Embedding Library Services in an Engineering Research Group

A report on the pilot project conducted by the Department of Engineering Library with the Use Less Group



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June 2017

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# Executive summary

For three months in early 2017 a member of the Department of Engineering Library team worked alongside a research group as their personal Embedded Librarian (EL), piloting a novel service and conducting Action Research on what such a role might look like. Using qualitative research methods, the Library team investigated how researchers perceive library services and their own work, while at the same time exploring the potential for new services and training opportunities.

 During the pilot the EL achieved the following practical outcomes:

* Prompted greater uptake and use of Symplectic, ORCiD and Google Scholar
* Changed perceptions of librarians’ expertise amongst the research group
* Contributed to a response that the group made to a government Green Paper
* Contributed to a project to build an ontology mapping the group’s research space
* Advised on impact and knowledge management
* Built relationships between the Use Less Group (ULG) and the Library

Access to the group during the pilot led to insights into researchers’ workflows, resources and perceptions of their work and how libraries fit into it. The following key insights are highlighted in the current report, which is an attempt to capture initial thoughts preceding further outputs:

1. **Potential for further embedded library services:** The initial feedback from the group was positive and the EL contributed to some key projects as well as providing advice, support and encouraging the group to use Symplectic Elements. Section 5.2 of the report outlines a tiered model featuring library services that can be offered as standard throughout the department, project-based ‘Borrow a Librarian’ services and fully embedded, programmatic services.
2. **Training needs:** The EL’s observations and feedback from the group led to insights about gaps in training and support that could be filled by the Library and by research groups. These are outlined in Section 5.3.
3. **Reflective practice**: Researchers who engage in reflective practice may have an advantage in understanding their information needs and the direction of their research, but no one in the group had been exposed to reflective practice as part of their formal training. Section 6.1 suggests ways of fostering reflective practice within the group.
4. **Knowledge management:** Although the group does an admirable job of sharing knowledge, there are some key elements missing around handover and unpublished research. Section 6.1 makes recommendations for addressing these needs.
5. **Timing:** The timing of embedding services is important, especially for supporting PhDs. This should be considered before embedding in the future. Section 6.2 discusses the issue of timing support with the research lifecycle.
6. **Promoting the Library’s services and expertise:** Current promotion of the Department of Engineering Library’s services is fairly passive, relying on researchers to identify that they have an information need that the Library could help with. With a better understanding of researchers, the Library can target specific groups with relevant messages and support. Section 6.2 highlights some lessons learned from the pilot that may help the Library promote its services more strategically.
7. **Relationships:** By the end of the pilot the EL had a good relationship with the group that has carried on since. Researchers use people they know as resources for information; if the Library can replicate the sense of ‘our librarian’ that developed during the EL pilot this may help researchers identify when librarians are a resource they can use. Building partnerships and mutual understanding between researchers and the Library team is key to successfully implementing the service and training developments discussed throughout this report.

Practical steps leading from this project are as follows:

* Share findings with the Department of Engineering and the wider library community. **Action: Embedded Librarian.**
* Evaluate training provision and enhance based on insights into information needs. **Action: Library team**.
* Develop strategies to promote services to key users (e.g. postdocs) and develop relationships throughout the Department. **Action: Library team**.
* Map out a model for tiered research support services, from standard to fully embedded, sharing it with researchers and staff in the Department. **Action: Library team**.
* Publish the research in a peer-reviewed journal. **Action: Embedded Librarian**.

# Introduction

 Ask researchers what they think a librarian does and the answer is likely to owe more to misconceptions than to recent first-hand experience. This was true for the majority of members of the Use Less Group, a research group in the Department of Engineering at Cambridge, where the impressions seemed to have a single image in common: a librarian is someone who sits behind a desk and organises books. While this stereotype is met with chagrin by many who work in libraries today, the fact remains that it is based on the small percentage of tasks that users see, like the tip of an iceberg, and the majority of the skills and expertise of librarians is largely invisible to their users.

 What happens when you turn the tables and ask a librarian what they think researchers do? Early in 2016 a member of the Department of Engineering Library team was asking this of herself. As a Research Support Librarian she could speak generically about concepts such as research data management (RDM) and managing references, but she had little concept of what this looked like in the actual day-to-day work of the researchers she supported. Not only did the users not know what the Library team could do for them, but the Library team were searching for a deeper understanding of what services and support would most benefit their users. This mutual misunderstanding was a barrier to the kind of partnership the Library team strives to develop with the Department.

 The best way the Library team could think of to bridge this divide was through a model known as ‘embedded librarianship’, where Librarians are located in the primary work environment of their users and develop a personal relationship with them. The Library team decided to identify a group willing to let a librarian work alongside them, pilot services and study the potential for such a role in an Action Research project. For the first three months of 2017, a member of the Library team worked alongside the researchers in the Use Less Group as an Embedded Librarian (EL), attending meetings, answering queries, working on projects related to the aims of the group, working with individual researchers to improve their practices and reporting on the various projects to the group’s Principal Investigator (PI). This provided an in-depth glimpse into the lives of a group of researchers that has already and will continue to impact the Library.

 The current report is an attempt to capture initial insights in preparation for further outputs and will discuss some of the background literature on how Cambridge librarians previously understood researchers and for embedded librarians around the world in Section 1, while Section 2 describes the method used by the EL before, during and after the pilot project. Section 3 describes an outsider’s view of what the Use Less Group is like based on observations, conversations and ethnographic data collection and Section 4 describes many of the activities and impressions of the EL during the pilot. The discussion of findings in Sections 5 and 6 is broken into an assessment of the pilot and the developments to services and training that it suggests, followed by insights for the Use Less Group and insights for the library team. Section 7 discusses the potential for further work to be done with this material and future research around this topic.

# 1 - Literature review

 In outlining a project with the aim of trying to better understand researchers it is important to establish what was known before the project. The Engineering Library team had an awareness of some of the topics being researched in the Department and had a broad understanding of the roles and responsibilities of ‘typical’ Cambridge researchers. There existed a level of awareness of the types of research happening in the Department of Engineering that derived from conversations with academics, teaching and training conducted by the Library and attending talks and meetings within the Department. However, there was little documentation of this understanding and it tended to be topic-based rather than experiential; prior to the EL pilot there was a better sense among the Engineering Library team of what researchers are working on than there was of the experiences, methodologies and motivations behind this research.

Some of the understanding of what it is like to be a researcher that Cambridge librarians can claim comes from work by Cambridge University Library. In 2012-2014 they shadowed and interviewed a large number of Cambridge academics to gather evidence that would underpin the FutureLib Programme for innovating library services. Key insights from this research were shared with the Cambridge library community in a series of presentations and informed what the Engineering Library team understood about what it was like to be an academic. They observed that academics have many roles and identities beyond research, including teaching, administration, applying for funding, chairing meetings, providing mentoring and support and managing their research groups (Marshall and Priestner 2016). The more senior an academic was, the more roles they took on; as such the most senior academics tended to closely manage the many demands on their time.

Management and cultures within research groups tend to vary widely, both based on management styles and discipline cultures. A common thread throughout was the gap in support for early career researchers, who are expected to take on a host of new roles and activities for which their previous training has not necessarily prepared them.

‘Early career academics are expected to be good at doing grant applications, recruiting, developing and managing PhD students, teaching, tutoring and time management. They are often not prepared for this – there seems to be an expectation that young academics will ask for help when they need it. Those who are less vocal or less savvy miss out on informal support within their department’ (Willatt 2014).

The quote above points to a gap in training, perhaps stemming from the mutual misunderstanding between librarians and researchers. However, there are academics who recognise the importance of information skills and make the connection between those skills and the expertise available in the library. After a conversation with a senior academic in the Department of Engineering during the course of writing a report on future library services for the School of Technology (Tumelty and Lamb 2016), the Department Librarian began to consider ways in which librarians might collaborate with and work alongside researchers for the benefit of both. When a member of the Library team came to her with concerns about understanding how researchers use data, they arrived at the same idea: embedded librarianship.

The phrase ‘Embedded Librarian’ (EL) is in common usage in academic librarianship literature and refers to a wide array of roles, relationships and situations. The definitive source on the subject is the study by Shumaker and Talley (2009) that surveyed the Special Libraries Association (SLA) membership in an attempt to classify the activities, funding structures and indicators of success of librarians they identified as embedded. This allowed them to develop a broad definition of embeddedness and pose several recommendations for successful deployment of ELs.

To some authors and service providers, ‘embedded’ equates to co-location with a particular user group. This stems from institutions that have replaced departmental and subject libraries with a centralised building housing the library collection and services. In this definition, ELs are based in a department with support from a central library, either permanently or for a certain percentage of the time as mobile librarians or onsite reference services (Schulte 2012). ‘Embedded’ can also refer to library instruction that is part of a curriculum, either live or virtual, developed in partnership with teaching staff (e.g. Muir and Heller-Ross 2010).

It is worth noting that the Department of Engineering Library at Cambridge already provides services that resemble both of these models of embeddedness. The Library team is physically based in the Department of Engineering alongside their user group; visit outlying laboratories on a weekly basis to provide mobile research support; work with teaching staff to develop information literacy instruction for undergraduates and postgraduates, which they deliver as part of the research skills training offered by the Department; and develop content for Moodle, the Virtual Learning Environment (VLE). Shumaker and Talley (2009) found that as many as 45% of survey respondents met their definition of EL by providing ‘specialized services to specific groups’, indicating that many libraries already have close ties with their user groups that could be described as embedded.

The difference that Shumaker (2012) highlights is in the relationship between the librarian and the information landscape of their users. Whereas traditional librarians need not understand the underlying goal or need behind a reference enquiry, ‘Embedded librarians need to be fully “read into” the nature of the work being performed,’ whether through engagement with a taught course, participation in organisational meetings or co-investigating on a research project. The term ‘liaison librarian’ is often used interchangeably for this type of embedded role, with its dual focus on consultancy and advocacy (Bracke 2017).

The most highly specialised embedded services are in the medical field. ELs who work as ‘informationists’ combine the skills and knowledge of an information specialist with a background in medicine in order to provide in-depth literature reviewing services in a clinical setting, and more (Shumaker and Talley 2009, p.8). Greyson et al. (2013) discuss their qualitative study of what they termed ‘research-embedded health librarians’ (REHLs), ELs who focus more on research support than clinical support. They found that some REHLs identify more strongly as researchers than librarians and discuss the challenge REHLs face in maintaining expertise in both information and health sciences (pp.294-5).

Outside of the clinical and medical disciplines, research based ELs receive more scant attention, making up only five of the 56 articles discussed in the literature review by Abrizah et al. (2016). The research-based EL model involves academic librarians working directly with faculty on specific projects or long-term as a member of a research group (Carlson and Kneale 2011) and takes advantage of the skills of library professionals in relation to the rapidly changing scholarly landscape. Literature about research-based ELs tends to include a discussion of the person specifications required to be successful in those roles (e.g. Freiburger and Kramer 2009; Greyson et al. 2013; Carlson and Kneale 2011) as well as the tasks they perform. Using the term ‘informationist’ outside of its traditional context, Bracke (2017) defines the role as ‘a professional with information expertise and experience with a specific academic discipline, providing in-depth services within the work context of that discipline’, such as in a lab or research group. In Bracke’s definition of informationists, subject expertise need not come from academic qualifications, but may derive from experience working closely with researchers in that discipline.

In addition to information expertise and subject knowledge, the authors above cite ‘soft skills’ such as flexibility, relationship building, shared goals and self-motivation as key attributes for success. The relationship between the EL and researchers is paramount and Shumaker describes it as follows:

‘The embedded librarian becomes just as engaged in the work of the team as any other team member. As the engagement grows, the embedded librarian develops highly customized, sophisticated, and value-added contributions to the team.’ (2012, p. 4)

Going beyond a reactive response to issues or queries brought to their attention, an EL is in the position to anticipate and plan ahead, ‘[customising] contributions to meet the most important needs of the user group’ (Shumaker 2012, p. 19).

Value-added services need not go hand in hand with subject specialisation and in their case study Fitzgerald, Anderson, and Kula (2010) describe an EL model that bucks this trend. Based in an innovation hub, the University of Toronto Libraries developed an academic information consultancy role serving business entrepreneurs. As these ELs were faced with diverse queries and situations every day, they considered it an asset to have an interdisciplinary approach. For each new client there was a phase of rapidly getting up to speed with the discipline and information skills were specialisation enough to meet needs of clients.

Whether they are working in a discipline they know well or adapting to a new problem with every query, ELs are challenging perceptions about the role of libraries in research: ‘These projects are examples of contributions to research that redefine librarian roles and help rewrite librarian stereotypes’ (Brandenburg et al. 2017). Research-based EL services have the potential to foster mutual understanding and collaboration between researchers and librarians.

Research-based EL models may be either project-based or programmatic in nature, with the EL ‘Working directly with the faculty they serve as collaborators on research projects or as an integral part of a research team’ (Carlson and Kneale 2011). Project-based ELs may be brought in as part of a grant application to fill a specific role or service for a shorter timeframe, whether that is conducting a literature review, performing indexing services, assisting with funding applications or helping to manage data on an individual project. Funding for these roles is increasingly accessible as funding bodies are becoming aware of the value of diverse research teams and broader information skills. ‘Librarians are seen as an important component of the research team, particularly with the emergence of requisite Open Access policies as well as policies governing research data management.’ (Bedi and Walde 2017) Programmatic ELs, on the other hand, provide an ongoing service, just as a co-investigator might work with a particular research group over the course of multiple projects. Bedi and Walde (2017) highlight other paths to embeddedness, such as research interest, where librarians’ own fields of study intersect with that of a particular group, leading to collaboration, and faculty members recognising a need for library intervention in their research group.

Shumaker and Talley define the success of an EL programme as, ‘An increase in the number of librarians providing services to the customer group; an increase in demand for services from the customer group; and an increase in the number of different services provided to the group.’ Based on their extensive survey they asserted that, ‘Successful embedded librarians are excellent relationship-builders, with strong knowledge of their customers’ work, and they deliver highly sophisticated, value-added services’ (2009, pp.6-7). However, the criteria for success of these programmes have not been expanded upon or fully fleshed out (Carlson and Kneale 2011, p.170), and consultation with the users of the services has yet to be included in a write-up as evidence of success. While increased demand is certainly indicative of success, it is unclear where EL services are succeeding and failing without input from their academic colleagues.

 While there are case studies of librarians embedding in research groups, the current literature search has not returned examples in which users of these services have been involved in data collection or analysis (Janke and Rush 2014, p.120). As such, the predominant form of evidence for the success of research-based EL is self-reporting by, or interviews with practitioners. These studies provide rich data on the experience from the practitioner’s perspective, for example this quotation from a Canadian research-based EL:

‘”What I bring to the discussion is the perspective of people who have been in other places. And so I can sort of step back and look at the situation in a way that some of my colleagues [Faculty] cannot… It’s the kind of adaptability [that] makes [librarians] core key members of research teams…They’re like the fluid that moves.”’ (Bedi and Walde 2017)

However, the missing piece is how these services are perceived by users. The adaptability discussed here and in similar papers is an opaque and abstract concept without a glimpse into the context of the research group.

The word ‘embedded’ means different things to different authors and, while there is a large body of literature on the topic, relatively few studies have dealt with the model of ELs as co-investigators in research groups outside of the medical profession. Few studies have gathered data from the users of EL services, which means that the dominant voices in the literature are the EL practitioners themselves. Surveys and literature reviews have revealed the scope of roles and activities associated with embedded models of librarianship, and interviews and case studies have presented accounts of existing services from the practitioner’s perspective. There is a gap in the literature around piloting and evaluating a research focused EL service with a practitioner who does not have a background in the subject they support. There is also a rich, untapped source of data on the perceptions and effect of these programmes on the users themselves.

