

Information handling in collaborative research

Ellen Collins

Research Information Network
ellen.collins@researchinfonet.org

Michael Jubb

Research Information Network
michael.jubb@researchinfonet.org

Abstract

UK public policy makers have a growing interest in collaborative research, where academics work with public, private or third sector partners on a joint project which supports the partner's aims. This paper reports on the findings of five case studies, looking at how information is sourced, managed, used and shared within collaborative research projects. It finds that researchers within collaborative projects have similar information management issues as are known to exist within academia more broadly, but that the specific conditions which govern research collaborations mean that interventions to improve or support information management must be carefully tailored.

Key Words: knowledge economy, collaboration, information handling

1. Introduction

All research is inherently a collaborative enterprise, building upon the expertise of colleagues, predecessors and competitors to arrive at new discoveries and understandings. In recent years, however, 'collaboration' has taken on a new

meaning in UK public policy as it relates to the research sector. Increasingly, the term has come to refer to the relationships and projects developed between academic researchers and their counterparts in the public, private and third sectors. A key feature of these relationships is that they should be targeted towards a specific outcome, solving problems in order to benefit industry, society and the economy (Lambert, 2003). Collaborative research is one element of a wider spectrum of interactions between higher education institutions (HEIs) and external organisations, including consultancy, education and training, contract research and intellectual property deals: all of these have become increasingly important aspects of UK higher education funding.

The wider context of UK higher education policy has reflected and supported this drive for some time. During the 1990s, government began to encourage universities to become more proactive about encouraging the commercialisation of their research in-house and through collaborations with external organisations. A series of Higher Education Funding Council for England (HEFCE) interventions established funds to support such work. The Lambert Review and the follow-up Science and Innovation Investment Framework demonstrated the Labour government's continued interest in this area, as did the departmental reshuffle in 2007 which brought higher education and business into a single portfolio for the first time, signalling a clear agenda for academia by separating it from primary and secondary education (Lambert, 2003). The Sainsbury Review and subsequent Innovation Nation white paper focused on the business demand side, while a series of concurrent reviews looked at the skills that graduates needed to meet employers' business demands (Sainsbury, 2007). The 2011 Innovation and Research Strategy for Growth (BIS, 2011) indicates the Coalition Government's continued interest in this area, as does the Wilson Review, which reported in early 2012 (Wilson, 2012).

The long history of political support has borne fruit, in the form of a growing number of relationships between research establishments — HEIs and others — and public, private and third sector partners. The most recent data from HEFCE indicates a 4% growth in knowledge exchange between 2008–9 and 2009–10 among UK HEIs, and a growth in income from such sources by 35% from 2003–4 to 2009–10. Collaborative research income increased by just over 2% between 2008–9 and 2009–10, although changes to the survey methodology mean that this figure is not entirely reliable. The report also highlights the growing importance of non-commercial collaborators, such as government

bodies or third sector charitable organisations, as partners in these enterprises. (HEFCE, 2011). A separate survey, undertaken by the Department for Business, Innovation and Skills (BIS), looks at public sector research establishments (PSREs) and their research interactions with external organisations. The most recent edition of this survey found that 25,000 new collaborative research projects began in 2007–8, and that 93% of PSREs were doing collaborative research (BIS, 2009).

So collaborations, as one possible interaction between research establishments and external bodies, have become increasingly important to universities and their finances. The question then arises: how should university librarians ensure that they engage with collaborative projects and contribute to successful research outcomes? To understand this, we must first understand the specific circumstances which govern collaborative research. Previous studies have shown that a researcher's environment and collaborators can strongly affect their information behaviour, but that they also retain strong associations and preferences from their own, early, training (RIN/NESTA, 2010; Bulger *et al.*, 2011; Meyer *et al.*, 2011). The cultures in business and higher education are recognised to be rather different, and the relationships can be difficult to manage (Lambert, 2003).

