



INVESTIGATION INTO THE EFFECTIVENESS OF CURTIN'S DATA MANAGEMENT PLANS

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Thesis Declaration

To my unsurpassed knowledge and belief, this thesis contains no previously published uncited material and full acknowledgement has been granted to all utilised sources.

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LITERATURE REVIEW

Research data management (RDM) is increasingly important to researchers, universities, and university libraries, as the greater availability of computers has changed not only the amount of data available, but the way data management must be approached (Borgman, 2018; Federer, 2016). However, many RDM services are basic, underutilised, or unexamined. At Curtin University, a large number of data management plans have been created in association with research projects, but their utility is yet to be determined. This study will investigate how useful data management plans have been at Curtin, and asks researchers who have completed a plan how they feel the plans could be improved. Three themes in the current literature have been identified as relevant to this study: the role of academic libraries in RDM; researcher behaviour in relation to data; and ways libraries can adapt their services to positively affect researcher behaviour and improve the quality of data.

ROLE OF LIBRARIES IN DATA MANAGEMENT

The role academic libraries should play in research data management has been a frequent topic of discussion in the past decade, and many academic libraries now have become involved in some aspect of RDM. Services differ greatly in type and extent from library to library (Cox, Kennan, Lyon, & Pinfield, 2017). Services are commonly divided between 'advisory' services like data-related training and data management planning support, and 'technical' services like metadata creation, data repositories, and preservation advice (Cox et al., 2017; Tenopir, Sandusky, Allard, & Birch, 2014). In a multi-national survey of research data services provided by academic libraries, advisory services were found to be more common and better developed in all countries surveyed (Cox et al., 2017). This is particularly true for services that can easily be related to traditional skills and duties of librarians: for instance, data literacy training, Web-based guides, and reference services (Cox et al., 2017; Southall & Scutt, 2017).

RDM services are arguably better developed in Australian academic libraries than elsewhere in the world (Cox et al., 2017; Keller, 2015), and according to Keller (2015) are more consistent and coordinated on a national level. She presents two reasons for this: Australian universities are more reliant on centralised funding, and Australian libraries tend to be more service-oriented. Australia's relative lack of extra-governmental funding means that Australian universities are more sensitive to government priorities, so they are more likely to adopt national priorities as institutional priorities, and government initiatives that include funding (which have included institutional repositories and open-access initiatives) have more widespread and lasting effects. Perhaps because European academic libraries are far more likely to have large collections of old or rare books, while Australian collections are more focused on electronic items that are licensed instead of owned, Australian librarians are more likely to value the skills and services they provide over the collections themselves. Australian academic libraries are also more likely to highlight the success of their institution as a primary goal (Keller, 2015). Academic libraries in other countries also consider their place in the larger institution, though: a survey of librarians in the US and Canada found that they believed RDM services increased the reputation of their institution, and their relevance within their institution (Tenopir et al., 2014).

The sole responsibility for these services usually doesn't lie with academic libraries (Cox et al., 2017; Keller, 2015; Pinfield, Cox, & Smith, 2014). Frequently, responsibility for RDM services is shared with research support or IT departments. This can be seen as an extension of each department's skills and priorities as RDM activities become more important, just as many of the advisory services are seen by librarians as a logical extension of current activities (Latham, 2017; Tenopir et al., 2014). In contrast, many librarians feel that they lack the skills and specialist knowledge to provide the more technical services, or even to estimate the cost to provide services such as storage for a wide variety of data (Cox et al., 2017; Cox & Pinfield, 2014; Diekema, Wesolek, & Walters, 2014). Some of those skills are more likely to be found in the staff of the IT department, or archives and recordkeeping staff (Cox & Pinfield, 2014; Grant, 2017; Pryor & Donnelly, 2009). However, the increasing importance of RDM and the expectation of funders that these services are provided by universities means that if the library does not become involved, another department will; choosing not to be involved could negatively impact the standing of the library within its institution (Tenopir et al., 2014). In some cases, electronic access to library collections is so seamless that researchers may already be unaware that the library has any involvement in the resources they use (Auckland, 2012; Cox & Pinfield, 2014; Keller, 2015). Another potential collaborator for these services is the research support department: research support workers have direct contact with researchers and students, who can be difficult for libraries to reach, and these relationships make them a natural partner for RDM services (Cox & Verbaan, 2016).

Collaborations between departments are seen in both positive and negative ways. Different departments have different cultures and strategic priorities, have different interactions with researchers and students, and think of RDM in different ways (Cox & Verbaan, 2016). The cost of storage space can compete with preservation needs; open access advocacy with security requirements; and quality assurance can be seen as a burden. This can lead to 'territorial struggles' between stakeholders, especially when one incurs costs for services it doesn't consider part of its responsibility and doesn't directly benefit from (Auckland, 2012; Cox et al., 2017; Keller, 2015; Tenopir et al., 2014). However, other libraries involved in collaborations emphasise that RDM service provision is time- and resource-intensive, and collaboration allows for cost-sharing and reduces duplication of services (Cox & Pinfield, 2014; Whitmire, Boock, & Sutton, 2015). Similar benefits can be found in collaborations with other institutions, either through informal information-sharing or formal partnerships (Cox et al., 2017; Cox & Pinfield, 2014; Keller, 2015). External collaborations can also help to standardise policies across institutions (Keller, 2015), and improve perceptions of the information professions through sharing skills and knowledge (R. A. Brown, Wolski, & Richardson, 2015).

DATA MANAGEMENT BEHAVIOUR OF RESEARCHERS

Although RDM has become a focus for research institutions, it is not the primary concern of researchers. Collecting and interpreting data is seen as the bulk of their work, while organisation and storage are often an after-thought (Hickson, Poulton, Connor, Richardson, & Wolski, 2016; Wallis & Borgman, 2011; Whitmire et al., 2015; Williams, Bagwell, & Nahm Zozus, 2017). Because it is seen as secondary to the core of research, RDM is often not properly provided for in grant funding (Williams et al., 2017). Developing RDM skills has been linked to a decrease in time required to complete studies, and an increase in the quality of published work (Hruby, McKiernan, Bakken, & Weng, 2013). Despite this, creating a data management plan (DMP) is often seen as an 'administrative burden', and data

preparation and sharing are seen as uncompensated work (Diekema et al., 2014) and an imposition on limited time (Burgess et al., 2016; Hickson et al., 2016).

When using datasets collected by others, researchers do consider metadata, proper organization, and data sharing statements (for instance, how the data should be cited) to be useful, but they fail to use these elements on their own data (Diekema et al., 2014; Haendel, Vasilevsky, & Wirz, 2012; Tenopir et al., 2015), or add only the minimum required (Perrier et al., 2017). What is required differs from institution to institution, with planning for data sharing after publication overrepresented in funder requirements when compared with statements about data description and organisation (Williams et al., 2017). In fact, often data are not described well enough for the creators themselves to understand their context even a few years after the project has finished (Tenopir et al., 2011, 2015; Thompson, Davenport Robertson, & Greenberg, 2014). Researchers are even less likely to properly describe their datasets when they have no plans to share them after publication (Hickson et al., 2016; Tenopir et al., 2015; Weller & Monroe-Gulick, 2014). Researchers decide against sharing data for many reasons, including because of the time required, fearing losing control of data, and not wanting to be 'scooped' (Borgman, 2012; Diekema et al., 2014; Tenopir et al., 2011, 2015). Others hesitate to share due to uncertainty over the process of describing and sharing data (Diekema et al., 2014; Tenopir et al., 2015; Weller & Monroe-Gulick, 2014; Whitmire et al., 2015). More recent surveys have found more sophisticated concerns about privacy and informed consent when future uses of data are unknown (Tenopir et al., 2015), which is a growing concern with more accessible data (Boyd & Crawford, 2012). Other essential elements of RDM, such as deciding ownership of and responsibility for the data created, are not necessarily planned for at all: researchers on the same project might have contradictory opinions, and they are not always aware of the policies of the institution or funding bodies involved (Van Loon, Akers, Hudson, & Sarkozy, 2017; Wallis & Borgman, 2011).

Researcher behaviour differs between disciplines, and is often transmitted between peers, from supervisor to student, and within teams (Diekema et al., 2014; Hickson et al., 2016; Whitmire et al., 2015). Researchers in some faculties use templates for DMPs instead of engaging in the process on their own (Van Loon et al., 2017), and systems for organisation and metadata tend to be unique to particular research groups (Whitmire et al., 2015). Different disciplines frequently gather different kinds of data, which might have very different requirements for storage space, security, and accessibility (Weller & Monroe-Gulick, 2014); data sharing and RDM norms can differ markedly even between sub-fields of a wider discipline (Borgman, 2012). They also tend to use discipline-specific terminology (Surkis & Read, 2015), and even when individual researchers have had some training in RDM, they might not see the relevance of generic information to their work, or understand how their data could be useful to other types of researchers (Hickson et al., 2016; Tenopir et al., 2015).

Ease of use is a major factor in researcher behaviour: data tends to be stored on their own devices, personal cloud storage, or faculty servers, even when the institution provides data storage services (Akers & Doty, 2013; Higman & Pinfield, 2015; Weller & Monroe-Gulick, 2014). These services are duplicated within individual departments, or even smaller research units, because researchers don't know that the service exists or don't feel that it could meet their needs (Diekema et al., 2014; Whitmire et al., 2015). The time and effort required to learn a new system can also be a barrier, when existing solutions are seen to be good enough (Hickson et al., 2016).

The experience of the researcher tends to dictate RDM behaviour better than formal requirements do (Diekema et al., 2014; Grant, 2017; Perrier et al., 2017; Whitmire et al., 2015). Frequently, 'mandates' for DMPs and data sharing are not actually mandatory, and compliance with data sharing

requirements is not always enforced (Berman, 2017; Higman & Pinfield, 2015; Tenopir et al., 2015; Van Loon et al., 2017). Because there are no consequences for ignoring these mandates, there is less incentive for good RDM behaviour to offset the burden of carrying out the extra work to follow them (Cox et al., 2017; Haendel et al., 2012; Keller, 2015; Tenopir et al., 2015). However, there is some evidence that behaviour is changing as researchers and institutions become more familiar with funding requirements and include some RDM activities in their workflow (Tenopir et al., 2015). Researchers have indicated that they would create DMPs if they were told that they should (Hickson et al., 2016), and university-based policies can potentially influence RDM practice (Higman & Pinfield, 2015).

