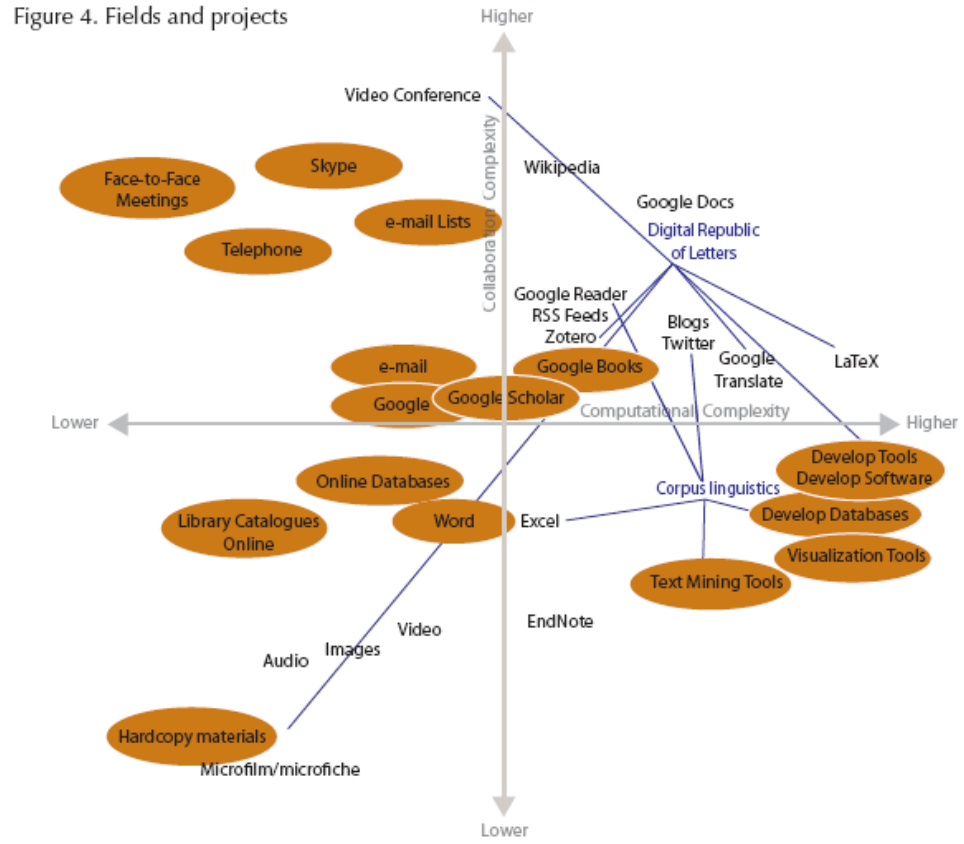


Doing research: humanities

Figure 3. Resource-centered cases



Doing research: humanities



Doing research: humanities?

- working with texts and images, in print, manuscript and digital forms
  - ease and speed of access to digital resources
- working with new tools and technologies
  - but little sign of use of advanced tools such as text-mining, grid computing, or semantic web
- 'digital humanities' *or* engaging with digital tools and approaches?
- growth of collaborative research
- developing and sustaining the intellectual infrastructure

5. Dealing with data

- Forms and varieties of data
  - observational (astronomy, environmental science, climatology, neuroscience.....)
  - surveillance and monitoring (epidemiology, civil engineering, mechanical engineering, clinical.....)
  - experimental (physics, chemistry, biology, medicine, engineering.....)
  - surveys, demographics and cohort studies (social sciences, epidemiology.....)
  - sequences and micro arrays (genomics)
  - scans and images (humanities, crystallography, neuroscience....)
  - qualitative (social sciences, clinical.....)
  - texts (humanities.....)
  - audio and multimedia (social sciences, humanities.....)

