Developments in research data services in Ireland – current activities of Irish libraries and librarians’ perceptions of drivers and constraints

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Dissertation submitted in partial fulfilment of the requirements for the degree of MSc Information and Library Management at Dublin Business School

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August 2019
Title:
Developments in research data services in Ireland – current activities of Irish libraries and librarians’ perceptions of drivers and constraints.
Declaration:
I declare that this dissertation that I have submitted to Dublin Business School for the Award of Information and Library Management MSc is the result of my own investigations, except where otherwise stated, where it is clearly acknowledged by references. Furthermore, this work has not been submitted for any other degree.

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Acknowledgments:
I would like to thank all of the participants in this research for their time and thoughtful commentaries that have helped develop a deeper understanding of research data services in Ireland. I would like to thank in particular Ronan Cox, Marta Bustillo, Brendan Devlin, Jane Burns, Tony Murphy and Caroline Rowan for making introductions on my behalf and permitting me to speak with the most knowledgeable and senior staff available.
In particular I would like to thank Ann O’Sullivan for her support throughout the process of creating this research.
Abstract:
Librarians and library staff active in research data services were surveyed and interviewed to assess perceptions of the development of research data services in Irish universities and Institutes of Technology. These results were compared against previous research. It was found that many more institutions have begun performing services in relation to research data. Policies governing the handling of research data are either in place or in planning stages for a majority of universities. Institutional repositories have been established at all of the institutions examined but the ability to accept datasets is not a common feature. The most common form of services provided include assisting in the deposit of data and maintaining a web resource of guides for research data management. Advisory services were more likely to be offered than technical services, although there has been some growth in the number of technical services provided. Participants rated the main skills needed to perform current services as knowledge of the research lifecycle, data description and documentation, and legal and advisory skills. Communications skills, advocacy skills, and teaching skills were also considered essential in the provision of current services. Many respondents argued that a skills gap prevented further development of the services provided. In most cases, the main driver for the creation of all of these services was the introduction of requirements by research funders regarding the management of research data. Other drivers for the development of these services included demand from researchers relating to storage, security, accessibility, and the goal of increasing the research profile of the institution. The main constraint on developing the library’s involvement in this sector in the future was funding. Other factors viewed as constraints were the tendency for researchers to associate data service with open science, the ambiguity over whether the library or another department provides or should provide such services, and the complexity of certain elements of data services such as data preservation.
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Introduction:

In the course of conducting research, scholars produce data of various forms. These may be in the form of transcriptions of interviews stored on Word Documents, SPSS, or NVIVO, large datasets stored in Excel or Stata, or many others (Cox and Pinfield, 2013, p.3). The analysis of this data generates new knowledge that is presented and published in the form of conference papers, journal articles, books, blog posts, or other mediums. As research is changing to become more international, collaborative and data intensive, new requirements and incentives have emerged for the intelligent processing of research data. Technologies such as cloud computing, online databases, scholarly communications networks and repositories have undergone constant developments that facilitate communication of and access to research publications and the materials used in their creation. Funders of research and political bodies with oversight of research on a national or transnational level have taken steps to increase the impact, accessibility and transparency of research. Within this context of evolving scholarship norms, the discussion of the library’s role in the provision of services relating to research data has emerged (Corrall, Kenna and Afzal., 2013, p.639). Many academic libraries have begun to offer a variety of research data services to support researchers in their institution.

The goal of improving how research data is handled is motivated by a variety of factors. The data produced for a particular research output may be of use to more persons than the original researcher or research team. A single dataset can, in many instances, be used to assess different research questions. Where datasets relating to a particular topic are available, those interested in a different aspect of the topic may be able to investigate this without having to commit resources to generate the primary data. Similarly, aggregate or historical studies based on the comparison of data in different datasets relating to the same topic that have been produced by various creators, can be used to analyse a phenomenon over a long period. Furthermore, the increasingly developed field of e-science, distributed computationally intensive processing of data, depends on the availability of accessible, well-described, and curated datasets (Carlson and Johnson, 2015, p.2). In short, there are many utilisations of datasets that are possible if the data is accessible, and there are more possible re-uses due to the developments in network technology, computing power, the rise
of interdisciplinary research and the internationalisation of scientific research. Data, however, is not always captured and managed in a way that facilitates reuse. Studies have found that scholars frequently organize data on their computers using ad-hoc and inefficient methods that can result in data-loss (Cooper and Springer, 2019, p.133). Graduate students also overestimate the quality of their data management practices (Doucette and Fyfe, 2013, p.169). When data is well managed, the record of previous research is reliable and exhaustive, data loss can be mitigated, and there is no need to expend resources and time to reproduce the data that has been lost or has been made inaccessible (Doucette and Fyfe, 2013, p.165) (Tripathi, Shukla, and Sonker, 2017, p.417).

In the past ten years, many of the largest research funders, both public and private, have introduced requirements that projects implement some research data management processes such as creating a data management plan (DMP). Rice and Southall (2016) describe three main drivers for these forms of requirements:

- The development of the open-access movement, of which open data is a constituent, which has made gains in promoting the message that research funded from the public purse should be publicly accessible.
- Efficiency gains through the avoidance of unnecessary repetition and duplication of research.
- Transparency, accountability, and avoidance of fraud in research (Rice and Southall, 2016, p.69).

Many funders in the UK and United States were among the first to implement such requirements. In Europe, the European Commission’s €20bn Horizon 2020 research programme included the requirement of a DMP for projects on the Open Research Data Pilot. Compliance with these requirements can be challenging for researchers (Carlson and Johnson, 2015, p.2). In this changing environment, support for researchers has been provided by different departments within academic institutions. A significant volume of literature has been developed covering the emergence of the library’s activity in this sphere. This literature encompasses case studies of institutions whose library services have expanded to accommodate new needs present in the research and student population, as well as quantitative reviews of the new roles that have emerged and the library services
provided, and qualitative studies of the relationships, roles, and drivers involved in this evolution.

One theme emerging from this literature is the discussion of how the library should position itself and which services could be provided by the library to support research data management and which roles may be best suited to library staff. Discussions of the services that libraries can provide in relation to research data can be facilitated through examination of an influential model of the lifecycle of research data. The Research Data Life Cycle model fragments the stages of a data’s involvement in a research project into six stages: *collection or creation* in which materials and background information is gathered; *processing*, in which collected materials are examined and transformed; *analysis* in which gathered information is processed and conclusions are derived from the data; *preservation* in which the attributes of the files that comprise the data and the duration they are to be kept are determined; and *re-use* which consists of the steps needed to grant access to other researchers (Brochu and Burns, 2018, p.2). In as much as it performs a research support function, the library may become involved in assistance with any of these stages of the research data life cycle. For example, *creation* stage support might consist in finding or locating datasets or information used in research; *analysis* might be facilitated through assistance with data mining techniques; and *preservation* and *re-use* can be facilitated through the conversion of files to more sustainable formats, depositing of data in a repository, or assisting with data description and metadata. Similarly, it may be helpful to make a distinction between *active data*, which is active in as much as it is being utilised in a research project, and *data archiving*, which maintains the data after the completion of the research project for which it was created and might not be active in any research project.

**Positioning: the library’s role in providing research data services**

The academic library operates as part of a higher education institute. This sector is undergoing changes on many fronts which are causing shifts in institutional strategy. In particular, student success, measurements of research impact, internationally recognised research and global reputation are key strategic priorities (Cox, 2018, pp.1-2). However, researchers often do not engage with the library (Auckland, 2012). Technological developments and the shift to electronic resources has impacted the visibility of the library’s
services to researchers – who, in many instances, associate the library more with supporting teaching and learning than research support (Corrall, Kennan, and Afzal, 2013, p.637). The library faces challenges of positioning in that more departments have taken on roles and responsibilities in relation to information management (Dempsey 2015, from Cox p.2), and the library services, rather than being taken for granted, must be defined and their value communicated effectively to the management of the institution (Cox, 2018, p.2) (Oakleaf, 2010). The library’s mission of supporting learning and research has required both that services evolve, in response to these pressures, to match the changing research and information environment and that the value of these services be captured and communicated. In libraries, participation in open science and open access initiatives has become a common element of library positioning and service provision (Pinfield, 2015).

Open data has been part of this movement and the introduction of funder requirements for research data management plans and the maturation of existing open science initiatives have made supporting research data management an institutional goal for many academic institutions (Cox and Pinfield, 2013, p.2). This development has been seen as an opportunity for libraries to involve themselves in research data management (Cox, 2018, p.15). The nature of this involvement varies significantly amongst institutions and the factors that shape this variation have been the subject of significant study. Differences exist among conceptions of research data management as to whether it should be conceived of as an independent function or as a component of digital scholarship, open access, or some other broader activity such as e-science. It may also be incorporated into research support services alongside scholarly communications and bibliometrics (Cox, Kennan, Lyon and Pinfield, 2017, p.2184). As some researchers remarked:

“[Research Data Management] is in fact comprised of a number of different strands of activity which might conceivably be seen as separate (albeit related) problems and therefore managed separately. The RDM challenge as being pursued by libraries involves arguing (explicitly or implicitly) for the bundling of these different strands into a single RDM agenda which should then be managed in a coherent way” (Cox, Pinfield and Smith, 2014, p. 17).