HOW LIBRARIES CAN BE OF USE

Many of the RDM skills and services needed by researchers can be seen as an extension of services academic libraries already provide (Southall & Scutt, 2017), and can build on the relationships that librarians already try to cultivate within their institutions and with organisations that have similar goals (R. A. Brown et al., 2015; Keller, 2015). Libraries are offering both more RDM services and more complete services (Cox et al., 2017), but they often fail to achieve expected researcher engagement (Cox et al., 2017; Diekema et al., 2014; Whitmire et al., 2015). In order to properly support RDM at their institutions, academic libraries need to ensure that the services available are marketed properly and that they are seen as easy to use.

Because RDM behaviours are formed early, and quickly become habits resistant to change (Ward, Freiman, Jones, Molloy, & Snow, 2011), libraries should aim their interventions at beginning researchers. There is not much research on data management in the early stages of research (Perrier et al., 2017), although this is arguably the most important time for any interventions (Grant, 2017). Early intervention with researchers can help them to develop the right habits and attitudes, which they can then bring to their interactions with peers. Early involvement in the research process can increase data quality and security by identifying potential problems before they occur, and while changes can still be made (Hickson et al., 2016; Wilkinson et al., 2016; Williams et al., 2017).

As mentioned, the primary reason researchers do not use university services is that they are often unaware that they exist (Diekema et al., 2014; Whitmire et al., 2015). Simply advertising services within the library is not sufficient: many researchers never physically use the library spaces. They instead access the collection solely through intermediaries like Google Scholar (Auckland, 2012; Cox & Pinfield, 2014; Keller, 2015). Libraries should use and develop the relationships they usually already have within faculties (Keller, 2015). These researchers already trust that librarians have useful skills and knowledge that the researchers themselves might lack (Diekema et al., 2014; Weller & Monroe-Gulick, 2014), and they are better placed to share the knowledge, because most RDM techniques are shared within research groups (Diekema et al., 2014). Additionally, having faculty support library initiatives can carry more weight with those faculty members who don't think that library staff is qualified to offer them advice (Dawson, 2018; Scaramozzino, Ramírez, & McGaughey, 2012). Embedded services are another way librarians can gain an understanding of the context of a particular group, while giving an opportunity to provide training (Hickson et al., 2016). Even though librarians are often aware that working directly with researchers can better promote services, fewer than half of Australian libraries in a 2014-2015 survey were involved in this way at all, and only 21% considered it a future priority (Cox et al., 2017).

Services also go unused when they seem to be irrelevant to the sort of work being conducted (Weller & Monroe-Gulick, 2014). University systems often require users to learn a new system of doing things, without providing value in return for the time and effort. This is because the services either replicate an external service already in use, or provide a service that is seen as unnecessary (Hickson et al., 2016). Researchers can be resistant to training that they believe is not directly applicable or immediately useful (Weller & Monroe-Gulick, 2014; Whitmire et al., 2015). Even those who understand the utility of data management in general might not see it as applicable to the sort of research they do or the data they collect (Hickson et al., 2016). Researchers with similar data need profiles sometimes have different preferences, and will all have needs that change over time (Diekema et al., 2014; Surkis & Read, 2015; Tenopir et al., 2015; Weller & Monroe-Gulick, 2014; Whitmire et al., 2015). It can also be useful to enumerate the specific benefits of institutional services over external services, as there can be security or long-term preservation benefits, and these might save researchers time and money over the services they currently use (Borgman, 2018; Hickson et al., 2016).

Another reason institutional services are dismissed is that they are unfamiliar and relatively difficult to use. Commercial storage systems are likely to have been used in the past for earlier or personal projects, and because they are widely used, it can be easy to find solutions for problems that arise (Hickson et al., 2016). Metadata can be challenging to create for those who have no experience (Diekema et al., 2014; Weller & Monroe-Gulick, 2014), especially if they don't see the need for it for their relatively small datasets (Hickson et al., 2016). Whether support is provided directly by the library or by another department in the institution, it is essential that libraries have the skills and tools to help researchers learn to use any tools and infrastructure they provide. Researchers can be easily discouraged if they encounter difficulties, and are likely to spread their negative experiences (Diekema et al., 2014; Hickson et al., 2016). Where possible, the best way libraries can help with encouraging uptake and use of known services is to make them easy to use: "the technical infrastructure provided to support researchers may be more important than the skills of the institution's information professionals" (Grant, 2017). If using secure university storage is as easy as saving data to a computer desktop, and data management plans can be shown to reduce time to complete projects and reduce later conflict (Hruby et al., 2013; Wilkinson et al., 2016), researchers will be more likely to believe that the benefits outweigh the costs (Hickson et al., 2016). The services must also be adequately funded: if services would not be able to handle the load should all potential users take advantage of them, they can't reasonably be required (Higman & Pinfield, 2015). However, since libraries don't necessarily have the funding or authority to make changes on their own, advocacy for services within the university is important in conjunction with service provision (Cox et al., 2017).

The intent of RDM services in academic libraries is to improve the quality of research and the reputation of the institution (Keller, 2015). Where elements of RDM are mandated, researchers will eventually adjust their behaviour to do what is required (Diekema et al., 2014; Hickson et al., 2016; Higman & Pinfield, 2015; Tenopir et al., 2015); this has also been seen at Curtin University, where a requirement for DMPs has led researchers to complete more DMPs than in any other Australian university. However, difficulties can arise when there's no clear standard of what is expected. While many funding bodies do require some form of data management plan to be created, the requirements are often vague or inconsistent (Diekema et al., 2014; Williams et al., 2017) and inconsistently applied (Van Loon et al., 2017). This uncertainty leads to lower compliance and erodes the benefits that can come with proper RDM (Hruby et al., 2013; Wilkinson et al., 2016). For this reason, it can be useful to advocate for changes not only within the institution the library serves, but also across institutions. Increasing the clarity of standards through advocacy and collaboration between institutions has

helped to increase RDM compliance in researchers in countries where this has occurred (Keller, 2015). This can be done by making a case for mandatory RDM, and by working to develop standards that suit the needs of the researchers.

DATA MANAGEMENT PLANS AT CURTIN UNIVERSITY

Curtin University of Technology is a large public research university in Western Australia. In 2016, Curtin employed 1,100 academic staff whose work involved some amount of research, and over 2,400 students were enrolled in a postgraduate research degree (Curtin University, 2016). The university has a strong background in scientific fields such as minerals and energy, data analytics, health sciences, astronomy, and agriculture. However, research occurs in all five teaching areas: Health Sciences, Humanities, Science and Engineering, the Curtin Business School, and the Centre of Aboriginal Studies; as well as the Vice Chancellory.

In order to improve research quality, Curtin has required many staff researchers to complete a data management plan (DMP) since the beginning of 2015, and students since 2016 (Liffers, 2016). DMPs are mandatory for any research that involves human or animal subjects, are a part of all applications for candidacy, and are required for access to university data storage. Because of this requirement, Curtin has more DMPs than any other Australian university: over 4,400 as of January 2018, as shown in the images below (J. Brown, 2018).

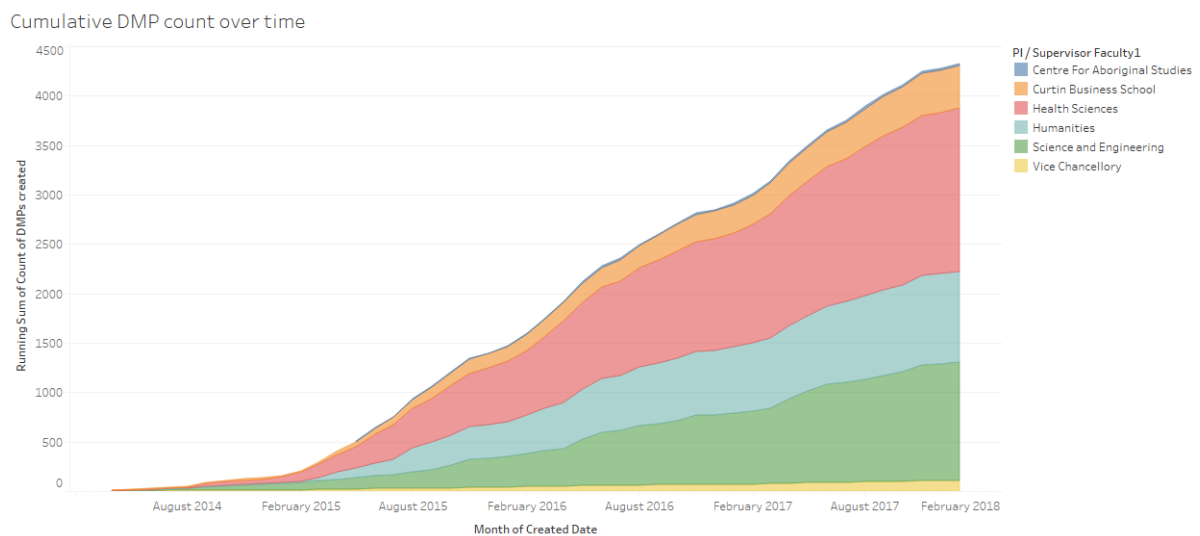


Image created by John Brown, with data current to January 2018

Total DMP count by faculty and owner type

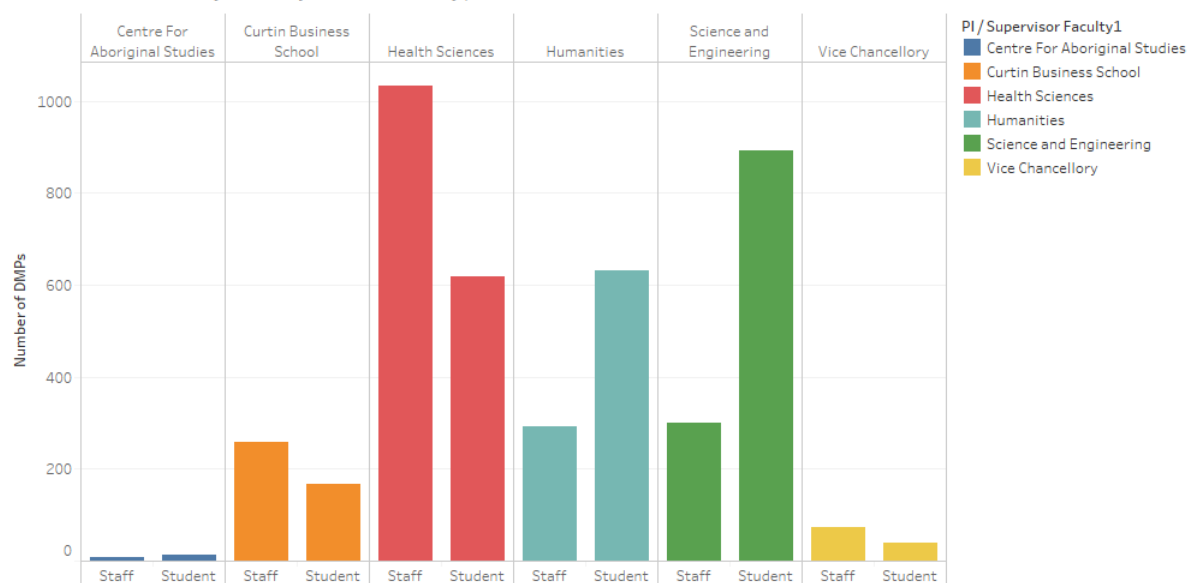


Image created by John Brown, with data current to January 2018

In surveys at other institutions, researchers have expressed confusion over RDM requirements and indicated interest in library assistance (Diekema et al., 2014; Weller & Monroe-Gulick, 2014; Whitmire et al., 2015). The data management planning tool created by the university is a web form that guides users in the creation of a DMP. Researchers are asked to explain what sort of data they will collect, what are the potential risks involved in collection of the data, how it will be stored and secured, who is responsible for it, and how it should be shared or disposed of when the project is complete. Information is available to Curtin about the demographics of DMP creators, when updates to plans occur, and what percentage of DMPs are attached to a request for storage space. However, no data yet exists on whether Curtin’s plans have been effective in improving data management practice at Curtin.