There are several stages of information handling for research projects, each of which offers challenges for researchers used to working in different environments. A new research project involves sourcing information that has already been published on the subject. Researchers outside academia generally have worse access to published scholarly information than those within academic paywalls, and employ different coping strategies when they cannot access the information that they need (CIBER, 2011). At this early stage, researchers will also often seek to discover and share unpublished information which may have a bearing on their research project. But researchers are often very protective of unpublished research and data: in academia, because they wish to protect future publication and funding opportunities, and in industry because of the need to protect commercial interests. Furthermore, there is some confusion and concern within industry about Freedom of Information legislation, and their vulnerability under such legislation if they share confidential data with an HEI. During the research process, new information is discovered and must be shared between different parts of the research team. Although there are standards and protocols for data collection and sharing in many

disciplines, at an individual level researchers' behaviour can be idiosyncratic, and there is no guarantee that their techniques will translate into a more commercial research environment (or, indeed, that the commercial techniques will make sense in academic settings). Finally, academic researchers want to publish and share their findings, as the chief way of securing recognition and credit for their work. In many cases, this may actively undermine more commercial strategies, where there are uncertainties about the ramifications of such publication for copyright and intellectual property (CIBER, 2010). And non-commercial partners, such as public sector or charitable organisations, may want to publish findings more rapidly to reach a wide community of stakeholders, thereby diminishing the academics' chances of having an article accepted in a highly-rated journal.

The circumstances governing information handling in collaborative research are thus highly complex and nuanced. If librarians and information professionals are to engage successfully with such projects, they must understand exactly how these circumstances affect the course of individual research projects. To promote such understanding, the Research Information Network commissioned a set of case studies, which looked at five collaborative research projects to identify some common themes and issues, and some possible actions for library staff in engaging with such projects (Jordan et al., 2011). This paper considers the findings of the study.

2. Methods

Five cases were selected, each of which included at least one university and one external partner. Overall, the cases were selected to reflect a range of criteria which we considered likely to affect information handling behaviour: these included the discipline of the collaboration, the number and types of partners involved, the stage of the collaboration — from early-stage to completed — the scale of the project and the types of external support received. Table 1 provides a brief overview of the five cases. Within each case, initial interviews with project managers helped establish the broad structure of the collaboration. Subsequent interviews with key individuals, identified in the initial stage, provided greater insight into the information management process within the collaboration. Finally, we undertook a series of workshops across the five collaborations to identify recommendations for future best practice.

Table 1: Participant cases.

	Discipline	Aim	Partners
Intelligent Care	Technology	Developing a monitoring system for older people living in residential dwellings	1 commercial partner 1 university
UK Reactics	Engineering	Exploring the potential commercial applications of novel auxetic materials (materials which expand when stretched)	6 commercial partners 3 universities
PRISMA	Health / Social care	European priorities for research and measurement in end-of-life care	11 partners, including 4 universities, with a range of public and third sector bodies
Structural Genomics Consortium (Oxford)	Structural biology	Pre-competitive mapping of protein structures to support new drug discovery	11 funders – mix of public and charitable funding and pharmaceutical companies 3 universities
Locating Communications Heritage	Arts / Digital technology	Developing a platform which enables mobile phone users to access history of communications and IT	1 university 1 third sector (museum) 2 commercial

Source: Jordan et al. (2011), Information handling in collaborative research. Research Information Network, p.13.

It is important to note that these cases represent nothing more than a snapshot of a few research collaborations. It would be unwise to draw far-reaching conclusions on the basis of such evidence. Nonetheless, we are confident that they represent a useful insight into researcher behaviour, which can be used to support investigations and interventions by library and information professionals in universities.

3. The challenges for information handling

The research uncovered a number of challenges for effective information handling in research collaborations. Many of these will be familiar to library and information professionals, who already encounter indifference and ineffectiveness among many of their academic researchers. Others relate more closely to the specific conditions within research collaborations.

