



The
University
Of
Sheffield.

Academic libraries, open access and digital scholarship – a Delphi study

Rónán O’Beirne, BA (Hons.), M.Ed., FCLIP, SFHEA

Thesis submitted in part requirement for the award of
Doctor of Education

University of Sheffield, School of Education

October 2017

Acknowledgements

As one engaged in collaborative and socially constructed learning, I wish to thank all those fellow travellers at the University of Sheffield, the colleagues in my cohort and the many friends I encountered there. I would like to thank the staff in the School of Education at Sheffield for their support, and in particular my supervisor, Professor Gareth Parry, who struck the important balance between allowing me to explore and experiment without interference and at the same time advising with wisdom when I strayed into choppy seas. Special thanks to Dr Heather Ellis at the School of Education who guided me through the final stages of this journey.

I would like to acknowledge and thank the 35 participants who took part in the Delphi study. Their contribution has been critical to the success of this project. In addition, I would like to thank those who assisted with the initial pilot phase, as well as Richard Layden and Tim Gildersleeve for their technical support in setting up the Moodle Delphi instrument. I would also like to thank Andrew Cox at the University of Sheffield for his encouragement and for one of those key conversations that began my journey.

Undertaking an enterprise such as this has required support from my family. My sincere thanks go to my partner Madeleine for two reasons, firstly for holding together our family and our home while I was so often immersed in research papers, and secondly for her sensitive, insightful and expert advice, always given generously, sometimes with humour and always with patience. Without her support this journey would, like so many journeys, have ended at an earlier stage.

This work is dedicated to you, Madeleine. Thank you.

Abstract

The thesis is an examination of the changing relationship between the academic library and university research. Advances in information technology, shifts in the modes of knowledge production and changes in research practice have affected all points of the research lifecycle. The implications for library practice are far-reaching. Informed by a review of the literature on the drivers of open access, digital scholarship and the knowledge economy, a web-based Delphi study was designed, conducted and analysed to identify the factors likely to have most impact on library practice. Thirty-five expert participants, all employed in roles such as library directors within universities, were asked to consider current and future scenarios for the development of the academic library, its identity and its shape and direction. In particular, the Delphi study investigated the overlapping areas of open access policy, research data management, organisational capacity, scholarly communication and peer review, and library leadership and workforce development. The findings of the research highlighted, firstly, the complexity of the policies and strategies associated with open access, secondly, their likely profound impact on the concept and character of the academic library, and, thirdly, the extent to which university and library leaders have yet to fully appreciate the potency and urgency of digital scholarship. The argument of the thesis is that academic libraries need to embrace transformative change and cultural shift across the entire research lifecycle, rather than simply responding with local, iterative change. In drawing on the expert understandings and reflections of key players, a conceptual framework is developed, to raise awareness of emerging issues and serve as a guide to future action.

Contents

Acknowledgements.....	i
Abstract.....	ii
Contents.....	iii
List of Tables.....	vi
List of Figures.....	vi
CHAPTER One – Introduction.....	1
1.1 Introduction.....	1
1.2 Context of this Research Study.....	3
1.3 Problem Statement and Research Aims.....	7
1.3 Aims and Themes of this Research.....	9
1.4 Research Questions.....	9
1.5 Research Approach.....	11
1.6 Conclusion.....	11
CHAPTER Two – Literature Review.....	14
2.1 Introduction.....	14
2.2 Open Access.....	16
2.2.1 Open Access Policy.....	22
2.2.2 Challenges of Open Access.....	28
2.3 Knowledge Economy and Academic Research.....	33
2.4 Academic Library Supporting Research.....	38
2.5 Emerging Theme One: Open Access Policy and Strategy.....	43
2.5.1 Open Access and Library Leadership.....	45
2.6 Emerging Theme Two: Scholarly Communication.....	45
2.6.1 Institutional Repositories.....	48
2.6.2 Bibliometrics.....	49
2.6.3 Research Data Management.....	47
2.7 Emerging Theme Three: Role of the Library.....	49
2.7.1 Library Positioning and Perception for Research Support.....	50
2.7.2 Library Skills and Workforce Development.....	50
2.8 Conclusion to Literature Review.....	52
CHAPTER Three – Methodology.....	56
3.1 Introduction.....	56
3.2 Research Philosophy.....	57
3.2.1 Ontology and Epistemology.....	57

3.2.2 Educational Research	62
3.3 Positionality Statement.....	63
3.3.1 Biographical Information	64
3.3.2 Purpose and Motivation	66
3.3.3 Research Approach and Method Choice	67
3.4 Explanation of the Delphi Study Method.....	70
3.4.2 Limits of the Delphi Technique	75
3.5 Research Design	79
3.6 Conceptual Framework.....	83
3.7 Conclusion	84
CHAPTER Four – Findings	87
4.1 Introduction	87
4.2 Participants	89
4.2.1 Comments on the Research Instrument.....	92
4.3 Round One Responses: Theme One – Open Access Policy and Strategy	96
4.4 Round One Responses: Theme Two – Scholarly Communication	103
4.4.1 Research Data Management.....	104
4.4.2 Institutional Repositories	110
4.4.3 Bibliometrics	111
4.5 Round One Responses: Theme Three – The Role of the Library	111
4.6 Round Two Responses	114
4.7 Comments Arranged by Theme	120
4.7.1 Theme One – Open Access Policy and Strategy.....	121
4.7.2 Theme Two – Scholarly Communication	123
4.7.3 Theme Three – The Role of the Library.....	127
4.8 Conclusion	129
CHAPTER Five – Analysis and Discussion	132
5.1 Introduction	132
5.2 Theme One - Open Access Policy and Strategy	133
5.2.1 Library Leadership and Open Access	135
5.3 Theme Two - Scholarly Communication	138
5.3.1 Institutional Repositories	142
5.3.2 Bibliometrics	143
5.3.3 Research Data Management.....	144
5.4 Theme Three – Role of the Library	148
5.4.1 Library Positioning and Perception for Research Support.....	148
5.4.2 Librarian Skills Development.....	150

5.5 Discussion.....	152
5.6 Conclusion	154
CHAPTER Six – Conclusion.....	156
6.1 Introduction	156
6.2 Evolving Scholarly Record	156
6.3 Conceptual Framework	158
6.4 Future Implications for Library Leaders	162
6.5 Concluding Remarks.....	165
References.....	170
Appendix 1 Ethical Approval Letter	185
Appendix 2 Letter of Invitation to Participants and Consent Form.....	186
Appendix 3 Delphi Study Results Round One	189
Appendix 4 Delphi Study Results Round Two	201
Appendix 5 Comments from All Rounds	205

List of Tables

- Table 1. Themes and sub-themes derived from review of literature
- Table 2. Defining questions for postulates of positive and interpretive approaches
- Table 3. Round One – Part A - Agreement Statements A1.1 to A1.5
- Table 4. Round One – Part A - Agreement Statements A2.1 to A2.5
- Table 5. Round One – Part B - Agreement Statements B1.1 to B1.5
- Table 6. Round One – Part B - Agreement Statements B2.1 to B2.4
- Table 7. Round One – Part A - Agreement Statements A3.1 to A3.4
- Table 8. Round One – Part A - Prediction Statements A4.1 to A4.4
- Table 9. Round One – Part A - Prediction Statements A5.1 to A5.4
- Table 10. Round One – Part B - Prediction Statements B4.1 to B4.4
- Table 11. Round One – Part B - Prediction Statements B5.1 to B5.4
- Table 12. Round One – Part B - Prediction Statements B6.1 to B6.5
- Table 13. Round One – Part B – Agreement Statements B3.1 to B3.5
- Table 14. Ranking of statements on present time issues
- Table 15. Ranking of statements on issues in five years' time
- Table 16. Ranking of statements on issues in ten years' time

List of Figures

- Figure 1. The three parts of the literature review
- Figure 2. The gold and green routes to open access publication
- Figure 3. Overview of phased approach to research study.
- Figure 4. Respondents in Round One Part A
- Figure 5. Respondents in Round One Part B
- Figure 6. The evolving scholarly record
- Figure 7. Conceptual framework: the academic library, open access and digital scholarship

CHAPTER One – Introduction

1.1 Introduction

Fundamental and fast-moving changes in research, caused by digital technology, an agenda of openness and the emerging knowledge-based economy have all brought about considerable disruption across Higher Education research and the services that support research and scholarship. The academic library, whose role has traditionally been to provide services to support learning, teaching and research, finds itself at the centre of this disruption. Research and scholarship are undergoing various and rapid changes – for example, data generated from research is sharable and useable in new ways – and so it follows that the support the library provides for research needs to change at a correspondingly fast pace and to a correspondingly significant degree.