METHODOLOGY

RATIONALE

All researchers at Curtin University are required to complete a data management plan (DMP), explaining how they intend to organise, store, and protect the data that they will collect. These plans are managed jointly by the Robertson Library and the Research Office at Curtin, and have been mandatory since 2015. Statistics about how many plans have been created by researchers from each faculty have been collected, but to date there has been no analysis of researcher behaviour related to the plans or to data management in general at Curtin. In addition, although research has been done on the role of academic libraries and research support offices in data management, and on how data management training and support can improve the quality of data management plans, there is little

research on how or whether data management plans and planning tools might affect researcher behaviour.

PURPOSE

The purpose of this project is to discover whether Curtin's data management plans have helped Curtin researchers manage their data, and how they have been most helpful.

RESEARCH QUESTION

Does Curtin's data management planning tool help researchers manage the data they collect?

DATA COLLECTION

The tools used to gather data for this project were both quantitative and qualitative: a survey and a focus group interview. Before the survey was widely distributed, questions were revised based on feedback from stakeholders at Robertson Library.

The survey asked respondents how they used the DMP, and if it prompted them to think about different aspects of data management. The purpose of the focus group interview was to gain a better understanding of where researchers are currently learning about DMPs; what sort of assistance they seek in completing them; what information they would have found helpful if it had been readily available when they completed their DMP; and was intended to address any contradictory findings that arose through the survey.

The survey was distributed to all researchers who had completed a DMP and whose email address was still active in the university system.

DATA ANALYSIS

Survey results were analysed by researcher type, focusing on basic statistical frequencies and group characteristics.

Due to low turnout, the focus groups were conducted as interviews. Results were transcribed and then analysed using the scissor and sort technique to identify themes relevant to the research question.

PROCESS/PROCEDURES

The population this project is concerned with encompasses all researchers who have completed a data management plan (DMP) with the university: approximately 2000 students and 900 staff members, across all faculties of the university. An email inviting survey responses was distributed to all researchers who had completed a DMP, although not all contact details were expected to be current. A sample of 352 responses was calculated (National Statistical Service, n.d.) to give a mean error of 5% and a confidence interval of 95%. A target of 243 students and 109 staff respondents would allow for roughly representative numbers of staff and students.

The survey was delivered online using Qualtrics software, and consisted of sixteen multiple-choice questions, with free text entry available for some answers (available as Appendix A to this proposal). There were no mandatory questions. Participants were asked to answer based on their most recently completed DMP. Questions were divided into three sections:

1. Interaction with the DMP
2. Whether and how that interaction influenced their behaviour
3. Demographic information about the participant, and whether they consulted resources other than the tool for assistance.

The survey was distributed by the Research Office at Curtin, which manages the personal information associated with the DMPs and owns the data, to all researchers who had completed a DMP. As well as providing more legitimacy for the survey through sponsorship from a trusted source, this ensured that personal information was not shared in a way the potential participants did not consent to.

The Research Office at Curtin gave permission as owners of the data to use it for the purposes of this project, and assistance was provided by the Library, who manage the plans. Data was anonymised, although separate contact information was solicited from participants in order to facilitate the focus group interviews. Other than information provided by respondents, only DMP group characteristics were used in the study. The nature of a focus group in a smaller community means that anonymity was not possible to guarantee, but the final project and reports based on the research aim to ensure that individuals are not identifiable by their answers. All personal information that was made available during this project, including potentially identifying interview answers and notes taken during the course of the interviews, were anonymised. The raw data was stored securely.

FINDINGS

This section will report, in four parts, the findings of the survey described in the Methodology section. A copy of the survey is available as an appendix to this paper. The survey comprised sixteen questions, as well as one question to indicate participant consent.

Part one of the Findings section will discuss the demographics of the survey participants, gathered using survey questions 13 and 14.

Part two of this section reports researcher interaction with the DMP (questions 1 through 6): the reasons participants completed a DMP, their history of accessing or amending their DMP, and whether their data management practice followed their plans.

Part three of this section reports the answers to questions 7 through 11, intended to discover whether the DMP has helped researchers. These questions asked whether the DMP prompted changes to the way respondents managed their data in several specific areas, if it made them think about any aspect of data management not mentioned, and how useful they found it to be overall.

The final part of this section, part four, concerns the assistance respondents had in completing their DMP. It reports the answers to questions 15 and 16: what resources respondents consulted in order to help them complete their DMPs, and whether they had completed a DMP before this one.

A link to the survey was sent to 2191 unique email addresses on July 23rd 2018, and the survey was open for one month, with a reminder email sent by Research Office at Curtin one week before the survey closed on August 20th. In total, 212 responses were received, and 197 of those respondents consented to their answers being used. No question was mandatory, and no other question was answered by all 197 respondents.

DEMOGRAPHICS

The survey asked two questions to understand the demographics of the respondents. Question 13 asked “At the time you completed the data management plan, what best characterised your role?” Students accounted for 95 of the 168 responses to question 13, which means that 56.6% of respondents were students, and 72 respondents answered that they were staff (42.9%). The staff responses were divided between early career researchers (ECR) (28, or 16.7%), mid-career researchers (MCR) (26, or 15.5%), late career researchers (LCR) (13, or 7.7%), and ‘Other’ (6, or 3.6%). ‘Other’ allowed a free-text entry, and most answered that they were professional/general staff.

Participants were also asked, in question 14, which faculty their research was conducted under. There were 168 responses. Most respondents were part of the Health Sciences or Science & Engineering faculties. All answers to this question are shown in table 1 below.

Faculty	Number	Percentage
Centre for Aboriginal Studies	0	0
Business & Law	19	11.31%
Health Sciences	65	38.69%
Humanities	31	18.45%
Science & Engineering	50	29.76%
Vice Chancellory	1	0.60%
Other	2	1.19%

Table 1: Survey response by faculty: number of responses and percentage of respondents.

Three areas had too few responses to make reasonable generalisations about the faculty from the responses: Centre for Aboriginal Studies (0 responses), Vice Chancellory (1 response, or 0.6% of all responses), and ‘Other’ (2, or 1.2%). For this reason, faculty comparisons in the findings for other questions will exclude all but the four most common responses: Business & Law, Health Sciences, Humanities, and Science & Engineering.

RESEARCHER INTERACTION WITH THE DMP

Question 1 of the survey asked why respondents completed a DMP. Multiple selections were allowed. There were 178 responses to this question, and 300 choices selected.

Table 2 shows the percentage of respondents who chose each option, as expressed by respondent type, with the number of respondents in parentheses. All staff includes ECR, MCR, LCR, and “Other” role responses.

	Ethics	Storage	Candidacy	Unit	Document decisions	Grant	Other
All (178)	64.60% (115)	39.33% (70)	32.58% (58)	12.36% (22)	10.11% (18)	7.30% (13)	2.25% (5)
Student (95)	54.73% (52)	33.68% (32)	49.47% (47)	17.89% (17)	8.42% (8)	4.21% (4)	3.16% (3)
ECR (28)	67.86% (19)	46.43% (13)	25.00% (7)	7.14% (2)	10.71% (3)	10.71% (3)	0
MCR (26)	80.77% (21)	57.69% (15)	3.85% (1)	0	19.23% (5)	3.85% (1)	0
LCR (13)	92.31% (12)	53.85% (7)	7.69% (1)	7.69% (1)	7.69% (1)	23.08% (3)	7.69% (1)
All Staff (73)	76.71% (56)	50.68% (37)	12.33% (9)	4.11% (3)	13.70% (10)	10.96% (8)	1.37% (1)

Table 2: Reasons for completing a DMP by respondent type

Table 3 shows the percentage of respondents who chose each option, as expressed by faculty, with the number of respondents in parentheses.

	Ethics	Storage	Candidacy	Unit	Document decisions	Grant	Other
Business & Law (19)	73.68% (14)	36.84% (7)	31.58% (6)	5.26% (1)	0	10.53% (2)	5.26% (1)
Health Sciences (65)	81.54% (53)	44.62% (29)	33.85% (22)	6.15% (4)	13.85% (9)	7.69% (5)	1.54% (1)

Humanities (31)	70.97% (22)	29.03% (9)	32.26% (10)	3.23% (1)	6.45% (2)	6.45% (2)	0
Science & Engineering (50)	32.00% (16)	48.00% (24)	36.00% (18)	28.00% (14)	12.00% (6)	6.00% (3)	2.00% (1)

Table 3: Reasons for completing a DMP by faculty

The need for a DMP in order to complete the ethics process was the top reason respondents of nearly all types cited for completing a DMP: 115 of all participants (64.6%) chose this option, and it was increasingly common in responses by participants later in their careers. "Access to storage" was also chosen more frequently by participants later in their careers, with 70 (39.3%) of all participants and 37 of 73 staff (50.7%) choosing this option.

DMP creation at Curtin is a requirement for PhD candidacy, and nearly half of the student respondents (47, or 49.5%) indicated that they completed a DMP for that reason, as did 7 of 28 (25.0%) early career researchers. Candidacy and unit requirements were far less common in mid- and late career researchers' responses, with only 1 of 39 (2.6%) of these researchers choosing this option.