The way that information is handled in collaborative research depends upon a number of factors. Perhaps most important among these is the primary purpose of the collaboration, and the nature of the area that it is investigating. Unsurprisingly, a collaboration which is focused upon creating a commercial product handles information differently from one which hopes to influence practice and behaviour among a user community. The effect of these differences is most readily observed around the dissemination of information. The Intelligent Care project focused upon developing new technologies which were not patentable; therefore, academic researchers on the project were very limited in their ability to publish early-stage research, as there was nothing to prevent the company's competitors using their findings to bring an alternative product to the market. UK Reactics, while also focused upon a commercial outcome, was producing research that was more likely to lead to a patent and so publication of early results was more acceptable. Although the commercial partners had 28 days to decide whether to veto a proposed publication in order to protect their intellectual property, only one publication was significantly delayed under these terms. In contrast to these two commercial projects, PRISMA sought to disseminate its findings as widely as possible, and in this case the pre-project agreement actually protected the academics, ensuring that they were able to publish findings before they were distributed among PRISMA's stakeholder community. The SGC represented a very interesting case, in that it required a high level of openness in order to protect the long-term commercial aims of the collaboration: in order to secure input from rival pharmaceutical companies, the researchers had to guarantee that no company would gain a competitive advantage by seeing the findings before any others, and the simplest way to do this was to release them to the funders, the companies and the world at large at exactly the same time. Information handling was also visibly affected by project purpose at an earlier stage in the collaboration: researchers working on Intelligent Care, for example, had to spend time investigating the market for a product rather than focusing exclusively on the academic literature.

Established cultures and norms were also important in defining information behaviour; in our five cases, there were noticeable differences between academics and their non-academic partners. For example, within academia there was a prevailing assumption of openness — researchers would share information not only with their own team but also with teams outside their own institution, even where these teams may (in some circumstances) actually be their competitors. Commercial organisations, in particular, were much more circumspect about sharing information, and tended to restrict this to internal sharing only. Aware of the greater openness within academia, they often showed reluctance to share information, rarely releasing it unless in response to a direct request, ‘blinding’ datasets and in some cases even generating dummy datasets to replace real, confidential, ones. Participants also observed differences in communications habits and behaviours, and the adoption of new technologies, between the academic and non-academic sectors. Academics were perceived by some of their commercial partners as having a different communications culture from the commercial world: one which was slower and more reliant on old technologies such as telephone or face-to-face conversations. In some cases, though, established norms and cultures could be very similar in the academic and non-academic organisations: the pharmaceutical companies and the academic laboratory working on the SGC project both reflected the strong conventions of this particular scientific field and used the same protocols, databases and electronic lab notebooks.

Project aims and partner cultures exert an important influence on information behaviours, but they also interact with several other characteristics of a collaborative project to further determine the way that researchers find, manage and share information. One such characteristic is the level of trust between the project partners, often based upon their previous experience of collaborating. This trust helped to mitigate some of the challenges which arose out of different expectations or experiences, and to make it easier to share information: as one researcher on the PRISMA project put it, ‘it’s much easier when you’re trying to badger people for things if you have that level of contact [knowing each other personally]’. A commercial partner on the UK Reactics project said ‘you need to reinforce with the academic what can and can’t be discussed ... as you build that trust up you come into a position where you can divulge more and more to them.’ These personal relationships were usually based upon previous experience of working together, or were created through a concerted effort at the start of the project through face-to-face meetings or mutually-trusted intermediaries. Previous experience of collaboration

also helped partners to make allowances for the different working cultures, as they had a better understanding of drivers within organisations that were different from their own.