# 2 - Method

 The aims of the EL pilot were twofold: first, to assess how viable embedded services might be in an Engineering research group and what those might look like; second, to gather insights about how research is conducted in the Department, including how people use and manage data, how people reflect on their work and how people perceive library services. A member of the Library team was selected to embed in a research group both to pilot this service and to conduct research to meet these aims.

The overall approach to the research was inductive, but the emphasis from the beginning was on a) service development, b) identifying training needs and c) any other insights that might arise. These three strands formed the overarching structure for analysis. The research questions that were implicit from the beginning and became explicit through the study were as follows:

* What is it like to be a researcher in the Use Less Group? What tools and resources are used? How do they think about information and data? What strategies and needs do they have?
* Can a librarian without an engineering background provide information services to an engineering research group in an embedded role?
	+ What might that role look like?
	+ Would those services add value to the group beyond those already provided by the Library?
* What services, training and outreach strategies could be developed based on insights from this experience?
* What perceptions do researchers have of librarians and will those change? How could that inform strategies that the Library could use to better promote its services and expertise?

Answers to these questions are complex and are not definitive after a single case study, but they were important in terms of providing a useful framework for considering key outcomes from the pilot.

Since the EL was embedded in a context based in her own place of work and the emphasis was placed on service development, Action Research (AR) was identified as the most appropriate method for this project. AR focuses on practitioners solving a problem by changing something about the context, making this well suited to organisational research based on developing and deploying interventions (Greenwood and Levin 2007). Ethnography, User Experience (UX) and Phenomenology provided inspiration for the data collection methods employed. Prior to commencement, the project received ethics approval from the Department and consent was acquired from participants to publish anonymously any excerpts from the studies.

## 2.1 - Data collection

 Prior to the pilot, focus groups were conducted by the EL to gain a sense of how the Use Less Group thinks about information, the topics they work on and their relationship to library resources. During the pilot, ten volunteers participated in a diary study, completing a diary entry about their work every week for ten weeks. This allowed the EL to have a glimpse into evolving research as well as the tools, resources and activities that the participants use on a regular basis. It allowed the EL to gain a more intimate knowledge of the topics and approaches the participants and to respond to any problems that arose. To gain a sense of how the EL pilot was received by the group, users and non-users of the service were selected for exit interviews at the end of the three month project.

 The EL kept a daily log to record observations, notes, plans and reflections during her time with the group. She noted down queries as she received them and tracked how much time was spent on each task, rounded to the nearest five minutes. Details of the data collection methods, including interview schedules and diary prompts, can be found in Appendix 2.

## 2.2 - Analysis

The EL’s point of reference for data collection and analysis was in Phenomenology, a research approach that is interested in exploring human experience (Given 2008). It was therefore not the EL’s intention to analyse the researchers’ statements in a way that created hard categories that could be subjected to statistical analysis, but to consider the broad range of ways in which researchers conceptualise their strengths, weaknesses, decisions and practices.

Diary study entries were coded on a weekly basis and the coding categories were recorded in a spreadsheet. The categories were emergent (Saldana 2013), highlighting ideas for interventions, service development and training needs; tools and resources in use; relational aspects such as meetings, presentations and mentoring; and reflective statements. The list of codes also acted as an index to the diary entries. There has been no second cycle of coding analysis performed to date, but excerpts from the diary study were analysed during the ideation stage of the project.

 In an ideation session conducted with one of the Engineering Department Librarians, excerpts from each of the studies were categorised thematically and potential service developments were discussed in the context of the evidence. A follow up session focused on translating these statements into pragmatic outcomes in terms of training and service development. Additional analysis was conducted by the EL reading through the body of evidence, highlighting the text and writing reflective notes. This analysis focused on pragmatic questions of EL and library service development as well as the Phenomenology of information literacy (IL). Ultimately, the analysis owes more to conversations, writing, reading and narrative analysis than to narrative analysis, as is appropriate for a Phenomenographic, user-centred method.

 A final level of analysis will be of the responses to this report from the group. A questionnaire will allow members of the group to comment on how they think this report portrays their group, in an attempt to establish ecological validity (Bryman 2008, p.33), and to express any ideas they might have for service development or training needs in a co-creative process.

## 2.3 - Limitations

The methods selected for this study are undeniably subjective and were modified from their textbook form in order to suit the time frame. While the strength of AR is its intimacy with a particular context, this makes it difficult to argue that the researcher can maintain critical distance or that results can be generalised. In the case of practitioner research, these hazards are unavoidable. This is a flaw that AR embraces for the trade-off of deeper understanding and familiarity with the context and the quality of insights.

Practitioners of AR justify the method through its outcomes, whether those are solving a problem, designing a service, or reflecting on one’s own practice. The solutions and insights generated by an AR approach are derived from the collaboration between the researcher and participants. By focusing on the experiences of researchers in a single research group, this study is attempting to capture something of what it is like to be a researcher in order to improve services and have a direct benefit to the users of the Department of Engineering Library.

The Use Less Group is not a microcosm of researchers in general, however, or even of the Department of Engineering. A single case study is problematic if it makes assertions about external validity. However, this study could function as a critical case for whether a librarian without subject expertise can embed in a research group and provide effective services. Failure in this context would be indicative of potential failure in other contexts, even if success in this context does not guarantee it elsewhere. This example is better understood as a critical case than a representative case, as it is unclear how typical the ULG is to other research groups (Bryman 2008, pp.55-6). In order to establish credibility, the Action Researcher must be meticulously transparent about their assumptions, ideologies and decisions. They must describe the context in rich detail to allow the reader to decide how well it applies to their own situation. Ultimately, though, the success or failure of an AR case study is in the growth of understanding that leads to improvements in practice or services.

# 3 - Context

The Use Less Group (ULG) are a research group in the Department of Engineering at Cambridge who are investigating resource efficiency and material demand reduction in pursuit of real change to the sustainability of major industries. ‘Our priority is finding new ways to use less resources to support great lives’, the group’s website proclaims. ‘The technology, system and policy changes we’re pursuing are practical, are big enough to make a significant difference, and can be implemented in reality.’ (ULG 2015) This is the ambitious work of around 20 researchers and PhD students, led by Professor Julian Allwood.

The research area of the group is expansive, but linked by the above mission. Among the researchers are economists, a social scientist and engineers from a variety of backgrounds, researching topics as diverse as haptic interfaces, re-use of steel, demand for resources in cities and financial and social drivers of material efficiency. This diversity is organised into three subgroups into which individual researchers fit:

* Whole systems thinking
* Material efficiency
* Novel materials processing technology

Several study participants discussed the ULG as existing as a spectrum, from ‘hard-core engineering’ on one end to material efficiency, with social science, economic analysis and policy related work on the other end. Throughout projects, researchers may move along the spectrum, but tend to have a sense of themselves as existing chiefly at one end or the other. 

One PhD student complicated this model by characterising the group’s research as a triangle made of interdependent facets: engineering and technology, industry and the policy frameworks in which the first two operate. This is perhaps a more useful way of describing the group; any individual project may sit in the middle of the triangle or on a point closer to one or another of the three corners, but the goals of the group demand that every project considers the push and pull of political and industrial ecosystems on technological innovation.



The ULG works so closely with another research group as to be almost indistinguishable, although they are categorised into two different academic divisions in the Department. Members of the groups share office space, attend the same meetings and seminars and collaborate frequently on projects. This second, smaller group focuses on energy and exergy research and is newer relative to the ULG. For the purposes of this study they were considered part of the ULG, as they make significant contributions to its workplace culture and research.

Owing to issues of space the group is divided between two offices, which are separated by the group’s lab space. Although they are close to each other, practically speaking this means there is a tendency toward less contact between researchers in the different offices. Even within offices conversations are mostly between colleagues whose work most closely relates or who are actively collaborating. However, knowledge transfer is a priority for the group and is facilitated by a number of regular meetings. Every Monday during term time the hour-long ULG Seminars are an opportunity for the group to learn about work in progress from one person and then to chat over coffee and cake. The subgroups also meet on a regular basis to share and discuss work in progress or work toward group projects. Knowledge transfer between outgoing and incoming members is managed through handover folders, a hard drive containing a folder of the outgoing researcher’s work, ‘organised as they kept it themselves’.[[1]](#footnote-1)

There are two major upcoming projects to which many members of the group are contributing. The first project is a book that will be a non-academic overview of the construction industry, highlighting evidence-based insights for increasing sustainability in the design and decision-making processes. During the pilot there were discussions underway about the contents of the book and its potential audience. This would be the second book put out by the group, after the popular *Sustainable Materials: With Both Eyes Open*. The second project on the horizon for the group is hosting the 2017 International Conference on the Technology of Plasticity (ICTP), an annual conference on plasticity in metal forming. Members of the group are working on selecting papers, organising venues and even producing a huge sculpture of a peacock that will showcase metal forming processes developed at Cambridge.

The day-to-day work of group members reflects the varied nature of their research. Postdoc researchers divide time between their own research, collaborations, meetings and providing guidance and mentorship to the PhD students in the group. This includes reading drafts, providing advice and giving software development support. PhDs have similarly intense schedules, divided between supervisions, meetings, projects, lectures and conducting their own research, not only for their dissertations but for publication as well. For some this research takes the form of data analysis, literature reviewing or writing, while others have the added element of experimental research through computer modelling or tests of specially designed metal forming machinery. Members of the group frequently travel for conferences, site visits and meetings with industrial partners. This contrasts with days on which they might spend eight or nine hours at their desks reading, writing, coding, analysing or managing their information and data.

With so many topics covered and so many methodologies used in a single group, it is difficult to characterise a typical ULG researcher. The commonality is perhaps a sense that problems this complex cannot be solved by a single method or a single discipline and a deep interest in the work that outshines even the heart-felt environmental aims. The buy-in to interdisciplinary work might contribute to the group’s reliance on using other people as resources. There is a strong culture of collaboration that pervades their activities, ranging from filling a small gap in knowledge by having a conversation with a colleague, to partnering with experts in different institutions and disciplines.

Communication through various forms of writing is essential to the group’s ethos. There is the collective sense that their work is worthwhile inasmuch as it has the potential to impact policymaking and industrial processes. This means that in addition to academic journal articles, the group contributes to opinion pieces in newspapers and popular journals, policy advisory reports and the aforementioned books, all of which are aimed at a more general audience. The emphasis on communication is woven into the fabric of the group from the activities of the PI to the first year PhDs. Professor Allwood delivers a series of workshops on writing to the PhDs, covering a range of topics including concise writing, writing for a general audience and producing grant proposals. Each of these sessions had an emphasis on awareness of the audience and communicating a clear message. The sessions give students the chance to practice writing and receive feedback in a supportive environment.

Pre-existing use of the Engineering library varied as much as the research topics. While many confessed to rarely or never using the library, some used it as a space, while others relied pretty heavily on physical resources, including Inter Library Loans. One person mentioned that consulting a librarian on finding data at the beginning of his work was very helpful and saved him a lot of time, but no one else discussed making use of the expertise at the library or mentioned thinking that this might be worthwhile. Before the pilot commenced, the consensus seemed to be that the library was a physical study space and a place to get published resources, not a place to find experts or ask for help. Among those who expressed a preference there was a strong emphasis on open source software, open research and open access resources. Past experience with publishers who focused on profits over quality left the researchers with a strong bias against those proprietary journals and tools. Negotiating data sharing is an integral part of partnerships between the ULG and industry. Even first year PhDs expressed a strong preference for openness and an awareness of IP and data re-use issues.

There is not a ‘typical’ ULG researcher but a community of researchers with different information needs and practices. These individuals share some common beliefs about the importance of their work and the value of open research, but the EL pilot was primarily interested in supporting their diverse practices and needs as well as furthering their research aims. The question of how typical this group is of the Department of Engineering or of researchers more broadly is beyond the scope of this report.

# 4 - The Embedded Librarian pilot

Before the pilot project the Engineering library team had a broad understanding of research at Cambridge, as well as an awareness of some of the topics explored by researchers in the department. However, there were significant gaps in their knowledge that showed when they were asked to provide detailed advice on research data management, specialist databases, patent searching and the like. Embedding library services in a research group emerged from the School of Technology Report written by the Engineering Department Librarian (Tumelty and Lamb 2016) as an idea both for filling these gaps in knowledge and developing an innovative service along the lines of the work by FutureLib discussed in Section 1. The ULG was identified as a willing group and arrangements were made to embed a member of the Engineering library team for three months as a trial of the service.

From January to March 2017 the EL sat in one of the ULG’s offices for three days a week and spent the other two days working on administration and analysis of the research project side of the pilot. The role was a speculative one, with few specific tasks outlined beforehand. The only project on which the EL had been was to think about how an ontology for the ULG’s research area might be developed. Initial work for the first few weeks consisted of getting up to speed with the ontology project, becoming familiar with the group’s research area and gathering data for a report on the metrics for the groups publications. The focus of the project then shifted to promoting the opportunity for one-to-one meetings and responding to individual needs discovered during the project.

At the end of January the EL noticed a Green Paper that had only recently been published, was relevant to the ULG’s research area and was open for comment and response. She raised this as an opportunity for impact with Professor Allwood, who agreed that the group should comment on the document. Over the course of the pilot, the work for the ULG resolved itself into three major projects (discussed in more detail in Appendix 3):

* Ontology project
* Bibliometric report
* Green Paper response

By the end of the embedded period, these projects formed the majority of active work on the ULG pilot, equating to about 185 out of 346 hours spent directly on work for the ULG over three months.[[2]](#footnote-2) The ontology project received by far the most attention - more than 85 hours - followed by 34 hours for the Green Paper response and 30 hours for the bibliometric project. This breakdown came as a surprise to the EL, who had anticipated more day-to-day queries, literature searching on behalf of members of the group and other tasks that more closely resembled the work typical of an academic librarian. Contrary to these expectations, the breakdown of tasks ended up more closely resembling that of a researcher. The EL produced individual reports to the PI on the progress she had made on each of these projects.

The other interactions that formed part of the EL’s work were recorded in the research log and spreadsheets. These included 14 direct, in-person queries from members of the group, and a further seven queries received by email during the pilot period. Topics ranged from access to resources to Open Access publishing protocols. The EL forwarded information about resources to several members of the group based on knowledge of their topics and methodologies and was able to provide more in-depth support to five members of the group in one-to-one meetings.

The EL attended ULG meetings and seminars and occasionally socialised over tea breaks, but for the most part the research group’s offices were fairly quiet and studious. Conversations broke out at the beginning and end of the day, at lunch time, or when two or more researchers had a discussion about work and were not held at a whisper. However, silence was the norm and many research group members used headphones while they worked. By the end of the pilot the EL felt like an insider in the group, which was friendly but not so close-knit as to be exclusive, perhaps due in part to the frequent turnover of PhDs and Postdocs. This was echoed by statements from members of the group and was reflected in the number of queries the EL received from ULG members after the pilot ended.

The original proposal was for the project to be structured into different phases. For the first half of the embedded period the EL was intending to be reactive to queries and prompts, more like a traditional librarian sitting with a research group, then in the second half she would develop some form of intervention to test. This structure evaporated quickly; the autonomous character of day-to-day work in the research group and the time spent on the large projects meant that interventions were made on a much smaller scale and implemented when the EL considered that they would be of use to the group. By the end of the first month the pilot became focussed on the higher priority projects and possible future interventions that were beyond the scope of a three month pilot were noted down to inform the service design dimension of this report.

 Three months of part-time work was too brief to simultaneously work on multiple large projects, develop interventions and have one-to-one meetings with every member of a large research group. Over a longer period of time, an EL might be able to explore knowledge management (KM), compile discipline-specific online resources, develop data management plans and visualisation guidance or work with more researchers on improving their information workflows and strategies. These, along with other potential specifications of an EL service, are discussed in Section 5.2. In this instance the EL role resembled a mixture of the programmatic and project-based embeddedness described by Carlson and Kneale (2011). In retrospect, the short time-frame would have suited a project-based model better. However, the experience generated numerous ideas for what programmatic and project-based EL services might include and, more importantly, fostered the development of a stronger relationship between the library and the ULG.