Without a clear uniform definition of what research data management roles are, universities and libraries have varied in their development of services and roles to manage it. Soehner, Steeves, and Ward (2010) indicate four different types of approaches to e-science (of which
data services are a component): first is an institution wide approach where a university establishes a unit with jurisdiction over all of its divisions; second is disciplinary focused units; third is a hybrid of discipline and institution wide approaches; fourth is collaboration amongst multiple institutions. Lack of a unifying direction on campus was seen as a hindrance to the further development of data services and e-science. (Soehner, Steeves, and Ward, 2010). In any case, qualitative research indicates that a host of local interrelated factors and influences shape the formation of the library’s role and the development of its services (Pinfield, Cox and Smith, 2014, p.21). Research differs in the effect of this ambiguity: Clarifying what the libraries role should be was listed as a significant constraint on the development of future services in one international survey of (Corrall et al., 2013), yet in another similar study, this was rarely rated as a significant constraint (Cox and Pinfield, 2013). The presence of a university policy on data management or policies administering research ethics, open science, or other initiatives can help frame the roles and responsibilities available to the library but university policies relating to open data or research support may differ in both how the role of the library is defined, and in level of detail and prescriptiveness (Cox and Pinfield, 2013, p.4) (Tripathi et al., 2017, p.418).

Without a universal definition of research data management roles, there has been interest in empirical study of how libraries have responded to develop research data services. Cox and Pinfield (2013) studied 81 UK institutions and found 31% had developed a RDM policy (Cox and Pinfield, 2013, p.10). Participants were asked to name what services were currently being provided by the library and their level of development: many institutions reported no level of services and few institutions reported any well-developed services. Assisting with copyright and intellectual policy concerns was one of the most common services mentions, but technical RDM services were very rare (Cox and Pinfield, 2013, pp.14-16). Tenopir, Sandusky, Allard and Birch (2014) in a study of 223 American institutions, and Corrall et al. (2013) in an international survey of institutions found that advisory services rather than technical services were more likely to be provided (Tenopir et al., 2017). This finding was replicated by Cox et al. in a later international study. In this study, the most common form of services being provided in academic libraries in the UK were: advising on copyright and legal aspects of data (76%), research data management training and data literacy instruction (65%), offering a data management advisory service
(61%), and promoting awareness of re-usable data sources such as data archives (60%) (Cox et al. 2017, Appendix F). There is more coverage of the United Kingdom and the United States than Ireland, although some studies have been conducted and will be discussed below.

**Skills required for RDM**

Amongst libraries who have developed some research data management function, variations exist in terms of roles, services provided, infrastructure, and relationships with other departments involved with information management and research support. One of the most significant factors in determining what form these services and roles take is the skill sets and competencies of the labour force in the library (Derven, Healy, Joy and Kilfeather, 2019) (Federer, 2018) (Auckland, 2012) (Corrall et al., 2013) (Antell, Foote, Turner, and Shults, 2014). The interest and knowledge of library staff in the area of data differs from institution to institution (Cox and Pinfield, 2013, p.4). A debate exists in the literature regarding which skills are required for research data management and whether these skills should be considered extensions of previously existing library skills or new skills unlikely to be acquired by librarians in the course of their studies in LMIS programmes. In a survey of science librarians, Antell et al. (2014) propose that there is uncertainty amongst this cohort regarding whether data management is “a natural extension of their jobs” (Antell et al., 2014, p.270). That is, whether specific new skills are required or whether traditional skills are required to provide data services to scientists. This ambiguity is evident when considering the proliferation of different job titles for positions that are expressly about RDM. Antell et al. remark that the following have emerged since RDM has gained prominence: Research Data Librarian, Data Curation Librarian, and Science Data Librarian (Antell et al., 2014). Federer (2018), in a survey of titles and responsibilities of data librarians (N=82) similarly discovered a wide variation in skills deployed and job titles suggesting that data librarians vary in terms of educational background and forms of work conducted. Reflecting this diversity, this cohort is not in agreement regarding the type of skills that are required for RDM and data services, yet networking and outreach skills, teaching through one-on-one consultation or instruction and oral communication and presentation skills were ranked as essential by the majority of data librarians surveyed (Federer, 2018, pp.298-299).
Debate regarding the skills required to conduct these services is evidenced in Kennan (2016) who argued that librarians working with data needed to have interpersonal skills and information technology skills, understand the nature of the research environment and be able to use appropriate information technology. Semeler et al. (2017) make the case that skills associated with data science such as computer science, statistics, and data mining are required for the nature of a role that involves assisting researchers at each stage of the research life cycle. They claim that a data librarian “must also possess the skills to work with any kind of data and s/he must understand how research modifies the practices and theories that underpin librarianship” (Semeler et al., 2017, p.8). A similar viewpoint is expressed in Lewis (2010) who claims that the library workforce needs to develop new skills, such as those of data scientists, to achieve readiness to implement data management training to university stakeholders. According to Latham, (2017) libraries have focused on providing RDM services that are characterizable as extensions of traditional library services – the predominate services being facilitating access to datasets as an extension of the reference interview, and consultation on the development of data management plans. Latham claims that few libraries are offering technical RDM services which require taking responsibilities for maintenance of technical infrastructure and it is considerations of what can feasibly be accomplished with limited resources rather than what needs are prioritised by researchers that are shaping this outcome (Latham, 2017, p.264). Cox et al. (2017), in an international survey of libraries, also found that advisory services were at a more mature stage than technical services, although progress was evident in the creation of technical services. In a qualitative study of the factors that influence librarian’s ability to support researchers needs in terms of research data management, Faniel and Slippigni Connaway (2018), found that 78% of librarians rated human resources as a significant influence on research data management programs. In particular, the provision of these services was frequently enabled by the existing expertise or experience of staff in various disciplines such as research, law, or archives (Faniel and Slippigni Connaway, 2018, p. 107).

Drivers of the development of RDM

While the skills available in a library’s staff influence what is possible in terms of evolution of library services other factors have been noted as drivers of adoption of
research data management. As mentioned previously, new posts, policies and services have been introduced to comply with data management requirements by funders of research data such as the European Commission, Research Councils UK, and the Engineering and Physical Sciences Research Council (Rice and Southall, 2016, p.71) (Tripathi et al., 2017, p.418) (Ray, 2014). Other drivers for developing roles and services in research data management include developing capacity to deliver on other institutional goals in areas such as records management, information security, freedom of information compliance and research ethics and integrity (Rice and Southall, 2016, p.71). Leadership support within the institution was also considered a driver in that this could build relationships across departments and helped bring about change (Faniel and Silipigni Connaway, 2018, pp. 110-111). This might involve leadership in relation to open science, research quality or other institutional goals. Collaboration and sharing of expertise amongst libraries across different institutions and professional networks was considered a route to learn from best practice and reduce duplication of efforts, yet little evidence existed that this was occurring at a frequent or formal level (Faneil and Silipigni Connaway, 2018, p.113).

Pinfield, Cox and Smith (2014) performed a qualitative study of 26 library professionals in academic institutions in the United Kingdom. They determined from this that the following factors acted as drivers for the development of research data services: Storage, security, preservation, compliance, quality, sharing, and jurisdiction (Pinfield, Cox and Smith, 2014, p. 12-13). Demand from researchers for storage facilities, means of securing data, in particular confidential or sensitive data, and developing the infrastructure and methods to support data archiving comprise the first three of these drivers. Compliance covers the funders’ research data mandates as well as general data protection or other legal obligations. Quality refers to the goal of raising standards of research conducted at the institution, improving transparency and reproducibility. Sharing comprises the need to develop mechanisms for enabling access to data. Finally, jurisdiction comprises the evolution of a narrative which locates the library as a needed participant in the research data management programme at the particular institution.
Constraints on development of research data management

Concern about the availability of suitable skills is frequently cited as a significant constraint on resource data management programme development. One study of RDM in UK university libraries reported a skills gap a “major challenge” (Cox and Pinfield, 2013, p.1). Auckland (2012) identified 32 competencies librarians needed to support RDM, and also commented that skills gaps were present in librarians interested in operating in this area. Tripathi et al. (2017, p.419) claim librarians generally lack fluency in data curation and do not have the skills to provide RDM services, but in many cases are taking the initiative to upskill in this area. In one study, skills were rated as a constraint by librarians from Ireland, Australia, the United States, New Zealand and Britain (Corrall et al. 2013, p.660).

Resourcing, the difference in needs across disciplines and the perception that research data management is not a library role have been reported as significant constraints on the development of research data services in academic libraries (Corrall et al., 2013, p.660). Faniel and Silipigny Connaway reported that librarians in the United States perceived long term storage and preservation as presenting numerous challenges for the libraries’ delivery of research data services (2018, p.107). Similarly, further upscaling of research data management programmes raised concerns of staffing and time commitments where the need to balance research data services with other responsibilities was viewed as a significant constraint (Faniel and Silipigny Connaway, 2018, p. 113).