Dealing with data

- processing, analysing and adding value
  - models and simulations
  - standardised formats
  - protocols, scripts and SOPs
  - ontologies and taxonomies
  - statistical analyses
  - software tools and code
  - editing and annotation
  - metadata

Dealing with data

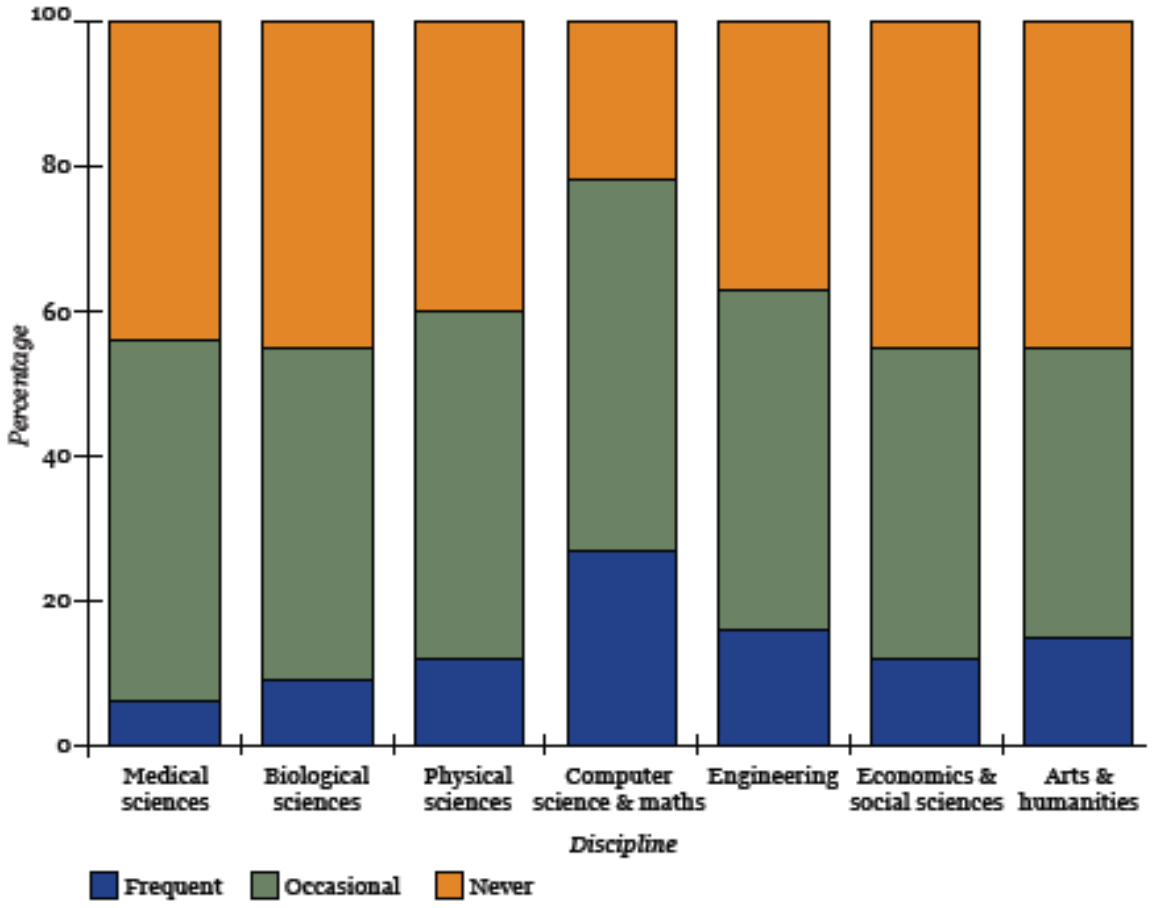
- open publishing
  - genomics, crystallography, astronomy (after 12 months).....
- reluctance to publish and/or the desire for control
  - chemistry, clinical, engineering
- differences between small and large datasets
  - development of the intellectual infrastructure
- real differences in cultures
  - career rewards the key

Dealing with data?