The focus of attention in this study is on the dynamics at play between the role of the academic library and the research activity of the university in the light of this disruption. The nature of the relationship between these two aspects is important primarily because managers and leaders need appropriate and timely insight to make effective decisions in a strategic manner. Of secondary importance is the wider understanding, gained from this relationship, of the emerging and future issues that are likely to have an impact on future research and scholarship within the university.

The impact of external change on the relationship between libraries and researchers has the potential to be profound. The problem that needs to be addressed is that of how library leaders in Higher Education can gain an insight into the shifting landscape in order to prepare for, mitigate against or take advantage of this change.

The internal challenge to this external environmental change, together with the question of how this challenge will manifest itself within the university, is important. Moreover, those with responsibility for the strategic direction of both research services and library services need to understand implicitly what the implications of such deep and rapid change might be. There will be opportunities as well as challenges, but currently the scope of both is uncertain. Those with leadership roles within the research function and its support need the clarity of vision to respond appropriately to external factors and to influence the internal developments within their organisation; currently the required level of clarity is slow to develop. The problem of not knowing what the urgency or level of impact on the library might be will undoubtedly incur cost, and gaining a more informed insight will enable library leaders to plan and resource their work more effectively. This research identifies and explores the gaps in knowledge related to changing research and scholarship and to the library support environment. It examines the changing relationship between the academic library and modes of knowledge production and scholarship. By reviewing the relevant literature, collecting empirical data using a Delphi technique and ultimately developing a conceptual framework, it identifies the issues associated with a changing mode of knowledge production. It further examines the impact of open access, digital scholarship and the evolving scholarly record on the academic library.

Of course, libraries themselves are changing in response to other developments and as the global library cooperative OCLC notes, there is a need to ensure that this challenge is recognised:

In a changing educational environment, the role of the academic library continues to evolve rapidly. Today we need the tools to be able to help highly mobile students, staff and researchers source content from all over the world in a multitude of formats. We also need the means to shine a light on the vital work that academic libraries contribute. (OCLC, 2016)

1.2 Context of this Research Study

Writing from the perspective that new media technologies are having on institutions, Flew (2014) identifies ten drivers of change in Higher Education that he suggests are transforming the sector worldwide:

1. the globalisation of higher education
 2. the rise of a knowledge economy
 3. the dispersal of knowledge and the dramatically reduced costs of access to knowledge through the internet
 4. rising demand for higher education worldwide
 5. changes in government policies to manage costs of higher education and promote differentiation within the sector
 6. changing student demographics and new expectations on the part of students about graduate skills and knowledge
 7. changing relations to industry
 8. cost pressures on higher education
 9. the rise of new for-profit higher education providers
 10. the implications of global rankings systems for universities
- (Flew, 2014 p.158)

The key drivers of the change that affect academic libraries, researchers and those who support the research are identified here to provide a backdrop. The drivers most pertinent to this study, a subset of those identified by Flew, appear repeatedly in the literature and feature in the general discussion. The tensions evident in the impact that these drivers have on policy and strategy are also manifest throughout the various arguments. The external environment is perceived to be beyond the control of the university settings in which this study is based. Drivers and levers for policy development are complex and often interdependent. In a broad sense, economic goals often make use of the education system to lever support and this is outlined in the literature review in relation to the knowledge-based economy. There is a tension in how knowledge is used, for instance the transfer of intellectual

capital from the publicly funded Higher Education sector to the private sector. Similarly, there are tensions in how universities gain concessions within copyright legislation and yet often transfer this advantage to private spin-out companies. There are inconsistencies about the transparency of motive within higher education research activity to do with generating profit through human capital, increasing or securing reputation, civic engagement and public good and, more generally, questions about the sustainability of the university within the knowledge-based economy.

Information and communications technology is the most obvious and also the primary driver for all aspects of this study. It plays a part in changing the academic environment, and all of the diverse agents who participate in the university are affected to some degree by developments in information and communications technology. Whether they view this technology as the cause of or the solution to their problems is open for discussion, and of course it could be both. Outlining the scale of the impact effected by technology, the McKinsey Global Institute asserts that:

Technology is moving so quickly, and in so many directions, that it becomes challenging to even pay attention—we are victims of “next new thing” fatigue. Yet technology advancement continues to drive economic growth and, in some cases, unleash disruptive change. Economically disruptive technologies—like the semiconductor microchip, the Internet, or steam power in the Industrial Revolution—transform the way we live and work, enable new business models, and provide an opening for new players to upset the established order. Business leaders and policy makers need to identify potentially disruptive technologies, and carefully consider their potential, before these technologies begin to exert their disruptive powers in the economy and society. (Manyika et al., 2013)

Notions of power and influence, both within the university and more widely, are accepted as playing a role in a broader transformation, and indeed can be seen as inseparable from technology; authors such as Servage (2009) and Slaughter and Rhoades (2004) are particularly engaged with this aspect of development within Higher Education.

The emergence of the knowledge-based economy, in which knowledge is regarded as a form of capital, can be viewed as a further driver. With knowledge, particularly scientific knowledge, being highly important to the economy, the research activity of the university is no longer regarded as simply informing teaching and learning; research, knowledge production and knowledge transfer have become critical activities within universities.

The abundance of knowledge, and the technological means to manipulate it, can be associated with the 'openness' agenda. Shifts towards openness, which can be linked to a wider open education agenda, have accelerated in response to the need for knowledge to be shared more effectively. A key factor that emerges is the way in which the 'openness' agenda of the internet age can be seen to undermine established 'business' models adjacent to the research community; in effect a mode of knowledge production that is distributed across the globe through fibre optic networks is difficult to constrain. The power of computing is allowing extremely large datasets to be generated and manipulated in ways never before imagined, and this provides the conditions for unprecedented and rapid change in knowledge production.

The upshot of the knowledge-based economy (a fuller discussion is provided in Chapter Two), is that greater expectations are placed on the university to take a position within the knowledge-based economy. In addition, Mode 2 knowledge production (Nowotny et al., 2001) and the disruptive nature of technological innovation (Yu and Chang 2010) have had, and continue to have, a fundamental impact on the processes associated with knowledge production and transfer.

In response to the changing environment and, more precisely, to the shift caused by technology on the activity of research, authors such as Borgman (2010), Weller (2011), Mackenzie and Martin (2016) have identified digital scholarship as an emerging concept, and this is prevalent throughout the present study.

The key setting for this study is the operational area within the university, where

research and knowledge transfer are conducted. Allied to this setting, and to those who support researchers, are the context of what is traditionally perceived as the research lifecycle and the strategic context which includes departmental, discipline-focused, professional, institutional, sector and national/international considerations. There is then, a need to zoom in to the operational level of the university to understand the day-to-day implications, while at the same time panning out to appreciate the wider strategic context.