Another element acting as a constraint was researchers’ perceptions of the library - derived from assumptions regarding what the library does and the lack of a clear response to researchers’ needs (Faniel and Silipigny Connaway, 2018, p.114). Cooper and Springer (2019) claim that the majority of research support services operate using the liaison model, of which they are critical due to a perceived mismatch between researchers’ needs and services offered. These authors argue that library interventions have mostly attempted to capture research data and modify an institutional repository in such a way that research data can be captured. The authors argue that librarians need to study how scholars communicate and conceptualise data sharing in order to develop services that are maximally responsive to the needs of researchers. They also recommend that, for disciplines where highly developed data sharing through technology and repositories have been co-created by researchers, librarians study the enabling factors of such services (Cooper and
Springer, 2019, p.134). The key element in successful data sharing initiatives is the presence of a data community – an informal network of stakeholders who utilise a shared form of data for research and develop a shared infrastructure for data sharing and re-use – in most cases, an online repository (Cooper and Springer, 2019, p.135). These communities are not always restricted to one discipline as researchers may identify more with their research area than any discipline (e.g. cancer researcher vs. biochemical scientist).

Research Data Management in Ireland
In Ireland, the role of the library in research data management has received some treatment. An international survey in 2013 which included nine Irish university libraries indicated that, at that time:

- None offered support on managing unpublished research data, and 62.5% had no plans to offer such support in the future
- 12% had an institutional policy in place with 75% expecting one to be developed within a couple of years
- 37.5% planned to develop a RDM support tool
- 50% had an institutional repository capable of admitting research data, and 37.5% expected to develop one in the coming years
- 14% provided guidance to researchers looking to deposit data in an external repository
- 25% assisted in locating datasets hosted on external databases
- 44% had technological infrastructure in place to facilitate RDM services and 44% anticipated that the university will invest in this in the coming years.
- The largest constraint on further development of RDM services is the need to develop knowledge and skills amongst staff
- Resourcing was rated as a significant constraint by 40% of respondent (Corrall et al., 2013, pp.654-661)

At the time, Ireland’s research data support activity was characterised as “relatively underdeveloped” and, by way of explanation, it was noted that the national research funding bodies had not issued data management policies.
An international survey conducted in 2016 found that research data programmes in universities in Ireland had undergone some development.

- 71% of institutions expected to have a policy in place within 12 months.
- 86% of respondents stated that research data services had not been developed or were in a basic state
- 57% reported no service in data analysis/mining/visualisation
- 14% offered advice on copyright and/or intellectual property rights relating to data and data management
- 29% operated a data repository or archive (Cox, Kennan, Lyon and Pinfield, 2017)

More information about Ireland was captured in this survey but was not included in the final publication. The raw data, as of the time of writing, is not publicly available. The information in this study represents a backward step in some regards: fewer institutions are reported as having policies in place than was previously reported in 2013 (Corrall et al., 2013).

Another study conducted in 2019, of digital scholarship activities in Irish universities revealed activity in a number of areas related to research data management (Derven et al., 2019, pp.5-6). In the views of librarians themselves, a plurality believe that current skills must be complemented with new skills in order to fully address this new requirement. Accordingly, 64% of respondents indicated that a skills gap in data management and curation was evident (Derven et al., 2019, p.9). When considering which digital scholarship area should be prioritised for further staff training, the skills gap in data management and curation was considered to be the second most critical intervention, after digital preservation – an area with significant linkages to data management (Derven et al., 2019, p.9). Despite considering the importance of addressing this issue, survey respondents indicated that there were not sufficient resources available for addressing it (Derven et al., 2019, p.9).

There have been a number of developments in Ireland that have lent credence to the idea that the landscape of RDM in Irish academic institutions has progressed but that this development has not been fully captured by the literature on research data management. A review of websites conducted by the author indicates that many academic
institutions now have research data policies in place. At the national level, the largest funder of scientific research in Ireland, Science Foundation Ireland has recently launched the Open Science initiative ‘Coalition S’ along with other European research funding organizations.\(^1\) The National Open Research Forum has launched the National Statement on the Transition to Open Research.\(^2\) The publication of FAIR data guidelines and the upcoming Horizon Europe research funding programme may be operating as incentives for institutions to develop their capacities in the RDM sphere. Numerous institutional repositories have been launched in Irish institutions.

Research data management in Ireland has not been studied using the qualitative methods employed in other regions (for example, as was used in studies by Faniel and Silipigni Conaway, (2018) and Pinfield, Cox and Smith, (2014)). Additionally, all of the literature on the topic of research data management in Ireland has exclusively focused on the experience of the universities. Yet the libraries in Institutes of Technology in Ireland also have roles in supporting research staff and similar pressures facing researchers and management in universities may be applicable to Institutes of Technology. This paper is an exploration of the work that is currently conducted in Irish third level institutions by the staff employed by the library in order to depict the current level of development of the area within the library sphere in Ireland. This topic has emerged from analyses of the gaps in information that currently exist regarding research data management practices in the library. This is an exploratory research project, intending to map out what is actually taking place in Irish academic libraries and reflects a call for further information presented in the literature such as the following:

“It would be useful to gain a longitudinal perspective on service evolution and innovation by conducting a follow-up survey after an interval to track service developments and explore how planned services have evolved in practice and what other plans have emerged since the present study. Second, it would be valuable to complement such a survey with more in-depth qualitative exploration of the factors driving, enabling, and/or retraining service department and delivery which could

\(^1\) See announcement at: [http://www.sfi.ie/research-news/news/coalition-s-open-access/](http://www.sfi.ie/research-news/news/coalition-s-open-access/)

examine issues such as library roles in supporting research” (Corrall, 2013, p.667-668)

The purpose of presenting this information is to identify the services that are being provided and the skills needed to deliver them, and to identify some of the commonalities between libraries in terms of drivers, best practices, and common difficulties.

Research Question:

What are the roles and activities that library staff in Irish third level institutions are conducting in relation to research data management and data services?

Sub-questions that will be explored include:

1. How many Irish third level institutions have developed policies for data management?
2. How prevalent are institutional repositories and data repositories?
3. What skills are required for the services relating to research data management that are currently provided?
4. What factors have acted as drivers for the development of these research data services?
5. What factors are viewed as constraints on the development of the library’s provision of research data services?

Sub-questions one and two pertain to quantifiable information, while sub-questions three, four and five are based on the perceptions of librarians.
Method:

Participants:
The participants were selected based on a profile of the population best suited to provide information about the state of development of research data services in Irish academic libraries. The selected population would have to be employees of an Irish University or Institute of Technology whose role involved the delivery of research data services, or whose role involved management of the library and definition of its services. Due to concerns about the time needed to collect and analyse the data required for this study, it was decided to restrict the population of institutions under analysis to public universities and Institutes of Technology (ITs). In other words, private colleges and other third level academic institutes would be excluded. According to the Irish government’s list of Universities and Institutes of Technology, in the Republic of Ireland there are eight universities and fourteen ITs. After the merger in 2019 of Institute of Technology Tallaght, Blanchardstown Institute of Technology and Dublin Institute of Technology into TU Dublin, the number of ITs in the country was reduced to eleven. Each of these institutions operates a library service and were thus eligible for inclusion in this research. As a result, all nineteen institutes were contacted. In this study, nine institutions were represented – six were universities and three were ITs.

Participants were selected by a review of staff directories on the websites of each of the institutions. These directories indicated the job titles of library staff. In some cases, information about the activities and responsibilities of each staff member was published online. Candidates selected for this study were either a librarian whose role covered management of the library and the services if provided, or a library staff member whose role involved the provision of research data services. The job titles of participants ranged from Institute Librarian or Deputy Librarian, to Research Data Coordinator, Data Manager, or Research Communications Librarian.

On average, at the time of the study, the participants had been in their current role for three and a half years. Seven of the participants were female and two were male. Information about the age of the participants was not collected. All were adults.

All participants received the same treatment in the study. They were not offered any compensation for their involvement and participated on a voluntary basis.
Design:

Quantifiable information relevant to Ireland in the research data services topic had not been recently collected at the time of creation of this study and similar surveys had been successfully used to uncover trends in service provision in other areas. It was felt that a survey would directly compliment previous survey research done in this area. However, based on the literature consulted it became clear that the nature of services and their drivers is likely to vary and be difficult to capture adequately using this method. There might be a tendency to overlook ways in which services are different from each other at each institution. For that reason a complementary qualitative study of the perceptions of the participants was warranted.

Previous studies of research data services had evidenced that a survey method would capture information about current activity and the prevalence of policies and repositories. This method would also enable comparison with previous studies that had examined perceptions of skill requirements if similar questions were posed. The apparatus from previous studies had been made accessible online and this informed the design of the survey. Hence, conducting a re-survey of this activity presented an opportunity to update and examine the information generated by highly influential papers in this field. Novel independent variables for this study are the status of universities and ITs – that is, the survey will show whether there is a difference in research data activities and perceptions between librarians from an Irish university and those from an Irish IT.

However, in addition to this, a recurring theme from the literature around research data services was the ambiguity over its lexicon. Clear, widely accepted and uniform meanings were difficult to define as the activities performed by libraries in research data differed in many ways. It was felt that qualitative investigation of librarian’s perceptions would yield greater insight into the nature of the drivers of research data services development as well as the means by which these developments were informed and shaped by local factors. Qualitative study could enhance the findings of the survey by enabling the researcher to seek clarification of answers presented in the survey. Furthermore, when participants were given greater freedom to expound on their perceptions of drivers and constraints in this area novel important differences between cases could be made visible. Previous research had demonstrated that drivers and influences could be inferred from qualitative analysis of interview transcripts (Pinfield, Cox and Smith, 2014).
Materials & Apparatus:

Letter of Introduction (Appendix A):

A letter of introduction was created in Microsoft Word. This document was personalised to address each of the candidate participants by their name. It introduced the researcher as a student in the Information and Library Management Masters Programme in Dublin Business School and described the project. Participants were told that the study consisted of a survey and a telephone interview. Estimates of the time commitment required were included. The purpose of the research was described briefly and the participants were told that a separate information sheet could be reviewed to learn more. The participants were told that the project had received approval from the Ethics Board at Dublin Business School. Contact information was also provided.