**Case 1 - Hector**

Hector is a first year PhD student in the ULG. As one of the whole systems thinking subgroup, he sees himself as sitting at one end of a spectrum, the other end of which is applied engineering and technology.

Over the three months of the EL pilot Hector has gone from having a very broad sense of what his research question might be, to having narrowed the scope of it in collaboration with his industrial sponsor.

The EL project was somewhat helpful to Hector, but he thinks that it would have been more helpful when he was actively working on his literature review. During that process he had to switch strategies from starting with

His perception of librarians has changed thanks to the pilot project. A self-professed non library user, he assumed that conversations with librarians would not prove to be relevant or useful to his research. Now he has the sense that particularly when it comes to finding data sources and ‘knowing what’s out there’, it might be worth his time in future to speak to a librarian.

However, he retains the concept of a librarian as someone who is helpful for finding things as opposed to someone who might be able to help develop strategies around information retrieval and management.

# 5 – Discussion

## 5.1 - Assessment of the EL pilot

 The research methods chosen for the EL pilot do not lend themselves to a simple quantitative assessment of the project. Shumaker and Talley (2009) evaluate the success of EL programmes through, ‘An increase in the number of librarians providing services to the customer group; an increase in demand for services from the customer group; and an increase in the number of different services provided to the group.’ In the case of the Engineering EL pilot the first criteria is irrelevant and the second will take more time to determine. For the purposes of this report, the criteria with which to judge the pilot are based on the outcomes that can be determined through observation, user feedback and reflection. The criteria addressed in this section are as follows:

1. **Value-added services:** Did the group see a benefit to embedded services over those normally provided by the library?
2. **More people aware of and using library services:** Did the relationship between the EL and the group lead to a better understanding of how librarians can help researchers and did this translate to an increase in use?
3. **Quality of insights gained:** Did the insights gained have a positive and transformative influence on library services, training, attitudes and understanding?

The evidence for the first and second categories comes primarily from statements by the researchers themselves, who will also have the opportunity to respond to this report to corroborate or reject the account and provide further ideas for service development.

### 5.1.1 - Value-added services

 The value of a service is difficult to define. According to this criterion the ‘traditional’ library services provided by the EL – answering queries, helping people find resources, etc. – might be the least valuable because they are the exact same services available in the Library itself: added value seems to derive from the Librarian working alongside the group. Convenience is not the only benefit of this arrangement in this case; it also contributed to a sense that the EL belonged to the group. One researcher expressed a sentiment echoed by several others as follows:

 ‘It was a lot more personal and I knew she was the librarian of our group for that time, so I was kind of freer to ask her even maybe stupid questions or even things she didn’t know and I knew she would go and find out about it, because it was her specific job. I guess I would feel less so if I was to talk to a librarian that is everyone’s librarian, or even just the engineering librarian… It just feels more personal and I feel she’s more involved with us than anybody else, so if she doesn’t know something, she can go and ask somebody else. But she would be my first point of contact.’[[3]](#footnote-3)

Indeed, one participant reflected that they would be more likely to come to the Library to seek out advice or support after getting to know an individual librarian. To them, the personal relationship would be an asset more than the distance would be a barrier.[[4]](#footnote-4)

This level of personal contact led to more in-depth, tailored services such as the ones described below:

‘I was trying to choose a journal to submit a paper for, so we talked a bit about ways of finding different ones of those and interpreting metrics and things like that, which I kind of wasn’t completely new but I didn’t know exactly what the difference was between cite score and SNIP and all of those and what kinds of things you might want to look at.’[[5]](#footnote-5)

‘I had a chat with Kirsten about literature searching, which was quite helpful – just to talk about the way that I do that. And I think that will … I haven’t done a great deal of it since but I’ve tried to put that into practice and when I’ve been doing that I think that will make a difference to what I do.’[[6]](#footnote-6)

‘I’ve been focusing so much on academic journals and not so much on industry and we went through some ways to look at patent searches. That was incredibly useful.’[[7]](#footnote-7)

‘She offered tailored feedback to each member of the group on how to manage their online profiles via Symplectic, ORCID, Scopus and Google Scholar. She took the time to walk me through these steps and in the process of doing this found that the Daily Mail had written an article on one of my papers. She also explained to me how I could compare the number of citations I have for my papers to subject/journal specific indicators. This allowed me to put together a well-informed impact statement for a job application I was working on.’[[8]](#footnote-8)

The personalised support was not just one-to-one. Through getting to know the research topics and methods in the group the EL was able to provide targeted guidance to the sub-groups. She presented on patent searching and other resources available at the novel materials group meeting, based on a firm knowledge of what those researchers needed. The feedback was generally positive:

‘She went through a lot of different ways of searching for patents, and that was quite interesting actually. …She showed us a website… and I used it today actually and I wasn’t aware of it. … I searched for a few key words and I immediately found what I needed. … Yeah, her talk was quite nice, actually. I was able to learn quite a bit.’[[9]](#footnote-9)

When asked about whether the EL pilot added value to their work, participants painted a complex picture of how it was perceived. Few felt the EL had a huge impact on their research in terms of moving it forward, but several noted that they felt the influence on their practice, whether that was through giving tips on workflows or resources, or through providing the opportunity to reflect on their work in the diary study.[[10]](#footnote-10) Others observed that it was valuable to work with someone who had a different perspective on the work they were doing. ‘I think that the real value of having an Embedded Librarian is that they can help you with things that you didn’t know you needed help with!’[[11]](#footnote-11)

### 5.1.2 - More people aware of and using library services

It was important to the EL to balance the input from researchers she spoke to with input from non-users of the service. These people provided valuable insights into different facets of the group and a better understanding of why people do not make use of the Library in general. Feedback from research group members focused on the perception that the nature of their work was not aligned with skills or expertise available in the Library; the perception that librarians would not understand their work and therefore would not be a useful resource; and the timing of the EL pilot being suboptimal for making use of the Librarian’s expertise. These barriers to use and the implications for promoting library services are discussed in more depth in Section 6.2.

Even among people who did not use the EL’s services while in the group there was a change in the perception of what libraries might be useful for, including information about data sources, publishing and building a search strategy. For one PhD student this experience was eye-opening, even though they did not consider that the EL had a big effect on their own work:

‘My perception of a librarian was someone that sat behind a desk and sorted out books, which is quite a rudimentary way to look at it. But then that’s the only experience that I’ve had with a librarian… Now I think about a librarian as someone who is able to handle knowledge, not just books, but just knowledge in any form, whether that be interviews or helping people do their own research. I’ve a more positive view, not that I had a negative view before, but I think there are so many ways that it can be useful.’[[12]](#footnote-12)

One participant credited the EL’s presence *in situ* for this change in perception. ‘I feel like people in the group have become more aware of how it could be helpful to talk to people because they’ve been confronted with specific examples that are relevant to what they’re doing, which is a lot easier to relate to than abstract things about helping with managing information or whatever.’[[13]](#footnote-13) Seeing how information management played out *in situ* was a learning experience for both the researchers and the EL, building relationships and mutual understanding relative to the level of interaction.

 Despite the number of participants who expressed a positive change in their view of the Library, the value of this pilot in building relationships will only be fully understood over time, as the proof will be largely in the ongoing interactions between the ULG and the Library.

‘Relationship building can be evidenced when a one-time collaboration leads to additional projects, ranging from faculty members returning to seek additional help or clarification, continued conversations about subject matter or shared interests, or the opportunity for co-authored publications.’ (Díaz and Mandernach 2017)

The early indications are positive, however, with ongoing contact between the EL and ULG including email queries as well as discussions of potential future collaborations. Whether this is a relationship that will last through changes in the library team and ULG membership remains to be seen. Knowledge management, leadership by example and continuing engagement may help reinforce these links though personnel changes.

### 5.1.3 - Quality of insights gained

Evaluation of AR is often based on the quality of insights gained. AR values insights that lead to improved practice, which in turn inform theory and drive further research. AR is, ‘relative to a specific context, and is valid insofar as it is useful, appropriate, and shared within that context’ (Jefferson 2014). Insights may point to good practice in other analogous contexts, but that is up to the judgment of the reader.

From the Engineering Department Library’s perspective the EL pilot was a clear success due to the insights gained. One of the most effective aspects of AR is its ability to open channels of communication that previously did not exist to improve mutual understanding (Jefferson 2014) and in this case doing so has had a profound impact on the Library team’s understanding of research, data and the perspectives of researchers. This deeper understanding seems to be mutual, based on accounts from members of the research group. Furthermore, the Library team is using evidence from the study to develop ideas for improving services, training and promotion. These are discussed in more detail in the following sections.

At the end of the pilot there was an attempt to capture some sense of whether participants, particularly the postdocs, could see a role for an EL in the future and in other groups. One person who was working on the ontology project noted that the topic of the project might influence the level of involvement that a librarian might have:

‘This project seems kind of unique because it was explicitly about information management almost, so I guess that seems a bit different from other projects that you might work on. I can imagine that having a librarian working on projects would be very useful but in a kind of different way, like not so much actually working on the project but it could be very useful for helping the project, you know, all the things that you do - researching literature and identifying things that are going on and finding resources, finding data, organising - all the stuff that you do as a researcher on a project. … I guess it would be like a supporting role as opposed to actually doing the research.’[[14]](#footnote-14)

This researcher seems to see the potential for librarians supporting research in an embedded role and co-investigating when a project centres on information architecture or information management.

Others saw the value as broader than that: ‘People who spend their whole lives thinking about how to store and link and how to better access information, I think they have a wealth of information that could be useful to people who are trying to use it, because if you understand the process then you can use and look for it in a much more efficient way. I think any group would be interested.’[[15]](#footnote-15) This is an optimistic assessment. Whether or not there is value for research groups in using EL services, there is still the barrier of perception to overcome. The fact remains that many researchers are unaware of librarians as a resource; even if they have identified gaps in their own practice they do not connect those gaps to expertise available from the Library. However, this participant’s point of view came closest to encapsulating what a librarian’s skillset can contribute to research.

Based on reflections by the EL on the pilot, the main failing of the pilot was the EL’s own reticence and lack of clarity in promoting the support she could offer while embedded. There was very low uptake on one-to-one sessions and the EL was not as proactive as she could have been in pursuing them or in communicating what she could contribute. On the other hand, the pilot project was intended to establish what these contributions might be rather than testing them, so in future iterations the lessons learned by this shortcoming can be put into practice.

The *caveat lector* for this generally positive assessment of the pilot is the road not taken: would embedded library services be more effective if delivered by someone with greater subject knowledge, along the lines of an informationist (see Section 1)? Would a different EL have provided more value, accomplished more for the group or gained more insights? It is likely that there are librarians who have the ideal skillset, background and temperament to support Engineering researchers better than the EL in this pilot. Some of the feedback around data and software support points to the idea that an informationist model, with the specialist knowledge of the subject, might well be of value to the group. As discussed in Section 7, further research is needed to tease out what standards of embedded service can span different research groups and different ELs. However, assessing the pilot on the criteria above demonstrates that information skills alone were enough to make a positive impact.

The Library team now have the opportunity to decide whether they want to develop EL services based around ‘new functional specialties that require a completely different position’, e.g. an informationist, or based on ‘specialties that are extensions’ of existing skills and expertise (Bracke 2017). In many cases the information landscape is evolving so quickly that experience with the researchers themselves may prove more valuable than any external disciplinary training. Just as ‘virtually everyone working as data librarians today received no special training beyond learning on the job’(Rice and Southall 2016), a librarian who knows researchers well may be able to engage with them on information literacy and advise them on developments in best practice for RDM as well as any informationist.

**Recommendations:**

1. The Library should place a strategic emphasis on relationship building. Researchers use people they know as resources for information, and if the Library can replicate the sense of ‘our librarian’ that developed during the embedded pilot this may help researchers identify when librarians are a resource they can use.
2. The Library should seek out further opportunities to embed with other research groups in order to gather more perspectives and insights and build more relationships.
3. The Library should develop staff with the skills needed for embedding in mind, including data management and coding experience. However, information skills and experience with researchers in the discipline are more important to an EL than first hand expertise in the discipline itself.

## 5.2 - Service development

### **5.2.1 - Tiered services**

**The evidence gathered during the EL pilot project supports the idea that embedded services are valuable to research groups and libraries. The pilot also highlighted the need for different timescales and schemes for different tasks. While the EL’s time was primarily spent on a single project that could be accomplished in the short term, there were interventions that could have been achieved through part-time or sporadic involvement, as well as potential roles for full-time, longer term employment. This can be resolved by creating a tiered model for library services, laid out in a menu that makes it clear to research groups what services the library offers.**

**The tiers of the model outlined in** Table 1 **are based on the project-based and programmatic divisions described by** Carlson and Kneale (2011)**, and for clarity are described as ‘Borrow a Librarian’ and ‘Embedded Services’ respectively. Each successive level is inclusive of the previous services. This table should be seen indicative of the sorts of service that could be developed and the library would welcome thoughts on other possible areas to include. Research groups would be responsible for funding any services necessitating cover for staff time. However, programmatic ‘Embedded Services’ do not necessarily need to be a full time role but could be as little as a few hours a week, or a recurring period at times where library input is regularly needed, such as during the handover period between PhDs. Similarly, some project-based ‘Borrow a Librarian’ services could only require a small time commitment and could therefore be rendered without need for payment. Discussion prior to any services above and beyond those listed as standard should be arranged with the Department of Engineering Library team.**

**The distinction between the ‘Borrow a Librarian’ and EL service roles would depend on the context, but broadly speaking the former would rely chiefly on the librarian’s pre-existing knowledge of policy and best practice, while the latter would be characterised by the EL having a deeper awareness and engagement with the activities of the research group. For example, working alongside a group to develop Data Management Plans could be done from a general perspective with the ‘Borrow a Librarian’ service, or an EL could get to know the group’s work and their information needs throughout proposed projects over a longer timeframe.**

#### Table 1 - Potential tiered services

\* indicates services that already exist. All other services would need to be developed. An amended version based on feedback is provided in Appendix 6.