- not all data are the same, or have the same value
  - terminology of raw, intermediate, derived and results data doesn't begin to capture the complexity
  - how data are processed and analysed varies too
  - significant variations in cultures for openness
  - distinguish between data needed for validation and data that may have value for re-use
- importance of 'infrastructuring' in some disciplines
  - and variations in the value attached to it
- implications for library and information services, universities and funders, and publishers
  - generic information skills will get you only so far (not very far) in supporting researchers
  - importance of domain expertise

6. Social media

Figure 3:
Frequency of use by discipline



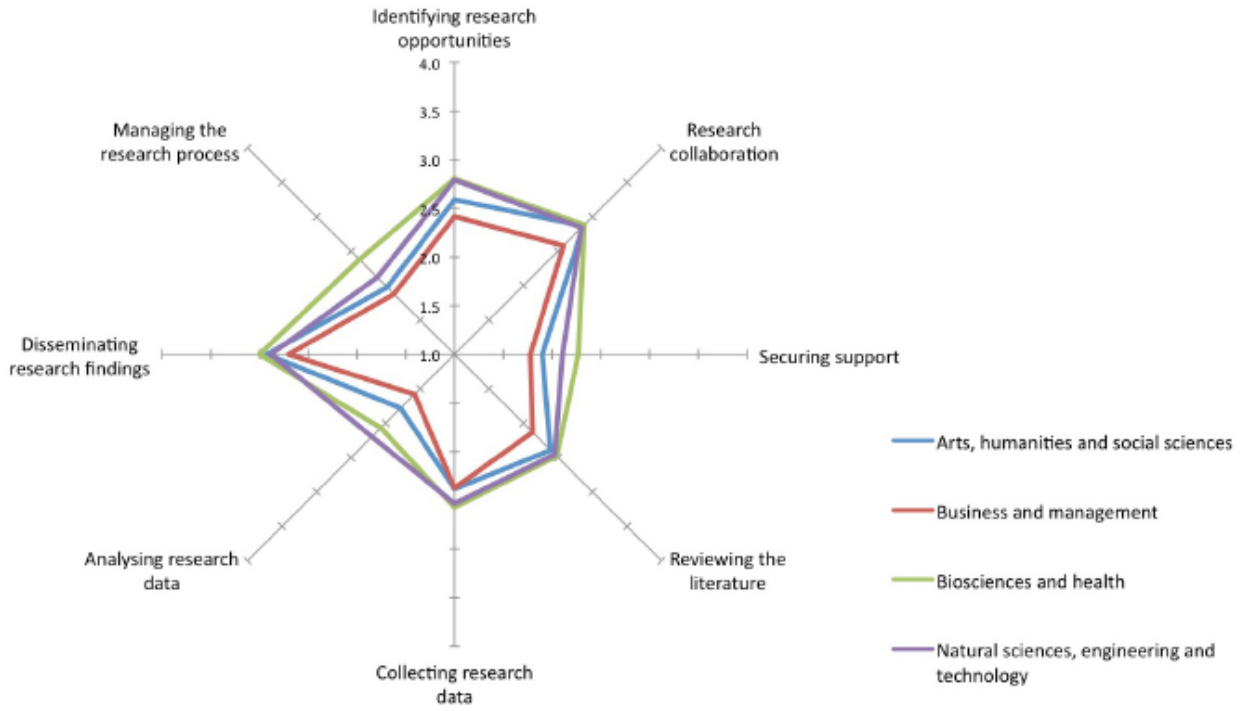
Social media: blogging

Discipline	Percentage within discipline who are frequent bloggers
Medical sciences	0.51%
Biological sciences	4.92%
Physical sciences	2.51%
Computer science & maths	7.74%
Engineering	1.82%
Economics & social sciences	3.56%
Arts & humanities	6.64%

Social media

Figure 15: Social networking and the research lifecycle

Perceived usefulness on a four-point scale where 1=Not at all useful and 4=Extremely useful