In the widest sense, the factors that have an impact on this study and which are driving change within the sector are globalisation, the internationalisation of Higher Education and global university rankings. The use of the word globalisation is often thought to refer to the most recent upheaval in world connectedness but, as illustrated by Steger (2009), there are competing views of the temporal scope of the term and disagreements about the period to which globalisation can be applied. An additional dimension to the trickiness of defining the term is the distinction between globalisation as a process and globalisation as a condition.

Globalization' has been variously used in both popular and academic literature to describe a process, a condition, a system, a force, and an age. Given that these competing labels have very different meanings, their indiscriminate usage is often obscure and invites confusion. (Steger, 2009, p.8)

This obscurity hampers the discussion and, rather than providing clarity, makes using the term 'globalisation' difficult. A further problem identified by Stiglitz relates to the unevenness of the impact of globalisation:

Those who vilify globalization too often overlook its benefits. But the proponents of globalization have been, if anything, even more unbalanced. To them, globalization (which typically is associated with accepting triumphant capitalism, American style) is progress; developing countries must accept it, if they are to grow and to fight poverty effectively. But to many in the developing world, globalization has not brought the promised economic benefits. (Stiglitz, 2003, p.5)

To state, then, that globalisation is a driver for change within higher education

teaching and research is in one way rather obvious. Yet in another way it is a loaded statement covering a range of causal relationships.

It is accepted that various contexts are influenced to a greater or lesser degree by several drivers. The key driver for this study is the open access movement. Providing open access to journal articles and other research outputs through various mechanisms, although ongoing for some years, has within the past 10 years gained traction and achieved a critical mass. Its momentum has extended to open data, in which large datasets are shared across and beyond disciplines; both initiatives have been supported through policy developments such as those introduced by the European Commission. The shift to open access indicates a fundamentally new way for research to be conducted and communicated. It has prompted significant change for those involved in research and also for those who support research.

Open access is having a strong influence on the behaviours of those within the research field. Most obviously, publishers have begun to change their approach, and increasingly leaders within universities and their libraries are responding to these changed behaviours and are themselves beginning to develop strategies to deal with the new reality of open access. Open access can be seen to be a critical factor in shaping scholarly communication (Shorley and Jubb, 2013). So together, changed publisher behaviours and the Open Access movement are having an impact on the academic library (McKnight, 2010); in short, open access is the driver that is changing the relationship between research and the academic library, though it is not the only relationship to be in a state of sudden and rapid change within the university.

1.3 Problem Statement and Research Aims

One could choose as a starting point for this study the role of the library in the origins of the university, and the reasons why the library and, more to the point, the knowledge bound between the covers of the book, first became the most valued

means of storing and transferring knowledge. From medieval times, the library has been paramount in the organisation of knowledge and also in the development of print, from the movable type printing press right through to the advent of the academic journal as a means of scholarly communication. As noted in the opening of this chapter, the last forty years have witnessed huge upheaval in the role of the library. The emergence of the digital library has now fundamentally changed both the library itself and the profession of librarianship.

An understanding of the relationship between knowledge production and the library will provide the opportunity to explore future meanings of knowledge within the university and, in broader terms, to consider how the knowledge production, research support function and academic library landscapes might all evolve.

Taken together, these drivers can be seen to have spawned a new research approach encapsulated in the term 'digital scholarship' (Weller 2011). With digital scholarship making an impression on all aspects of the research lifecycle, for instance creating increases in the numbers of researchers collaborating, and leading to the greater use of large datasets, the skills traditionally associated with research have needed to expand to include facets such as bibliometrics in a digitally networked environment. As Finch notes:

Most people outside the HE sector and large research-intensive companies - in public services, in the voluntary sector, in business and the professions, and members of the public at large - have yet to see the benefits that the online environment could bring in providing access to research and its results. For many of them, the only way in which they can gain access to quality-assured research publications is to pay up to £20 or more as a 'pay-per-view' (PPV) fee in order to read a single journal article. (Finch, 2012, p.4)

At the same time, the world of the academic librarian has changed significantly and now needs to embrace areas such as information literacy, bibliometrics, resource discovery and Research Data Management (RDM). Throughout this study, the influences that the key drivers are having on library and research activities are presented as themes, and are discussed and explored further.

1.3 Aims and Themes of this Research

The aims of this research can be summarised as follows:

1. To identify themes associated with the changing research environment
2. To explore issues emerging within these themes
3. To develop a conceptual framework that illustrates the emerging relationship between the researcher and the academic library
4. To suggest some possible emerging scenarios
5. To recommend action for senior leaders and policymakers in the light of the findings

Through engagement with the literature in Chapter Two, the following three themes emerged as the most important. These informed the empirical study and synthesised the resulting data to form the discussion in Chapter Five:

Theme One: Open access policy and strategy with the sub-theme, Open access and library leadership.

Theme Two: Scholarly communication with the sub-themes, Institutional repositories; Bibliometrics; RDM.

Theme Three: Role of Library with the sub-themes, library positioning and perception for research support; library skills and workforce development.

1.4 Research Questions

In exploring the relationship between the research function and the academic library's remit to support this research function, a series of research questions were asked. The questions became more assured following the review of the literature. Some are answered, while others become central to the empirical data collected through the Delphi study; following from this they form the basis of the discussion.

The research questions are:

- How is the external environment disrupting and changing the research process?
- How is open access instigating change in the structure and functional support of research?
- What might be the impact of open access on those stages of the research lifecycle supported by the library?
- How might disruptive changes reshape the library?
- What is the response of the library to the changes in open access research?
- What are the important and pressing issues library leadership needs to address?

Top-level questions gleaned from the literature, for example ‘what are the key issues that face researchers and librarians and which, by extension, are influencing the relationship?’ are explored in terms of their context, whether international, national, institutional or individual. Where a national issue is identified, then aspects of government policy are further explored. Where an issue is seen to be of institutional significance, then it is explored in terms of institutional policy and strategy. If the issue is seen to be related to the area of librarianship, then subsequent investigation explores whether the library leadership has an appropriate strategy. If an issue is seen to be related to individual skills, then aspects of librarians’ and researchers’ skills are explored.

Within the wider context of the emerging academic infrastructure, there are questions about the position of the library and the research support function within the university setting. New processes and practices within the digital research lifecycle, such as those like digital curation and the institutional repository related to dissemination, may yet develop into functions for which the library will naturally assume responsibility. The future of research and its supporting functions is uncertain, and in many ways unpredictable. So, too, are the library’s extended responsibilities, and one of the aims of this study is to offer an insight into how the relationship between them might emerge. Against the backdrop of the professional role, the study considers the skills and competencies needed by librarians to

undertake research support. Similarly, it considers the skills and competencies required by researchers to manage datasets in an open research and open science environment.

1.5 Research Approach

It is useful in this introduction to outline the research perspective employed. The dominant approach driving this research can be seen to fit into the interpretivist paradigm. In taking such an approach, the assumption is made that multiple realities exist among humans, and that these are set within complex cultural contexts. Research approaches are often said to be either deductive or inductive; the research approach here is inductive because there is an attempt to discover if what is suspected is actually the case. The reasoning is also inductive, because it seeks to affirm that the author's own observations, made in relation to professional practice, are a reality, and to establish what the implications are.

1.6 Conclusion

To conclude the introduction, the study has three stages of investigation. The literature is reviewed, and from this a number of themes emerge. These themes are then tested with experts through a Delphi study; the insights gained from this empirical exercise are used to re-engage with the theory, resulting in a discussion of how the operational issues, together with the theory, might generate further exploration.

One example that typifies these anticipated operational issues is the emerging landscape of scholarly communication and its changing relation to knowledge production and the library, brought about by rapidly changing publishing practices and the rise of open access.

The structure of the research is developed within a cycle:

i - looking at the literature and outlining the key themes

- ii - collecting data to clarify and test the literature's themes
- iii - analysing the data in the context of the literature
- iv - discussing and synthesising the knowledge gained to reach conclusions and to make propositions

When looking at the literature, various aspects of the general research topic come to the surface. At the same time, certain aspects are identified as irrelevant or out of scope. For example, no attempt has been made to examine how the relationship between research and the academic library might improve teaching and learning.