|  | ****Standard Services (Available to all)**** | ****‘Borrow a Librarian’ (Project-based)**** | ****Embedded Librarian (Programmatic)**** |
| --- | --- | --- | --- |
| ***Current awareness*** | Keeping researchers informed about the scholarly landscape including metrics such as the REF, profiles like ORCiD and Scopus, tools like ResearchFish and methods of keeping up with the literature in a particular field\* | Setting up alerts for relevant authors, publications or keywords in a research group’s area | **Using deep knowledge of research interests of group members to flag up material relevant to what they’re working on**  |
| ***Data*** | Training in data management\*, signposting data sources by research theme | Compiling a list of useful data sources, assisting with Data Management Plans, identifying practical workflows for data sharing | **Assisting Data Management Plans, helping create a data resource, helping** **develop group standards for data sharing**  |
| ***Ethics and integrity*** | Ensuring awareness of best practice in research ethics, plagiarism and intellectual property\* | Assisting with ethics approval applications, identifying any areas in which outside ethical or legal approval should be sought | **“** |
| ***Grant proposals*** | Guidance on DMPs\*, signposting to resources available | Gathering evidence through literature and policy searching, Liaising with KTFs, the Research Operations team and other relevant support staff to ensure that applications fit the standards of the various funding bodies [[16]](#footnote-16) | **“** |
| ***Handover*** | Providing a standard handover template | Developing a custom handover template for the group | Handover consultation: meeting with outgoing researcher, helping structure the documentation, then meeting with the incoming researcher |

|  | ****Standard Services (Available to all)**** | ****‘Borrow a Librarian’ (Project-based)**** | ****Embedded Librarian (Programmatic)**** |
| --- | --- | --- | --- |
| ***Knowledge management*** | Providing generic advice on group knowledge management (KM), signposting to electronic lab notebooks and other KM tools | Consulting or facilitating discussions about group KM, setting up a KM solution | **Researching group KM needs and designing a solution, assisting with managing information and data through the course of a project** |
| ***Literature searching*** | Conducting one-to-one meetings to talk about search strategies\* | Assisting with literature searches leading up to a grant proposal or patent application | Literature searching as part of a research project in which EL is a co-investigator |
| ***Organising information*** | **One to one meeting to talk about information management strategy\*** | Modelling good information workflows and practices, engaging in conversations about information literacy, developing templates for managing information and data, | **Managing information and data through the course of a project** |
| ***Patent applications*** | **Basic patent searching help, signposting to existing patent search training\*, signposting to Cambridge Enterprise\*** | Literature searching, patent searching, checking over necessary documentation | **Liaising with patent lawyer, compiling all necessary documentation** |
| ***Policy/impact*** | Providing advice on how to search for policies | Current awareness, keeping group up to date with developments in policy, bibliometric and wider impact. | **Assist with development of responses to Green Papers and other opportunities to influence policy, develop impact case studies based on the work of the group**  |
| ***Reference management*** | Ensuring awareness of best practice in reference management through training\* | Helping individuals and teams develop workflows for managing references to resources, building bibliographies and lists of publications | **Play an active part in curating bibliographies and resource collections specific to the group**, checking for copyright permission on any images, graphics or other media from outside the group that might be used |
| ***Relationship building*** | **Facilitating group conversations about bibliometrics, information and data management, transferrable skills, group KM etc.** | **Act as a consultant, joining the group for a fixed amount of time, assessing current practices and then offering advice rather than simply facilitating conversations**  | **In the fully embedded model librarians would be able to play an integral role in these conversations as a core member of the team** |
|  | **Standard Services (Available to all)** | **‘Borrow a Librarian’ (Project-based)** | **Embedded Librarian (Programmatic)** |
| ***Sharing research*** | **Helping academics manage their online profiles on Symplectic and other scholarly tools as well as their social media profiles\*, ensuring awareness of best practice in open access publishing** | Helping to develop a social media strategy for the group, leading a project to ensure all Symplectic profiles are up to date | **Managing the social media output for the group,** assisting with communication and dissemination of research in innovative and non-academic channels online, ensuring that outputs are open access and eligible for the REF |
| ***Visualisation*** | **Providing advice and resources on data visualisation** | Work on data visualisation for the group at a fixed point in a project | **Create data visualisations on behalf of the research group throughout the project, for example for publications and presentations as needed**  |

 **An additional model was discussed by the Library Committee in their May 2017 meeting, wherein the Library would offer a limited number of short-term consultancy slots per year for which groups could apply. There was a concern that as soon as research groups found out about these services the Library would be inundated with requests. Initial reactions from researchers have been positive and interest in general has been high.**

Librarians’ skillsets are broad and can apply to many facets of the research lifecycle. Academics who work in partnership with a librarian may find that they are able to consult them on everything from productivity and time management to writing literature reviews to how to put together a podcast about their research. Furthermore, consulting regularly with someone who does not have specialist knowledge of the research topic could help solidify ideas or inspire new connections as well as providing an opportunity to for researchers to practise communicating their research to a non-technical audience. Many of these skills are a standard part of librarianship, while others may be specialties of one or two individuals on the Library team. A key part of implementing embedded services in the future will be matching these skills to the needs of particular research groups. The services provided may vary depending on the member of the Library team that embeds and the level of engagement from the research group.

### **5.2.2 - EL employment models**

Bracke (2017) **describes barriers to large scale implementation of EL services, citing the difficulty with integrating such a new model into library services as chief among these. In the aftermath of this research project there has been clear interest in embedding librarians within research groups in the Department, whether that would be on a short-term basis to take on a specific task or on a longer-term basis as a member of the research group. The logistical challenge is to come up with a model that enables flexible deployment of the librarian with the right set of skills to complete the required work at the research group’s point of need, without negatively impacting the Library’s regular services. There are a few ways to approach this problem, each with its own advantages and disadvantages.**

**Option 1: Hire temporary staff to complete specific projects within research groups. The advantages of this approach include the ability to hire additional staff members as needed and for any length of time, with limited impact on the regular work of the Library team. These advantages are outweighed by the fact that these temporary staff members would have little or no background knowledge of the Department, the quality of their work would be unknown to the research group and the Department Librarian in advance, they would require a high level of support to understand the required role, the in-depth knowledge of research group’s needs generated through the embedded period would be lost when the temporary staff member finished their contract and the Library team would miss out on the opportunity to build relationships with researchers.**

**Option 2: Release existing staff from their regular duties to support specific research groups for fixed periods. These librarians would have already developed an understanding of the Department as a whole and their skillsets would be familiar to the Department Librarian, who would therefore be able to place the most appropriate person in each project, and the Library team could benefit from the deeper understanding of and personal relationship with the research group at the end of the embedded period. Option 2 is a more suitable solution to the problem because the embedded period becomes a development opportunity that has the potential to benefit the individual and the Library team as well as the research group. The challenge with this approach is that the day-to-day operation of the Library could be disrupted and, depending on the frequency of embedded periods, it could become difficult to roll out improvements to Department-wide services with frequent fluctuations in the Library team.**

**Option 3: A possible solution to this problem may be to think more broadly and to develop an additional team of librarians within the Cambridge University Library network with the skills and knowledge required to step into research or teaching support roles within individual departments as needed. This team could provide support when needed for a range of reasons, including cover for other forms of staff absence and flexibility to enable embedded librarianship. With careful planning, individuals from this team could work regularly with specific departments and be ready to step into particular posts as and when required. Further thought is required to consider how this team would be developed and funded, but part of the funding could come from research groups building the costs of ‘buying’ librarian/information specialist time into grant applications.**

**Implementing this wider-scale EL programme would present a change management challenge; different departments will have different levels of organisational readiness. While the Department of Engineering seems to have a high level of readiness that suggests embedded services should be a high strategic priority** (Shumaker and Talley 2009)**, this may not be true of other areas of the University.**

### **5.2.3 - Requirements for an Embedded Librarian**

 The EL pilot confirmed that a librarian without an academic background in engineering can provide embedded services to a research group in that discipline. The core skills of teaching, information literacy and problem solving can offer value to engineering researchers. However, there were aspects of the pilot that were underdeveloped because of a lack of expertise. An EL who had a background in data literacy and software development would have provided different services that may have been more immediately helpful to the group. A few participants observed that this gap might prevent them from considering librarians as a resource in their work.[[17]](#footnote-17) It is worth considering developing the Library team’s expertise in these areas moving forward, particularly if EL services will be offered in the future.

‘Soft skills’ are an important consideration for EL services. Taking on an embedded role is a unique role for a library and information professional and one that will not suit every personality type. In three months the EL had to rapidly acclimatise to an unfamiliar situation, acquire some level of competency in a topic with which she had no previous academic experience and face some of the same obstacles and frustrations as the researchers she worked with. There were times when she questioned her usefulness to the group or her approach to the research project and, although she had the support of the Library staff behind her and the context of a friendly and welcoming research group, at times being an EL felt like being out on a ledge.

The EL was most effective when she was able to develop a personal rapport or relationship with researchers. One such person reflected on a conversation they had on the EL’s last day with the research group:

‘She was talking about… how she thought about information. That was the most useful thing, having Kirsten in a very relaxed environment just talking about what she liked to do. And then suddenly I understood… all of these dimension in which a librarian works… and also the spectrum of questions I could ask where that type of information would be useful.’[[18]](#footnote-18)

This researcher was gradually getting the sense that librarians might be a more useful resource through work-related conversations and emails, but the idea of managing information became very concrete and comprehensible through having an informal conversation with the EL. The same participant expressed regret that they did not have this understanding earlier on, saying, ‘We could have had a completely different relationship from the beginning because I could have made more use of the fact that we had an embedded librarian and there were all these issues that actually I needed help with, but I never realised that I could… talk to Kirsten to see if we could actually work on some of those issues.’[[19]](#footnote-19)

**Recommendations:**

1. The Library should outline a tiered service model to promote within the Department, allowing research groups to bid for one-to-one consultancy services, or include an Embedded Librarian in funding proposals. The level of embedding, the amount of time and the nature of the role would be negotiated up front.
2. To be successful in a research group an Embedded Librarian should prioritise the following:
	1. Having a clear understanding of the role as it has been negotiated with the research group
	2. Being a good listener, being flexible and being interested in what the research group is trying to achieve and how members of the group approach their work
	3. Focusing on the relationship building aspects of the role
	4. Talking to library colleagues as frequently as possible to gain perspective and feel supported

## 5.3 - Training needs

**Beyond the question of whether or not a librarian could provide value-added services to a research group, the library team was interested in using the pilot project to explore information literacy (IL, see** Appendix 5 **for a definition), in particular how researchers conduct their work and how they reflect on their practices. Built into each of the data gathering exercises was an investigation of this theme and interesting insights were gained at each stage of the project. The diary study in particular was a rich resource for exploring information needs as it gave a window into day-to-day work that the PhDs and Postdocs in the group were doing, and this in turn pointed to gaps in the training these researchers received.**

The training offered by the Engineering Library is going to be reviewed in the near future, in hopes of developing a curriculum that uses blended learning to ensure that face-to-face sessions are as interactive and personalised as possible. Accordingly, this report will not attempt to assess the current training through the lens of this particular group’s needs. However, there are insights from this project that could inform the upcoming study.

The ethnographic data generated a wealth of insights into how researchers approach the skills and literacies that libraries teach. In several cases there seemed to be a self-conscious acknowledgement that librarians make certain recommendations about managing information or conducting research that the researchers were not following, evidenced by language such as, ‘I know I should be doing this instead’ or ‘I know that’s not what I’m supposed to do’. In these cases, participants remembered training and advice about research skills was but it was not informing their practice. In other cases, researchers described highly effective strategies they had developed for working with information and data. There were as many different methods and workflows as there were researchers; while some were very comfortable with the systems they had in place, others felt lost in their own information landscapes.

Overall, the impressions given by participants in the study could be categorised into a recognisable research lifecycle. However, it quickly became apparent to the EL how much more researchers in this group engaged in coding, computer modelling and other software-based activities than anyone in the Library team previously thought. Ethnography generated detailed descriptions of workflows, tools, tips and tricks that the library will likely use as examples in training but are too numerous to list in the current report. They point to the varied ways in which individuals choose to work, but also highlight areas in which support could be improved. Table 2 outlines some gaps in understanding and practice that could be bolstered by library training or by support from the group itself.

Another revelation was the data review as a common part of the report produced by PhD students in the first year of their programme. As a research output it is on a par with the literature review and is an important stepping stone toward the First Year Report, and is not currently supported as part of existing First Year Report training (University of Cambridge 2017). Therefore, it is an area for which the library should consider providing training and support, whether that takes the form of discussing how to search for data, how to critically analyse it or policy and licensing issues around data. This could be included in the existing Research and Communication Club (RCC) programme as well as being delivered one-to-one.

One-to-one training from the Library already existed as an option, but there was very little uptake on it. However, during the pilot these meetings were easier to prompt. One effective method was for the EL simply to ask individuals if she could speak to them about their research. During one-to-one conversations, the EL was able to ask for more details about the researcher’s work and provide bespoke advice based on their preferences, existing workflows and information needs. This service seemed to be particularly useful for postdocs, who had more capacity to take on board advice that might improve their impact, save them time, or help them grow as researchers. Historically, postdocs have been among the hardest for the Engineering Library to reach with training and information support. Embedding support within the group was a natural way of making contact with postdocs, but the Engineering Library should consider how to provide better training to postdocs across the whole Department.

#### Table 2 - Training needs as indicated by evidence from the EL pilot

|  |  |  |
| --- | --- | --- |
| Training needs | Engineering Library | ULG |
| *Data review* | Include data review in training, develop collection to include information about how to conduct data reviews | Make past data reviews available to read, group critique circle for data reviews |
| *Data workflows* | Include data workflows in training, differentiate between creation and re-use workflows, illuminate issues around relying on software to manage data automatically  | Develop group standards for data sharing, start regular KM sessions around research techniques, tools and practices  |
| *Differentiated search strategies/troubleshooting searches* | Teach troubleshooting and advanced literature searching in addition to the basics, offer one to one support | Mentors refer anyone struggling with search strategies to the library |
| *Information skills and personal knowledge management* | Offer one to one support in information skills (along the lines of existing transferrable skills offerings) | Mentors refer anyone struggling with information skills to the library, knowledge sharing sessions in the group |
| *Reading skills* | Build on existing strategic reading training to go more in depth into ways of keeping up with reading, how to be an active and engaged reader and how to save time | Mentors refer anyone struggling with reading workload to the library |
| *Reflective practice* | Build reflective practice into existing training materials | Mentors model reflective practice, implement an accountability group on Slack for regular reflective writing |
| *Software support* | Include software documentation in literature search training, co-teach managing information and data with divisional computing officers | Mentors signpost forums and documentation, use Slack to create a list of useful help forums/tutorials |

The pilot revealed that within divisions, and even within research groups, there are very different research methods in play, making it impossible to deliver generic training that suits everyone. The RCC programme for PhDs could be differentiated based on experience level or workflow rather than delivered by academic division. For example, the session titled ‘Managing Information and Data’ could be split so that students could attend the session that most resembled their workflow with data, given a choice between primarily creating their own data, primarily analysing someone else’s data and a hybrid of the two. Differentiation would allow the trainers to delve into more depth with strategies for critical reading, organising information in hybrid analog/digital workflows, research integrity for social science research versus experimental research, and so on.

The timing of any training is paramount, particularly to PhDs. At the time of the pilot many of the PhDs were in a phase that involved thinking about and actively manipulating data rather than simply managing it. Although one-to-ones are useful throughout the research process, there is the perception that taking the time to have a conversation with a librarian will be a waste of time or will highlight more time-consuming work that will need to be done. Time pressures during PhD programmes mean that information skills training should be delivered when it will be immediately useful, or signposted so that students can take advantage of it in their own time. The issues of timing and promoting library training are discussed more in Section 6.2.

One of the most effective ways to instil information behaviours in early career researchers is peer learning and learning from mentors. Research groups could instigate knowledge sharing sessions that highlight tips, tricks, techniques, tools, methodologies, time-management and other research skills that are delivered by and for members of the research group. These sessions could be prompted, organised or facilitated by a librarian, who could help generate potential topics for the sessions, or they could be entirely autonomous within the research group.

**Recommendations:**

1. Some library training could be reframed to make it more useful and relevant to those with stronger research skills backgrounds, such as teaching literature searching in terms of troubleshooting and structural reading in terms of being strategic about time management.
2. The Library team should expand their own skills to include better data and software literacy, and support the information skills training in these areas accordingly.
3. While the team develops these skills, postdocs wishing to develop their own teaching skills could be recruited to work with the Library to develop and deliver training on the more technical areas.­­­
4. Some training gaps could be met by postdocs and more senior researchers for those they mentor, such as building reflective practice and writing into the culture of the group, while others can be outsourced to the Library team. Informing research group leadership that they can signpost to the Library for various needs may help reduce the level of time commitment that mentorship currently demands.
5. The Library should consider timing of training more carefully to target the right information at the right time for different students, particularly PhDs. This may involve introducing some differentiation and changing the structure of the RCCs to skills- or timing-based rather than Division-based.
6. More support should be offered to postdocs, who come from a variety of backgrounds and are taking on new challenges as researchers, but who are currently underserved by research skills support. Acknowledging and supporting their roles as mentors in their groups would be of particular benefit.

# 6 – Insights

A report focused on the practical outcomes of this pilot cannot comprehensively cover the various insights gained from a large body of rich data. Someone interested in organisational research would be able to pull out a huge amount of material on the culture of this research group. Someone interested in learning technology would be similarly rewarded with material on specific tools and workflows. A phenomenological analysis of the information literacy of the group could generate more insights about the practice of research and the perception of library services. In the interest of providing pragmatic outcomes, this section discusses insights gained during the pilot project that might be utilised by the ULG and by the Engineering library to inform practice, delving briefly into other insights that were of interest to the EL and the library team.