Participant Information Sheet (Appendix B):

An information sheet was created on Microsoft Word using a template provided by Dublin Business School. This sheet explained that the research was being conducted as part of the Information and Library Management Masters programme in Dublin Business School. It provided the name of the researcher, the name of the supervisor of the dissertation and the contact details for both. A short explanation of the research question and sub-questions was provided. The participants were told that the project had received approval from the Ethics Board at Dublin Business School.

In this document, the procedure for the study was explained. Participants were told that they were being asked to complete a web-based survey, and a recorded telephone interview. Estimates of the time commitment involved were provided.

The participants rights were explained: they were told that they could withdraw from the study at any point without having to provide an explanation, and that they could request that all or any of the data that they had submitted be destroyed. The participants were also told that they had the right to refuse to answer or respond to any questions posed during the study. Confidentiality and anonymisation was discussed and the participants were told that the data used in the report would not contain any personal information that could be used to identify them. Participants were invited to contact the researcher or supervisor if they had any questions about the research.
Consent Form (Appendix C):

A consent form was created in Microsoft Word using a template provided by Dublin Business School. The document contained a summary of the project, the title of the project and a space for the participant to provide their signature. The participant was advised that by signing, they were agreeing that they had consulted and understood the Information Sheet, their questions about the study had been satisfactorily resolved, they were aware of potential risks involved in participating, and their participation was voluntary. There was a space for the signature of the student (researcher) and the date which the document was signed.

Survey/Questionnaire (Appendix D):

A survey/questionnaire containing 16 questions was created using Microsoft Forms. It was administered online and could be completed using a computer or phone. Mandatory questions were marked with a red asterisk symbol and not all questions were mandatory. The survey was divided into five sections and asked multiple choice questions, binary yes/no questions, Likert-scale questions, and open questions.

The first section of the survey asked free-text questions about the participant’s job title, institution, and the length of time they had held their current position. The length of the answers was restricted using the settings on the questionnaire design application. The second section posed multiple choice questions about data management policies. Participants were asked to indicate whether their institution had such a policy or not or whether such a policy was under development. They were asked about how long the policy had been in place, and about whether it related to a broader digital scholarship or research policy. Similarly for the next section, institutional repositories were investigated. Participants were asked if their institution had an institutional or data repository. They were then asked which department operated the repository and how many library staff were involved in its operation.

The fourth section examined current services and provided a list of options described various forms of data management services. The participants were instructed that they could select multiple answers. The list of services was developed by selecting names of services from the studies conducted by Corrall et al. (2013), and Cox et al. (2017). Examples of the services listed include “Support in depositing research data in an institutional
repository” and “Advising researchers regarding data citation practices”. It was possible that this list of options would not be reflective of the services provided at any of the institutions, so a free-text long answer box was provided to permit participants to describe the services provided in their institutions in their own terms.

The fifth section asked about the perceptions of which skills are involved in research data services. The list of skills was derived from Corrall et al. (2013) and included items such as “Knowledge of the research lifecycle” and “Data documentation and description”. Participants were first asked to rate which skills were needed to perform current services. Questions were posed using a Likert scale which permitted grading various options from “Least important” through “Somewhat Important”, “Very Important” and “Essential”. A space to describe other skills that might be needed was provided in a free-text question. After this participants were asked to rate which skills needed to be developed further to provide research data services. The question was constructed using a Likert scale ranging from “Least in need of development” through “Is sufficient but could be developed further” to “Most in need of development”. A space to provide further options was provided in a free-text question.

Interview Schedule (Appendix E)

An interview schedule was developed on Microsoft Excel. This was created through an analysis of the themes in the literature and previous qualitative studies. Questions were designed to seek elaboration on the nature of current services, the role of the library qua provider of research data services within the institution, the skills involved in delivering current services, the perceptions of the participants in relation to drivers of the development of research data services in their institution and the perceptions of what factors act as constraints on this development.

An edited transcript of a trial interview conducted prior to the data collection phase of the research, was referred to by the researcher at the beginning of each interview. This transcript consisted of a preamble that could be used to quickly remind the participants of their rights and of the proposed structure for the interview.

The interview schedule consisted of 10 questions divided into four sections. The first section asked about current activities in terms of policies and services that were being provided at the time of the interview. The second section asked about what skills were
needed to deliver these services, and whether the participant believed that there was a skills gap influencing the research data management programme at their institution. The third section asked questions about the participants perceptions of the factors that had influenced the development of research data services at their institution. And the fourth section looked at what the participants viewed as constraints on further development and whether they believed any future services would be provided in this area.

**Gmail Calendar**

The appointment scheduling application in Gmail Calendar was used in arranging times with participants to conduct interviews.

**OnePlus 5T – MODEL ONEPLUS A5010– smartphone**

This device was used to call participants and conduct the interview. It was also used to briefly store recordings of the interviews.

**Cube ACR – phone-call recording application**

This software was downloaded from the Google play store and installed on the researchers’ phone. While installed, when a call was initiated or received the application would automatically begin recording the audio of the call. Upon termination of a call, this recording was saved as an .amr file on the phone.

**NVIVO 12 (12.0.0 (2449))**

This software was used in the transcription of interview audio and in the analysis of these transcripts.
Procedure:

Between the 18th and 22nd of July 2019, participants were contacted via email with the letter of introduction, consent form and information sheet about the study and invited to participate. The information sheet explained that the study would consist of a survey followed by an interview and that the participant’s information would be anonymised. The time commitment required, estimated based on pilots of the survey and interview, was also explained at this stage. The participants were asked to review the information sheet and send a signed copy of the consent form to the researcher.

Included in the email was a link to the survey which was hosted on the researcher’s Microsoft Forms account. Each participant was able to see and complete the survey questions but could not see the responses provided by other participants. On average, the survey was completed in 14.26 minutes.

Upon completion of the survey participants were presented with a message on the Microsoft Forms site thanking them for participating in the research and explaining how interviews could be scheduled. Another link was embedded in this message. This link led to a Gmail Calendar owned by the researcher which permitted them to book an appointment for a telephone interview using the appointment scheduling plug-in. Upon selecting an appointment time, each participant received an automatically generated email invitation. A copy of this invitation was also sent to the email inbox of the researcher enabling confirmation of appointments without further communication over email.

The interviews were conducted between 25th July and 12th August 2019. On the day prior to the day that each interview was to be conducted, the researcher contacted the participant through email to confirm which phone number should be used. All of the interviews were conducted in the quiet room facility of the office where the researcher was employed. In this facility, at the allocated time, the phone number was dialled.

At the initial phase of the call, the researcher thanked the participant for their contributions to that point, indicated how the telephone interview was being recorded and then informed the participant of their right not to respond to any question that they did not wish to answer. Additionally, the participant was reminded of their right to withdraw from the study without explanation. The researcher then outlined the structure of the interview and asked if the participant was willing to proceed.
Upon confirmation, the researcher asked questions informed by the interview schedule.

The average duration of the interview was 29 minutes.

At the end of the interview, the call was terminated and the researcher selected the newly created .amr file in the Cube ACR application. This was then emailed from the phone to the researcher’s Outlook email address. From here it could be downloaded and inserted into NVIVO for transcription.
Ethics:

Three main ethical concerns were considered at various stages of the design and implementation of this research: the well-being of the participant during the research process, the consideration of the impact that taking part in the research may have on the participant’s career and future employment, and the confirmation of informed consent to participate in the research process.

Regarding the well-being of the participant, care was taken in both the design of the survey and interview schedule and in the implementation of the interview to avoid confrontational or problematic topics that may cause distress. Participants were informed at the beginning of the interview, before any questions had been posed that they were under no obligation to answer any of the questions and could notify the interviewer of this. If this occurred, the interviewer would then move on to the next topic without challenging the participant.

Additionally, the interview was conducted in a calm and professional manner to avoid placing undue pressure on the participants and to avoid causing distress.

Participants spoke about their perceptions of drivers and constraints on the development of library services. In speaking about this topic, it was considered that participants may state beliefs that they would be unwilling to share with other staff in their institutions or with other librarians in the same field. In other words, the statements made in the course of the study could potentially act as risks to reputation or employment. As a result, it was felt that the participants should be anonymised as far as possible. As the number of library staff involved in research data services in Ireland is relatively low, the inclusion of the name of participating institutions and job titles would be sufficient to identify each participant. Consequently, this information is not included together in this report.