Question 2 asked whether respondents had accessed their DMPs since they were completed. There were 178 responses to this question.

Table 4 shows the number of respondents who answered this question in total, and the number and percentage of respondents who did access their DMP at least once after completing it, expressed by faculty.

	Total responses	Answered "Yes"	Percentage "Yes"
All	178	60	33.71%
Business & Law	19	7	36.84%
Health Sciences	65	20	30.77%
Humanities	31	6	19.35%
Science & Engineering	50	22	44.00%

Table 4: Respondents who accessed DMP since completion by faculty

Two thirds of survey respondents (118, or 66.3%) report that they never accessed their DMP again after it was completed, with respondents from the Humanities faculty less likely (6 of 31, or 19.4%) and Science & Engineering respondents more likely (22 of 50, or 44%) to have done so. No differences based on researcher role were clear in the answers to this question.

Question 3 asked how many times each respondent had amended their DMP since it was completed. There were 178 responses to this question.

The two graphs below show the percentage of respondents that chose each option, with the number of respondents in parentheses, expressed by respondent type in table 5 and faculty in table 6.

	Never	Once	Once a semester	Once a year	More frequently
All (178)	67.98% (121)	24.16% (43)	3.37% (6)	0.56% (1)	3.93% (7)
Student (95)	66.32% (63)	25.26% (24)	2.11% (2)	1.05% (1)	5.26% (5)
ECR (28)	71.43% (20)	21.43% (6)	3.57% (1)	0	3.57% (1)
MCR (26)	80.77% (21)	19.23% (5)	0	0	0
LCR (13)	76.92% (10)	15.38% (2)	7.69% (1)	0	0

Table 5: Frequency of DMP changes by respondent type

	Never	Once	Once a semester	Once a year	More frequently
Business & Law (19)	57.89% (11)	36.84% (7)	5.26% (1)	0	0
Health Sciences (65)	70.77% (46)	24.62% (16)	0	0	4.62% (3)
Humanities (31)	80.65% (25)	19.35% (6)	0	0	0
Science & Engineering (50)	66.00% (33)	20.00% (10)	6.00% (3)	2.00% (1)	6.00% (3)

Table 6: Frequency of DMP changes by faculty

Less than one third of respondents (57, or 32.0%) say that they made any amendments to their DMP, and most of those (43, or 24.2%) made only one amendment. Business & Law respondents were slightly more likely than those in other faculties to have made any amendments (8 of 19, or 42.1%), and Science & Engineering respondents were more likely to have changed their plan more than once (7 of 50, or 14.0% of all answers to this question). Research staff were more likely (51 of 67, or 76.1%) than students (63 of 95, or 66.3%) or “Other” staff (4 of 6, or 66.7%) to report that they had never amended their DMP.

Question 4 was shown only to participants who reported having made a change to their DMP, and asked whether the change had been basic (spelling or small changes) or substantial (changes to the details of the plan). There were 55 responses to this question.

Substantial changes had been made by 35 (36.4%) respondents, with a higher frequency of these changes made by early career researchers (5 of 8, or 62.5%) and respondents from Health Sciences (9 of 19, or 47.4%), and only

minor changes reported by Business & Law respondents (0 of 8 respondents indicated making substantial changes) and mid-career researchers (0 of 5 respondents).

Question 5 was likewise only shown to participants who reported amending their DMP, and asked what prompted the changes made to their plans: a request by their principal investigator or supervisor, deciding to make changes on their own, or “Other”. For “Other”, a text box was provided for respondents to elaborate. Multiple choices were allowed on this question. There were 55 responses to this question, and 58 choices selected.

Table 7 shows the percentage of respondents who chose each option, expressed by the faculty the research was conducted under. In the first column, the number of respondents to the question who belong in each category is listed in parentheses; all other columns list the number of times that choice was selected in parentheses. Note that the totals in some cases exceed 100% because multiple answers were allowed.

	Request by PI/supervisor	Made changes on own	Request by ethics committee	Other
All (55)	21.82% (12)	47.27% (26)	21.82% (12)	14.55% (8)
Business & Law (8)	37.50% (3)	62.50% (5)	12.50% (1)	0
Health Sciences (19)	26.32% (5)	36.84% (7)	21.05% (4)	26.32% (5)
Humanities (6)	0	33.33% (2)	66.67% (4)	0
Science & Eng. (17)	11.76% (2)	64.71% (11)	11.76% (2)	11.76% (2)

Table 7: Reason reported for changes made to DMP, by faculty

Respondents were most likely to have decided to make changes on their own (26, or 47.3%), and then to have made changes in response to a request made by their principal investigator/supervisor (12, or 21.8%) or the ethics committee (12, or 21.8%). Five respondents (9.1%) report making amendments because of a change in circumstances, such as needing more space than anticipated, a change of role or location, or a new research partner. No trends based on stage of career were visible, but Business & Law and Science & Engineering respondents were more likely to have decided to make changes on their own (5 of 8, or 62.5%; and 11 of 17, or 64.7% respectively), while Humanities (2 of 6, or 33.3%) and Health Sciences (7 of 19, or 36.8%) respondents were somewhat less likely.

Question 6 asked whether the way respondents managed their data followed the model set out in their DMP, with five possible answers including “I don’t remember”. There were 175 responses to this question.

The two graphs below show the percentage of respondents that chose each option, with the number of respondents in parentheses, expressed by respondent type in table 8 and faculty in table 9.

	Yes	Mostly	Some of it	No	Don’t recall
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All (175)	37.71% (66)	34.29% (60)	13.14% (23)	6.29% (11)	8.57% (15)
Student (95)	34.74% (33)	33.68% (32)	15.79% (15)	9.47% (9)	6.32% (6)
Staff (73)	42.47% (31)	30.14% (24)	10.96% (8)	2.74% (2)	10.96% (8)
ECR (28)	28.57% (8)	35.71% (10)	21.43% (6)	3.57% (1)	10.71% (3)
MCR (26)	57.69% (15)	34.62% (9)	0	0	7.69% (2)
LCR (13)	46.15% (6)	23.08% (3)	7.69% (1)	7.69% (1)	15.38% (2)

Table 8: How closely data management practice follows DMP, by respondent type

	Yes	Mostly	Some of it	No	Don't recall
Business & Law (19)	63.16% (12)	26.32% (5)	10.53% (2)	0	0
Health Sciences (65)	43.08% (28)	26.15% (17)	12.31% (8)	4.62% (3)	13.85% (9)
Humanities (31)	38.71% (12)	35.48% (11)	9.68% (3)	6.45% (2)	9.68% (3)
Science & Eng. (50)	20.00% (10)	44.00% (22)	20.00% (10)	12.00% (6)	4.00% (2)

Table 9: How closely data management practice follows DMP, by faculty

Most participants (126, or 72.0%) report that their DMP either entirely (66, or 37.7%) or mostly (60, or 34.3%) describes the way they manage their data. Students and early career researchers are more likely to deviate in some way from their plan than researchers later in their careers. Business & Law respondents are more likely to follow their plan entirely (63%), and Science & Engineering respondents are less likely to do so (20%).

DOES THE DMP HELP?

Questions 7 through 11 asked questions aimed at understanding whether researchers believed the DMP had helped them in some way. These questions allowed respondents to elaborate on their answers in a free-text box, and their answers will be explained in the Discussion section. There were 168 responses to question 7, and 167 responses to each of questions 8, 9, 10, and 11.

The two graphs below show the percentage of respondents who answered 'Yes' to questions 8-11, and who did not answer 'Not at all useful' to question 7. The questions do not all have the same number of respondents, so these graphs show (Number of 'Yes' answers/Number of respondents in this category) in parentheses after the percentages. This is expressed by respondent type in table 10 and faculty in table 11.

	Organise/name	Store/back up	Make available	Other aspect	At all useful?
All	37.72% (63/167)	47.31% (79/167)	26.95% (45/167)	45.51% (76/167)	77.98% (131/168)
Student	44.68% (42/94)	50.00% (47/94)	34.04% (32/94)	51.06% (48/94)	77.89% (74/95)
Staff	28.77% (21/73)	43.84% (32/73)	17.81% (13/73)	38.36% (28/73)	79.45% (58/73)
ECR	25.00% (7/28)	42.86% (12/28)	17.86% (5/28)	32.14% (9/28)	71.43% (20/28)
MCR	30.77% (8/26)	42.31% (11/26)	15.38% (4/26)	38.46% (10/26)	80.77% (21/26)
LCR	30.77% (4/13)	38.46% (5/13)	23.08% (3/13)	46.15% (6/13)	84.62% (11/13)

Table 10: Utility of DMP by researcher type

	Organise/name	Store/back up	Make available	Other aspect	At all useful?
Business & Law	31.58% (6/19)	42.11% (8/19)	31.58% (6/19)	52.63% (10/19)	73.68% (14/19)
Health Sciences	36.92% (24/65)	35.94% (23/64)	18.46% (12/65)	40.00% (26/65)	78.46% (51/65)
Humanities	46.67% (14/30)	64.52% (20/31)	33.33% (10/30)	53.33% (16/30)	83.87% (26/31)
Science & Engineering	36.00% (18/50)	54.00% (27/50)	34.00% (17/50)	44.00% (22/50)	74.00% (37/50)

Table 11: Utility of DMP by faculty

In question 7, respondents were asked to rate how useful completing a DMP had been to them on a five-point scale from 'Extremely useful' to 'Not at all useful'. Most participants found the DMP 'Moderately useful' (48, or 28.6%; and 25 of 65, or 38.5% of Health Sciences respondents), the mid-point answer, then 'Slightly' and 'Not at all useful' (37, or 22.0% each), with the fewest responses for 'Extremely useful' (12, or 7.1%). Students were the group most likely to find it 'Extremely useful' (8 of 95, or 8.4%), but the most frequent response for students (25 of 95, or 26.3%) – as for staff (23 of 73, or 31.5%) – was 'Moderately useful'. Respondents from the Business &

Law (5 of 19, or 26.3%) and Science & Engineering (13/50, or 26.0%) faculties were most likely to find the DMP 'Not at all useful', and ECRs (8 of 28, or 28.6%) were the researcher type most likely to find the DMP 'Not at all useful'.

When asked by question 8 if completing the DMP prompted any changes in how data was organised or named, 63 (37.7%) respondents agreed that it had. Students were more likely (42 of 94, or 44.7%) to report that the DMP had prompted changes in the way they organised or named their data, and although all staff types were less likely (21 of 73, or 28.8%) to find it helpful in this way, ECRs (7 of 28, or 25.0%) were the least likely. Participants from the Humanities faculty were more likely (14 of 30, or 46.7%) to have made changes to the way they organised or named their data after completing a DMP than respondents from any other faculty.