## 6.1 – Insights for the Use Less Group

 Most members of the ULG have research practices that resemble the basics of what the library staff teach in the RCC programme. There is a general awareness of what they ‘should’ be doing, even if their own practices have developed more out of convenience, habit, time pressure or happenstance than out of training. The following insights on knowledge management (KM) and reflective practice may help develop facets of the ULG’s work.

### **6.1.1 - Knowledge management**

 Early on in the pilot the EL flagged up KM as a likely theme to explore, as several researchers had expressed a need to easily access the knowledge of other members of the group, past or present. Opinion on this topic was divided, however, with some participants expressing doubt about the need for such a resource, or the likelihood of consulting it if it existed.[[20]](#footnote-20) Developing a KM solution that meets the most important needs with the lightest touch possible would take longer to scope than the duration of the pilot, but the initial recommendations provided below are based on information gathered throughout the process. These focus on two separate workflows: the handover process between incoming and outgoing researchers and knowledge sharing within the group as a whole.

 Knowledge transfer within the group is generally well managed, both in the form of the meetings and seminars and through handover documentation. One postdoc researcher observed that the practice of using handover folders for knowledge transfer is, ‘A very simple approach but it is helpful and gave… the PhD students a huge leg up into starting… They’re learning from the problems that the previous person had and then developing from there as opposed to starting from the beginning and coming across the problems themselves.’[[21]](#footnote-21) One PhD student, however, characterised this process in a different way:

*‘I’ve had to find things myself and it would have been easier if they had been already there for me. Like, if there was a person that managed all this kind of handover between a PhD and the next one, for each kind of sub-project that we’re doing, it would be really great. It’s taken me a long time … I have a folder with everything that… my predecessor has done but I’ve had to ask for it and had it explained... Otherwise I need to read the theses or the first year reports, but sometimes since it’s the polished version they don’t write the finer details. Especially if it’s your predecessor using the same machine as you’re using, you really need everything that they’ve done.’*[[22]](#footnote-22)

They thought that a ‘formal, regular moment’[[23]](#footnote-23) where the handover is managed more centrally would have helped. One potential solution would be to develop a template for handover to be filled out by outgoing researchers. This would sit over the existing folder and act as a map to the important information as well as prompting them to reflect on problems they needed to solve, people they spoke to and anything else that might not otherwise be explicit in the existing documents.

In a follow up e-mail, the PhD student outlined their ideal situation: the group’s computer officer, or another designated person, would collect and manage ‘unpublished documents of interest’[[24]](#footnote-24) in a shared space. New starters would get access to this space at the same point they currently receive access to the group’s welcome document covering photocopying, coffee and other practical issues.

 A change in the group’s information practices may be necessary to ensure handover would be smooth. One PhD student reflected:

‘We don’t tend to design our spreadsheets to be understood by other people, which obviously makes it harder for others to understand our calculations and thought process. It would be good at least within the group, if we are to share files, to develop an explanation sheet on all of our spreadsheets where we explain what different notations mean, and where to find things. It will help us be more conscious about it when we start up a blank spreadsheet as well.’[[25]](#footnote-25)

This person is advocating for the use of metadata standards within the group, and similar standards might be useful to ensure that software is adequately documented, that research is shareable and that handover folders contain useful commentary. Standardising the documentation for internal collaboration and handover would reinforce the importance of general good practice in information management.

Material covered by a KM solution for the group might include:

1. Unpublished research to help researchers get a sense of what others in the group have done or are doing, e.g. First Year Reports, literature reviews. This could also contain information about how to access any associated publications or theses.
2. Information to help with handover, e.g. a template prompting outgoing researchers to describe what is included in the handover folder and provide adequate commentary to get their successors up to speed.
3. Potentially ephemeral evidence of knowledge transfer, e.g. Monday seminar slides, meeting agendas, or recordings of the seminars.

The consensus among those who want a KM resource seems to be for some shared digital space, and there are various options to consider.

The University Information Service (UIS) offers storage through Dropbox Business, OneDrive, Research Data Store, Research Cold Store, Research File Share. Of these, the most suitable options for the needs listed above are Dropbox Business and OneDrive (see Appendix 4 for discussion), not least because these are the most commonly used storage products by members of the group. The other two products are intended for higher level research data storage needs so they are less well suited for the purpose.

However, commercial shared storage options come with a long list of caveats about security and longevity, so local solutions may be more appropriate. The most secure solution would be to set up a shared drive on the Department’s network, which can be arranged through the IT helpdesk. The research group can control membership and if remote access is needed to the drive that can be done through a Virtual Private Network (VPN). Once again there are limits on size so this would not be a suitable solution for storing terabytes of research data, but for the needs highlighted in this report it is a secure, locally managed solution that should function with any operating system.

The organisation of a KM resource should encourage a light-touch approach for ease of navigation and ease of management. For example, a flat structure of folders covering categories such as the three sub-groups, ‘Meeting minutes’ and ‘Seminar slides’ could be populated by files arranged by date and titled clearly based on consistent file naming conventions. This would result in minimal work for the designated manager of the resource. Such a resource would be a place for researchers to get a sense of the group’s work over all, to find background information for published work and to keep up to date with any meetings or seminars they have missed.

### **6.1.2 - Reflective practice**

 **Information literacy (IL) can be thought of as an umbrella term for various skills and literacies around information including everything from time management and organisation of personal records to critical engagement with information sources. It can help researchers transition into the different phases in their careers and transform their understanding of their work (see** Appendix 5**). A key part of IL is the ability to reflect on the decisions and practices that make up one’s personal information landscape. Therefore, the EL was interested in finding out how reflective ULG researchers are and used the diary studies and conversations during the pilot to come up with insights about this facet of the group.**

Reflection did not seem to be part of the group’s consciousness, as few researchers seemed to engage in questions of why they did things the way they did, apart from to justify decisions based on how much time they took. Participants in one focus group seemed to find it easier to discuss the units of their research than to reflect on their strategies and approaches. One researcher was particularly adept at discussing the relationship between information and data: ‘I heard somewhere that there’s a hierarchy where data becomes information if it’s organised in some sense and then that becomes knowledge if you can draw an insight from it. That’s what I currently use for a way of thinking about it, because then that means data could be anything.’[[26]](#footnote-26) On the other hand, the questions about information strategies caused more hesitation; despite listing numerous strategies for dealing with information in their work, few people thought explicitly about how and why they used them.

 **While the EL had expected the diary study to reveal the most about reflective practice, she found that a number of participants were much more introspective in conversations or interviews than in writing. This in and of itself is an interesting observation, perhaps stemming from a disciplinary culture that seldom emphasises the importance of sense-making and reflection through writing. One participant observed that reflection, ‘**seems a bit alien and a bit like a waste of time’ to many researchers.[[27]](#footnote-27) **This is borne out in the diary entries where, unless specifically prompted, reflective statements were the exception rather than the norm.**[[28]](#footnote-28)

**There were two notable exceptions to this trend. One diary study participant, a PhD student, self-identified as someone who thinks by writing and found that writing thoughtful diary entries came quite naturally. The other, a postdoc, had never learned about reflective writing in their engineering training, but had recently encountered it through a professional development course. They described reflective practice as sitting in the gap between ‘**what you get taught and what you need to be a professional teacher or engineer’.[[29]](#footnote-29) While most other participants made at least one reflective statement at some point, these two participants found it beneficial and built it into their practice.

The weekly diary study had the potential to be useful even if it was not expressed as reflective statements. A few participants wrote that they would like to continue the regular planning and accountability that had become routine during the diary study, including one participant who was among the least reflective in their written diary. In an exit interview they noted how the exercise had transformed their working habits, saying, ‘I think forcing myself to make this plan at the beginning of the week and at the end of the week to look back on it, that’s been invaluable. That’s something that’s really going to help me.’[[30]](#footnote-30) In this case, the participant engaged in internal reflection that was not articulated in their diary entries, but that helped them to clarify where their work needed to go next.

Reflective practice can be as simple as stopping periodically to assess current knowledge, take stock of the information one has or consider barriers to progress. One participant explained that reflecting has, ‘Helped me identify the things that I think are less good that I could do better… A lot of those are to do with actually taking time to stop and review what I’ve got … and written a comment about what I did at the time that … would help me later on when I came back to things.’[[31]](#footnote-31) This ensures that thoughts, decisions and actions are captured in a way that will be meaningful later, but this skill can take time to learn. A first year PhD observed:

‘I was churning out simulations and getting all this data and I wasn’t really handling it very well. So I’d have loads of data that I’m sure was useful, but because I’d done so much I didn’t know which parts would be very useful and then I had to stop and think. [Over the past week or two] I’ve started to go back and then run the simulation and really look into it in more detail… taking one set of results, summarising those results before moving on, so I’m making informed decisions about where to target the work next.’[[32]](#footnote-32)

This student’s postdoc mentor talked about teaching critical thinking in the experimental modelling process. ‘Primarily at the moment most of my input to their research has been on the simulation side … but also I guess the way of thinking about what it is the simulation represents and how that could exist in a physical sense.’[[33]](#footnote-33) Being critical about experimental design is a form of IL that requires reflection and under this postdoc’s mentorship the PhD student is learning how to put this into practice, stopping periodically to evaluate the information at hand.

In this way, experiments are a microcosm of the research process as outlined in the figure below. Training develops some of the skills required for research, while the practice informs understanding, the literacy and competence that bridges the gap between the decisions that researchers make and their justifications. It is often a cyclical or iterative process involving multiple rounds of defining information needs, identifying resources to meet those needs (whether that is a journal article, a dataset or a particular experimental set up), evaluating the resulting information, gaining insights and capturing or communicating them. Between each of these stages a reflective researcher might decide to stop and take stock of what they have done, what information they have, what they want to find out, what did or did not work, whether there are any potential risks ahead, what the audience or stakeholders expect of them, the information landscape in their discipline and so on.

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The library, the research group and mentors feed into this cycle through training, building the skills, knowledge of necessary tools and procedures and so on. These figures should build reflection into the training of new researchers so that they come to understand why they are doing what they are doing and have a deeper justification and reasoning behind the decisions they make as researchers.

Reflective practice is a transitional, transferable, transformational skill (Coonan and Secker 2011) which it encourages students and professionals to engage with their own practice by periodically stopping to assess what they know, what they need to know and what the next steps should be to get them there. Reflection can be built into every stage of the research process but it was not part of the standard training for members of the research group. The ULG could foster this practice by starting an accountability diary channel on Slack, by building it into the existing mentorship and supervision process or simply by senior members of the group modelling reflective practice in their own work. Different researchers reflect in different ways but the important thing is to periodically stop and think about information needs and use, whether that takes the form of a written diary, a conversation or a list of bullet points.

**Recommendations:**

1. The group should consider engaging with the Library to develop a handover template to help transfer knowledge between outgoing and incoming researchers.
2. A shared drive managed by the computer officer or another designated person would be a light-touch way of allowing the group to share unpublished research artefacts such as Seminar slides, meeting minutes and first year reports.
3. **The group should consider options for a light-touch KM solution for sharing unpublished research with each other.**
4. **The group should consider developing regular knowledge sharing sessions focusing on a skill, technique, workflow or tool that may help with time management, information management, productivity, writing etc.**
5. **Mentors in the group could foster reflective practice by modelling the behaviour, implementing an accountability group on Slack and encouraging a culture of stopping to assess information needs.**
6. **The group should engage with the Library team for help with literature searching and other information strategies, particularly where this can help reduce the workload of postdoc mentors.**

## 6.2 – Insights for the Engineering Library

The following section is intended to capture some initial impressions that will inform strategy and service development for the Engineering Department Library over the coming months and years.

### 6.2.1 - The life of a researcher

 To provide better services to researchers in the Department, it is important to understand the various ways they think about their own research. This will help identify skills and knowledge gaps present in the Department and point to strategies for promoting library services to people who would benefit from them.

Before this project, when the Library team would categorise users, it tended to be in broad strokes: undergraduates, postgraduates (including PhDs) and ‘staff’. The term ‘researchers’ could stand variously for academic staff specifically or anyone in an academic role beyond a Master’s degree. The pilot allowed the EL to gain a deeper understanding of the variety within the homogenous category of ‘researchers’.

In particular, the various postdoc roles are more strategically significant than the library team had previously understood. The postdoc experience is harder to conventionalise than the stereotypical PhD experience and, owing to the lack of a structured programme for most postdocs, along the lines of the RCCs, they are harder to reach. For many people the postdoc role represents a transition back into academia from industry, into a different field of study, into a more difficult course of research from what they are used to and often into roles and responsibilities that are entirely new to them. They tend to stand in a translational role, communicating on both the day-to-day level of the PhDs and the strategic level of the PI.

One ULG postdoc corroborated the findings of the FutureLib study discussed in Section 1, saying that there were various research skills they were missing out on.[[34]](#footnote-34) Better understanding of postdocs’ needs could lead to more targeted promotion of support. The Library could offer support as co-teachers and postdocs transfer some of the workload associated with mentorship to the Library in the situations listed in Section 5.3. The Library could also leverage the position of postdocs in their research group to promote Open Access publishing and best practice for data sharing. Differentiation between researcher roles bears further exploration in other research groups in the Department.

 The pilot allowed the EL to learn more about how the group approached gaps in their knowledge. Participants in the focus groups expressed different types of gaps and different strategies for addressing them. The following comment was typical of those expressed in the focus groups:

 ‘You can just not know something that fits into your existing framework and then it’s quite easy to fill that by looking it up, but if you realise that you don’t know anything about a whole range of things then I think that’s when it’s more worthwhile trying to find a book, say, that gives you a more structured way of finding out about something.’[[35]](#footnote-35)

In both groups there was a broad agreement that often it was easier to have a conversation with a colleague, technician or contact in another department rather than looking something up, particularly if there was a single piece of information needed in order to progress. Strategies for getting to grips with a larger topic included starting with Wikipedia, watching online tutorials, finding books and browsing their contents pages to get a sense of the level of audience the resources are aimed at.

‘Strategy’ seemed to be a word that researchers were reluctant to apply to themselves, despite describing practices that the EL identified as strategies. A conversation in Focus Group 1 highlighted that even if one has a strategy from the beginning, it is likely to change and that it is hard to know what will be most important and what will be a blind alley without spending the time and energy to figure that out. One participant highlighted a possible solution:

 ‘Maybe the answer is just keep talking with people and find out what they’re doing, and maybe don’t judge yourself saying “I wish I’d done this” because you can’t go back. But yeah, I probably would have benefitted from talking to people about their literature reviews more. We’re not a very competitive group. We’re all very friendly, so I should have done that more anyway.’[[36]](#footnote-36)

This points to the value of collaboration, conversation and reflection in the research process. While the library already emphasises this in the RCC programme, it could do more by facilitating conversations between researchers in the library space and by becoming known as a resource for these sorts of reflective conversations. For example, the library could host ‘swap shop’ events in the North Room where researchers share a method, tool, workflow or some other practical skill, complementing the topic-based seminars and talks held throughout the department.

 Strategies aside, participants in each of the studies shared what they considered their strengths and weaknesses. These varied widely between individuals, but several participants felt that as Engineers their strengths are in data manipulation and analysis rather than in reading. These individuals felt that the literature review was a necessary hurdle to get to what they wanted to do, namely getting into analysis and manipulation of data.[[37]](#footnote-37) One first year PhD expressed his struggle getting to grips with the volume of reading during his literature review: ‘I think my problem is probably trying to understand how to strategically process that information, so which things to read first, how to capture what I’ve read and to go about it in a strategic manner, rather than kind of reading one thing and then moving on to something else, not having a cohesive thread to follow.’[[38]](#footnote-38) Another observed:

‘Reading is obviously essential for the PhD but I personally find myself straining on a lead to implement some of the ideas I develop whilst reading by analysing datasets. Too much reading and I struggle to see concrete progress without producing something tangible of my own in the form of a graph. The flip side to this is obviously that it can be so easy to spend too much time on useless data problems that aren’t useful with respect to the field.’[[39]](#footnote-39)

This highlights the importance of providing more support for strategic reading and the literature review, which could be accomplished through having parallel RCC sessions addressing different needs.