The overarching research question is: 'How is the nature of the relationship between the academic library and research changing?' One question, then, that it may be pertinent to ask is that relating to the organisational structure and to whether the jurisdiction of the library is important. A key dimension in the process of reviewing the literature is to seek out material that not only explores the current situation but also looks ahead to what might be developed in the future. The literature is extensive and so, to ensure a clear structure, themes and sub-themes have been used to distil it into more manageable sections. A clear challenge arising from this approach is that of deriving pertinent and perceptive questions from the literature review to ensure that the Delphi study provides a significant insight into the operationalised aspects of the theory.

Following the examination of the literature, the methodology of the approach to the empirical exercise is outlined, with a detailed explanation of the Delphi study being provided in the Methodology chapter. The Delphi study is the vehicle being used to test the literature and so, by drawing interpretations and conclusions from the data, it ultimately contributes to the discussion. Implementing the Delphi study forces a trade-off between the resources available, in this case time, and the number of rounds that should be conducted in order to reach a consensus.

Following the empirical exercise, the Findings chapter outlines the process of data collection and records the outcome in full detail. It presents the data that was

gleaned from the Delphi study and arranges this data across themes.

In the Discussion chapter, the findings from the empirical exercise are gathered and collated and the issues are synthesised with the literature, allowing some new knowledge of the issues to be developed.

A key outcome of this research is the development of a conceptual framework that links to the research lifecycle. One of the propositions it suggests is that, in the light of digital scholarship and the changing scholarly communication environment, the accepted research lifecycle is no longer fully accurate. With research dissemination tending to live in a more virtual space, there are less clearly defined points of beginning and ending. Research is more likely to 'mutate', in classical biological life cycle parlance. It is less likely to be hierarchically structured, as in family reproduction, and more likely to be structured through a network. It is also likely to be organic, and therefore messy and less easy to control; exercises such as the Research Excellence Framework (REF) will become more burdensome as they attempt to measure impact factors.

As this study progresses, so its findings, conclusions, propositions and claims to knowledge are formed and developed. The results are translated into a cohesive overview of the direction that the relationship between academic libraries and research functions is going to take, together with a strategic overview of the future.

CHAPTER Two – Literature Review

2.1 Introduction

The review of the literature sets down a firm foundation upon which to build the thesis, provides context for the research and identifies related fields and ideas. It further weighs up the varying positions and trends in order to define coherent arguments relating to the research question.

The literature review is structured to reflect the three parts, or main subject areas, that are pertinent to this study. The rationale for doing this is based primarily on the author's experience and observation of the library profession and the Higher Education sector. It considers some of the tensions encountered in the everyday management of library services within a changing research landscape. The first area examines open access and provides an insight into the wider movement, the policy environment and the challenges of implementation. The second area assesses the overall context and looks at the literature on recent upheavals in the activity of knowledge production and research within the academic setting. The third surveys those aspects of academic librarianship that are emerging to support digital scholarship and the changing research function. Of the three, the third makes up the greatest part, as it focuses on the central research question. The points at which all three areas of literature overlap or link together are vital, and indeed their existence justifies the need for this study. The Venn diagram below, Figure 1, illustrates the three parts of the literature that have been identified and those areas of overlap.

As well as reviewing each of these parts individually, it is necessary to appreciate fully the relationships between them and to consider the dynamics that are at play. The literature guides the empirical investigation by identifying topics for examination within the Delphi study. Moreover, it investigates how connections between these topics might delineate the arguments, inform the discussion and

illuminate the way ahead.

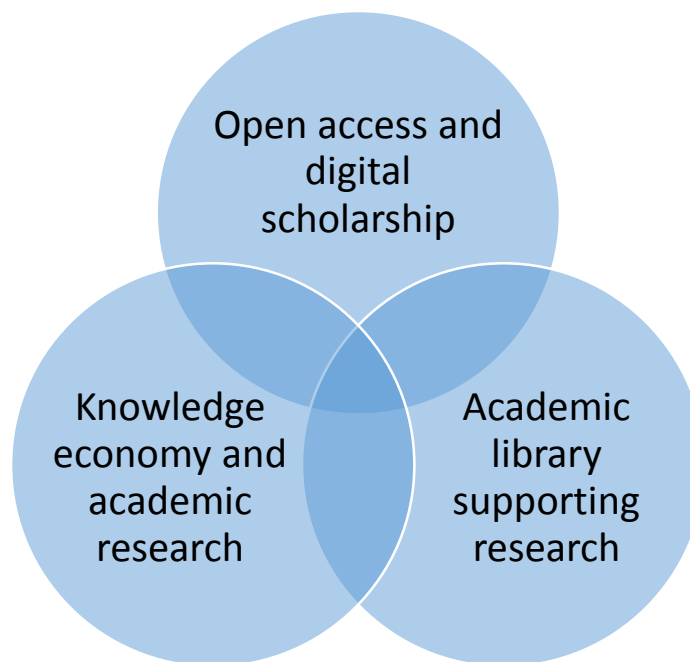


Figure 1. The three parts of the literature review

The relatively recent emergence of, and rapid changes in, open research and digital scholarship would suggest that a literature review arranged chronologically could be rather dense, and might not provide any temporal perspective from which the reader could benefit. The sequence concerning the development of UK open access policy is an exception, because here a clear chronology is used to illustrate dependencies.

Providing a comprehensive review of the literature is challenging because of the contemporary nature of this area of study. It is set within a rapidly changing policy environment, ever-evolving practices and differing vantage points. The approach that has been taken is that of working from the general to the specific, funnelling and narrowing the literature into a manageable corpus that can inform the empirical part of the study.

The scope of the study has broader potential and it is tempting to digress into

adjacent areas. Furthermore, not all of the issues which have been identified as being within its scope hold the same significance. Indeed, assessing the future importance of a range of issues from the present point in time creates its own challenges. Such cases will become apparent in the analysis of the Delphi study.

The most apposite area of the literature, and that which directly informs this study, is located where 'open access and digital scholarship' overlap with 'academic library supporting research' (See Figure 1) The existing studies on this are highly relevant and valuable. The key catalyst clearly identified within the literature is the Open Access movement, so this is examined in some detail. The shifting practices in publishing, from traditional to open access, are having a fundamental influence on the way in which research and library practices develop.

The literature on open access is surveyed first and this is done for two reasons, firstly to explain the concept of open access and secondly to define in detail both the use of the term and also its by-products as it applies across the study. Also relevant is the UK education and research policy environment, and the way in which this has evolved during the second decade of this century. Much of the policymaking that has taken place regarding open access is having an impact on practice currently, and for this reason it is examined in the sequence in which it emerged. The review looks in turn at the knowledge economy and academic research, then at the academic library, paying particular attention to the adjacencies and intersections between these areas. Studies which seek to look to the future of the relationship between them are subsequently considered, and this part of the process is relevant in informing the empirical exercise.

The final part of the chapter collates the themes and discusses the issues that emerge from the literature. These form the basis and content of the empirical research instrument and of the subsequent analysis and discussion.

2.2 Open Access

It seems appropriate to begin with what might be considered the spark that set the

current research upheaval in motion. The Open Access movement, fuelled by digital technology, is the primary influencing factor. It has made an impact not only on the way in which research is being conducted, but also on the way in which the outputs of research are being organised, managed and disseminated (Shorely and Jubb 2013). One of the key enablers of open access has been technology itself, directly as it provides the means to change practice and indirectly as it creates new environments, such as those developed online, in which scientific research is given the opportunity to become universally accessible. The convergence of the universal research principle of sharing discovery and the enabling nature of new technologies has opened a new vista for knowledge production:

An old tradition and a new technology have converged to make possible an unprecedented public good. The old tradition is the willingness of scientists and scholars to publish the fruits of their research in scholarly journals without payment ... The new technology is the internet. (Budapest Open Access Initiative 2002)

Such an opening up of new information frontiers has enabled world citizens to understand and engage with science. This phenomenon can be observed in the wider context of increased engagement by a more general public in scientific research or 'open science'. As almost everything in today's world is prompted by, or delivered through, science and technology, it is natural to expect a keener interest in this facet of everyday life.