Alongside these informal, trusted relationships, most partnerships had more formal agreements in place which affect information management, usually agreed at the project outset. These arrangements might include non-disclosure agreements, formalised reporting and update structures and systems for monitoring project outputs. Often, these arrangements were put into place at the instigation of project funders: the Technology Strategy Board (TSB) was particularly keen to ensure information flow is managed in an effective way. In other instances, the arrangements might stem from the project requirements: SGC had strong information governance policies because of the highly competitive nature of its research and the need to ensure all partners were treated equally with no unfair advantages. The size and geographic spread of the collaboration also affected the formality of information governance arrangements: PRISMA, for example, a multi-national research collaboration with over 30 project researchers, constructed much more formal arrangements than Locating Communications Heritage, a small project with around five researchers based in London. The burden and legal cost of creating and observing a very formal information governance structure was also a consideration for Locating Communications Heritage researchers when they decided to maintain a much more informal arrangement.

Thus, the information environment in which researchers operate is affected by the collaboration's background, aims and objectives, and organisational cultures. Researchers' information activities reflect the specific circumstances of their collaboration, as outlined here, but there are some attitudes and behaviours which seem to permeate many of the collaborations that we studied.

First among these is a general indifference to — and in some cases, scepticism about — the importance of effective information handling, particularly around data management. Formal information governance policies — where they existed — were usually quite selective in what they covered. Non-disclosure agreements, intellectual property ownership and embargo procedures for scholarly publication were considered important as disagreements in these areas could potentially derail the collaboration; poor data management and curation was not seen as a threat in the same way. Furthermore, as projects

were so outcome-focused, relatively little attention was paid to the long-term reusability of the data: this was not a success factor and therefore considered unimportant. The only exception to this was the SGC, where data publication was a key project aim. There was little evidence that failure to plan for and effectively manage information had a negative impact on any of the projects, but researchers did acknowledge that they might benefit from better information management — with the usual caveat that ‘we shouldn’t put any additional constraints or paperwork for us’.

Researcher expertise around systems and technologies for managing information, including data, was fairly limited. There was little evidence of researchers using centralised data repositories, virtual research environment, wikis or other systems to manage their project information and communications, although again the SGC was something of an exception due to the project aim of publishing data. Project support officers acknowledged that there was a lack of capacity and expertise, particularly in smaller organisations, but it was also clear that many participants had misconceptions about the repercussions of using online tools to manage information. Researchers expressed concerns about whether repositories could be hacked into, uncertainty about whether uploading information to an online system constituted ‘disclosure’ from the point of view of intellectual property, and concern that the company which owned the technical system might also claim ownership over any content that the research team put into it. These concerns were mostly borne out of uncertainty rather than fact: but researchers were also worried that implementing new systems might be costly and inefficient, particularly if they were overspecified.

Another important area of commonality across the projects was a limited use of library and information services, and a general perception that the benefits of using such services would be outweighed by inconvenience. As has been the case in other research projects, many researchers were not aware that the library was responsible for providing the published information that they used, and in discussing library services they were referring more to those which are accessed within the physical library space (Meyer *et al.*, 2011). Library services were seen as too general, designed for students rather than researchers, and inept in providing the commercial information necessary for many projects. Furthermore, some participants saw the laborious selection and filtration of material as an essential part of the academic’s work at the start of a project, helping them to become grounded within the field, and felt that asking a librarian for more effective search strategies might interfere

with this process. While there was some use of specialist libraries by researchers who had previous experience of them through other projects, this did not usually spread to other project team members.

One library service which researchers did use — although, as we have said, in many cases they were not aware that they were doing so — was online access to published scholarly information. As might be expected, levels of access varied enormously between partners, and the relationships could be very complex. In some cases, a large commercial organisation might have better access than a non-research-intensive university. For this reason, along with the habitual openness in academia and the — incorrect — perception that the collaboration's confidentiality agreements protected all information exchange within the partnership, researchers often shared the full text of scholarly articles, despite copyright restrictions. Researchers also adopted coping strategies such as taking advantage of walk-in access at information-rich institutions — this, clearly, being a library service that they did value. In other cases, it was not considered necessary for all researchers to have access to the original literature, and much of the academics' time was taken up with producing literature reviews for dissemination to the wider collaboration. In these cases, participants often highlighted a need for strategies to help filter and refine the information to make it manageable and relevant.