Regarding consent, the essential motivation was that, in order for their consent to be considered informed, participants knew what would occur in the study, how information was being recorded, and what rights they held as participants. To ensure this, a consent form was sent to participants on initial contact and was collected prior to data collection. Information about the study was presented on the information sheet that accompanied the consent form. Information about the participant’s rights were presented on this form and also on the appointment scheduling module on Gmail Calendar. Additionally, at the
beginning of the interview the participants were informed of the content of the interview and how it was being recorded. At this stage, they were also reminded of their right to request at any point that, without the requirement that they provide an explanation, all or any information collected as part of the research be withdrawn and destroyed.
Data analysis:

Responses to the survey were downloaded from the Microsoft Forms site to Excel. Using this software, different content could be labelled and frequency counts could be run on different questions. Data was extracted from papers provided by other researchers and manually added on a separate sheet in Excel. Tables were created in Excel through manual entry of data from both sources and formatting. Visualisations of the survey responses were also created in Excel.

Using NVIVO, transcriptions were created for each of the interview recordings. The first stage of the process of thematic analysis was listening to the interviews, transcribing the data and reading the transcription to become familiar with the data. The contents of the transcription were coded in two phases. The first phase was a deductive coding program using predefined codes based on expected themes. From a review of the literature, it was expected that information about the following list of themes would be expressed by participants:

- Roles
- Policy
- Skills
- Current services
- Future services
- Drivers
- Constraints

Occasions where it appeared to the researcher that the participant was speaking about policy, constraints, drivers and so, would be coded to a node of the same name in NVIVO. The second phase was an inductive coding program using the predefined codes as a guide to the more fine grained list of themes. The transcripts were reviewed and coded based on whether they represented separate sub-themes of the above list. The nodes for the sub-themes were arranged underneath the node hierarchically above it. For example, the transcripts were re-read to determine whether, when the participant was talking about skills, they were talking specifically about skills in relation to metadata creation or to advocacy. Passages relating to metadata creation skills were added to a node hierarchically under the skills node. Prevalence was not the only factor influencing the decision to
consider themes important. The sub-themes were revised as familiarity with the data deepened. Ultimately, the themes that emerged most coherently from this process were consolidated into a list and selections were prepared for inclusion in the report.
Results:
Nine institutions responded to the survey. Of these, six were universities and three were institutes of technology. This represented an overall responses rate of 47.37%, a response rate from Irish universities of 75%, and a response rate from Irish Institutes of Technology of 27.27%.

Seven interviews were conducted. Of these five universities participated, and two ITs. The participation rate was 36% overall, 62.5% for universities and 10.5% for ITs.

Roles/Positioning:
There was a diversity of roles that had been adopted by the different library services represented in the study. The form that each service had taken was influenced by the skills available in the staff and the technological infrastructure in the institution. Many services were offered on a one-to-one basis but the element that all institutions had in common was the provision of a web resource outlining information pertinent to RDM.

RDM was provided either by a small general library unit or a specialised unit. In the latter cases it could be clustered with scholarly communications, bibliometrics, or digital scholarship and open science. For all participants, RDM was one duty of many rather than their sole responsibility. As a result, defining a position for this function had to be balanced against other priorities. Similarly, the provision of RDM was influenced by the activity of other departments within the institution. In many cases fruitful collaborative relationships had been formed that had helped shape the positioning of the library or library unit.

During the interview, the process of positioning was explained narratively. One participant worked closely with the research office and was involved with developing expertise in RDM, developing the institutional repository and liaising with the institution’s research community. This library unit was positioned as a neutral deliverer of education and advisory services where researchers with limited time could receive consolidated information about next steps for their research data management. This role was developed over time and built on pre-existing relationships formed during the construction of the repository. In another case, a librarian had joined as head of an institution where previously no RDM activity had been developed. Using experience from a research background, this librarian, consulted with what were perceived to be strong influences in the management of the institution to
define and institutional policy for research data management that specified the library’s role as the provider of certain advisory and technical services in relation to data.

There was near universal agreement that RDM was not solely a library role and that arrangement with other departments in the university needed to be worked out to address the needs of researchers.

Policy

In this study, it was found that a research data management policy is in place in three institutions, and in development in three others. In three institutions no policy is in place or under development. A divide was evident between universities and ITs where all but one university had a policy either in place or planned, and only one IT was in the planning stage for its research data management policy. This IT expected to have a policy in place in the coming months.

Table 1: Research Data Management Policies

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>%</th>
<th>Universities</th>
<th>%</th>
<th>ITs</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Is there an institutional policy for research data management at your institution?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>33%</td>
<td>3</td>
<td>50%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
<td>33%</td>
<td>1</td>
<td>16.7%</td>
<td>2</td>
<td>66%</td>
</tr>
<tr>
<td>Not at present but one is planned</td>
<td>3</td>
<td>33%</td>
<td>2</td>
<td>33%</td>
<td>1</td>
<td>33%</td>
</tr>
</tbody>
</table>

In terms of the effects of the policies, some participants rated them as an enabler of development of the library’s role and positioning:

“I think having a policy always gives you something to point to when you go to meetings to talk about this”

However, the interviews revealed questions about whether the policies that were in place needed amendments to reflect developments of new services and changes in the wider research data management and open scholarship fields.

“[The policies] do not reflect the kind of support that we would be giving in terms of FAIR. Things have moved on a lot in terms of the services and support that we are providing but the policies need to updated in order to take those things into account”

Similarly, some participants claimed that policies had been drafted to justify at an institutional level the existence of library activity in this area but these current documents
would need to be revised as more clear ideas take form about what the library services should consist of, based on, for example, an understanding of researchers needs. Other accounts described policy that was in development as a codification or a formalization of services that were already being deployed by library staff.

In many cases, complementary policies such as data protection, research integrity, or open research policies were used in framing the library’s involvement in research data services.

Current Services:
The survey asked about current services provided by each institution. The design of the survey aimed to facilitate comparisons against previous research. In the following table, the current activity in Irish universities is compared with the data covering Irish universities gathered by Corrall et al. in 2013.

*Table 2: University Services in 2013 and 2019*

<table>
<thead>
<tr>
<th>Universities 2013</th>
<th>In 2013, Planned to be delivered</th>
<th>Universities 2019</th>
<th>Type of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.3%</td>
<td>57.1%</td>
<td>100.00%</td>
<td>Support in depositing research data in an external repository - a repository operated by a body other than your institution</td>
</tr>
<tr>
<td>50%</td>
<td>37.5%</td>
<td>100.00%</td>
<td>Support in depositing research data in an institutional repository</td>
</tr>
<tr>
<td>0%</td>
<td>37.5%</td>
<td>83.33%</td>
<td>Assisting researchers in using existing tools for data management</td>
</tr>
<tr>
<td>0%</td>
<td>37.5%</td>
<td>83.33%</td>
<td>Guidance on the handling and management of unpublished research data - for example, data literacy training</td>
</tr>
<tr>
<td>14.3%</td>
<td>42.9%</td>
<td>33.33%</td>
<td>Developing tools to assist researchers manage their data</td>
</tr>
<tr>
<td>25%</td>
<td>37.5%</td>
<td>33.33%</td>
<td>Finding and gaining access to external datasets for researchers</td>
</tr>
</tbody>
</table>

Significant changes have occurred since 2013, and many more universities are providing research data services of some description. Support for data deposit in both institutional repositories and other repositories was reported as a service in all institutions. The most extreme changes were visible in the growth of the provision of services that assisted researchers in the use of data, and services that assisted with the handling of unpublished
research data with both seeing a rise from 0% to 83%. In general, universities provided more services than ITs although this was not universally true. The following table represents the services provided in universities and ITs.

Table 3: Difference between services provided by Universities and ITs

<table>
<thead>
<tr>
<th>Universities</th>
<th>ITs</th>
<th>Type of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>100.00%</td>
<td>100.00%</td>
<td>Maintaining a web resource/guide of useful resources for research data management</td>
</tr>
<tr>
<td>100.00%</td>
<td>33.33%</td>
<td>Support in depositing research data in an external repository</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- a repository operated by a body other than your institution</td>
</tr>
<tr>
<td>100.00%</td>
<td>100.00%</td>
<td>Support in depositing research data in an institutional repository</td>
</tr>
<tr>
<td>83.33%</td>
<td>33.33%</td>
<td>Assisting researchers in using existing tools for data management - for example, the Digital Curation Coalition's Data Management Planning tool - DMPOnline</td>
</tr>
<tr>
<td>83.33%</td>
<td>66.67%</td>
<td>Guidance on the handling and management of unpublished research data - for example, data literacy training</td>
</tr>
<tr>
<td>66.67%</td>
<td>33.33%</td>
<td>Advising on copyright and/or intellectual property rights relating to data and data management</td>
</tr>
<tr>
<td>50.00%</td>
<td>33.33%</td>
<td>Advising researchers regarding data citation practices</td>
</tr>
<tr>
<td>33.33%</td>
<td>33.33%</td>
<td>Assistance in creating or transforming metadata for data or data sets</td>
</tr>
<tr>
<td>33.33%</td>
<td>33.33%</td>
<td>Developing tools to assist researchers manage their data</td>
</tr>
<tr>
<td>33.33%</td>
<td>0.00%</td>
<td>Finding and gaining access to external datasets for researchers</td>
</tr>
<tr>
<td>16.67%</td>
<td>66.67%</td>
<td>Advising on data analysis/mining/visualisation</td>
</tr>
<tr>
<td>16.67%</td>
<td>66.67%</td>
<td>Operating a data repository/archive</td>
</tr>
<tr>
<td>0.00%</td>
<td>33.33%</td>
<td>Conversion of files holding research data to more sustainable formats</td>
</tr>
<tr>
<td>0.00%</td>
<td>0.00%</td>
<td>None of the above</td>
</tr>
<tr>
<td>0.00%</td>
<td>33.33%</td>
<td>Provide a data catalogue including your institution's research data</td>
</tr>
</tbody>
</table>
Four services saw more support in ITs than in universities: providing a data catalogue, operating a data repository, conversion of files holding research data to more sustainable formats, and advising on data analysis/mining/visualisation.