Question 9 asked respondents if completing the DMP had prompted any changes to the way data was stored or backed up, and the process was seen as being most useful in prompting this sort of change to data management practice, according to responses to this question. Seventy-nine (47.3%) respondents agreed that they had made changes in this area due to the DMP, including half of student respondents (47 of 94, or 50.0%). Humanities and Science & Engineering respondents were more likely to have made a change to this aspect of their data management, with 20 (of 31 Humanities respondents, or 64.5%) and 27 (of 50 Science & Engineering respondents, or 54.0%) participants respectively answering yes to this question. Health Sciences respondents, in contrast to other faculties, were actually slightly less likely to have been prompted to change their storage/back-up decisions (23 of 64, or 35.9%) than to have changed how they organised or named their data (24 of 65, or 36.9%).

Question 10 asked if respondents were prompted to change some aspect of how their data would be made available after their research was complete. Participants were least likely to have reported changes in this area, with only 45 (27.0%) respondents agreeing to this. Students were slightly more likely to answer yes to this question, with about a third (32 of 94, or 34.0%) agreeing that the DMP prompted them to change how their data would be made available after their research was complete. Health Sciences respondents were less likely than other faculties to agree with this question, with only 18.5% (12 of 65) answering yes.

Question 11 asked if there was any other aspect of data management that respondents had not previously made arrangements for, that they were reminded of when completing their DMP. The DMP reminded 76 (45.5%) participants of some other aspect of data management that they had not previously made plans for. Slightly more than half of students (48 of 94, or 51.1%) agreed that they were reminded of some other aspect of data management while completing the DMP. Staff were much less likely (28 of 73, or 38.4%) to answer yes, although staff later in their career were more likely to have been reminded of some other aspect of data management than staff earlier in their career. Business & Law (10 of 19, or 52.6%) and Humanities (16 of 30, or 53.3%) respondents were both more likely to answer yes than no to this question.

Question 12 was a text entry question, asking what respondents now know that they wish they had known when they first completed their DMP. Responses to this question will be outlined in the Discussion section.

ASSISTANCE TO COMPLETE THE DMP

Question 15 asked survey respondents where they sought help to complete their DMP. Multiple selections were allowed. There were 168 responses to this question, and 249 choices selected.

The two graphs below show the percentage of respondents that chose each option, expressed by respondent type in table 12 and faculty in table 13. In the first column, the number of respondents to the question who belong in each category is listed in parentheses; all other columns list the number of times that choice was

selected in parentheses. Note that the totals in some cases exceed 100% because multiple answers were allowed.

	PI/supervisor	Libguide	Peers	Faculty template	Library staff	Research Office	Other	No help
All (168)	38.69% (65)	27.98% (47)	20.24% (34)	11.90% (20)	10.12% (17)	5.36% (9)	7.74% (13)	26.19% (44)
Student (95)	53.58% (51)	35.79% (34)	20.00% (19)	14.74% (14)	12.63% (12)	3.21% (5)	10.53% (10)	11.58% (11)
Staff (73)	19.18% (14)	17.81% (13)	20.55% (15)	8.22% (6)	6.85% (5)	5.48% (4)	4.11% (3)	45.21% (33)
ECR (28)	35.71% (10)	17.86% (5)	25.00% (7)	14.29% (4)	7.14% (2)	7.14% (2)	3.57% (1)	32.14% (9)
MCR (26)	0	26.92% (7)	23.08% (6)	3.85% (1)	7.69% (2)	3.85% (1)	7.69% (2)	50.00% (13)
LCR (13)	23.08% (3)	7.69% (1)	7.69% (1)	7.69% (1)	0	7.69% (1)	0	53.85% (7)

Table 12: Resources consulted in completing the DMP, by researcher type

	PI/supervisor	Libguide	Peers	Faculty template	Library staff	Research Office	Other	No help
Business & Law (19)	42.11% (8)	21.05% (4)	10.53% (2)	15.79% (3)	10.53% (2)	10.53% (2)	0	21.05% (4)
Health Sciences (65)	38.46% (25)	20.00% (13)	23.08% (15)	6.15% (4)	4.62% (3)	1.54% (1)	6.15% (4)	38.46% (25)
Humanities (31)	32.26% (10)	45.16% (14)	16.13% (5)	12.90% (4)	12.90% (4)	9.68% (3)	19.35% (6)	12.90% (4)
Science & Engineering (50)	42.00% (21)	32.00% (16)	22.00% (11)	16.00% (8)	14.00% (7)	6.00% (3)	6.00% (3)	20.00% (10)

Table 13: Resources consulted in completing the DMP, by faculty

The most common resource participants turned to for help completing the DMP was their principal investigator or supervisor, and this was particularly true for students (51 of 95, or 53.6%) and Business & Law (8 of 19, or 42.1%) respondents, with the Curtin Libguide (47, or 28.0%) and peer assistance (34, or 20.2%) close behind.

Respondents were increasingly likely to require no extra assistance as they progressed in their career. Health Sciences participants were less likely to seek help outside of their faculty, with 'No help' (25 of 65, or 38.5%), supervisor or PI (25 of 65, or 38.5%), and peers (15 of 65, or 23.1%) being the most frequent choices. The answers respondents gave in the text field for 'Other' will be explained in the Discussion section.

Question 16 was the last question in the survey, and it asked whether respondents had completed a DMP before. There were 166 responses to this question.

The two graphs below show the percentage of respondents that reported that they had completed a DMP previously, with the number of respondents in parentheses, expressed by respondent type in table 14 and faculty in table 15.

	Answered 'Yes'
All (166)	39.76% (66)
Student (94)	21.28% (20)
Staff (72)	63.89% (46)
ECR (27)	55.56% (15)
MCR (26)	73.08% (19)
LCR (13)	76.92% (10)

Table 14: Respondents who have created a DMP previously, by respondent type

	Answered 'Yes'
Business & Law (19)	52.63% (10)
Health Sciences (64)	54.69% (35)
Humanities (30)	23.33% (7)
Science & Eng. (50)	28.00% (14)

Table 15: Respondents who have created a DMP previously, by faculty

Most students (74 of 94, or 78.7%) and nearly half of the early career researchers (12 of 27, or 44.4%) who participated indicated that this was the first DMP they had completed, as did 23 (of 30, or 76.7%) Humanities and 36 (of 50, or 72.0%) Science & Engineering respondents. Participants further in their career were more likely to have created a DMP before, as were participants from the Health Sciences faculty (35 of 64, or 54.7%) and the Business & Law faculty (10 of 19, or 52.6%).

LIMITATIONS

This project is subject to some major limitations, including time limits of the project, factors related to the methods used, and a small sample size.

This study was planned, approved, and held within one year. It was held in order to fulfil the requirements of a Master's by coursework thesis project, which is necessarily limited in scope. Due to the short time frame, the survey could only be open for a short period, and focus groups were held during a busy time for most of the potential participants. Only three participants were able to attend focus groups, so their responses have been analysed as in-person one-on-one interviews instead.

The study relies on self-reported survey data. The survey was designed to be quick to complete, but it is possible that respondents had stronger feelings about the topic than non-respondents, or a more positive disposition towards this sort of research. Non-respondents who don't remember completing a DMP might not have realised that the survey was relevant to them. Even with an anonymous survey, respondents might have been hesitant to admit to non-compliance with a university-mandated plan. Additionally, survey respondents could not ask for clarifications to any question; there are indications in the data that some questions might have been interpreted in slightly different ways by different respondents, or answers missed or misunderstood.

The population this study is concerned with was smaller than initially expected. After deleting email addresses that were duplicates or no longer in service, there were 2191 students and staff members, instead of the initially expected 2900. However, the response rate at 8.99% was low, and the number of responses (197) was well below the required sample size of 327 for the chosen confidence level, even with a smaller total population. In this project, I report the results of smaller groupings within the sample in order to discover differences between groups, but it should be recognised that the groups are too small to make strong predictions. The results should serve more as an indication of the sort of responses received, and possible trends within different groups, in order to help build the foundation for further work.

Lastly, because the survey was sent to everyone who had completed a DMP since the current system was instituted in 2015, different respondents had completed their DMPs at different times. The resources that were available to each of them might not have been the same even if their demographic characteristics otherwise match.

The Robertson Library collects some information during the DMP process which can be used to verify the results found in the survey. Information about the ratio of staff to student DMPs, the relative representation of each faculty, and the proportion of student-created DMPs within a faculty were collected during DMP creation, and the trends in these numbers largely match the survey results. For instance, the percentage of student-created DMPs is 57.1%, while the survey was 56.5% students; 77.4% of Science & Engineering and 68.2% of Humanities DMPs were created by students, and survey responses from these faculties show 78.0% and 65.5% students respectively. Business & Law and Health Sciences are not as closely aligned, but both faculties are still staff-heavy, with more than 55% staff representation in both DMPs created and survey responses. The two faculties with the largest discrepancy in representation are the Vice Chancellorry (4.5% of all DMPs, but only 0.6% of those surveyed) and Health Sciences (36.6% of all DMPs, but 38.7% of those surveyed).

In addition, all R drive storage requests are made using the DMP tool Web site, and although more of the survey respondents report creating a DMP in order to gain access to storage (39% of survey respondents, compared with 33% of all DMP creators), the relative faculty trends are similar.

DISCUSSION AND RECOMMENDATIONS

This project is concerned with the question of whether Curtin's DMP tool helps researchers manage the data they collect, in order to discover how that can be used to improve the DMP tool and RDM-related library resources. This section will discuss:

1. How researchers interact with their DMPs;
2. Where researchers sought assistance to complete their DMPs;
3. How researchers managed their data, and where that differed from their plans;
4. Whether the DMP was found to be useful; and
5. Recommendations for library services based on the above.

RESEARCHER INTERACTION WITH THE DMP

This section explains researcher interaction with the DMP: why they created their DMP, how often they accessed or changed it later, and their experience of the process.

REASONS FOR CREATING A DMP

Findings from the survey indicate multiple reasons Curtin researchers create DMPs, but the most common reasons are for ethics approval, to access data storage, and to gain candidacy. These are the three situations for which a DMP has been made mandatory at Curtin. Only 53 of 178 (29.8%) respondents chose one of the other possible answers in the survey – a unit requirement, to document decisions, as part of a grant application, or 'Other' – and just 14 (7.9%) did not also select one of the top three answers. It is clear that the institutional requirement for a DMP is the main driver of DMP creation.