The publication by the Royal Society of '*Science as an open enterprise*' (Royal Society 2012) provided policy and strategic cohesion to a movement which had been evolving within the sciences for over three decades. Its publication signified a turning point in the emergence of the open science movement, because it was the culmination of much thinking in this area. Also, it provided the foundation upon which many of the arguments outlined in this study have been built.

Recent decades have seen an increased demand from citizens, civic groups and non-governmental organisations for greater scrutiny of the evidence that underpins scientific conclusions. In some fields, there is growing

participation by members of the public in research programmes, as so-called citizen scientists: blurring the divide between professional and amateur in new ways. (Royal Society 2012 p.8)

It is not only the so-called 'citizens' who have increased their interest in and focused new attention on scientific issues, Henderson (2012) outlines the rising activism of scientists who deploy various social media and he uses the term 'geeks' to refer to those involved in promoting the benefits of science. Moreover, there is a group of professional scientists who are active and highly visible in challenging negative images of science and criticising much of its poor media coverage (Goldacre, 2009). In the wake of the financial crisis of 2008, the issue of research funding was brought into sharp focus and, consequently, in the lead up to the UK Government's 2010 Comprehensive Spending Review, a mobilisation of many thousands of scientists, in an unprecedented show of strength, sought to prevent huge cuts in science research funding.

Providing a rare, contrary insight to the endeavour of scientific research more globally, Sarewitz (2016) suggests that the huge outputs in the fields of science are in fact misleading and that 'much of this supposed knowledge is turning out to be contestable, unreliable, unusable, or flat-out wrong' (p.5). Using the term 'datageddon', Sarewitz also suggests that with approaches such as open data and big data 'these difficulties are about to get much worse' (p.30).

The discussion of open access should not be limited to the sciences. The humanities and social sciences are also experiencing an impact, albeit less dramatic than that demonstrated within the hard sciences, and this is occurring primarily through the relatively new and emergent area of Digital Humanities.

With wider participation come questions about access to research, particularly where high costs to journals still prevent many from gaining access. The economic model that has historically underpinned traditional publishing has been perceived as unfair to the academic library, with soaring journal prices threatening to make (often publicly funded) research outputs inaccessible for many. Emerging open

access policies and practices have provided the opportunity to explore the ways in which research can become more accountable through openness.

The reason open access is relevant to this study is that it is having an impact on the way in which research output is distributed and, at the beginning of the research lifecycle, on how research projects are developed. An understanding of the Open Access movement provides the key to unlocking new approaches to research and knowledge production and, more precisely, to scholarly communication, referred to as the 'complex ecology of research and communications' (Shorley and Jubb, 2013 p. xv). The metaphor of a complex ecology is apt and suggests a context for the relationships under investigation. These relationships are further described as '... a set of systems, processes and activities involving many different groups of players who interact dynamically with each other and who fulfil complementary but overlapping roles.' (Shorley and Jubb 2013, p. xv) In their in-depth study for the Californian based Center for Studies in Higher Education, Harley et al. refer to the 'future landscape' of scholarly communication (Harley et al., 2010).

Open access is a strong agent of change in scholarship and research, and one which fundamentally alters the economics of academic research and publishing. This is illustrated by the decisions of policymakers within Higher Education and at a national government level (Willets 2012). Implementing open access policies and their associated changes for everyday practice can be seen to place another layer onto an already complex landscape.

As already noted, the Royal Society's encouragement of open science is a valuable indicator providing a fully constructed example of a policy level response to the challenges of open access, and is indicative of much of the recent discussion in the literature, because it provides a synthesis of the underlying issues critical to today's science researcher and a starting point for the emergent 'digital scholar' (Weller 2013). The recommendations of the Royal Society's report represent a significant departure from tradition, and moreover they signal the biggest upheaval in scholarly communication since the practice of peer review emerged during the

1660s with the publication by Henry Oldenburg of *Philosophical Transactions of the Royal Society of London*. (Royal Society, 1665)

It is difficult to locate a standardised and universally accepted definition of open access. While many statements and declarations have been made about it, these have tended to be superseded by ongoing events, and to have been revised or updated frequently. As is the case with most definitions, context is important and can elucidate the semantics. There is not space here to consider the full evolution of open access and the open data movements, but it is useful to signpost three key moments and subsequent definitions through what is often referred to as 'BBB': 'Budapest Open Access Initiative' (February 14th 2002), 'Bethesda Statement on Open Access Publishing' (June 30th 2003) and 'Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities' (October 22nd 2003). For this study, one definition that is useful, because of its simplicity and brevity, is that provided by Suber (2012): 'Open access (OA) literature is digital, online, free of charge, and free of most copyright and licensing restrictions.' (Suber 2012 p4) This definition, which Suber calls his 'shorthand definition', is useful enough to set the scene but clearly has shortcomings, specifically in its use of the term 'most copyright and licensing restrictions'; this is discussed further below.

There are two key points of reference to the literature on open access. The first is *The Open Access Directory (OAD)*, which is a compendium of simple factual lists about the relationship of open access to science and scholarship. The directory is maintained by the OA community and is based at Simmons College, Boston, USA. Within the OAD is the comprehensive *Bibliography of Open Access*, which is based on Charles W. Bailey Jr's original *Open Access Bibliography: Liberating Scholarly Literature with E-Prints and Open Access Journals* (Bailey 2005). This bibliography, comprising over a thousand entries, covers the history of the Open Access movement in detail, the earliest entry dating back to 1966. The second point of reference is Peter Suber's *Timeline* which, from 1966 to 2008, maintained a list of key events outlining the origin and early developments of free or open access to scholarly communications. The *Timeline* is supplemented by a further list which

highlights additional aspects of the movement, giving, for example, an overview of the Budapest Open Access Initiative.

The *Create* report (Frosio, 2014) provides comprehensive coverage of the literature on open access. It 'investigates the current trends, advantages, disadvantages, problems and solutions, opportunities and barriers in Open Access Publishing (OAP), and in particular Open Access (OA) academic publishing.' In addition, it provides an historical perspective which shapes the context for current discussions.

In its survey of the literature the report states firstly that: 'literature discussing OAP is plentiful, the subject is still in its early stages of development and additional research is needed in several directions.' (Frosio, 2014, p.9) Secondly, it states that in terms of constructing argument and debate within the literature, there is little divergence in views:

Again, as another preliminary comment, it is worth noting that diverging views seem quite rare in the literature, at least as far as the basic tenets of the debate are concerned. Besides the increasing emergence of views questioning the so-called OA advantage, there is general agreement of the need for embracing OAP as an instrument of enhanced democratisation and an opportunity to rapidly speed up the process of knowledge creation. (Frosio, 2014, p.9)

Another useful explanation of open access is provided by Weller (2013), who relates the principles to the Open Access movement and the concepts of open education and identifies and defines terms relevant to education, for example open sources, open courses, open educational resources, open research and open data. Weller also examines the terms provided by his own institution, the Open University, offers a sense of the wider issues at play within the educational and research context and posits an explanation of the way in which technology is transforming scholarly practice. It is certainly the case that much of the explanation for the traction gained by open access can be directly attributed to technology (Weller 2013), but it might be more accurate to consider technology as an enabler, rather than the cause, of the Open Access movement. The seeds were sown, within scholarship and research in particular, a long time before the realisation of the internet. In fact, as Suber

notes:

We'd have less knowledge, less academic freedom, and less OA if researchers worked for royalties and made their research articles into commodities rather than gifts. It should be no surprise, then, that more and more funding agencies and universities are adopting strong OA policies. Their mission to advance research leads them directly to logic of OA: With a few exceptions, such as classified research, research that is worth funding or facilitating is worth sharing with everyone who can make use of it. (Suber 2012 p.14)

The impact of open access has been contemplated for some time, even before the actual realisation of technological facilities to distribute journals worldwide. In 1994, what was referred to as a 'subversive proposal' (Harnad 1995) began to shape the emerging world of electronic publishing, setting traditional academic publishing against the emerging online distribution of research output. Ten years after this, the debate was continuing with a suggestion that open access to pre-prints was inclined towards peaceful co-existence and fruitful collaboration rather than, as many publishers feared, the ruination of their industry. (Berners-Lee et al., 2005)

2.2.1 Open Access Policy

Having explored the concept of open access and introduced some of the issues arising from this, it is appropriate now to look at how open access is implemented. There is little divergence across the literature from the view that open access is a 'good thing'. The real challenge arises in its implementation, and this is effected through the development of open access policies which are then put in place at national, funding body and institutional level. A key challenge within the process is to ensure that all the stakeholders in the policy formulation exercise are in full agreement. (Shattock 2012)

While it may be thought that, in principle, the advantages of open access are well-understood and relatively straightforward, when it comes to the application and implementation of policies by authorities such as government, research councils,

funding agencies, higher education institutions, learned societies and publishers, they seem rather less so (Eve 2014). In recent years there have been numerous new policies relating to research, and open access has been a key feature of many. While open access models have been emerging since the late 1990s (Suber 2012), in the UK the real impetus for a shift in policy came in 2004 when the Government announced:

There is mounting concern that the financial benefits from the Government's substantial investment in research are being diverted to an excessive degree into the pockets of publishers' shareholders. (Science and Technology Select Committee (2004) para2)

From his perspective as University Librarian at the Bodleian, Carr (2007) provides an account of the Open Access movement's increased traction within academic libraries from the late 1990s. He notes the significance of the House of Commons Science and Technology Committee's decision, in December 2003, to conduct a Parliamentary enquiry into scientific publications and open access:

... the declared aim to examine the provision of scientific journals to the academic community and the wider public, the enquiry created a flurry within the research, library and publishing communities, with the various interest groups lining themselves up to provide evidence to the committee. (Carr, 2007 pp.164-165)

Again in 2011, as part of its innovation and research agenda, the UK Government suggested that publicly funded research should be made available in response to innovation challenges:

'Opening up access to data, information and research that is held within the public sector so its economic and social value can be maximised'. This 'expanded access to research publications and data' mission laid the basis for further and more urgent work on open access. (Department for Business, Innovation and Skills, 2011, paras 6.1-6.13)

Increasing evidence that the challenges faced by the researcher in negotiating the gaps in, and barriers to, scholarly content were having a detrimental effect was

provided by the CIBER report, sponsored by the Research Information Network (RIN), the Joint Information Systems Committee (JISC) and the Publishing Research Consortium (CIBER 2011). Within the wider global context too, researchers were becoming aware of the need to take action on providing open access within the UK.

Jubb (2011) championed the need for open access, and outlined in detail five scenarios for taking this forward, also stressing the requirement for whatever model was chosen to be sustainable. Similarly, Harris (2012), with backing from the publisher SAGE and also from the British Library, wrote urging academic libraries to prepare for an open access future, concluding:

Academic libraries and research communication will change as open access grows in importance. Some of libraries' traditional roles will be reduced and others will need to change, but libraries still have an important role to play in managing and advising on information and information-related budgets. (Harris, 2012, p.15)

In response, the UK Government commissioned a 'National Working Group on Expanding Access to Published Research Findings', chaired by Dame Janet Finch and known as the Finch Group, to conduct an independent review which would consider how to expand access to publicly funded research. The results of the group's deliberations were published in June 2012 and were immediately acknowledged favourably by government. The main outcome of the Finch report was the positive uptake of its recommendation to support the direction of the gold open access route, whereby the publisher takes revenue from the author and in turn provides the article free of charge to end-users. The Government, in particular David Willetts, the then Minister of State for Universities and Science, welcomed the report's gold open access recommendation and looked to the research and funding councils, in consultation with universities, researchers and publishers, to implement the recommendations (BIS, 2012).

Shortly after the publication of the Finch report in July 2012, Research Councils UK (RCUK) published their own policy and guidance on open access (RCUK, 2012). It

provided an update to their 2005 document for researchers and outlined how gold open access might be implemented. However, this 2012 document, to which the literature referred as the RCUK's 'revised policy', lacked fine detail on how the gold model could be implemented and was criticised by many stakeholders. The resulting confusion and discord were immediately evident in the numerous outcries which ultimately led the Government to seek a further review.

In December 2012, to counter the confusion, the House of Lords commissioned its Science and Technology committee to look into the issues. It noted in the introduction to its report:

The revised policy has caused considerable concern in both the publishing and academic communities. Publishers are worried about specific requirements of the policy. Learned societies fear they will lose a valuable income stream which they use to support their respective academic communities. Academics are concerned about the policy taking a "one size fits all" approach, and possible unintended consequences such as lessening the quality of peer review, restricting ability to collaborate and limiting freedom to publish in the best journals. Both communities have expressed frustration that they were not adequately consulted about the policy. (Science and Technology Select Committee (Lords) 2013, summary)

Implementing open access within a complex ecology of stakeholders and across a range of contested issues was highly challenging. Moreover, despite having gained traction in some disciplines, open access as a key aspect of policy and institutional strategy was itself a relatively novel concept. The most difficult issues were considered to be funding and licensing, embargo times and the use and re-use of data. In addition, concerns were expressed about the consultation exercise that had been undertaken by the RCUK. In its call for witnesses the inquiry committee stated:

We would specifically ask you to submit your views on the actions taken by Government and RCUK following the publication of the Finch Group's report. In particular, you may wish to address:

- support for Universities in the form of funds to cover article processing charges, and the response of universities and other higher education institutions to these efforts;
- embargo periods for articles published under the green model;

- engagement with publishers, universities, learned societies and other stakeholders in the development of research council open access policies and guidance;
 - challenges and concerns raised by the scientific and publishing communities, and how these have been addressed.
- (Science and Technology Select Committee (Lords), 2013, p.26)

Supporting the recommendations of the Finch report and its main principle of gold open access, the House of Lords report, published in February 2013, did calm the waters somewhat, and it did recommend that the RCUK implementation should be monitored as it was rolled out. However, concerns had been raised about some of the more challenging issues associated with open access, and in January 2013, just days before the House of Lords report was to be published, it was announced that The Department for Business, Innovation and Skills (BIS) was to use the following terms of reference to conduct its own inquiry:

The Government's acceptance of the recommendations of the Finch Group Report ... including its preference for the 'gold' over the 'green' open access model; rights of use and re-use in relation to open access research publications, including the implications of Creative Commons 'CC-BY' licences; the costs of article processing charges (APCs) ... the level of 'gold' open access uptake in the rest of the world versus the UK, and the ability of UK higher education institutions to remain competitive. (BIS 2013a)

A further difficulty with the Finch report has been the apparent revelation that it had, in the main, considered the gold model of open access at the expense of the green model, and had dismissed the green model on the grounds that there was little or no evidence that it would be effective. The significance, then, of this new enquiry was its intention to examine the preference for gold and to question whether the green model had been sufficiently considered. In introducing its own report and comparing the work of the two houses, BIS noted the primary development to be that it had 'conducted a wider examination of the conclusions and recommendations of the Finch Report, as reflected in the Government's open access policy.' (BIS, 2013b, para 11)

As an explanation of the Gold and Green models it is important to outline that Gold and Green are the two main ways of implementing Open access. Each can be seen

as a choice that is available for the author. In the Gold model, journals charge the author, or their funder, a fee for publishing in their journal. The Green model requires the author to self-archive or deposit a copy of the article in an open access repository which is usually within an institution but can also be disciplinary focused. There are many different business approaches taken by journal publishers who use open access, sometimes combining open access with subscription business models. From the perspective of journal users, a key difference between Green and Gold approaches is how access to articles is provided to readers. In the Gold model, once paid for through an initial APC, access is universal. In the Green approach, where deposit in an institutional repository occurs, publishers usually impose embargos and other restrictions on the use of the article.