The results of the survey for both universities and ITs is depicted in the following table. Also depicted, for the purposes of comparison, is the data collected by Cox et al. (2017) regarding current service provision in UK universities.

<table>
<thead>
<tr>
<th>Type of service</th>
<th>Ireland</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintaining a web resource/guide of useful resources for research data management</td>
<td>100.00%</td>
<td>59%</td>
</tr>
<tr>
<td>Support in depositing research data in an institutional repository</td>
<td>100.00%</td>
<td>16.40%</td>
</tr>
<tr>
<td>Guidance on the handling and management of unpublished research data - for example, data literacy training</td>
<td>77.78%</td>
<td>65.40%</td>
</tr>
<tr>
<td>Assisting researchers in using existing tools for data management - for example, the Digital Curation Coalition's Data Management Planning tool - DMPOnline</td>
<td>66.67%</td>
<td>44.40%</td>
</tr>
<tr>
<td>Support in depositing research data in an external repository - a repository operated by a body other than your institution</td>
<td>66.67%</td>
<td>16.40%</td>
</tr>
<tr>
<td>Advising on copyright and/or intellectual property rights relating to data and data management</td>
<td>55.56%</td>
<td>75.60%</td>
</tr>
<tr>
<td>Advising researchers regarding data citation practices</td>
<td>44.44%</td>
<td>54.30%</td>
</tr>
<tr>
<td>Advising on data analysis/mining/visualisation</td>
<td>33.33%</td>
<td>22.20%</td>
</tr>
<tr>
<td>Assistance in creating or transforming metadata for data or data sets</td>
<td>33.33%</td>
<td>21.50%</td>
</tr>
<tr>
<td>Developing tools to assist researchers manage their data</td>
<td>33.33%</td>
<td>-</td>
</tr>
<tr>
<td>Operating a data repository/archive</td>
<td>33.33%</td>
<td>43%</td>
</tr>
<tr>
<td>Finding and gaining access to external datasets for researchers</td>
<td>22.22%</td>
<td>59.20%</td>
</tr>
<tr>
<td>Conversion of files holding research data to more sustainable formats</td>
<td>11.11%</td>
<td>-</td>
</tr>
<tr>
<td>Provide a data catalogue including your institution's research data</td>
<td>11.11%</td>
<td>24.05%</td>
</tr>
<tr>
<td>None of the above</td>
<td>0.00%</td>
<td>-</td>
</tr>
</tbody>
</table>

The most common forms of services provided were advisory services and facilitating access to resources. Irish institutions were significantly more likely to offer web resources for data management and services linked to depositing data in an institutional repository. This points
to the fact that the experience in Ireland in working with repositories may be influencing the nature of the services Irish libraries are providing. One participant remarked:

“[We] decided back in 2008, its nearly eleven years since we brought our repository online ... we wouldn’t include datasets. But it’s in the background as kind of like what are we going to do, because data is going to become an issue at some point in the future”

The development of repositories was also noted as a way that relationships and reputation was built between the library staff and researchers. In contrast universities in the UK were more likely to provide services that locate and access data for research, and advisory services relating to copyright and intellectual property.

**Institutional Repository:**

All institutions (N=9) had an institutional repository. In all cases, the library operated the repository by itself – without partnering with any other department in the institution. The capacity for intake of data sets in these repositories varied. No repository operated by the ITs accepted data sets as well as articles, or other scholarly outputs.

Of the universities studied, 50% operated a repository which permitted the hosting of datasets. One university operated subject specific data archives distinct from its institutional publications repository which did not generally accept research data. One other university had recently created a trial repository for data in collaboration with the IT department in order to determine requirements and capacities, evidencing exploratory movement in progressing this capacity at the institutional level.

Of those institutions who had developed the capacity for intake of datasets, the level of engagement was mixed. For one university, which captured 85% of publications produced at the university in its repository a requirement that publications be accompanied by a metadata record of their data was introduced rather than a requirement that datasets themselves be included. As a result, the percentage of datasets entered was significantly lower than that of publications entered. In another case, one university had a long history with the input of datasets onto the repository.
Skills needed for RDM

Reports on what skills are perceived as most important for the delivery of research data services revealed that data description and documentation, and knowledge of the research lifecycle were considered to be most important in the provision of current services. Legal and advisory skills were also viewed as important. Participants differed significantly in their perception of what skills were essential, important, or desirable - perhaps reflecting differences in visions of what the libraries role is and what services can or should be provided. It is notable that assessments of the importance of technical skills are considered less important in delivering current services than knowledge of data description, the research lifecycle and an awareness of legal and policy concerns. This marks a contrast with Corrall et al.’s previous report wherein technical skills were the second most important skill (88.9%) and indicates the Irish librarians’ perceptions may have changed over time.

Figure 1: Most important skills in provision of research data services

One participant remarked that if library services are going to assist researchers with making datasets align with the FAIR Principles, technical skills need to be developed and centralised as the need to be fluent in persistent identifiers, standardised metadata, repository structure and so on all involved technical know-how. Multiple participants expressed the view that if new roles are created, staff with technical skills should be hired:

“very recently we turned one of the librarian roles into the post of library developer and we’ve employed a developer on the grounds that things are getting very complicated and we need someone with technical skills”
Others claimed that because technical skills were present within library staff a role for the library could be defined:

“I would have developed a lot of these skills being involved in high level research ... what we are going to be delivering ... and have been delivering, is from my skillset”

Other participants felt that technical skills were not particularly necessary to perform the services that they currently provided and emphasised other skills. In many ways the perception of what was important was linked with what role the participant saw for the library or their unit in the library – what could feasibly be provided using the skills and resources available, and what opportunities should be seized to increase the library’s impact on institutionally valuable goals.

In the interviews, there was near universal support for the claim that one of the most important skills needed to deliver current services was communication and advocacy skills. Making the case for the library’s involvement and bridging gaps between the library and researchers faced with novel data needs required excellent communication skills.

“Communication and negotiating skills I’d say are quite key ... you have to be kind of able to communicate on multiple levels”

Related to this was the need for teaching skills which was emphasised by multiple participants.

While most participants agreed with the statement that there was a gap between what the library would like to deliver in terms of RDM and the skills available in its staff, a mixed picture of what skills are most in need of development emerged from the survey.

Figure 2: Skills in need of development
Again this diversity may reflect the different visions of the libraries role in this sphere – with some institutions allocating more technical responsibilities to an IT department or other research support service.

Drivers

One driver universally acknowledged was the introduction of the demand for DMPs by research funders.

“[RMD is] starting to become increasingly common in discussion at higher university levels and part of that is probably because of the greater requirements of funders to have data management plans and publicly funded research to be made openly available”

The need to demonstrate compliance with these funders was considered a significant driver and, in some cases, the single most important driver:

“The funders dictate everything. I mean I can talk to researchers until I'm blue in the face about DMPs but once that SFI demanded that ... you're getting these ... panicked [calls] “what's a DMP and what do I do?””

Another driver was the demand from researchers to provide data storage solutions for active data. These demands would occasionally be directed towards the IT department and filter towards the library indirectly. In other cases, data audits were conducted in order to raise awareness of the need to intervene and improve data handling. In one university, the lack of storage had acted as a hinderance for researchers looking to access sensitive data.
that was held by other bodies. In another institution, researchers were finding it easier to have grants funded when they partnered with industry as these partners may provide data storage and securitisation needed for funding requirements which the institution was not in a position to provide. Demand for such solutions had brought attention to RDM to library and other senior management.

Some participants claimed that compliance had played a smaller role than research impact as a driver of development. The movement towards open science had in some cases been motivated by improving research quality and profile. In one institution this case was stated clearly:

“everything to do with open access … is about impact, not in the first instance about compliance or even about managing collections or anything like that… The research data was all about the citation advantage by getting the publications out there in the first instance, and attracting more attention to them”

In general, drivers were described as both bottom up and top down, with expectations that more top down drivers would come online with the normalisation of DMP requirements and open science policies, and more bottom up drivers would emerge as researchers faced additional data needs in this new scholarly environment.

One driver of development mentioned by a plurality of staff was the ability to follow activity occurring in other institutions and share learning among the professional librarian networks. For ITs, this meant that the lessons learned during the development of research data services could be used to select which services would be feasible for their institution.

“Because we are small, we can see how the other how bigger institutions operate and learn from their mistakes and learn from their experience … - the library community is good in Ireland and across the world for sharing information like that and helping colleagues”

Other drivers mentioned by participants included the desire for compliance with data protection legislations, and the conversations emerging in different discipline within the university regarding reproducibility of results and improving transparency.

Constraints

The main constraint indicated was resourcing both in terms of funding and staffing. For some, money was the only constraint and a deliverable role of the library had been
worked out with room for expansion. But for others, competing priorities meant that RDM would not receive the attention needed to work out a role for the library. Especially in some institutions whose research profile was quite low.