Novelty was the most common concern among participants, particularly among PhD students.[[40]](#footnote-40) Some people were applying an existing method to a new context while others were developing a new process. There was a variety in the methods, topics and scales of research, but the anxiety around whether the research was novel was nearly ubiquitous. Some researchers were consulting patents to establish their novelty and a few were preparing to file patents of their own.

The strategies, workflows and practices in place in the group are too numerous to describe in detail in this report. A beneficial outcome from the project may be to develop ‘personas’ based on different information workflows that point to different training and support needs.

### 6.2.2 - Timing

 For the Library to engage with researchers, in particular PhDs, timing is of the utmost importance. During the three months of the EL pilot the PhDs were almost uniformly at a point in their research that required analysis, thinking, writing and planning and the external help they needed was from their mentors and supervisors. Feedback commonly mentioned that the EL would have been incredibly helpful during the literature search, or might have been helpful later on when they were searching for additional data sources. The EL could be helpful on an ad hoc basis, but one student reflected that the timing was not right to ‘get the most out of’ having that expertise available.[[41]](#footnote-41)

There is no easy way to ensure that all PhD students are being reached at the right point with a prescribed system like the RCCs. However, there was the sense that more tailored, hands-on support would be most useful for this group. One participant reflected on the value of having an EL early on:

‘I think it could be very useful for when people arrive into a PhD. Because … I imagine that’s where you can have the greatest increase in efficiency, would be in your first few months when someone’s helping you to work out how to be more efficient about what you’re looking at. I know we have the RCC sessions where we have a briefing from the library… and maybe that would be the optimum point. But people are always at different stages.’[[42]](#footnote-42)

This quote points to the value of individual students having one-to-one meetings with a research support librarian, either when they are beginning to search or when they run into problems. Early contact could accomplished by supervisors booking their new PhD students in for a one-to-one session with a librarian, or building one-to-ones into the RCC structure.

Many of the services outlined in Section 5.2 are time-sensitive, specific to particular points in the research lifecycle, but there are other ways in which an EL can be useful at any point in a project. It may be ideal to have a data management plan or file structure set up at the beginning of a project, for example, but this does not mean that the same structure will still be working well ten or twenty months on. Periodic reassessment of information resources, needs and strategies could be prompted and guided by librarians at any point in the research process.

 There is a potential alternative to the narrative that the timing was wrong to make use of the EL, which is that the participants found it difficult to connect their current work to an information need. If this is the case it may be due in part to perceptions of what librarians are for; even after three months and opened minds librarians were still connected to finding and to ‘knowing what’s out there’. It may also arise from the difficulty many people have in identifying that there is a need. Developing reflective practice could help researchers become aware of information needs, while better promotion and marketing of the expertise in the library may help researchers identify it as a resource for meeting those needs.

The library should develop a clear statement of expertise and a growing body of practical examples that would help communicate to researchers what kind of resource they are on first meeting. The team should also ensure that they can back up that statement with actual expertise through professional development, upskilling and recruitment as required.

### **6.2.3 - Branding our expertise**

 **The changes in perception of librarians discussed in** Section 5.1 **were thanks in large part to unplanned, serendipitous conversations held between the EL and researchers and facilitated by the EL being physically located in the same space. What lessons can be derived from this experience that can be applied on a larger scale? What are the barriers to library use and how can the insights from the EL pilot inform how the library develops relationships with researchers in the future?**

**The Library has traditionally promoted itself as a service framed in terms of availability, exemplified by the phrase, ‘We’re here to help’. Despite making efforts to promote their services and build relationships throughout the Department, this is a somewhat passive stance to take. It sets the impetus on the researcher to identify they have a need, identify the Library as the optimum resource to meet that need and approach the Library themselves, able to articulate what information they are after or what skills they would like to develop. One researcher encapsulates this particularly well:**

‘Now I understand that I can go to Kirsten and say, ‘I’m looking for this spatial information at this scale and this the type of work I’m trying to do’ and then she could actually help me look for that information in the right places, which I had never realised I could do. I thought it was much more generic. I would have to come and say, ‘This is what I’m looking for, this specific data base.’ I couldn’t go and say, ‘This is what I want to do and this is more or less the characteristics of my research. What should I be looking for?’ So I had never realised that I could ask a question like that of a librarian.’[[43]](#footnote-43)

**The researchers in this study were reflective about their own information needs and had strategies in place to meet those needs. These varied from software documentation to textbooks to having a conversation with an expert who they thought would be able to help. Librarians were often seen as not having enough technical or subject knowledge to be of help. Similarly, few people connected the skills and practices they were engaged in to library training or expertise. One person explained, ‘I’ve used the Department Library to find books, done the same at the UL, but that was as a Master’s student where, after a year of doing my project, I knew exactly what I wanted to go and find out. I knew that the book was there. I think at the moment, where I don’t kind of quite know what I need to know, I can do that from my desk, which is probably why I haven’t yet ventured into the library.’**[[44]](#footnote-44) **This person expressed a common viewpoint that the library and the people who work there were primarily useful for providing resources, particularly physical resources, rather than being a resource themselves. In the process of sense-making, defining the problem and building a strategy, librarians are an underutilised asset.**



**There are numerous misconceptions and misunderstandings about what librarians do, which has been slow to change. There is a disjoint between what people see librarians doing and what they actually do. This is a problem of messaging, which can contribute to the following barriers expressed by participants:**

1. **Physical distance from the Library**
2. **Not identifying information need or not connecting that need with the expertise in the Library**
3. **Not wanting to bother the librarians, especially if they thought that the librarians would not know the answer**
4. **Not recognising expertise, e.g. not knowing that librarians know about data**
5. **Thinking that conversations with librarians would not be helpful because they lack the specific subject knowledge required**

These barriers seem to boil down to the fact that the skillset of librarians is largely unknown. Once this expertise is identified, people can begin to connect it to questions they may not have thought of before:

‘It’s like the chicken and the egg thing: you won’t ask her other questions because you don’t realise that there is this myriad of questions you could have asked Kirsten from the beginning.’[[45]](#footnote-45)

The traditional librarians’ refrain of ‘We’re here to help’ is insufficient as a pitch for the support they can offer when researchers are unaware of the kinds of questions they can ask.

**With the successes at building relationships of the EL pilot and tailored teaching for one of the MPhil courses, the Library team is interested in finding ways to recreate this effect throughout the Department. Developing personalised services for a department as large as Engineering would not be easy. It might require the Library team to upskill in strategic areas, including non-traditional sources of information, data management and software development. A simpler and perhaps more effective plan would be to get to know the researchers and their work better. This could be accomplished by attending seminars and talks, conversing with the researchers about their work informally, in one-to-one meetings and in meetings or talks.**

**Another factor that would be beneficial is promoting the work the library team has done so far.** Reframing the sentiment ‘We’re here to help’ not in terms of what we can do but in terms of concrete examples of what we have done may help contextualise the services. **One participant pointed out that the pilot could help promote information support:**

‘One thing that I think would help would be from the beginning to know what is the role, what are the skills that a person who works with information has, and also some practical examples. For example, using this pilot project to say, “This is what I realised, this is how they usually do things and this is where we think we might contribute for this process to be more efficient or this is how we can be helpful.”’[[46]](#footnote-46)

Another participant noted that it would be helpful to promote library expertise in areas that are not traditionally associated with the library, for example data:

**‘**One of the sources she directed me toward was a list of websites for accessing data. And actually I think my perception would be that it’s my job to go and look for data, but if I need help with things relating to literature then I could go and speak to the library about it. So perhaps… putting a broader message that actually the library is able to do a lot more around data than people realise and they have that knowledge of where these sources are.’[[47]](#footnote-47)

While this is not an area in which library staff consider themselves experts, information skills and strategies are applicable and useful in this realm and, given time, it is an area in which the team could easily develop expertise.

**Marketing of the library services will have to be carefully considered in light of these insights. Placing the emphasis of marketing on specific areas and examples of the kinds of services available through the library, leveraging champions throughout the Department and targeting the right messages to the right user groups - administrators, postdocs, etc. - may be more effective than waiting for researchers to come to the library to ask for help. Postdocs could be a pivotal resource in making stronger connections with research groups. Their role acts as a bridge and as such they would benefit hugely from knowing what support they can get from the library. The more the library provides tailored support to the different types of researchers in the department, the more examples the library will be able to put forward to demonstrate its expertise in context.**

**Recommendations:**

1. **Information literacy could be supported on a group or individual basis throughout the Department using one of the two embedded models to manage staff time, focused on helping researchers develop strategies based on their actual workflows, experience and knowledge.**
2. **The Library should consider the timing of services for researchers as there are definite cycles of activity. However, the timings are not universal across the Department. Speaking to administrators would be a useful way of finding out about the timing within individual research groups, as would developing stronger relationships with taught course coordinators and PIs.**
3. **The research support staff and heads of service should develop strategic, targeted marketing of library expertise based on insights from the EL project. Making contact with key groups, such as administrators, the Postdocs of Cambridge Society etc. would help focus engagement efforts.**
4. **The Library team should prioritise researcher welcome e-mails and one-to-one meetings. They should get to know the researchers better and develop personal relationships, initiating conversations with an approach of ‘Tell me what you do’ instead of ‘Tell me what I can do for you’. Knowledge sharing in the Library team is already fairly good owing to the weekly staff meetings and the shared space, but it is worth considering whether an additional KM method is required for these kinds of insights.**
5. **The EL should develop personas that will inform service development based on data use and ontology project use cases.**
6. **Development of the Library team should take into consideration gaps in current knowledge that serve as barriers to supporting researchers, i.e. data expertise, patent searching and software coding.**

# 7 - Further research

Previous literature reporting on ELs working in a research context has focused on the role and experience of the practitioner; the perspectives of the users were not integral. This report brings a new method to the exploration of embedded roles for librarians and reports on a service that is new to Cambridge libraries. The primary intention of the current document is to report on the pilot to the Engineering Library team, the Department, the University Library and most importantly the Use Less Group. The group’s responses to this report will be captured through a questionnaire in order to check whether they feel they have been portrayed fairly and to contribute any additional ideas about library services. This validity check will form a crucial part of any future written outputs of this project.

The ULG may represent a best case scenario for embedding library services in this form, with its open and communicative culture and its wide variety of research methods leading to a cooperative and interdisciplinary environment that meant the group was open to the EL pilot. The degree to which this group is unique in the Department will be unclear until a member of the Library team embeds with additional research groups. Therefore, the Library should pursue further opportunities to embed in order to test whether the insights gained and the services developed are more widely applicable.

The open-ended brief for the project from its outset was one of its assets as well as a clear limitation; the pilot involved the EL spending a good deal of time gathering a sense of what the role could be like as opposed to actively implementing any of those ideas. If she had gone into the embedded period with a clearer list of roles or tasks then she might have accomplished more, but might also have been closed off to possibilities and insights. In future the EL should have a more precise brief, developed in collaboration between the library team and the research group, based on the tiered services discussed in Section 5.2. It would be crucial to define the role of the EL more clearly, particularly how their time would be divided between larger projects and developing interventions. Similarly, there should be clear boundaries between the EL and their customary library role.

If other Engineering research groups are interested in an EL, this should be treated as an iteration of the first pilot. The focus of this research would be to check whether the insights gained in the initial pilot are valid in other contexts, or whether new insights can be gained, particularly those pertaining to service development, training needs and information literacy. A preliminary investigation could help the EL get to know the group beforehand, as would attending seminars or meetings and doing a light-touch literature review of their past work. Use of the diary study method was an effective way of gaining insights that could be acted on immediately. It also proved to be a useful tool for some researchers and led to small changes in their reflective practice. This report should provide perspective that will help make future iterations possible. Further research should focus on developing a standard level of embedded service that can be clearly costed and outlined, as well as person specifications that will outline to library managers what staff skills and attributes are needed to provide a successful embedded service.

With such a large body of rich, qualitative data, there is the opportunity to gain many more insights and explore other facets of the lives of researchers. This report is an amalgam of many of the insights gained and questions raised and is the first of several intended outputs. A brief summary of the project and a brochure presenting the tiered model of services will be circulated in the Department of Engineering. Then, a case study will be produced and submitted for peer reviewed publication, followed by a toolkit for library managers.

The recommendations listed throughout this report are initial guidelines and are not the last word on the EL pilot. The Library team will continue to work on transforming the insights from this project into services and training that support the research in the Department. They will also continue to conduct research that enhances their understanding of the needs, practices and perspectives of their users. In doing so, they hope to build stronger relationships with researchers and become embedded in the academic ecosystem of the Department of Engineering.

**Recommendations:**

1. The Library team should seek opportunities to embed their services and treat those opportunities as further iterations of the first pilot.
2. Prior to embedding, the scope and particulars of the role should be discussed in depth with the research group.
3. Qualitative data should be gathered and Action Research methods used with a view to improving the services and practice offered by the EL and the Library team.
4. The Library team should continue to investigate the data gathered during this pilot in order to gain further insights.

# Acknowledgments

 The authors would like to acknowledge the support of the University Library in making this project possible. Lynne Meehan and David Marshall were both enormously helpful, providing support, advice, conducting exit interviews and proofreading the report. Alexandra Bolton and Dai Morgan provided valued guidance at points during the project. Thanks to the Engineering research office and to the Library team of Emma Etteridge, Mehveş Dignum, Sarah Burton and Dan Crane for their assistance and for enabling the Embedded Librarian to step out of her regular role. Thanks also to Georgina Cronin for the use of her teaching materials on cloud storage.

 Finally, this project would not have been possible without the partnership and support of the Use Less Group. It was a privilege to be able to work with and get to know these researchers. The library team owes them a debt of gratitude for the opportunity to gain insights into their working lives. Particular thanks go to all of those researchers who generously participated in the data collection exercises and to Dr Rick Lupton and Prof Julian Allwood for their support throughout the project.

# Recommendations

Section 5.1

1. The Library should place a strategic emphasis on relationship building. Researchers use people they know as resources for information, and if the Library can replicate the sense of ‘our librarian’ that developed during the embedded pilot this may help researchers identify when librarians are a resource they can use.
2. The Library should seek out further opportunities to embed with other research groups in order to gather more perspectives and insights and build more relationships.
3. The Library should develop staff with the skills needed for embedding in mind, including data management and coding experience. However, information skills and experience with researchers in the discipline are more important to an EL than first hand expertise in the discipline itself.

Section 5.2

1. The Library should outline a tiered service model to promote within the Department, allowing research groups to bid for one-to-one consultancy services, or include an Embedded Librarian in funding proposals. The level of embedding, the amount of time and the nature of the role would be negotiated up front.
2. To be successful in a research group an Embedded Librarian should prioritise the following:
	1. Having a clear understanding of the role as it has been negotiated with the research group
	2. Being a good listener, being flexible and being interested
	3. Focusing on the relationship building aspects of the role
	4. Talking to library colleagues as frequently as possible to gain perspective and feel supported

Section 5.3

1. Some library training could be reframed to make it more useful and relevant to those with stronger research skills backgrounds, such as teaching literature searching in terms of troubleshooting and structural reading in terms of being strategic about time management.
2. The Library team should expand their own skills to include better data and software literacy, and support the information skills training in these areas accordingly.
3. While the team develops these skills, postdocs wishing to develop their own teaching skills could be recruited to work with the Library to develop and deliver training on the more technical areas.­­­
4. Some training gaps could be met by postdocs and more senior researchers for those they mentor, such as building reflective practice and writing into the culture of the group, while others can be outsourced to the Library team. Informing research group leadership that they can signpost to the Library for various needs may help reduce the level of time commitment that mentorship currently demands.
5. The Library should consider timing of training more carefully to target the right information at the right time for different students, particularly PhDs. This may involve introducing some differentiation and changing the structure of the RCCs to skills- or timing-based rather than Division-based.
6. More support should be offered to postdocs, who come from a variety of backgrounds and are taking on new challenges as researchers, but who are currently underserved by research skills support. Acknowledging and supporting their roles as mentors in their groups would be of particular benefit.