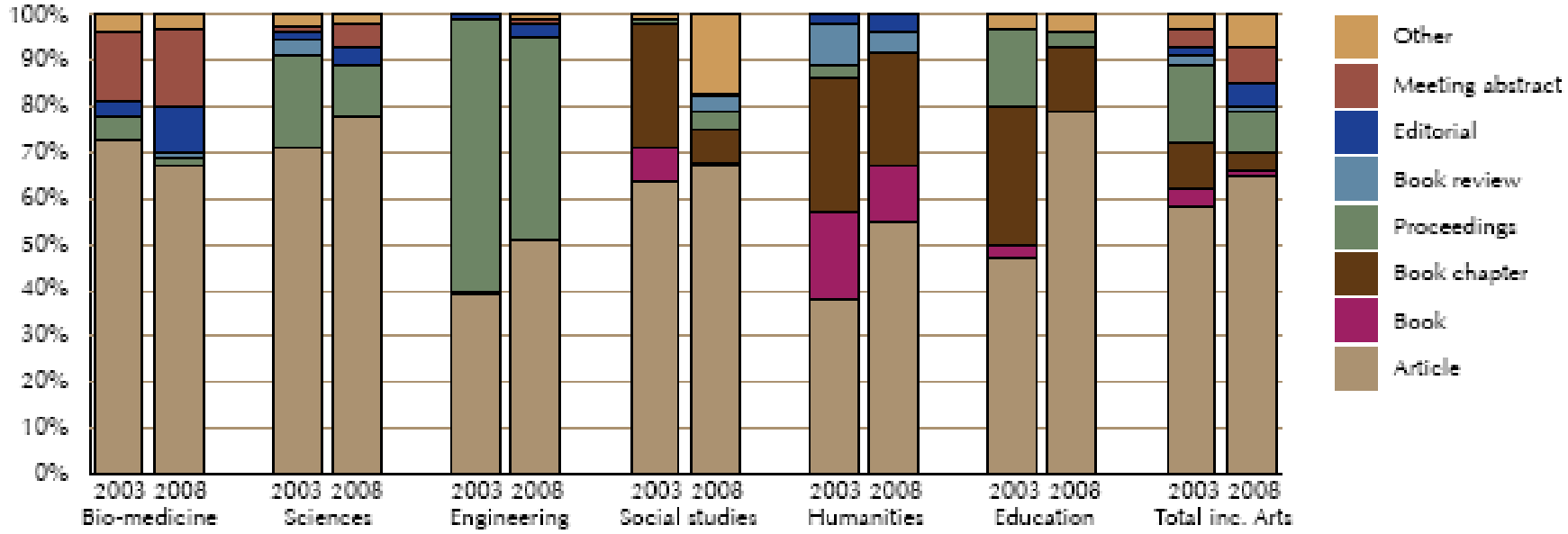


Social media?

- relatively low take-up as yet across all disciplines
  - but real interest in potential
  - discipline-specific services don't generate the critical mass to bring obvious benefits
- only real outlier is computer science.....