4. The role for library and information services

The previous section shows that researchers in collaborations have some fairly generic problems with maintaining effective information behaviours. Concerns about data management, information overload, new technologies and systems and the relevance of library services have all been found in previous studies of researchers working solely in academia, and librarians have begun to come up with some ways of addressing these concerns. However, as we have seen, the specific circumstances of collaborations can mean these problems present themselves in a more complex way, and that any attempts to intervene will need to take account of such circumstances. The scope of this study did not include extensive work with librarians and, as such, it would be inappropriate for this paper to make specific recommendations about what librarians should and should not do in working with collaborative research projects. But it is possible to highlight some important factors which might affect the success of any such interventions.

The research highlighted the importance of trust in collaborative projects, and its central role in securing input from partners. Trust was built through previous knowledge of partners, their introduction by a trusted intermediary, and evidence that they understood the drivers, behaviours and backgrounds of the various parties working within the collaboration. Once trust was established, information flowed more freely around the collaboration and researchers found it easier to work together. There was even some evidence that trusted members of a collaboration could begin to influence information behaviours: the PRISMA project manager, for example, was rigorous about following up information policies which ‘dramatically changed the way that people worked’. Informal channels, rated by many researchers as more important than formal communication techniques, were heavily dependent upon trust. Any librarian or information professional seeking to work effectively with a collaborative project will need to ensure that they become a trusted part of the team. Early engagement with the project is crucial: this could be achieved by building links with knowledge transfer teams within universities, who will help facilitate many new collaborative projects.

Collaborative research projects are also noticeably outcome-driven, with a strong focus on the agreed outputs. This is accepted by the project’s academic researchers, and they recognise that more traditional academic research outputs such as publications may have to assume a smaller role, if they go against the project aims. That said, many of them recognise that alternative benefits can flow from participation in collaborative research — whether that be a better understanding of industrial processes and the real-life applicability of academic research (Intelligent Care) or by participating in a prestigious collaboration (SGC). But the agreed output remains central to research activities, and systems and procedures therefore need to support these outputs. Services offered by librarians will likely have most success where they can show that they will support the aims and objectives of the project. It is clear that there are some such areas — for example, helping researchers to find and organise published information in an efficient manner, and perhaps also working with them to manage new data in a better way to improve project efficiency. But any such interventions must be proportional: the non-academic partners in particular are very wary about over-burdening themselves with unnecessary administration. Services will need to show that they can improve project outcomes and are tailored to the project’s specific needs, even when this might mean that they fall short of best possible practice. Like the academic researchers who accept that they may not be able to publish, librarians will need to be

a bit pragmatic in order to get their foot in the door: once they are there, they may be able to demonstrate the value of conforming fully with best practice and standards — or they may find that the standards which apply to academic research are less important when it comes to the aims and objectives of a research collaboration.

5. Conclusion

The five case studies showed that collaborative research does, indeed, operate upon its own terms. While strong disciplinary conventions, such as those in the scientific field explored by the SGC, can help academics and external partners work to the same standards and processes, in other cases local systems and behaviours prevail, meaning that researchers in different organisations end up working in quite different ways. This presents a challenge for librarians and information professionals in seeking to support researchers in collaborations, as they will be working with a number of different cultures, each of which has its own aims and objectives.

The aims and objectives of the collaboration as a whole are equally important in understanding how best to support information management and effective information behaviours. Collaborative research projects are particularly focused upon specified outcomes, and researchers in academia and external organisations direct their efforts towards achieving those outcomes. Any interventions by library and information professionals will need to demonstrate that they can contribute towards such outcomes, and will not produce additional burdens which might — as the researchers perceive it, anyway — distract from them.