“I don't see us doing anything in the next year with research data management because we're a small staff and we've got other priorities and we're going to be developing other things before we get to that you know. It’s not in our list of priorities. It’s not even [just] low down on [the list], it’s not even on it”

With one exception, the question of whether the library should take a part in this activity did not emerge as a constraint but the need to define what that role should be would require effort and resources in terms of gathering knowledge about needs and strategizing. Indeed, the need for getting buy in at an institutional level was listed as a challenge for developing the services.

“It’s not a library problem: It’s a university problem. So I suppose getting ownership of the issue in the university is my priority. So getting buy in from the research office from the it crowd from the other element from the other units in the university is one huge constraint.”

One participant emphasised that a conflation of research data management with open access had played a significant role in constraining the development of services. Researchers faced with data needs, but involved in projects where the openness of the data was not required or unlikely to be required, would not think to turn to the librarian who they associated primarily with advocacy for scholarly communications. Perceptions of researchers in regards to the library could be conservative in certain institutions and this could require significant advocacy work to frame the library as suited to meeting researchers needs. Furthermore, there were concerns about the technical issues involved in various data services such that whether they should even be carried out at an institutional level was questioned. One topic that was discussed frequently was the challenges involved in data preservation and the suggestion that an optimal solution may be the development of national infrastructure rather than institutional infrastructure. Similarly, anonymisation and other technical services were considered highly specialised and valuable but infrequent demand in the institution might not warrant the creation of a library post in this area.
Discussion:

The intention of this research was to update information available about Irish institutions’ activity in research data management and to provide a qualitative examination of the factors that are driving development. There has been a significant advancement in terms of services provided than was captured previously in the literature and this study has highlighted some elements which have played a significant role in shaping the engagement by Irish academic libraries with research data management.

Similar to what has been reported elsewhere, in Irish institutions there are a variety of ways of conceiving of research data management and organising its delivery. For all participants, a key element is the development of a narrative around research data management and staking a claim for the library in this sphere. Responsibility for this area, defining what can be done, and how the institutions needs can be met is commonly is a situation laden with ambiguity. Having a presentation for what the library is willing to do and how it addresses this is evident from the responses of all of the participants. Similarly, institutional commitment to open science and research integrity in different forms have facilitated the libraries activity at multiple institutions in carving out a space for their research data services activities. Previous efforts to establish and develop institutional repositories have also facilitated the development of the narrative that the library can play some role in this new sphere – construed in some way as an extension of its existing activity. In 2013, Corrall et al. found that 12.5% of Irish institutions had a policy in place for research data management but 75% of respondents expected to have a policy in the next 12 months. Surprisingly, in 2017, Cox et al. reported a backwards trend in the landscape wherein no Irish institution had a research data management policy in place, but 71.4% expected to have one in place in the next 12 months. In this study, policy was in place or planned to be in place in 66% of institutes, and in place in 50% of universities. However, the interview showed that the definition of a policy may not always resolve issues around determining how research data management should be conducted.

In general, it is just as true in Ireland as elsewhere that the evolving research landscape is placing converging pressures on researchers, the institute more generally and libraries to reform activity so that it matches the overall frameworks emerging in funding
arrangements, open science policies, and institutional metrics. Librarians see that defining a role for the library or one or more of its departments is an effective means to demonstrate value to the institute and researchers but the nature of these services needs to be tailored to match the resources available and future direction of the institute. This reflects the previous finding that local factors significantly shape the delivery of research data services (Cox, Pinfield and Smith, 2014). This study would validate Latham’s (2017) claim that pragmatic use of resources is shaping the form of services provided. Akin to what has been described elsewhere (Pinfield, Cox and Smith, 2014) the drivers for development of RDM considered most influential are compliance with research funder requirements, institutional drives for research quality, demand from researchers regarding data storage and security, and the momentum of developing a professional narrative regarding the libraries role in RDM. The most highly cited constraint on development of research data services was resourcing. Both funding and staffing were mentioned frequently.

This study has shown that Institutes of Technology are also engaging with this situation and working out a space for RDM. The manner in which they are engaging with this problem is in many ways very similar to the way that it is being approached in universities. The level of development of Institutes of Technology is lower than most universities but this is not universally true.

Similar to other empirical studies of services provided by academic libraries (Cox and Pinfield, 2013) (Corrall et al., 2013) (Tenopir et al., 2014), Irish academic libraries are mainly providing advisory, informational, and educational services rather than technical services. However, the lack of skills in technical disciplines would limit the development of libraries or library departments into new service creation. Furthermore, while traditional library skills were considered helpful in some aspects of data services, many new skills would be needed to deliver the envisioned services. Nearly all participants mentioned that there was some form of skills gap that prevented development of library services. Recruitment of new staff may be needed.

With 75% of Irish universities represented in this study, it is likely what is reported reflects what is happening around the country but the number of institutions participating
in this study is significantly lower than in the studies upon which the questionnaire was based. This may have had an effect on the reliability of the survey instrument as, with a smaller number of participants, outliers can exert a greater effect on the result. Additionally, the percentage of ITs represented in this study was much lower than universities and this therefore raises concerns about the representativeness of the sample. Extrapolating the results could misrepresent what is occurring at a majority of ITs. Not all of the institutions who participated in the survey completed an interview. This could mean that information that might have helped interpret the survey was collected and analysed.

The findings of this research demonstrate that research data management has grown in importance in Irish institutions and that there is significant evolution in libraries in terms of the creation of new services and the organisation of roles. Because of the limited space available in the reporting of this topic, further study of librarian’s accounts of the growth of their services collected could help develop case studies of different institutions and provide significantly more detail regarding how research data services have evolved. During the project, certain participants argued that the sharing of best practices and lessons learned in RDM helps with the development of services elsewhere. For this reason, further detailed research of the process of establishing research data services and the dissemination of such information could itself act as a facilitator of the further development of the academic library in this area.
References:


Appendices
Appendix A: Letter of Introduction

Tiernan O’Sullivan
110 Landscape Park
Dublin 14
Tel: 0851634058
Email: 10505966@mydbs.ie

Dear X,

I am student in the Information and Library Management MSc programme at Dublin Business School. As part of my course, I will be conducting a study of research data services provided by Irish academic institutions.

This study consists of a survey that will take approximately 10 minutes to complete. It is complemented by a telephone interview that will last for approximately 20 minutes. The name of the staff member participating in the study will not be published but the names of the institutions that have agreed to participate will be listed in the dissertation.

The purpose of the research is to provide an overview of the activities that are taking place in libraries in Irish Universities and Institutes of Technology that comprise research data services. This study follows a previous study in 2013\(^4\) which examined the emergence of new library services in the spheres of bibliometrics and research data management: I intend to show whether and how the sector has changed since the publication of this previous research. Your institution may have participated in the 2019 CONUL survey of digital scholarship activity.\(^5\) My research differs from this in that it focuses on research data services specifically and in more detail.

A research proposal and an ethics form, formulated in consultation with the Research Ethics Board at Dublin Business School, have been completed by me in advance of this study. If you would like to see these documents, or any other material in support of this activity, I will gladly provide them.

Please email me to indicate that you are willing to participate.

Thank you for considering my request,

Tiernan O’Sullivan

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INFORMATION SHEET FOR PARTICIPANTS

What is the state of development of Research Data Management in Ireland? A mixed methods study of research data activities in Irish Academic Institutions

You are being asked to take part in a research study on research data management (RDM) and data services provided by librarians in Irish universities and Institutes of Technology. I am a student in the Information and Library Management MSc. course in Dublin Business School who is interested in comparing the results of previous studies of RDM in Ireland with current information. It is my belief that the landscape of research data management in Ireland has changed since 2013 when a detailed study took place. I want to collect information on what services and tools Irish librarians are providing to assist members of their institution with research data management.

My research question is:

What are the roles and activities that library staff in Irish third level institutions are conducting in relation to research data management and data services?

Sub-questions that will be explored include:

1. How many Irish third level institutions have developed policies for data management?
2. How prevalent are institutional repositories and data repositories?
3. What skills are required specifically for research data management?
4. What factors constrain the development of data services?

I believe this information will be useful to librarians around the country who want to find out about the experiences and activities of their contemporaries in other institutions. At this point, it is difficult to find information about the experience of establishing RDM or other data services in Ireland and hence to draw comparisons between institutions. Additionally, the information gathered by this study may be of use to those working in other countries who do not have the means to learn about the experience of Irish librarians.

This project is being supervised by Tony Murphy, Head of Quality Enhancement and Innovation in Teaching and Learning at Dublin Business School.

The project has been granted ethical approval by Dublin Business School.

WHAT WILL HAPPEN
In this study, you will be asked to complete a short survey about your institution and the services provided by your library. This survey will take approximately 10 minutes to complete and can be done on a computer or a mobile phone. After this, you will be asked to take part in a telephone interview which will be recorded and transcribed. During this
interview you will be asked about your perceptions of what factors have influenced the development of RDM and data services at your institution. The interview will take between 15 and 20 minutes to complete.

TIME COMMITMENT
This study will take approximately 30 minutes to complete. The survey and interview do not need to occur on the same occasion. The telephone interview can be arranged at a time that is convenient for you.