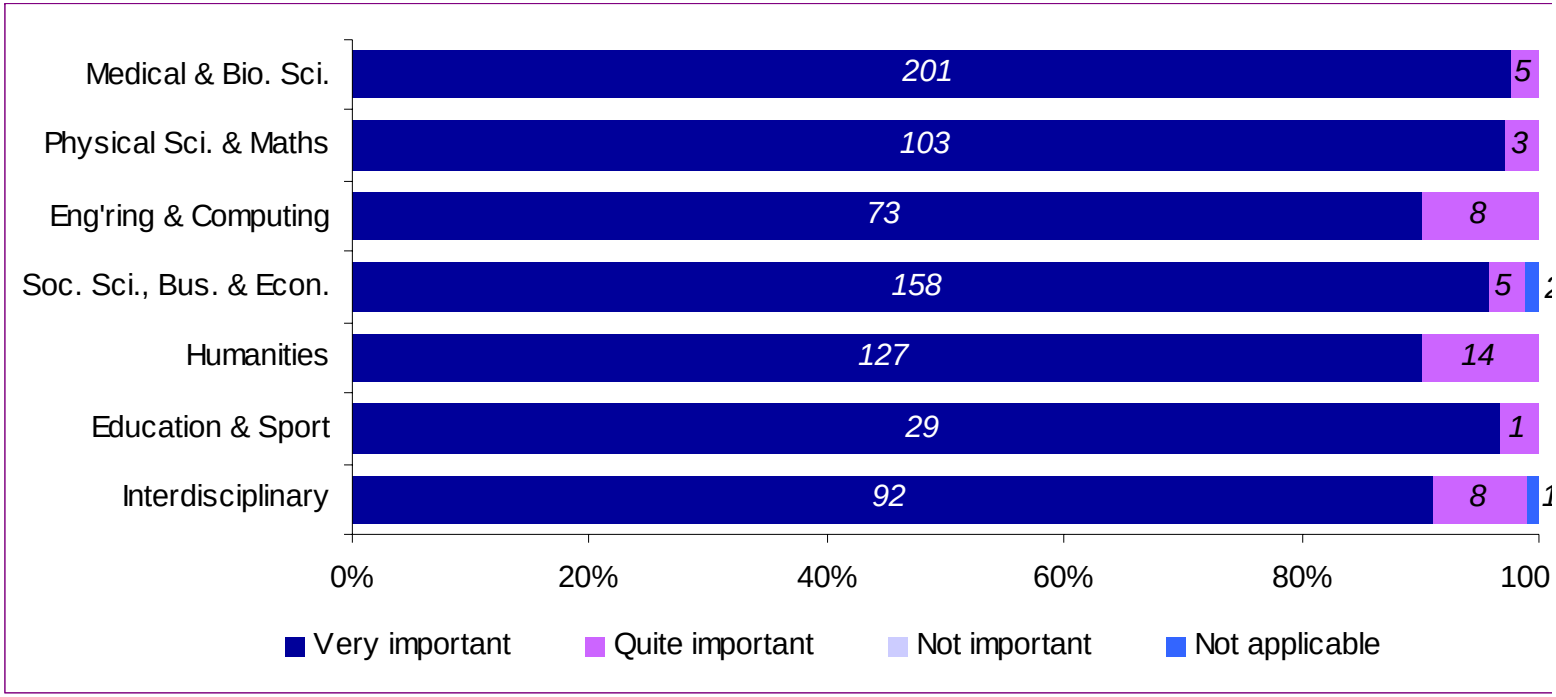
7. Publishing

Figure 1: Outputs by type



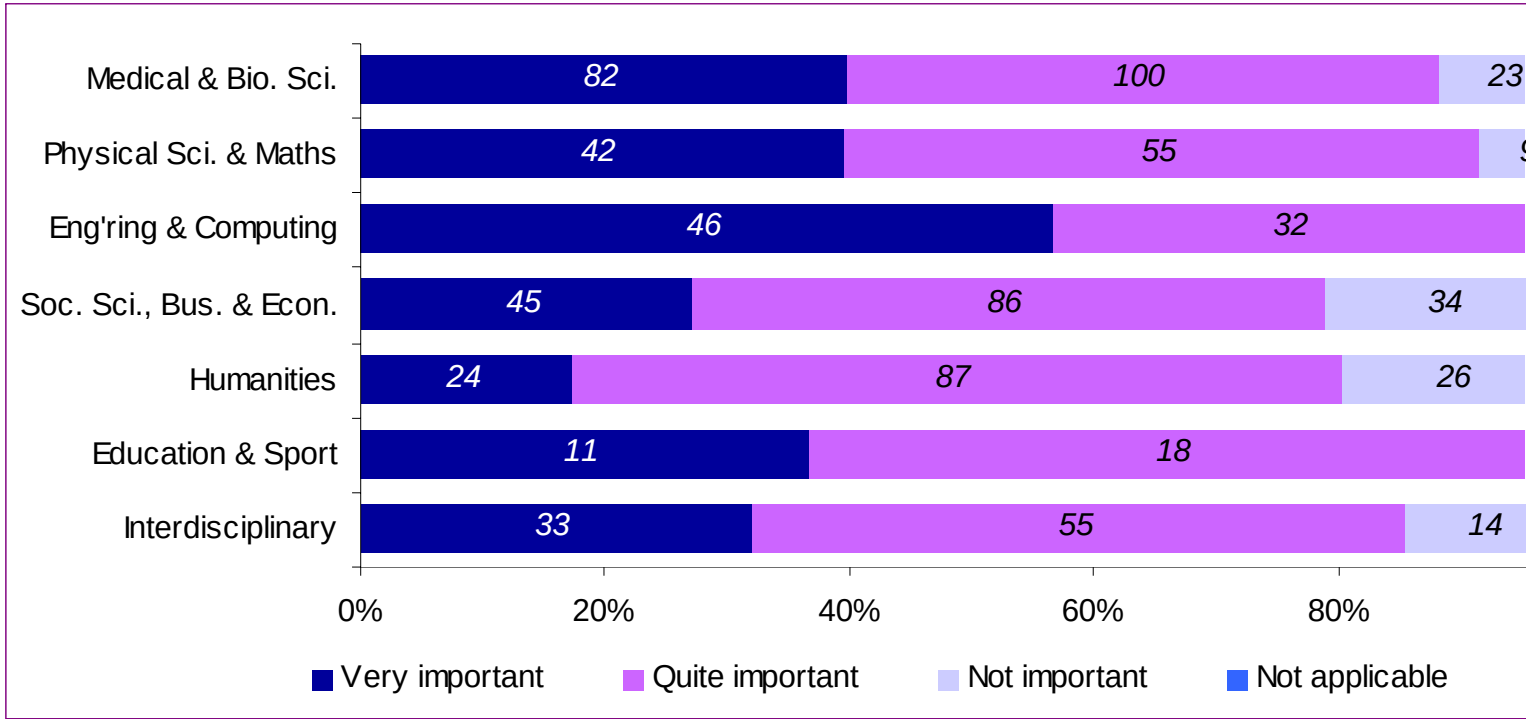
Publishing

Figure 3 Importance of peer reviewed journals



Publishing

Figure 9 Importance of conference presentations/posters

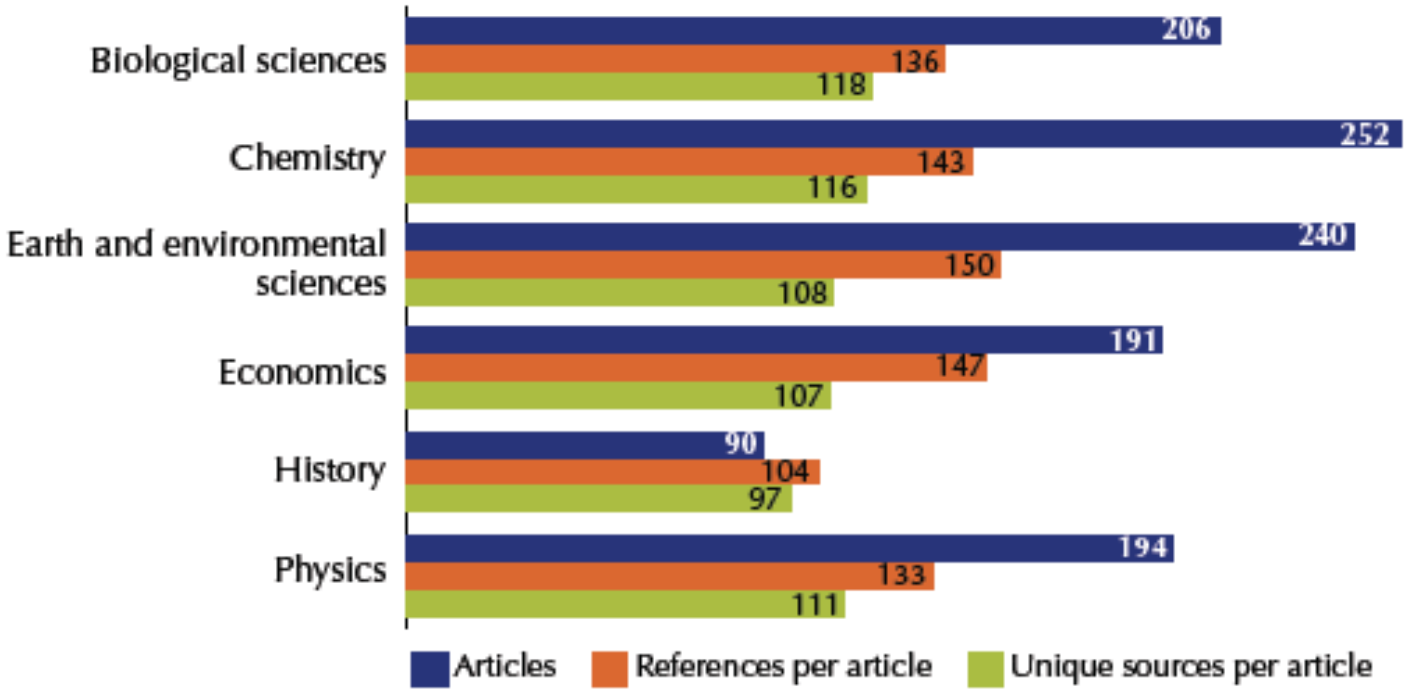


Publishing?

- the *increasing* dominance of journal articles
  - clearly associated with performance management/assessment and bibliometrics
- conference proceedings in engineering etc
- monographs and chapters in humanities and social sciences
- differences between what researchers regard as important, how they publish in fact, and what they submit for assessment.

Referencing

Figure 1: Growth in numbers of articles published, references per article, and unique sources per article by discipline, 1990-2007; worldwide (index 1990=100)



Source: Online analysis of Thomson Reuters citation databases

Referencing

Table 3: Average number of references per article published in journals covered by the Thomson Reuters databases, 1990-2007

	1990	1995	percentage increase on 1990	2007	percentage increase on 1990