Many of the information behaviours observed in these five cases will be familiar to library and information professionals: lack of awareness of library services, poor data management, attachment to known systems and suspicion about the time and effort required to begin using new ones. But the research also suggested that, in order to influence behaviour, external parties need to become trusted partners within the collaboration, and that a key way to do this is to demonstrate an understanding of the unique circumstances which govern its activities — its size, geographic dispersal, aims and objectives, participants' history of working together, and the relationship between

formal and informal information channels. By recognising these conditions, and tailoring a service which takes account of them, librarians may be able to provide valuable support in making research collaborations more effective.

References

- BIS (2009). *Fifth annual survey of knowledge transfer activities in public sector research establishments: Final report*. London: Department for Business, Innovation and Skills. Retrieved October 6, 2012, from <http://www.bis.gov.uk/assets/biscore/corporate/migratedd/publications/2/2009-5th-psre-report-v2.pdf>.
- BIS (2011). *Innovation and research strategy for growth*. London: Department for Business, Innovation and Skills. Retrieved October 6, 2012, from <http://www.bis.gov.uk/assets/biscore/innovation/docs/i/11-1387-innovation-and-research-strategy-for-growth.pdf>.
- Bulger, M. E., Meyer, E. T., de la Flor, G., Terras, M., Wyatt, S., Jirotko, M., Eccles, K., & Madsen, C. (2011). *Reinventing research? Information practices in the humanities*. London: Research Information Network. Retrieved October 6, 2012, from <http://www.rin.ac.uk/our-work/using-and-accessing-information-resources/information-use-case-studies-humanities>.
- CIBER (2010). *Research support services in UK universities: What services do researchers need and use?* London: Research Information Network. Retrieved October 6, 2012, from <http://www.rin.ac.uk/our-work/using-and-accessing-information-resources/research-support-services-what-services-do-resear>.
- CIBER (2011). *Access to scholarly content: gaps and barriers*. London: Research Information Network. Retrieved October 6, 2012, from <http://www.rin.ac.uk/node/1172>.
- HEFCE (2011). *Higher education – Business and community interaction survey 2009–10*. London: Higher Education Funding Council for England. Retrieved October 6, 2012, from http://www.hefce.ac.uk/media/hefce1/pubs/hefce/2011/1125/11_25.pdf.
- Jordan, E., Hunter, A., Seale, B., Thomas, A., & Levitt, R. (2011) *Information handling in collaborative research: an exploration of five case studies*. London: Research Information Network. Retrieved October 6, 2012, from http://www.rin.ac.uk/system/files/attachments/Collaborative_research_report.pdf.
- Lambert, R. (2003). *Lambert review of business-university collaboration: Final report*. London: HMSO. Retrieved October 6, 2012, from http://www.hm-treasury.gov.uk/d/lambert_review_final_450.pdf.

Meyer, E. T., Bulger, M., Kyriakidou-Zacharoudiou, A., Power, L., Williams, P., Venters, W., Terras, M., & Wyatt, S. (2011). *Collaborative yet independent: Information practices in the physical sciences*. Institute of Physics, IOP Publishing. Retrieved October 6, 2012, from http://www.iop.org/publications/iop/2012/file_53558.pdf.

RIN/NESTA (2010). *Open to All? Case studies of openness in research*. London: Research Information Network. Retrieved October 6, 2012, from http://www.rin.ac.uk/system/files/attachments/NESTA-RIN_Open_Science_V01_0.pdf.

Sainsbury, D. (2007). *The race to the top: A review of government's science and innovation policies*. London, HMSO. Retrieved October 6, 2012, from http://www.hm-treasury.gov.uk/d/sainsbury_review051007.pdf.

Wilson, T. (2012). *Review of business-university collaboration: The Wilson review*. London: Department for Business, Innovation and Skills. Retrieved October 6, 2012, from <http://webarchive.nationalarchives.gov.uk/20120305154225/http://www.wilsonreview.co.uk/wilson-review/wilson-review.pdf>.