Section 6.1

1. The group should consider engaging with the Library to develop a handover template to help transfer knowledge between outgoing and incoming researchers.
2. A Dropbox Business account managed by the computer officer or another designated person would be a light-touch way of allowing the group to share unpublished research artefacts such as Seminar slides, meeting minutes and first year reports.
3. **The group should consider options for a light-touch KM solution for sharing unpublished research with each other.**
4. **The group should consider developing regular knowledge sharing sessions focusing on a skill, technique, workflow or tool that may help with time management, information management, productivity, writing etc.**
5. **Mentors in the group could foster reflective practice by modelling the behaviour, implementing an accountability group on Slack and encouraging a culture of stopping to assess information needs.**
6. **The group should engage with the Library team for help with literature searching and other information strategies, particularly where this can help reduce the workload of postdoc mentors.**

Section 6.2

1. **Information literacy could be supported on a group or individual basis throughout the Department using one of the two embedded models to manage staff time, focused on helping researchers develop strategies based on their actual workflows, experience and knowledge.**
2. **The Library should consider the timing of services for researchers as there are definite cycles of activity. However, the timings are not universal across the Department. Speaking to administrators would be a useful way of finding out about the timing within individual research groups, as would developing stronger relationships with taught course coordinators and PIs.**
3. **The research support staff and heads of service should develop strategic, targeted marketing of library expertise based on insights from the EL project. Making contact with key groups, such as administrators, the Postdocs of Cambridge Society etc. would help focus engagement efforts.**
4. **The Library team should prioritise researcher welcome e-mails and one-to-one meetings. They should get to know the researchers better and develop personal relationships, initiating conversations with an approach of ‘Tell me what you do’ instead of ‘Tell me what I can do for you’. Knowledge sharing in the Library team is already fairly good owing to the weekly staff meetings and the shared space, but it is worth considering whether an additional KM method is required for these kinds of insights.**
5. **The EL should develop personas that will inform service development based on data use and ontology project use cases.**
6. **Development of the Library team should take into consideration gaps in current knowledge that serve as barriers to supporting researchers, i.e. data expertise, patent searching and software coding.**

Section 7

1. The Library team should seek opportunities to embed their services and treat those opportunities as further iterations of the first pilot.
2. Prior to embedding, the scope and particulars of the role should be discussed in depth with the research group.
3. Qualitative data should be gathered and Action Research methods used with a view to improving the services and practice offered by the EL and the Library team.
4. The Library team should continue to investigate the data gathered during this pilot in order to gain further insights.

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# Appendix 1 – Embedded Librarian pilot proposal

The table below outlines the initial proposal for ways in which an EL might assist a research group. Several of the services below were rendered during the pilot and, had it lasted longer, others may have proven useful to members of the group. Additional services were identified during the study and are discussed in Section 5.2.

|  |  |
| --- | --- |
| **Information literacy** | * Modelling information behaviour
* Teaching key skills and concepts
* Engaging in constructive dialogue about issues surrounding information literacy
 |
| **Grants and Funding** | * Pulling together documentation
* Liaising with KTFs and other relevant support staff to ensure that applications fit the standards of the various funding bodies
 |
| **Data Management Plans** | * Helping to form a plan for managing the data throughout a project and beyond, including how records will be managed, the ethics and practicality of sharing data and the strategy for ensuring the data is accessible for as long as might be required by funding bodies
 |
| **Workflows** | * Managing digital workflows and group discussion forums
* Archiving digital conversations
* Identifying useful technology that might assist with particular workflows
 |
| **Literature Searching** | * Assisting with the literature search including developing a search strategy
* Framing useful research questions
* Helping with critical appraisal of resources
* Facilitating access to resources
 |
| **Reference Management** | * Helping individuals and teams develop workflows for managing references to resources
* Building bibliographies
* Checking for copyright permission on any images, graphics or other media from outside the group that might be used
 |
| **Ethics and Integrity** | * Ensuring awareness of best practice in terms of research ethics, plagiarism and intellectual property
* Assisting with ethics approval applications if needed
* Identifying any areas in which outside ethical or legal approval should be sought
 |
| **Sharing research** | * Assisting with communication and dissemination of research in innovative and non-academic channels online
* Writing plain-language descriptions of the research to aid in accessibility for non-specialists
* Suggesting and facilitating innovative approaches to sharing research
* Where appropriate ensuring that an Open Access approach is used and that any resulting publications are in a repository
 |
| **Data reuse** | * Identifying and developing practical workflows for knowledge transfer between collaborators
* Advising on metadata
* Ensuring that data storage complies with policy and best practice
 |
| **Managing online profiles** | * Helping academics manage their online profiles on Symplectic and other scholarly tools as well as their social media profiles
* Discussing ethical and sensible approaches to using social media and assisting with set-up
 |
| **Support for social science methods** | * Assisting and consulting on research projects that may contain a social science aspect that is unfamiliar to researchers with a science background, such as interviews, questionnaires or focus groups
 |
| **Conferences** | * Providing constructive critiques of conference posters
* Helping with presentation skills
* Arranging online publishing of conference proceedings
 |
| **Current awareness** | * Keeping the group informed about the scholarly landscape including metrics such as the REF, profiles like ORCiD and Scopus, tools like ResearchFish and methods of keeping up with the literature in a particular field
 |
| **Consultation** | * The skills of an information specialist are broad and can apply to many facets of the research lifecycle. Academics who work in partnership with an information specialist may find that they are able to consult them on everything from productivity and time management to writing literature reviews to how to put together a podcast about their research. Furthermore, consulting regularly with someone who does not have specialist knowledge of the research topic could help solidify ideas or inspire new connections.
 |

# Appendix 2 – Method

## Appendix 2.1 – Focus groups

 Two focus groups were conducted by the EL in early December 2016, before the commencement of the pilot. Recruitment was achieved through a Qualtrics survey and promoted via email and at the weekly ULG Seminar. They were held in a neutral location, a meeting room within the Department, and were recorded on the researcher’s mobile phone. Consent for quoting anonymously in published work was sought before the recording started.

 Each focus group had four participants, one of whom was a postdoc, and the three PhDs were a mixture of Professor Allwood’s and Professor Cullen’s. Both lasted approximately one hour. The researcher followed the schedule below broadly, though skipped a couple of questions each time due to the natural flow of conversation, and information having already been covered.

|  |  |
| --- | --- |
| **Questions** | **Follow-up questions** |
| Q1 [ROUND ROBIN]: Could you tell me about your role in the research group? What area do you focus on? | 1a: What does your day to day work look like? |
| Q2 *[ROUND ROBIN]*: Does your research have different or distinct phases (for example where you’re doing different activities or asking different questions)? If so, what would you call those different phases? | 2a: How long do you spend in each of those phases? |
| Q3 *[ROUND ROBIN]*: What do you think of when I say ‘data’? What does that word mean in your research? | 3a: What about the word ‘information’? |
| Q4: Thinking back to a time in your research when you realised there was a gap in your knowledge, how did you go about addressing it? | 4a: What sources did you use?4b: Can you talk me through the process in more detail? |
| Q5: What resources do you use most regularly in your work when you’re looking for answers to questions or gathering data? |  |
| Q6: When you’ve gathered information in a literature search or through lab work, how do you evaluate it? | 6a: How do you decide if it’s relevant to your research?6b: Where did you learn those skills? |
| Q7: What procedures are in place to help you look after data, files and documents you produce? | 7a: What tools do you use for this process? |
| *Q8: For those of you that have published your research, what impact do you think it has had outside of being read and cited?* |  |
| *Q9: How do you use library services in your research?* |  |
| **Q10: In libraries we think a lot about being strategic about information. How would you describe your strategies for dealing with the information you use in your research?** |  |
| Q11: Which areas of your research do you tend to struggle with? | 11a: What types of work do you outsource to someone else? |
| Q12: Do you have any thoughts on how an information specialist might be helpful to you in your work? |  |
| Q13: [Summarise the discussion so far.] Have I missed anything? |  |

The discussion in the first group focused initially on what members of the group were working on and what resources they were using. Two were working on literature searches and a key item that those present agreed upon was that identifying the scope or focus of one’s research is a key challenge. It was noted that while literature searching introduced people to interesting material, they felt like reading through this material was not their strength. Those participants who had a materials engineering background said that although the content was different, the problem-solving approach was the same. Similar ideas came up in the second group.

Both groups broke down their approach to gaps in knowledge into distinct categories based on whether the gap consisted of a whole field they did not understand, or a small piece of technical or procedural information. The second group had a more lengthy conversation about using other people to help answer these questions, noting that often it will save a lot of time just having a conversation with someone rather than spending a long time looking for the information and reading about it in detail.

Both groups had in-depth discussions around defining data and information. They tended to conceptualise data as something ‘pure’ and usually quantified. Data could be manipulated, interpreted, contextualised and analysed, and those secondary layers constituted information. However, few participants expressed a sense that they had a strategy for dealing with information. There was some agreement that organisation was important, but that they often felt like they did not have time to do it or that they had started in a haphazard way and it was too late to impose a strategy on their data.

With regards to the role they saw for an information specialist in the group, most of the answers focused on finding and accessing information. Both groups showed self-awareness of their processes and habits, but did not really connect this to a strategy or concepts such as information literacy, nor did anyone seem to connect information strategies with the expertise available in libraries.

## Appendix 2.2 – Diary study

Recruitment for the diary study was conducted in the same way as the focus groups. Each participant received a £10 gift voucher for an online retail outlet as thanks for their time at the end of the study. Consent to use excerpts from the diary studies anonymously in published work was sought at the beginning of the study.

Of the eleven initial volunteers, one dropped out after the first week, leaving ten participants completing diary studies each week for ten weeks during the EL pilot. Two participants missed an entry each, meaning that the body of evidence for the study is 98 individual diary entries.

Every Monday during the diary study the participants received an email with an attachment containing one of the prompts below and instructions to return it at the end of the week. The diary entries were coded by the researcher during her two non-embedded days each week, and the codes were added to a spreadsheet to act as an index.

**Week 2 – 6 prompt**

*Please write about the work you did this week, reflecting on what you did, what decisions you made and why you made those decisions. If you would like some guidance, you may use the following questions as prompts but you don’t have to:*

* *What resources did you need to find this week? How did you go about finding them?*
* *What data, documents, files or other forms of information did you need to manage this week? How did you do that?*
* *What data, documents, files or other forms of information did you produce or work on producing this week? How did you go about it?*

**Week 7 – 10 prompt**

*Please write about the work you did this week, reflecting on what you did, what decisions you made and why you made those decisions. If you would like some guidance, you may use the following questions as prompts but you don’t have to:*

* *What resources did you need to find this week? How did you go about finding them?*
* *What data, documents, files or other forms of information did you need to manage this week? How did you do that?*
* *What data, documents, files or other forms of information did you produce or work on producing this week? How did you go about it?*
* *If you haven’t done so already, maybe start reflecting on any decisions you’ve had to make in your research and how you made those decisions, or how your understanding has changed in the last week.*

**Week 11 prompt**

*This week you can write your usual sort of entry, or take the opportunity to think back over the last ten weeks and write about what has changed in your understanding of your work.*

## Appendix 2.3 – Exit interviews

 Interview participants were hand recruited by email to represent a mixture of PhDs and postdocs; users and non-users of the EL’s services and expertise; and the different subgroups within the ULG. Where interviews had to be cancelled a written statement was sought so that reflections would still be received in the participant’s own words. The interviews were conducted by other librarians, rather than the EL, in an attempt to minimise bias.

**Interview schedule**

An interview schedule was provided to the interviewers, with the suggestion that they use it as a prompt for a semi-structured conversation. The interviewers also received some background information on each participant from the EL. From that base, the interviewers added their own questions so that each interview was unique but broadly followed the following schedule:

1. Tell me about your work.
2. How did you end up working with the Use Less Group?
3. How have your ideas about your research changed over the last few months?
4. What is something you feel you do well in your research?
5. What is something you feel you could improve on in your research?
6. Did you make use of the Embedded Librarian while she was with your group?
	1. *(If yes)*
		1. In what way?
		2. Has working with a librarian in your group changed how you think about any aspects of your work?
		3. [Theme: How did embedded librarian differ from services you would expect to get in a traditional library?]
	2. *(If no)*
		1. Why not?
		2. What is your perception of the types of areas in which an embedded librarian might be useful to others?
		3. [Theme: For non-users, what is it about the perception they have of library services/embedded librarian that makes them think ‘This isn’t relevant to me’?]
7. Did having a librarian in your group add value? How would you characterise that?
8. Theme: Any information about knowledge management – how they find stuff out from past or current members of the group, what sorts of information they would want to have deposited somewhere centrally accessible to all members of the group.

## Appendix 2.4 – Research log

 The final piece of qualitative research data during the pilot came from the EL’s daily log of observations, notes, planning and reflections. Along with a task tracker to capture time spent on tasks, this document was constantly open when the EL was working. The day would often end with at least 5 minutes of reflective writing, and any pertinent conversations, meetings and other events of the day were noted down in these documents.

## Appendix 2.5 – Post-report questionnaire

In order to check the accuracy of the impressions and seek further ideas for library services, the following questionnaire will be made available to members of the ULG after they have read this report:

**1 - How much of the report did you read?**

* All of it
* Most of it
* Just the parts that seemed most relevant to me
* I skimmed it
* None at all

**2 - Do you think the report accurately portrayed researchers in the Use Less Group?**

* Yes
* Not sure
* No

**3 - Can you please explain your answer to Question 2?**

**4 - Which recommendation did you think was most useful? Please explain your answer.**

**5 - Which recommendation did you think was least useful? Please explain your answer.**

**6 - After reading the report, do you have any more ideas for how library services could help you in your research?**

**7 - Do you have any other comments about the report and how it portrayed your research group?**

# Appendix 3 – Major projects

## Appendix 3.1 – Ontology project

 Ontologies are an information architecture that defines terms and concepts and links them in a more three-dimensional way than a simple hierarchy. It is the same kind of information architecture that enables the semantic web to be semantic. The ontology project formed the largest part of the EL’s work in the group. The brief was to look into Ontology-Based Data Access (ODBA) for a tool that would allow researchers to query large, diverse, distributed data and produce Sankey Diagrams of the current flows of materials, as well as projections based on the manipulation of variables.

A significant portion of time early in the pilot was spent doing a literature search and getting up to speed with how ontology based data access works and finding other researchers who have put it to similar uses. The EL quickly ran into the problem of the literature being technical to the point of being unhelpful and incomprehensible to someone without a software engineering background. She changed tactics to look instead at information architecture and design principles for consideration by the group and an ontology engineer taking up the project. Avenues explored by the EL included visual analytics, UX design, query formation, semantics and federated databases. She also compiled a list of research questions based on past publications by the group that could form potential use cases, categorised them and considered what sorts of data they would be querying and how best to construct the queries themselves. These were summarised in a report to the group upon the pilot project’s end.

This project posed the biggest challenge to the EL. With a very broad brief and no prior knowledge of ODBA it was difficult to know where to start and in retrospect time was lost exploring avenues or using approaches that did not ultimately pan out. However, this helped the EL experience the mentality of a researcher more than any other project. When a diary study participant discussed the need to spend time going down blind alleys to know that they do not lead anywhere, the EL had recent first-hand experience of this feeling. Ultimately, the potential contribution of the EL to the overall ontology project was always going to be limited by her lack of specialist knowledge.