The most commonly given reason for why a DMP was created, chosen by 115 of 178 (64.6%) respondents, is as part of the ethics approval process. It is the most frequently chosen response for every type of researcher, and for every faculty except Science & Engineering, which will be discussed below. Text responses to the survey support that the Ethics Committee was the main source of awareness of the need to create a DMP. Researchers have found that when so-called mandates are not enforced, they are less likely to be influential on researchers (Higman & Pinfield, 2015); this study shows that the reverse also holds. In order to gain ethics approval, the details of the plan must be approved by the Ethics Committee. This process helps to build awareness of best practice and university resources, and lends authority to the DMP. Health Sciences respondents were the most likely to choose this option: ethics was a reason for 53 of 65 (81.5%). Researchers in medical or social science fields have been shown to have concern over data sharing because their research is more likely to involve sensitive data (Akers & Doty, 2013); ethics approval might be more commonly required for Health Sciences research, or supporting documents like the DMP more closely inspected.

For students, candidacy is nearly as common a response as ethics; it is listed by 25% of early career researchers, but drops off as a common choice for later career staff. Similarly, creating a DMP as a unit requirement is a response more likely to be chosen by students than other groups: 17 of the 22 responses (77.3%) were students. This is not unexpected, as staff and researchers later in their careers are less likely still to be studying, and thus less likely to be subject to unit or candidacy requirements. Science & Engineering accounted for 14 of the 22 (63.6%) unit requirement responses.

The second most common reason for creating a DMP was R drive access, chosen by 70 of 178 (39.3%) respondents. Access to university data storage was more likely to be cited as a reason to create a DMP for Health Sciences and Science & Engineering respondents, which might relate to differences in the type and size of the data their research is likely to generate; previous studies have also found use of institutional storage to be higher in science-related fields, as well as differences in data needs (Akers & Doty, 2013; Weller & Monroe-Gulick,

2014). That being said, the numbers for all groups surveyed are larger than expected. This study was not primarily about R drive use, and it did not ask whether the R drive was being used for primary or backup storage, or ask about actual use: this could be an avenue for future research at Curtin. However, even in the group least likely to have created a DMP for storage space, Humanities, 29.0% reported this as a reason. Most previous research asking about storage has found that less than 20% of their respondents use institutional storage, particularly when university-wide storage is listed separately from departmental or unit storage (Hickson et al., 2016; Scaramozzino et al., 2012; Whitmire et al., 2015).

One caveat is that survey respondents in general were slightly more likely to have made a DMP at least partly to gain access to storage space, at 39%, while only 33% of all Curtin plans have an associated request for storage; this trend holds for respondents from every faculty. Science & Engineering survey respondents were much more likely to choose this option than the percentage of Science & Engineering DMPs with a request: 48.0% of respondents mentioned storage as a reason for creating a DMP, while only 34.9% of plans in this faculty are associated with requests. There was a smaller gap for Health Sciences respondents, of whom 44.6% mentioned storage as a reason, with 39.6% of plans involving a request. There was no indication as to why survey response rates might be higher in the segment of the population that requested R drive access. However, because the DMP process recommends using R drive storage, it is possible that responses were inhibited from potential respondents who did not follow their DMP or the recommendations.

The Science & Engineering faculty's reasons for creating a DMP differed from the rest of the surveyed population in multiple ways. At 32.0%, they were the only group where under 70% of respondents created a DMP for ethics approval; they were also among the most likely to request storage space, and the most likely to create a DMP as a unit requirement. This group had a higher than average number of student responses (39 of 50, or 78.0%), and 7 of the 11 staff respondents were early career researchers, both of which groups were less likely to choose ethics as a reason for DMP creation. However, ethics was chosen by Science & Engineering respondents even less than expected for either students or ECRs. Responses from Humanities, which (at 65.5%) also has a higher than average proportion of students, do not follow the same patterns in their reasoning for completing a DMP: 71.0% made a DMP due to an ethics requirement, only 29.0% indicated a need for storage, and only one respondent mentioned a unit requirement. This implies a faculty difference, rather than a difference in researcher role. The type of research undertaken in the Science & Engineering faculty might be less likely to require ethics approval than research in other faculties at Curtin. Alternatively, it might be that a DMP was needed and created earlier in the research process, before they were aware of ethics requirements: perhaps as an assignment early in a unit, or in anticipation of the need for storage space for research data. Some responses to both the survey and interviews indicated that researchers were not necessarily aware that they would have to create a DMP until late in the ethics review process.

Only 10.1% of respondents created a DMP in order to document their RDM decisions. As with storage space, Health Sciences and Science & Engineering were more likely to have chosen this response. However, mid-career researchers were far more likely (5 of 26, or 19.2%) to report this reason. This could be an artefact of the small number of responses, or it is possible that these groups are more likely to work with complicated data or larger teams, and use the DMP requirement as a genuine opportunity to structure their planning process.

ACCESSING AND AMENDING THE DMP

Most survey respondents report that they did not access their DMP again after it was accepted, and made no changes. This section discusses which groups made changes, and why they reported making changes.

Only a third of survey respondents (60 of 178) accessed their DMPs after completing them. Although MCRs were more likely than other groups to have made a DMP in part to document their RDM decisions, they were not more likely to have accessed their DMP after completion: only 26.9% of them did. Humanities respondents

(19.4%) were less likely to look at them again, and Science & Engineering respondents more likely (44.0%). Humanities respondents were also the group most likely to make no changes to their plans, with 25 of 31 respondents (80.7%) saying they never changed their plan. The proportion of students who accessed their DMPs again (31 of 95, or 32.6%) was similar to the proportion who made any changes to their plan (32 of 95, or 33.7%). In contrast, while staff as a whole accessed their DMPs at a similar rate (24 of 73, or 32.9%), only a quarter (18 of 73, or 24.7%) made any amendments.

Amendments are both more likely to be made at all and more frequently made by students and ECRs than by MCR and LCR staff. This suggests the possibility that experience allows later-career researchers to plan more realistically from the beginning. In contrast to the uncertainty voiced by inexperienced respondents, one LCR who had completed previous DMPs said, "It's quite a familiar process, so there were no surprises." More than half of the early career researchers who explained what sort of changes they had made reported making substantial changes to their plans, while mid-career researchers reported only small changes. Another possible explanation is that MCR and LCR researchers are less likely to expect that the DMP match actual practice. This was raised by one interview subject, who created the DMP for their large research group. They found that more senior researchers thought of the DMP as a formality only useful to pass the ethics process. Previous work has found that some researchers think DMP requirements are time-wasting formalities that should not be required for their own work (Burgess et al., 2016; Diekema et al., 2014; Hickson et al., 2016). Although there are responses to this survey that betray that attitude towards the DMP mandate, in the answers respondents gave about their own data management practice there was insufficient evidence that their attitude actually led to lax behaviour. There was evidence of planning for more flexibility, however: one experienced survey participant mentioned creating a less-detailed data structure because they knew the plan was to be used by multiple researchers.

The explanation that experience leads to more robust DMPs does not seem to hold for faculty differences on face value. Business & Law respondents, who are more likely to be MCR or LCR staff and to have DMP experience, amend their DMPs more than any other faculty. Humanities respondents, largely students with less DMP experience, report making fewer changes. However, Business & Law respondents who made amendments reported only minor changes, and largely chose to make those changes on their own; and two thirds of the amendments made by Humanities respondents were made at the request of the ethics committee. The types of changes made by these groups could indicate that experience does make a difference. Health Sciences respondents – also more heavily staff than student – reported fewer amendments, but were more likely to have made substantial changes. A large portion of these amendments were updates to the DMP after a change in circumstances, such as the addition of a researcher to the project, or an unexpected increase in data volume requiring more storage space. Changing the DMP in response to changes in circumstance indicates that these respondents do value having their DMP match their data management practice.

RESEARCHER EXPERIENCE OF DMP CREATION

User experience of creating a DMP was not directly measured by the survey, but survey question 12 was an open-ended question asking what respondents wished they had known when they created their DMP. Of the 80 responses, 19 specifically mentioned the process, as did all three interview subjects. This section describes the main complaints: navigating the online process, getting appropriate assistance, feeling that the DMP was not relevant to their situation, and awareness of the tool; the positive comments were generally less detailed.

Although not universal, the difficulty of the DMP process was a common theme in answers to this question (13 of 19 responses). Navigating the online process was the most frequent issue mentioned. The data management planning tool is housed on its own subdomain within the larger Curtin Website. Most users would access this site either as part of the ethics approval process or in order to gain access to the R drive, both of which processes are controlled by different departments than the DMP tool, and have different security. Logging in to multiple sites "got a little tedious", according to one interview subject. Information is not necessarily shareable across

the multiple Websites used in gaining ethics approval, or available in similar formats, and the process for amending information on each site can be quite different. This adds unnecessary hurdles to the process that can discourage users from using the system, as described by (Hickson et al., 2016).

DMP creation assistance is likewise provided by different departments, in different forms, and some resources are only available or known to small portions of the institution. In an interview, one student mentioned that they found the process simple: all PhD students in that faculty had been provided with a candidacy packet that collated the links to these sites and links to some resources like the RDM Libguide (<http://libguides.library.curtin.edu.au/research-data-management>). The Library had not been familiar with this candidacy resource prior to the interviews. Another interview subject had little guidance from their supervisor, and found the process much more challenging.

Several respondents mentioned that the DMP process using the DMP tool was "long and complicated" or time-consuming out of proportion to its benefits, and that it did not take into account different circumstances. Some had almost completed the ethics approval process or finished their research planning before they were aware they had to create a DMP, or were unaware of the DMP tool to guide the creation of their plan.

The positive comments, 6 of 19, were likely to reference that the process was "reasonable" or straightforward. Some mentioned specific ways that the DMP helped them, which are mentioned later in the Discussion section.

ASSISTANCE TO COMPLETE THE DMP

Curtin University has a variety of resources available to assist in creating a DMP. This section discusses what resources respondents were most likely to use, whether having previous DMP experience influences the use of resources available, and in what ways the assistance available fell short of respondents' desires.

For students and early career researchers, the most common resource consulted was their supervisor or principal investigator. These groups are less likely to be the principal investigator themselves, and already have an established relationship with their supervisor or PI. This supports findings in previous studies that many researchers follow the lead of the person in charge of the research team when it comes to data management (Hickson et al., 2016). Curtin's Libguide was the next most frequently consulted resource by students (34 of 95, or 35.8%), and the most common resource in Humanities (14 of 31, or 45.2%). This resource is linked in the instructions in the DMP tool, and gives guidance that is specifically relevant to Curtin's DMP.