PARTICIPANTS’ RIGHTS
You may decide to stop being a part of the research study at any time without explanation required from you. You have the right to ask that any data you have supplied to that point be withdrawn / destroyed.

You have the right to omit or refuse to answer or respond to any question that is asked of you.

You have the right to have your questions about the procedures answered (unless answering these questions would interfere with the study’s outcome). If you have any questions as a result of reading this information sheet, you should ask the researcher before the study begins.

CONFIDENTIALITY/ANONYMITY
The data I collect does not contain any personal information about you and it will be anonymised. I would like to include the names of participating institutions in the research documents, but this too can be rendered anonymous if you so desire.

FOR FURTHER INFORMATION
I or / and my supervisor Tony Murphy will be glad to answer your questions about this study at any time. I can be contacted at

Email: 10505966@mydbs.ie
Mobile: 085 163 4058

You may contact my supervisor by email or phone at:

Email: tony.murphy@dbs.ie
Phone: 01 4170645
Mobile: 086 329 0525
INFORMED CONSENT FORM

PROJECT TITLE:
What is the state of development of Research Data Management in Irish Academic Institutions?
A Mixed-methods study of Research Data Management Activity in Irish Academic Institutions

PROJECT SUMMARY:

This study will consist of a survey and a telephone interview. The survey is delivered through Microsoft Forms, and will ask questions about the services provided by librarians in your institution that relate to research data management. Some questions about other data services will also be posed. The survey will take approximately 10 minutes to complete.
The telephone interview will be recorded and transcribed for analysis. The interview can take place after the survey has been completed or at a later time. The interview questions will pertain to your perceptions of the drivers of the development research data management and other services as well as to your perceptions of factors that constrain the development of such services. The interview will take approximately 20 minutes to complete.

By signing below, you are agreeing that: (1) you have read and understood the Participant Information Sheet, (2) questions about your participation in this study have been answered satisfactorily, (3) you are aware of the potential risks (if any), and (4) you are taking part in this research study voluntarily (without coercion).

__________________________________________________________
Participant’s signature

__________________________________________________________
Participant’s Name (Printed)

__________________________________________________________
Student Name (Printed)

__________________________________________________________
Student Name signature

__________________________________________________________
Date
Appendix D – Survey Instrument - Microsoft Forms Questionnaire

Research Data Management and Data Services Questionnaire

This questionnaire will ask about the services provided by the library and library staff in your institution. It will take approximately ten minutes to complete. It can be completed on a mobile phone or on a computer. Not every question needs to be completed in order to complete this survey. Mandatory questions are indicated by a red asterisk at the end of the field: *

1. What is the name of the institution where you currently work?

   Enter your answer

2. What is your job title?

   Enter your answer

3. How long have you held this position?

   Enter your answer

Next
Research Data Management Policies

4. Is there an institutional policy for research data management at your institution? *
- Yes
- No
- Not at present but one is planned

5. If you answered yes above, does this policy fall under a larger research policy or digital scholarship policy?
- Under a broader research policy
- Under a broader digital scholarship policy
- Under both a broader research policy and a broader digital scholarship policy
- No
- I don't know

6. When was this research data management policy published?

Enter your answer
Research Data Management and Data Services Questionnaire

* Required

Institutional Repository

7. Does your institution have an Institutional Repository or Data Repository? *
   - Yes
   - No

8. If you answered yes to the above question, when was the repository set up?
   Enter your answer

9. Who operates the Institutional Repository?
   - The library
   - The library and another department
   - Another department
   - I don't know

10. If you answered "The library and another department" or "Another department" to the previous question, please provide the name of the department(s) here.
    Enter your answer

11. How many library staff work with the Institutional Repository/Data Repository?
    - None
    - Between 1 and 5
    - More than 5

Back  Next
Data Services Overview

12. Does your library offer any of the following data services? Multiple answers may be selected for this question. *

- [ ] Guidance on the handling and management of unpublished research data - for example, data literacy training
- [ ] Support in depositing research data in an institutional repository
- [ ] Support in depositing research data in an external repository - a repository operated by a body other than your institution
- [ ] Developing tools to assist researchers manage their data
- [ ] Assisting researchers in using existing tools for data management - for example, the Digital Curation Coalition's Data Management Planning tool - DMPonline
- [ ] Finding and gaining access to external datasets for researchers
- [ ] Assistance in creating or transforming metadata for data or data sets
- [ ] Conversion of files holding research data to more sustainable formats
- [ ] Advising researchers regarding data citation practices
- [ ] Maintaining a web resource/guide of useful resources for research data management
- [ ] Advising on copyright and/or intellectual property rights relating to data and data management
- [ ] Operating a data repository/archive
- [ ] Advising on data analysis/mining/visualisation
- [ ] Provide a data catalogue including your institution's research data
- [ ] None of the above

13. If your institution provides any other services related to data, or if the options above do not accurately characterise the services provided by your library, please describe these briefly in this text box.

Enter your answer
## Skills needed for data services

14. Which of the following skills are needed to perform the data services provided by your institution.

<table>
<thead>
<tr>
<th>Skill</th>
<th>Least important</th>
<th>Somewhat important</th>
<th>Very Important</th>
<th>Essential</th>
</tr>
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<tbody>
<tr>
<td>Data curation skills</td>
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<td></td>
<td></td>
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<tr>
<td>Technical and ICT skills (e.g. data storage, infrastructure, architecture etc.)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Subject and or disciplinary knowledge</td>
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<tr>
<td>Knowledge of a variety of research methods (e.g. data analysis, data visualisation)</td>
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<tr>
<td>Knowledge of the research lifecycle</td>
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<tr>
<td>Data description and documentation</td>
<td></td>
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<tr>
<td>Legal, policy and advisory skills (e.g. intellectual property, ethics, licensing, etc.)</td>
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</table>

15. Are there any other skills which are needed to deliver the data services at your institution?

Enter your answer
16. Which skills are most in need of development in order to provide data services in your institution?

<table>
<thead>
<tr>
<th>Skill</th>
<th>Least in need of development</th>
<th>Is sufficient but could be developed further</th>
<th>Most in need of development</th>
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<tbody>
<tr>
<td>Data curation skills</td>
<td>![ Checkbox ]</td>
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<tr>
<td>Technical and ICT skills (e.g. data storage, infrastructure, architecture, etc.)</td>
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<td>Subject and/or disciplinary knowledge</td>
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<td>Knowledge of a variety of research methods (e.g. data analysis, data visualisation)</td>
<td>![ Checkbox ]</td>
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<tr>
<td>Knowledge of the research lifecycle</td>
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<td>Data description and documentation</td>
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<tr>
<td>Legal policy and advisory skills (e.g. intellectual property)</td>
<td>![ Checkbox ]</td>
<td>![ Checkbox ]</td>
<td>![ Checkbox ]</td>
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</tbody>
</table>

17. Are there any other skills which you believe are in need of development?

Enter your answer

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Appendix E – Interview schedule

Preamble:
First of all I wanted to say thanks for taking part in the research up to this point, and thanks for agreeing to take part in this further interview. Before we get started with the interview I thought I would explain some things up front. This phone call is being recorded: I’m using an application called Cube ACR which will store a recording of it on my phone. I will then transcribe later to analyse it. Just as a reminder of your rights in this research. If at any point in time, you can decide to stop being a participant in this research, you have the right to request that all the data we have collected so far be withdrawn and permanently deleted. You don’t need to give me any explanation. If at any point in time during this interview I ask you a question that you don’t want to answer – just notify and we will move past it. And if you have any questions about this interview at any time, you have the right for me to provide an answer for you on that. So before I go forward, I would like to know, would I have your permission to make a recording of this phone call?
So what’s going to happen now is that I’m going to ask you a series of questions that will be based on some of the information you provided in the survey. And what I’m looking for here is just to get a fuller picture of the research data services that are provided by your university. Really what I’d like to know is your perceptions of why the services are taking the form that they are currently and how you envision things happening in the future. And I’m trying to keep this topic quite open in some regards because I know that the research data landscape does vary enormously from one place to another. And I think the value of this research will be able to give some practitioners representing difference institutions a chance to represent what is happening where they are and a sense of why things have developed in the way they have in their institution and what they think are the main causes of that. So really, during this, we are going to be looking at four different elements of that story: One is I’d like to know a little bit more detail about the services that you are currently providing.
And I’d also like to know your perceptions about the type of skills that are needed to deliver those services.
And ... after that, I'm going to ask you very briefly about what you think are the main drivers for this situation - what is causing it to take the form that it has.
And finally, I'll ask you, what do you think are factors that are acting as constraints for developing this further.

<table>
<thead>
<tr>
<th>Interview Schedule</th>
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<tbody>
<tr>
<td><strong>Section 1</strong></td>
</tr>
<tr>
<td>1 Is there an overarching strategy for data management?</td>
</tr>
<tr>
<td>2 Is there a policy for Research Data services/management in place?</td>
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<tr>
<td>3 Are there any guidelines for how to handle research data?</td>
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<tr>
<td>4 Can you tell me about the services that are provided by the library?</td>
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<tr>
<td><strong>Section 2</strong></td>
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<tr>
<td>5 For the services that you are currently providing (X,Y,Z) what would you say are the most important skills needed in the library at the moment?</td>
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<td>Section 3</td>
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<td>Section 4</td>
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