The reasoning behind the dismissal of the green model in the Finch report became known as the 'Finch hypothesis', and in a well-constructed argument, supported by evidence of effective green open access practices, Gargouri, et al. (2012) proved the hypothesis wrong, stating: '... contrary to the Finch Hypothesis, Green Open Access mandates do have a major effect, and the stronger the mandate, the stronger the effect' (p.1)

Writers including Harnad (2013) and Anderson (2013) were critical of the RCUK policy and guidelines for a variety of reasons, one being that they felt that the UK might lose its advantage as the leading provider of open access across the world. The ensuing controversy centred on the decision to favour gold over green open access. Publishers preferred the gold route because it ensured that they received the same financial reward as they would have done via subscription models, but this route presented financial difficulties for universities and their researchers, so for them the better option was to take the green route. While publishers were prepared to accept the green route, they insisted that certain embargoes be put in place, and this slowed down the actual open access process, because in effect the paywall barriers remained in position for embargo periods of up to two years. The different routes to open access are highlighted in the decision tree represented by Figure 2 below.



Figure 2. The gold and green routes to open access publication

In 2013, following the wake of the Finch report and its echo in the RCUK 's revised policy and guidelines, higher education researchers, administrators and librarians became concerned. By February 2013, the Higher Education Funding Council for England (HEFCE) had written to all universities to consult on proposals as to how open access would be administered within the forthcoming Research Excellence Framework, and this compounded the situation. In September 2013, the BIS review was published and its third chapter was entitled *'The Finch Report: a U-turn in UK Open Access policy.'* The report opened the way for serious consideration of green open access and as such allowed for this model to evolve. (BIS 2013b)

2.2.2 Challenges of Open Access

The protracted debate around UK open access policy only represents part of the issue; the real challenges of open access come with its implementation. In the rather tongue-in-cheek opening to his article outlining twenty-five of the most common misunderstandings that occur when adopting open access, Suber uses the

birdwatching analogy to inject humour into his observation:

The woods are full of misunderstandings about OA. They thrive in almost every habitat, and the population soars whenever a major institution adopts an OA policy. Contact between new developments and new observers who haven't followed the annual migrations always results in a colorful boomlet of young misunderstandings. Some of these misunderstandings are mistaken for one another, especially in the flurry of activity, because of their similar markings and habitat. Some are mistaken for understanding by novices unfamiliar with the medley of variant plumage, adaptive camouflage, and deceptive vocalizations. (Suber, 2009)

For all its humour, Suber's field guide does provide an excellent summary of the many arguments associated with all hues of open access, and it demonstrates the need for clarity. The confusion and misunderstanding facing those not in a position to follow the developments closely are acknowledged throughout the education sector (Anderson, 2013), with bodies such as JISC producing guides and top tips on implementation and funded pathfinder projects.

Naturally, a compounding factor is that practitioners need to follow their own institutional policy together with those of different funders, and they then need to triangulate these policies with the practices of publishers. The Registry of Open Access Repository Mandates and Policies (ROARMAP) is a searchable international registry that holds details of all policies adopted by universities and research institutions. It also holds research funders' mandates. At the time of this research it held 79 mandates from funders and 557 mandates from research organisations, e.g. universities and research institutions. Swan's (2015) research, based on an analysis of 120 mandatory policies, outlines the problems and also some remedies, such as proposing criteria for a model open access policy.

A central tenet of the Open Access movement, and one that is critical to its success, is that researchers are motivated, and allowed, to share their research outputs. The notion of sharing, together with its challenges, is not well represented in the literature, yet it is fundamental to the open access concept. MacMillan (2014) looks

at the barriers to sharing research data from a perspective that is sympathetic to the academic librarian, but concludes:

However, in order to realize the potential libraries have for supporting data-intensive research, librarians may need to develop new expertise and much deeper understandings of researcher workflows, journal and funder requirements, metadata conventions and available repositories and dissemination venues for data. (MacMillan 2014 p.546)

MacMillan also suggests that, while researchers appreciate the obvious benefits of sharing their data, they also see barriers such as disciplinary or cultural practices, lack of reward or recognition, and the perceived additional administrative cost of sharing an issue tackled by Manista (2012). Borgman (2012) explores the issue of sharing further. She models researchers' rationales by both identifying the arguments for sharing and also considering those who are its beneficiaries (p.1067). Reinsfelder (2012) takes a more holistic approach and suggests that the relationships and interdependencies of the stakeholders – and this includes librarians – are key to understanding the complexity of the situation.

Different authors have approached the challenges of open access implementation from different stances, but outright rejections of open access are rare. It is worth noting Osborne's argument, which is summed up in this way:

Academic research is different in kind from industrial contract research where the funder determines the activity and therefore is entitled to decide the use to which the results are put. (Osborne, 2013, p.97)

Osborne is correct to point out this fundamental difference in research funders' motivations for research. He makes the following points to support his case:

- The inspiration for research council projects comes from academics who therefore should retain the right to determine the form and location of the outputs.
- There is no clear dividing line between projects funded by research councils and an academic's daily activities of thinking and teaching. If there

are fees for access to teaching there should be fees for access to research.

- Under the current system quality control is encouraged, and so is writing for a broader rather than a narrower readership.
- Under Gold OA there is a risk that the amount of work published increases and the quality decreases as publishers seek to maximise income from APCs. (Osborne, 2013, p. 97)

Without doubt, the challenge of implementing open access, particularly gold open access lies, with its financial model. From the university research administrator's position there is need of a system in which the financial burden is relieved through support from the funders, while from the research funder's perspective the public funding model needs to ensure that publicly funded research stays in the public realm and is freely accessible. Currently, following the various policies outlined above, there exists a supposed transition period from a subscription-based model to an author pays model. In this respect, because the librarians' interests stem from the 'serial pricing crisis' (Guédon, 2001, p.1), their main aim can be considered to be taking the financial pressure off the academic library.

The preference for the gold route places the economic burden on the university researcher, who must account for the article processing charges that are paid to the publisher. The green route, while alleviating this burden to some extent, is not cost-free, and still requires the university and its researchers to provide the administrative and technical infrastructure to ensure publication. For proponents of open access, the free dissemination and publication of research outputs has been, and in many cases still is, prevented by the barriers put in place to protect publishers' profit margins, and this is a recurrent theme within the literature. The publishers' view is that there is a need to maintain their current grasp of the industry in order to ensure sustained profits; the subscription model has worked well for them, and the transition to an article processing charge model may be less profitable.

Researchers themselves are likely to want the academic freedom to choose their publication route, and they will want a fair slice of the available funding, whether it

is administered within their faculty or across their university. They will want to disseminate their research as effectively as possible and ensure that their own prestige requirements are met. From the institutional point of view, they will want to perform as well as possible in the future REF exercise.

The Finch Group consultation provided the main opportunity for influencing the economic model. The literature, in covering the monetary dimension, clusters around the arguments that were outlined in the formation of policy (Houghton et al., 2009; Houghton and Oppenheim, 2010; Swan and Houghton, 2012).