Staff were most likely to look for no help to complete their DMP (33 of 73, or 45.2%, as compared with 17.7% of respondents), and the average number of resources consulted decreased as seniority increased: ECR staff made 1.4 choices per respondent, MCR 1.2, and LCR only 1.1; students consulted an average of 1.6 resources per respondent.

Faculty DMP templates or "boilerplate" language were mentioned as a possibly notable factor in some disciplines (Van Loon et al., 2017), but were less frequently consulted than expected by survey respondents: 8 of 50 (16.0%) Science & Engineering respondents and 3 of 19 (15.8%) Business & Law respondents chose this option, and it was less common in every other group examined.

A large majority of students had not completed a DMP before, and students in Health Sciences, Business & Law, and Humanities were even less likely to have ever completed another DMP. The greater proportion of Science & Engineering students with previous DMP experience might be due to the type of assignments found within the normal course of study: this was the only faculty with a large proportion of respondents who had created their DMP due to unit requirements. Just under 30% of all respondents, and 41% of students, were part of the Science & Engineering faculty, but they made up 63.6% of those who completed their DMP because of a unit

requirement. Despite having previous experience, Science & Engineering respondents were no more likely than other groups to seek no help, and on average consulted a similar number of resources to the student group (1.6).

All groups of research staff were more likely to have had a previous DMP than not, and over 70% of MCRs and LCRs. Over 80% of staff from the Business & Law faculty had previous experience, although this might relate to the larger proportion of MCR and LCR staff in the survey respondents for Business & Law. Respondents who had created a DMP previously were less likely than the average respondent to seek assistance from every resource listed in the survey except peers. Nearly a third (32.9%) selected 'No help required', compared with 26.2% of the whole. As with the lower number of changes to the DMP by more senior staff, this suggests that respondent experience improves the planning process – at least, for staff.

The most common resources cited by participants who chose 'Other' in the survey were library DMP workshops, online guides from other institutions, and other Curtin staff (IT staff, ethics officers, or unit supervisors). The first workshop was run soon after DMP mandates were instituted, in March 2016. However, many respondents did not seem to be aware of them, even when they would have been interested in attending. A workshop along these lines was noted as the primary resource one interview subject would have liked to have been able to consult, in order to get advice relevant to their specific circumstances. Four of the five respondents who mentioned attending DMP workshops had also consulted the Libguide or spoke with library staff, which might indicate that these workshops are not reaching students and staff who are not already aware of library services. Outreach and better promotion of services are needed to allow current services to reach all interested researchers on campus (Dawson, 2018; Diekema et al., 2014; Eva, 2015).

When discussing the assistance respondents wished they had received, 18 of 80 (22.5%) indicated that they had received enough information. One of these wanted no extra help because they saw no value in the process, but others found that their experience, the instructions given by the DMP tool itself, and the assistance they had received were sufficient. Several respondents called the process straightforward, and one said that it was "a good way of ensuring I set out my broader research plan systematically". One mentioned that they were able to see a model DMP from a researcher in a similar position to them, which was a resource an interview subject said they would have liked.

On the other hand, a desire for more specificity in guidelines was a recurrent theme in the interviews and open-ended survey questions. In the survey, some respondents expressed that they did not have the experience or knowledge to be able to plan realistically before starting research, and they did not feel that the guidance they had in creating their DMP was adequate for their situation. Some found that their data management practice diverged appreciably from their plan, or they had to frequently revise the amount of storage space they needed for their data. A challenging aspect of the DMP, according to an interview subject, was knowing whether what they'd written met expectations. Similarly, a survey respondent wished they had known "To what level [...] details were required" in the plans. Twelve of 80 (15.0%) respondents mentioned that they wanted more clarity in Curtin requirements and ethical procedures. One interview participant mentioned that they found it difficult to apply the generic advice in the DMP tool and Libguide to their very different field, and two other subjects expressed a desire for model DMPs that were recent and specific to their field. Although samples were available, they were too different for the participants to use them confidently as a model. This theme has been seen in other research on this topic: generic information does not always seem relevant to users (Hickson et al., 2016; Weller & Monroe-Gulick, 2014; Whitmire et al., 2015), even if it seems adequate to information professionals. It adds a level of abstraction to what is already likely to be an unfamiliar and unwelcome task. Even librarians with broad information management skills can have trouble putting theory into practice without specific examples, if they have little data-specific training (R. A. Brown et al., 2015). In contrast, a respondent who had been able to see a model DMP from a researcher in a similar position to them felt "well supported to complete my DMP".

RESEARCHER RDM BEHAVIOUR

In order to understand how DMPs are useful, it is important to understand how well respondents actually followed their DMPs. This section addresses respondents' reported behaviour, how well it matched their planning, and their reasons for any divergence.

When it came to the way researchers actually managed their data, about 70% of respondents reported entirely or mostly following their DMP. Staff, especially MCR and LCR staff, are more likely to say they fully followed their plan. Not all respondents reported that they did follow their DMP, though, and students and ECR are more likely to deviate from their plans. One interview subject stated that there is a "gap between what the right answer is [when creating the DMP] and what is practical and realistic to do." They weren't entirely sure how to apply the file naming procedure that had been recommended in the DMP Libguide, but could tell immediately that the way they had interpreted it when creating their DMP was not going to work. Another made changes to the way they managed data because the initial file structure detailed in their DMP was impractical. In both cases, inexperience led to changes needing to be made; because the changes were minor, they did not feel the need to change their DMP to reflect it. As discussed in the section on DMP amendments, the greater experience of MCR and LCRs might mean that they are more likely to understand ahead of time how to plan for data management, leading to a more accurate document.

Alternatively, it's possible that their decisions are better respected by other researchers in their team than those made by junior researchers. When working in collaboration with others, it can be difficult to keep to the original plan, even when all investigators in a team are in agreement. One interview subject involved in a group project found that the way they managed research data was negatively impacted by a lack of authority to insist that all group members follow the DMP, particularly when faced with senior researchers who considered the DMP "a hoop to jump through." Another interview participant noted that guidance from senior researchers was to use less secure methods of storage and data sharing, even if it differed from the plan, because it was easier for both parties than the official method. Although they initially intended to follow their plan, the authority and mindset of direct supervisors was more compelling than DMP requirements. This supports previous findings that ease of use and changing researchers' attitudes is key to ensuring good data management practice (Diekema et al., 2014; Weller & Monroe-Gulick, 2014).

One other theme impacting adherence to the DMP is that for some, the facilities available did not match their needs. This was especially true for those who do most of their work off-campus, several of whom mentioned that they were unable to access the R drive at all. According to one respondent who did manage to follow their plan, security procedures "slowed access to my data" and off-campus VPN access to the R drive was not always available. They added, "I am also not convinced it is any more secure". One representative remark from an interview was that they were required to state that they would store their information on the R drive in order to gain ethics approval for their DMP, but they were unable to follow this in practice: in their case, the software they needed to use to analyse their data was not available on computers that had access to the R drive. For students, R drive access must be requested by their supervisor. If the supervisor is unavailable, they might not be able to get timely access to the R drive that their DMP states they will use. Several respondents noted that they were hesitant to use the R drive because difficulties could arise if the person who has primary responsibility for a project's shared DMP and R drive leaves the institution without first transferring that responsibility officially, or because it could not provide consistent access to external collaborators. These barriers decrease use of the provided infrastructure even among those who are open to using it, and can erode trust in the official recommendations (Diekema et al., 2014).

DID THE DMP HELP

How researchers interacted with their DMPs was useful information to gather, but the most important question this project sought to answer was whether Curtin's DMPs actually helped researchers manage their data, and where it was most helpful. This section discusses the results to the survey questions on this topic: four ways the plan might have helped, and where it did not.

When asked directly how useful completing a DMP had been, 74 of 168 (44.0%) respondents thought the DMP was overall 'Slightly' or 'Not at all useful', while only 46 (27.4%) found it 'Extremely' or 'Very useful'. There was also no specific aspect of data management the DMP helped more than half of respondents with. Despite this, 131 of 168 (78.0%) reported that going through the process to complete a DMP had been helpful in some way, and 13 of the 37 (35.1%) respondents who reported that the DMP process was 'Not at all useful' also reported making a DMP-influenced change to the way they managed their data in some aspect.

The survey asked if DMPs had prompted respondents to change the way they managed their data, broken out into four aspects: naming and organisation, storage and backups, how it would be made available after their project's completion, or some other way. For most researcher types, the DMP was most useful in prompting changes to data storage or backups, and secondarily in prompting changes to some other aspect. It was least likely to prompt changes to how data would be made available. Students and Humanities respondents were more likely than other groups to find the DMP useful in each aspect, perhaps because they were less likely to have had previous DMP experience.

Each of the survey questions related to whether creating a DMP prompted the respondent to make changes to how they would manage their data included a text-entry option so that respondents could elaborate on their answers.

NAMING AND ORGANISING DATA

Of the 63 people who agreed that the DMP prompted them to change some aspect of the way they organised or named their data, 20 respondents used the text entry field to elaborate on their answers. Respondents reported making changes to how they organised or named their data in order to facilitate access by others or future use; adding dates; and having a filing and naming system that was more logical, intuitive, or conventional. More than half of these responses (11) reported making changes to their naming system, and 4 reported changes to organisation or to the structure in general. Creating a DMP made one respondent "Think more deeply about the purpose and how [I] would be using the data". Having a logical structure and naming system in place before beginning data collection would, if put into place as in the plan, help researchers to make sure their data is retrievable and recognisable. It reduces the extra work to make data usable to others that serves as a barrier to sharing in some cases, and can help to ensure that the researchers themselves remember the purpose and context of their data.

STORING AND BACKING UP DATA

The most frequent changes made to how respondents stored or backed up their data were to use university storage (R drive), ensure that data was backed up, and make arrangements for data security or privacy. Fourteen of 25 respondents specifically mentioned the R drive. Eleven of these said that they would use the R drive either for primary or backup storage due to their DMP, 2 that they were made aware of it for the first time while using the DMP tool, and one respondent said that they planned to use it but ran into trouble accessing it in practice. This difficulty in using the R drive was echoed in both interviews. Backing up data was mentioned by 7 respondents: the DMP prompted 3 to have a data backup, and 4 more to have multiple backups. Several respondents were prompted to rethink the security or privacy of their data, as it related to storage.