biological sciences	29.63	34.45	16.3%	40.18	35.6%
chemistry	21.31	23.40	9.8%	30.55	43.4%
earth and environmental science	23.17	25.35	9.4%	34.88	50.5%
economics	21.12	24.30	15.1%	30.95	46.5%
history	34.46	32.77	- 4.9%	35.89	4.2%
physics	18.99	20.62	8.6%	25.30	33.2%

Referencing

Table 4: Average number of sources per article published in journals covered by the Thomson Reuters databases, 1990-2007

	1990	1995	percentage increase on 1990	2007	percentage increase on 1990
biological sciences	2.37	2.80	18.0%	3.36	41.8%
chemistry	1.84	2.14	16.01%	2.46	33.8%
earth and environmental science	4.38	4.72	7.6%	7.66	74.8%
economics	7.57	8.13	7.4%	9.03	19.3%
history	20.97	20.29	- 3.2%	23.95	14.2%
physics	1.89	2.10	11.0%	2.57	35.6%

Referencing?

- the number of references included in an article differs significantly by subject
- the number of sources from which those references are drawn vary too
- our evidence does *not* support the claim that the digital revolution – and easier access to articles – has brought a narrowing in the range of sources that researchers cite

Some conclusions?

- disciplinary cultures remain strong

  but

  - behaviours driven in large part by the services available
  - Google omnipresent
  - scholarly journal articles increasingly dominant (*for how long?)*
- significant differences *within* disciplines, and between
  - universities
  - research institutions
  - teams
  - individuals
- cultures and behaviours are changing

  but

  - only a limited number of services are being taken up, and only those that are easy to use and offer clear benefits
  - little sign of homogenisation
- training and support remain big issues
  - and they require domain expertise as well as technical expertise

A final thought....

- every man, accustomed from time to time to take a survey of his own notions, will by a slight retrospection be able to discover, that his mind has suffered many revolutions; that the same things have in the several parts of his life been condemned and approved, pursued and shunned

  Samuel Johnson

  The Adventurer, 1753

Thank you

Questions or comments?

Michael Jubb

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