## Appendix 3.2 – Bibliometric report

 One of the earliest ideas the EL had was to produce a bibliometric report for the group.

 In the initial data gathering exercise in Week 1 of the pilot, the EL looked at Symplectic, Scopus, Google Scholar and ORCiD. This revealed that only four members of the ULG had ever logged on to their Symplectic accounts, and of those only one was updating their account regularly. This meant that much of the group analysis could not be performed. The priority became educating the group about these tools, how to use them and why it is important to keep them up to date. The EL emailed each researcher with a custom list of actions to take to get these up to date, and sent a generic email to the PhD students. After a few weeks and one or two other prompts, the majority of the group had claimed their publications on Symplectic.

 The emails included the offer of one-to-one help setting up these tools and one member of the group set up an appointment with the EL as a result. During this meeting, the EL walked the researcher through setting up these accounts and discussed making research more visible. As the researcher was particularly interested in having a broader impact, the EL showed her Altmetric.com where they looked up her work. It turned out that, unbeknownst to her, one of her most recent publications had been written up in a popular UK newspaper. Feedback from this initiative was positive, with most researchers emailing back to thank the EL for the information. A few considered themselves ‘no good’ at these kinds of administrative activities and were grateful for the clear guidance on what actions they should take.

Once Symplectic was largely up to date for most researchers, the EL was able to produce a report on the bibliometric data available. The report included a discussion of the different metrics available, the patterns of publication by the group, a discussion of the tools that were not being exploited already and the table of recommendations below for managing publications and sharing research online. Feedback for the report highlighted the fact that it did not include many specific recommendations for increasing impact, particularly on policy. The EL then investigated this further and produced an additional section that tied in with the work she had already conducted on the Green Paper response (see Appendix 3.3). To help with this, the EL consulted with one of the Department’s Knowledge Transfer Facilitators (KTFs) to ask about channels of impact and how it can be tracked.

|  |  |
| --- | --- |
| **Recommendations** | **Why?** |
| Login to **Symplectic** (symplectic.admin.cam.ac.uk) and follow the prompts to set up your account:* Connect/set up **ORCiD** identifier
* Claim/Reject publications
* Modify search settings
* Connect with funding
* Fill in profile with information about your research
* Add other scholarly/teaching activities
 | Symplectic feeds out to the Department’s publications pages, giving your research more visibility. It automatically searches online databases that you specify in your search settings and adds your publications if you have used an ORCiD.**ResearchFish** can pull data from Symplectic about publications linked to funding. |
| Add your ORCiD to your **Scopus** profile and check for potential author matches to find out if you have multiple profiles. | This helps disambiguate you from authors with similar names, unites all of your work published under variations of your name and helps Symplectic claim new items as they appear on Scopus. |
| Set up a **Google Scholar** profile and make it public. | People searching for academics will often try Google Scholar first so it is an important place to have a profile. |
| **Suggested extras** | ***Why?*** |
| Set up citation alerts for your publications on Scopus, Google Scholar and **Altmetric.com**. If you need assistance, see the ‘Help’ section of these sites, or see a librarian. | This way you will know immediately when your work is cited and be able to gather evidence of impact. |
| If you are interested in using social media (e.g. Twitter, YouTube, or a blog) to promote your work, make sure you link to a version with a **DOI**. A DOI can be obtained simply by uploading the output to a repository, such as repository.cam.ac.uk. This can be done from your Symplectic home page.  | This will enable Altmetric.com to find mentions of your work and ensures that potential readers can easily find the full text version. |
| If you are an early career researcher you might consider joining professional networks such as **LinkedIn**. | Professional networks can be a good place to make connections with other researchers with whom you might like to collaborate and increases your professional visibility. |

 Although this project employed the same methods that the EL had already used to prepare group reviews in the past, it ended up posing a greater challenge. In the group reviews she was accustomed to deferring to the expertise of PIs and researchers, merely presenting the information without suggesting particular changes to behaviour. Similarly, in teaching skills to new PhD students she tended to emphasise that there is no ‘right way’ of conducting research and that it is the job of the individual to be thoughtful about why they are making the decisions they are making. In this case, however, Professor Allwood was keen to have recommendations from the EL.

This points to a key difference in the relationship between an EL and a research group as compared to that of a traditional librarian and researcher. In this case, the EL’s opinion was valued as that of an insider and colleague and was asked to express an opinion rather than to lay out options without expressing any judgments.

## Appendix 3.3 – Green Paper response

 The final large project the EL was involved in was helping the group prepare a response to a Green Paper published in January by the Department for Business, Energy and Industrial Strategy. This document discussed the development of an industrial strategy for post-Brexit Britain and was open for comment through 17 April, 2017. The EL came across it the day after its release while looking at information on impact and policy. She flagged it up to Professor Allwood, who agreed that the group should produce a response to the document. One researcher described the contribution as follows: ‘She identified the call for evidence early on meaning that we had time to put together a thorough response and she provided research support for this task.’[[48]](#footnote-48)

 The EL’s involvement with preparing the response was to search for national policy instruments that focused on material demand reduction, carbon taxation and other similar strategies. She prepared a spreadsheet of these policies and any evaluations that were conducted and passed it on. Later, she reported on past publications by the Climate Change Committee and other select committees who had advised the Government on linking industrial strategy with carbon emissions targets and proofread a draft of the response. ‘Industrial metamorphosis: a response to the Green Paper on building our industrial strategy’ was published on the Cambridge repository in April 2017.

 This project was the most natural fit for the existing skillset of the EL because it involved searching, organising and summarising information. It required enough of an understanding of the strategic aims of the group and their research domain to be able to select relevant information, but the policy documents were non-technical and so were very readable. With the hope that it would help the group’s research have an impact on climate change policy, the EL was also the most enthusiastic about working on this project.

# Appendix 4 – Cloud storage options

UIS provides a 50% discount on Dropbox Business accounts, giving options for unlimited storage. The advantages of this over a free account include unlimited storage, unlimited document recovery and the guarantee that the servers are based in the EU, meaning that it meets the requirements of some funders for data protection. OneDrive offers similar advantages to Dropbox and is free through the University, though the data storage is capped at 1 TB. The servers are based in the European Economic Area and so meet the requirements of some funders for data protection. OneDrive does not integrate with Linux, so the few Linux users in the group would need to create a Windows partition or devise some other solution to access it.

Neither Dropbox nor OneDrive are ideal from a data protection standpoint, leading to funders such as the Medical Research Council (MRC) banning researchers who work with personal information from storing it in the cloud at all. While it is less likely to affect this group, it is worth noting the potential for conflict with funder policies with regards to data protection. Longevity of storage on the cloud is another important consideration. For the KM needs expressed above the risk of disastrous data loss in the event of interruptions to these services is relatively low, but if the group started to rely on Dropbox or OneDrive as a tool for managing essential research data the risk would need to be reassessed.



Figure - Cloud storage options. From a handout created by Georgina Cronin from the Moore Library.

# Appendix 5 – Information literacy

Information literacy (IL) is an umbrella term for a range of skills and competences, from finding and evaluating information to synthesising and communicating it cogently and ethically. In the 2005 Alexandria Proclamation, UNESCO defines IL as follows:

Information Literacy empowers people in all walks of life to seek, evaluate, use and create information effectively to achieve their personal, social, occupational and educational goals.

This includes reflecting on what those goals are in order to decide what information is needed, and the critical awareness to be able to justify the decisions made. This broader definition applies universally, while other models focus on IL in educational and academic contexts.

The ANCIL framework (Coonan and Secker 2011, p.5) outlines the role of IL in the lives of learners:

* **Transitional:** IL bridges gaps between a learner’s past experience and new expectations, e.g. the transition from Masters programmes to PhDs, or from institution to institution.
* **Transferable:** it provides learners with the ability to be strategic about information in any context, including working with industry or entering the workplace.
* **Transformational:** it changes the practices and attitudes of learners, sometimes in small ways and sometimes radically.

In other words, IL can empower researchers to make better decisions, to have a flexible and opportunistic approach to information and to transform information into deeper learning. The Engineering Library places IL at the centre of its training curriculum, but there are gaps that still need to be addressed.

# Appendix 6 – Modifications to tiered services model based on feedback

 Feedback after an initial reading of this report has led to development of the idea of tiered services. While the EL had fallen back on tasks and services that were comfortable and familiar, Professor Allwood expressed that where the most productive partnership lay from his perspective was in pushing the boundaries of knowledge rather than in signposting existing knowledge.[[49]](#footnote-49) This prompted a reframing of the tiered service model, outlined below in Table 3, which will inform outputs that are shared with the Department. They have been presented as short, concrete examples rather than an exhaustive list in the interest of brevity, as suggested by Professor Allwood. This version further differentiates the Embedded from the ‘Borrow a Librarian’ model by emphasising the partnership in the former and the consultancy in the latter.

 Prompted by Professor Allwood’s feedback, this model forms the basis of promoting tiered services to the Engineering Department. In the current report, the tiered model presented relatively safe and familiar services, albeit in a different context. These services focused on signposting and wayfinding among existing resources. Where the unexplored territory lies, however, is in librarians working as partners in research, helping to map the edges of the unknown. Table 3 outlines potential services, further delineating the difference between the ‘Borrow a Librarian’ and fully embedded levels with the former comprising consultation – or ‘teaching how’ – and the latter comprising a deeper partnership – or ‘exploring with’. This represents the current thinking about these services as of 4 July 2017 and is subject to change as this project develops.

#### Table 3 – Potential tiered services, Version 2

|  |
| --- |
| Standard Services |
| These services are available to anyone in the Department. |
| *A coordinator needs help setting up a Moodle course and works with a librarian to develop digital materials that support learning.* |
| *A coordinator of a taught course wants to make sure their students are getting the right advice at the right time about searching, managing and communicating information well. The library helps develop a bespoke programme of research skills content embedded in the curriculum, with web-based materials to support learning.* |
| *A PhD student is publishing their first paper as the corresponding author and wants to know what to do to comply with funders and be eligible for the REF. A research support librarian explains the process and how to upload his paper to the repository.* |
| *A postdoc has a lot on their plate between setting up a conference, writing papers and mentoring PhDs. When a PhD runs into some trouble with their literature review, the postdoc refers them to a librarian, who meets with the PhD to talk about search strategies and helps them identify what kind of information they’re looking for.* |
| These are just a few of the services we offer. Are you trying to find, manage, use, communicate or share information more effectively? We can help! |

|  |
| --- |
| ‘Borrow a Librarian’ |
| These services are available to research groups by arrangement with the Library and include facilitating conversations and signposting resources for groups wanting to develop new information and data workflows, and providing support for publishing and communication. |
| *A research group is interested in finding out how they can improve their knowledge transfer. A librarian spends some time with the group and suggests some tools and workflows they could implement, as well as coming up with a file naming convention for the group.* |
| *Some new PhDs are arriving in a group and there are concerns about ensuring a smooth handover. The librarian meets the outgoing and incoming PhDs and helps organise the documentation so it will be useful to the new starter.* |
| *A research group is developing a new technology, and this means that they need to stay up to date on patents and policies that might affect what they can develop. A research support librarian performs searches and sets up alerts so that the group knows each time something relevant comes up.* |
| *Do you have a particular project that would benefit from an information professional? Is your group interested in building your online presence? Do you need to compile information or data sources, bibliographies or reference lists? Talk to us about whether borrowing a librarian could meet your needs!* |

|  |
| --- |
| Fully embedded services |
| These services are available for research groups who wish to work more closely with a librarian and can include the role in their funding. Add a librarian to your research group for long term projects and to benefit from collaboration with an information specialist who gets to know your work. |
| *A research group is trying to identify the gaps in current knowledge into which they can venture. An embedded librarian spends time coming to understand their work and helps them map out the knowledge gap.* |
| *The embedded librarian, having come to know the group by participating in meetings and speaking with researchers, sends them interesting and relevant data sources and policy updates, improving the group’s current awareness.* |
| *Working as a research associate, an embedded librarian assists the group with a project involving ontologies, taxonomies and other information architectures, providing advice on what architecture is best suited to the group’s needs.* |
| *A busy PI who values communication and open research brings in an embedded librarian to support and coach their group on best practice and lead by example as a research associate.* |

1. EI.P2 [↑](#footnote-ref-1)
2. This is based on a daily task tracking sheet that was rounded to the nearest five minutes, excluding library work and teaching conducted during this period. The ‘other’ category includes time spent on reflective writing and administrative activities related to the study, such as preparing emails for the diary study. [↑](#footnote-ref-2)
3. EI.P3 [↑](#footnote-ref-3)
4. EI.P4 [↑](#footnote-ref-4)
5. EI.P4 [↑](#footnote-ref-5)
6. EI.P4 [↑](#footnote-ref-6)
7. EI.P6 [↑](#footnote-ref-7)
8. Written feedback from a postdoc researcher [↑](#footnote-ref-8)
9. EI.P5 [↑](#footnote-ref-9)
10. e.g. EI.P4 [↑](#footnote-ref-10)
11. Written feedback from a postdoc researcher [↑](#footnote-ref-11)
12. EI.P6 [↑](#footnote-ref-12)
13. EI.P4 [↑](#footnote-ref-13)
14. EI.P4 [↑](#footnote-ref-14)
15. EI.P7 [↑](#footnote-ref-15)
16. While the Knowledge Transfer Facilitators (KTFs) are the main resource for information on grants and funding in the department, there is an information-based aspect to grants that the library could support, including advising on Open Access, Open Data and Data Management Plans and gathering evidence for proposals. [↑](#footnote-ref-16)
17. e.g. EI.P3 [↑](#footnote-ref-17)
18. EI.P7 [↑](#footnote-ref-18)
19. EI.P7 [↑](#footnote-ref-19)
20. e.g. EI.P1 [↑](#footnote-ref-20)
21. EI.P2 [↑](#footnote-ref-21)
22. EI.P3 [↑](#footnote-ref-22)
23. EI.P3 [↑](#footnote-ref-23)
24. Personal correspondence on 27/04/2017. [↑](#footnote-ref-24)
25. DS.W10.P10 [↑](#footnote-ref-25)
26. FG1.P3 [↑](#footnote-ref-26)
27. EI.P4 [↑](#footnote-ref-27)
28. Statements were coded as ‘Reflection’ if they showed evidence of a participant thinking about why they did what they did or how they felt about it. ‘Strategy’ was the code used when participants wrote about their practice without considering why it did or did not work. [↑](#footnote-ref-28)
29. EI.P4 [↑](#footnote-ref-29)
30. EI.P6 [↑](#footnote-ref-30)
31. EI.P4 [↑](#footnote-ref-31)
32. EI.P6 [↑](#footnote-ref-32)
33. EI.P2 [↑](#footnote-ref-33)
34. EI.P7 [↑](#footnote-ref-34)
35. FG1.P4 [↑](#footnote-ref-35)
36. FG1.P3 [↑](#footnote-ref-36)
37. e.g. FG1.P2 and FG2.P2 [↑](#footnote-ref-37)
38. FG1.P2 [↑](#footnote-ref-38)
39. DS.W11.P2 [↑](#footnote-ref-39)
40. e.g. FG1.P1 and FG2.P3 [↑](#footnote-ref-40)
41. EI.P1 [↑](#footnote-ref-41)
42. EI.P1 [↑](#footnote-ref-42)
43. EI.P7 [↑](#footnote-ref-43)
44. **FG1.P2** [↑](#footnote-ref-44)
45. EI.P7 [↑](#footnote-ref-45)
46. EI.P7 [↑](#footnote-ref-46)
47. EI.P1 [↑](#footnote-ref-47)
48. Written feedback from a postdoc researcher. [↑](#footnote-ref-48)
49. E-mail correspondence (14/06/2017). [↑](#footnote-ref-49)