A study of data management practice in science-related disciplines by (Diekema et al., 2014) found that only 13% of faculty indicated that their institution provided data storage, although at least 60% of the library and IT

staff surveyed at those institutions said that they did. In the Curtin survey, 11 of 80 (13.75%) respondents to question 12 remarked that creating a DMP raised their awareness of the existence of the R drive and the reasons for using it, and 6 others mentioned the need for storage and backup more generally.

One notable result is that Health Sciences respondents were less likely to report changes to storage and backups, with only 35.9% agreeing, compared with the average of 47.3%. This result could indicate that they are more knowledgeable about this topic; but they might also be more likely to have already decided to use the resources available within their faculty to store and back up their data. One respondent from Health Sciences reported that their area "has its own data storage and backup resources", and implied that researchers in that area were likely to use their own local storage instead of the R drive. An interview subject from the same area used the R drive as a periodic backup, and a faculty drive as the main location for data storage. These comments support previous findings that science-related disciplines might be more likely to use department-based storage (Akers & Doty, 2013; Tenopir et al., 2015; Whitmire et al., 2015).

MAKING DATA AVAILABLE

Fewer participants agreed that the DMP tool prompted a change to the way they would make their data available after their research was complete, with only 45 'yes' responses. Of those, 9 explained their answers further. The most common change they made was to make plans for where data would be stored when the project was complete. Long-term storage (and who was responsible for keeping the data) was a concern for 3 respondents, including archiving and sentencing, and another expressed a desire for more information about the details of R drive storage after the completion of the project. Four respondents mentioned the possibility of use by other researchers, and how to share data ethically. Two said that they had not thought about this topic before the DMP process. This linked to organisation for one respondent: "It made me think it should be better organised".

This was the aspect least useful for most respondents. The reason for this could be because the DMP tool does not require users to explain their plans for making data available in as much detail as it does the other aspects, but could also support previous findings about researcher reluctance to share datasets (Borgman, 2012; Tenopir et al., 2011, 2015).

SOME OTHER ASPECT OF DATA MANAGEMENT

Nearly half of the survey participants (76 of 167) were reminded of some other aspect of data management when they completed their DMP, but only 18 left text responses to explain their thinking. In these responses, the most common aspects the DMP tool helped them with were the respondents' learning how long data must be kept to comply with university recordkeeping requirements, learning the reasons for data planning, estimating data volume for storage, and questions of privacy, security, or access. Some of these answers were similar to answers to the previous questions: several respondents cited long-term storage, use of the R drive, data use by other people, backup, security, and organisation here. This might indicate that their understanding of the previous questions was slightly different to other respondents.

REASONS GIVEN FOR WHY THE DMP WAS NOT USEFUL

Of those who offered an explanation for why they did not find the DMP useful in some way, there were three main reasons:

1. They already did what the DMP recommended;
2. They did not follow their plan when it came to actual data management; and
3. The DMP was useless, or they could not verify that it was followed. This might be because they couldn't recall what they did or because they created the plan but were not the ones using the data.

Some survey respondents indicated that they believed the DMP process was just an administrative burden: when asked what they wish they'd known when first completing a DMP, 13 of 80 (16.3%) respondents expressed frustration about having to create a DMP that they never actually used. One elaborated that it was "a fundamental" principle that "researchers are time poor", and administrators making DMPs mandatory failed to understand this point. Several respondents felt that they put more time into the DMP than it was worth, or that it negatively affected their research. Even some way into their research, some respondents didn't see the point of a DMP. This echoes the findings of previous researchers (Burgess et al., 2016; Diekema et al., 2014; Hickson et al., 2016), but was less commonly expressed than expected at the beginning of the study.

RECOMMENDATIONS: HOW CAN THE LIBRARY HELP?

Overall, the DMP did seem to be useful in some way to the majority of participants. It was most useful as an awareness tool, leading respondents to learn about the existence of university resources and expectations: several respondents commented that the first time they had learned about the R drive or data retention requirements was while creating their DMP. Although the DMP was found less useful by those respondents who were experienced in research and DMP creation, almost every respondent who did find it useful had a different answer for how it had helped. The range of topics covered meant that it was able to fill gaps in knowledge for very different kinds of researchers, and most participants found it helpful in some way. The recommendations that arise from this study largely agree with previous work. The most important aspects for a library to keep in mind are to use their skills and their position as a place of learning and advice within a university. Some recommendations will require the library to collaborate more closely with other departments in the institution. Libraries should make sure that the institutions understand the purpose and value of the services they offer, and how they can be more smoothly connected with other university systems and procedures.

HELPING RESEARCHERS CREATE A PLAN

Helping researchers create their DMP involves two aspects: helping them to understand the expectations and concepts, and helping them to navigate the physical sites.

The library is already well-placed to help researchers to understand the concepts (Latham, 2017), and Curtin's Libguide is a useful resource that explains the high-level concepts behind creating a DMP. However, the survey indicates that respondents were confused about how to apply those concepts to their circumstances; this was also seen in other research (Johnson & Knuth, 2016). The library has already implemented DMP workshops, which have already begun to help researchers, and allow for individual assistance where necessary. It would be useful as well to have more examples of how guidelines would apply to specific circumstances: for instance, model DMPs for different faculties, and examples of file organisation for different types of data.

Curtin expectations differ from project to project, and the library does not necessarily have the expertise to answer these questions. If there is a discrepancy between the advice the library gives and advice given by a body with more authority, such as the Ethics Committee, all other advice given by the library will be seen as suspect by the user; this could exacerbate concerns that the library is not qualified to give advice. It might be necessary to separate "best practice" from what meets internal requirements in advice. However, the respondents who felt most supported to complete their DMP had someone or something to guide them through the process, including these expectations; a guide to how to complete the processes required for obtaining storage space, ethics approval, and other Curtin-specific processes would no doubt be useful.

Navigating the sites required for the ethics process was mentioned frequently in the survey. The physical sites are not all under the control of the library, and might require more collaboration with other groups. However, integrating the separate sites or having a standard navigation for each site within the university would reduce the burden on researchers to learn a new system for each step. As a simpler, more practical first step, it would be useful to link to instructions for each of the separate sites in the Libguide: one source for information would reduce the burden on researchers (Burgess et al., 2016).

HELPING RESEARCHERS FOLLOW THE PLAN

Given the indications that some elements of the plans are not followed, outreach to specific faculties to improve use of the R drive will be necessary. Due to the influence of authority figures shown in the survey, PIs and heads of school might need to be convinced of the benefits of following RDM advice. In order to do this, librarians need to be sensitive to the different concerns of different types of researchers, and try to frame services in ways that make sense to each group (Surkis & Read, 2015; Whitmire et al., 2015). The cost-saving benefits of sharing network resources might be a convincing argument.

Advice on how to access the R drive needs to be more clear, and available to supervisors/PIs and on the Libguide, where the majority of users seek advice. Many off-campus users could not work out how to access the R drive. Recommend realistic workarounds where necessary. For instance, with users who are dealing with large files, it might be easier to manipulate the data locally, and then transfer the data to the R drive at the end of each day.

IMPROVING THE DMP ITSELF

Some respondents were uncertain about how to make their data available after their project was complete, and fewer respondents found the DMP useful in that regard than in any other way. Respondents did not necessarily know where they would store their data long-term, or if their plans for that were realistic. Requesting that users provide more detail related to sharing and permanent storage solutions is recommended in the plan itself.

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APPENDIX A: SURVEY

Note: for this survey, the open bullet (◻) indicates that multiple answers may be chosen, and the closed bullet (•) indicates that only one answer may be chosen. If the answer to question 3 is Never, the survey will skip questions 4-5 and question 6 will be the next question displayed.

This survey will ask about your interactions with data management plans at Curtin University. If you have completed more than one data management plan, please answer based on your most recent plan.

- 1) Why did you complete a data management plan? Select all that apply.
 - Access to storage
 - Requirement of grant applications
 - Candidacy requirement
 - Unit requirement
 - Part of the ethics approval process
 - To document data management decisions
 - Other reason: _____
- 2) Have you accessed your plan since it was completed?
 - Yes
 - No
- 3) How many times have you amended your plan since it was completed?
 - Never
 - Once
 - Once a semester
 - Once a year
 - More frequently
- 4) How would you characterize the changes you made to your plan?
 - Basic (spelling or other small changes)
 - Substantial (changes to the details of the plan)
- 5) What prompted the changes you made to your plan? Select all that apply.
 - Request by principal investigator or supervisor
 - Decided to make changes on your own
 - Other: _____
- 6) Does the way you manage your data follow the model you set out in your plan?
 - Yes
 - Mostly
 - Some of it

- No
 - I don't remember
- 7) Overall, how useful has it been to complete a data management plan?
- Extremely useful
 - Very useful
 - Moderately useful
 - Slightly useful
 - Not at all useful
- 8) Did the data management plan prompt you to change some aspect of the way you organized or named your data?
- Yes: _____
 - No: _____
- 9) Did the data management plan prompt you to change some aspect of how you stored or backed up your data?
- Yes: _____
 - No: _____
- 10) Did the data management plan prompt you to change some aspect of how your data will be made available after your research is complete?
- Yes: _____
 - No: _____
- 11) In completing the data management plan, were you reminded of some other aspect of data management that you hadn't considered before?
- Yes: _____
 - No: _____
- 12) What do you know that you wish you'd known when you first completed your data management plan?

- 13) At the time you completed the data management plan, what best characterized your role?
- Student
 - Early career researcher
 - Mid-career researcher
 - Late career researcher
 - Other: _____
- 14) At the time you completed the data management plan, what faculty was your research under?
- Centre for Aboriginal Studies
 - Business and Law
 - Health Sciences
 - Humanities
 - Science and Engineering
 - Vice Chancellory
 - Other
- 15) Where did you seek help to complete your data management plan? Select all that apply.
- Principal investigator or supervisor
 - Library staff
 - Research Office at Curtin
 - Peers
 - Research data management Libguide
 - Faculty/school templates
 - Other: _____
 - No help required
- 16) Is this the first data management plan you have completed?
- Yes

- No

APPENDIX B: FOCUS GROUP

Where did you hear that it was a requirement to complete a data management plan?

What do you remember about creating your DMP?

Was any aspect of the DMP particularly challenging for you?

Were you aware of any support or resources to help you with your DMP? Where did you look for help?

What kind of resources do you wish you had access to?

What factors most influenced the way you managed research data, while you were conducting research? *(For instance: familiarity with certain tools, or the way things were organised in your lab, or an attempt to make data easier to find later.)*

Do you feel like any of your actions (when managing your research) were influenced by the decisions you made for your DMP?

Is there anything else you would like to add related to DMPs?