More recently, rather than theorising on the potential of open access and instead benefiting from the use of data from the actual practices, Björk and Solomon (2014) analysed the market with an aim to 'review the current market for Article Processing Charge (APC) funded open access, analyze emerging trends in the UK and internationally, and identify the key current and future drivers that will serve to determine costs' (p.7). Their findings suggest that the open access APC market is evolving rapidly at a rate of 30% per year and, interestingly, they calculate the average cost of an APC in a hybrid journal to be 2,727USD in the year 2013 (p.4).

Pinfield, Salter and Bath's (2015) study analysed the total cost of publication across 23 universities. This work is extremely useful as it tackles the issue of 'double-dipping', a practice whereby universities subscribe to a journal through their library while also paying that same journal an APC. The scale of open access, and in particular its costs, are clearly visible in their research. For instance, across the 23 universities surveyed in 2013, a total of £29.3m was spent on subscriptions to journals; an additional £3.3m was spent on APCs.

In surveying the literature on open access, the overriding issue is the impact that it is having on the various stages of the research lifecycle, for example the cost of scholarly communication. The way in which this impact is altering the support needs of researchers leads to questions about the library's role in supporting open access.

2.3 Knowledge Economy and Academic Research

The task of reviewing the appropriate literature for the purpose of this thesis requires forays into many adjacent territories. An attempt to define research, however, would tend to require a significant digression. Tight (2012) outlines the challenges of exploring knowledge and research in Higher Education, suggesting that: 'Knowledge and research – involving discovery, expansion, analysis, interpretation, transmission and dissemination – is at the heart of what higher education is all about.' (Tight, 2012, p.163)

The task of offering a clear and precise definition of the term 'research' is not simple. Tight identifies with Brew's (2001a) four types of researchers which she identified: 'domino', 'layer', 'trading' and 'journey'. Where the 'domino' type is seen as a series of tasks performed by the researcher; the 'layer' is seen as excavating and surfacing reality; the 'trading' type emphasises the product or output of research, and the 'journey' relates to the transformative experience of the researcher. These categories identify the researchers' motivations and provide some insight into their styles.

Again, according to Brew, there is a range of forces at play:

The changing context of higher education, however, provides an urgent reason for developing a systematic understanding of the nature of research as it is experienced. Questions about what counts as knowledge, and what counts as an appropriate method for generating it, are now known to be bound up with questions about the ownership and control of knowledge, including questions of power (see, for example, Lyotard, 1993; Gibbons et al., 1994). Indeed, it has been suggested that knowledge itself is in crisis (Barnett and Griffin, 1997). (Brew, 2001a, p.271)

Definitions of research lie somewhere between teaching on the one hand and knowledge production for profit on the other. Whatever the relationship between research, teaching and learning, it seems that more recently there has emerged a need for research itself to become a profit-making enterprise. As Brew notes:

The most powerful and pernicious influences on academic research currently in focus are output views of research with their emphasis on performativity, enshrined most particularly in government policies and funding formulas. The products of research are viewed as commodities within such an economic model... (Brew, 2001b, p.12)

The changing agenda of research is a response to the wider requirements of the knowledge economy. The understanding of the knowledge economy that we have today has evolved over the past five decades, through various concepts and theories, from a 'post-industrial' society (Bell 1974) to a 'networked society' (Castells 2000), the two jostling for position and gaining prevalence within economic and political theory. Godin (2006) and Leydesdorff (2010) provide analysis of the emergence and currency of these terms.

The latter part of this ongoing debate can be illuminating in providing a clearer definition of the knowledge-based economy. Godin (2006) traces the origins of the knowledge-based economy back to 1962 (Machlup, 1962) as the 'knowledge economy' and then charts its re-emergence in the mid-1990's. He explains:

Briefly stated, it can be said that the term knowledge-based economy referred to at least two (supposed) characteristics of the new economy. Firstly, knowledge would be more quantitatively and qualitatively important than before. Secondly, applications of information and communication technologies (ICT) would be the drivers of the new economy. (Godin, 2006, p.20)

Godin identifies the OECD as the 'main sponsor' of the term and offers the OECD definition of knowledge-based economies as 'economies which are directly based on the production, distribution and use of knowledge and information' (p.23). He charts the marginally successful efforts of the OECD in using a series of indicators to measure and quantify the knowledge-based economy, and cautions that 'important methodological difficulties await anyone interested in measuring intangibles like knowledge'. (p. 24) Despite such difficulties, Godin does suggest that the term knowledge-based economy provides a useful conceptual framework, an umbrella

that has promoted the introduction of new concepts and, in turn, fresh terms such as 'knowledge management':

The knowledge-based economy is an umbrella concept: it allows one to gather existing ideas and concepts on science and technology, and any indicators, into a conceptual framework, i.e., all under one roof. This is a fertile strategy for rapidly producing new papers and discourses, and alerting policy-makers to new trends. (Godin, 2006, p.24)

In the literature Leydesdorff (2010), illustrates an important, if at first subtle, difference between the knowledge economy and the knowledge-based economy. Knowledge is either tacit and embodied, as understood in the term 'knowledge workers', or else embedded in various contexts within the (original) knowledge economy. However, more recently, it has become possible to decontextualise codified knowledge, which means therefore that it can be transferred, exchanged or traded, and so it should now become the critical element in understanding the economy:

While tacit knowledge continues to play critical roles, affecting individual and organizational competencies and the localization of scientific and technological advances, codification has been both the motive force and the favoured form taken by the expansion of the knowledge base. (Leydesdorff, 2010, p.2)

Those who argue against the idea of the knowledge-based economy tend to examine the link between these information society theories and the pragmatic politics of global economic downturn. For instance, Ampuja and Koivisto (2014), use an analysis of both Bell's established 'post-industrial' theory and Castells' 'network society' theory, suggesting that the wider movements in politics such as neo-liberalism and the increased intervention of the state, austerity and authoritarian solutions, represent a crisis in information society theory.

Publications by Peters (2010) and Olssen and Peters (2005) chart a course 'from the free market to knowledge capitalism' in order to explore the wider area of neoliberalism and the moving political economy. Bringing the debate closer to

higher education, Slaughter and Rhoades are not shy in using the phrase 'academic capitalism' to express their concerns over the marketisation of education and the commodification of academic research. (Slaughter and Rhoades 2004)

The codified nature of knowledge as a unit of exchange within a knowledge-based economy has an impact on the role of the university. There is a political imperative that underpins the knowledge-based economy. According to Olssen and Peters (2005), it is the neoliberalism policy framework that identifies higher education as a form of capital-producing endeavour. This is explored in a practical way by Deem (2004), who examines forms of public management, 'new managerialism' and work with academic knowledge. Looking at a wider academic context, Scott (2010) brings a synthesis to some of the strands, and in introducing massification suggests the need for better understanding:

The relationship between the development of mass higher education and the emergence of a knowledge society, and a new global economy, is of crucial importance but poorly understood, in both theoretical and empirical terms. The more intense and direct this relationship becomes, the more complex – and at times contested. (Scott 2010, p.370)

Not everyone buys into the idea of the knowledge-based economy. Indeed Leydesdorff (2010) himself wonders, 'How can an economy be based on something as volatile as knowledge?' (p.367). There are opposing views, and there are dissenters and sceptics; Hancock et al. note the contested and fashionable nature of the term 'knowledge economy' and suggest that the term has become hackneyed. Nevertheless, their contribution to the discussion 'aims to enrich debate on universities and the knowledge economy through exploring the existence of an informal knowledge economy or, more accurately, to illuminate the frequently unacknowledged informal aspects of the knowledge economy.' (Hancock et al., 2012, p.118)

A wider consideration of research as knowledge production is provided by Gibbons et al. (1994), whose seminal work on developing Mode 1 and Mode 2 conceptions

of knowledge production has laid the basis for much further discussion (Leydesdorff, 2010). The premise of Mode 2 knowledge production is that, in contrast to Mode 1, its research is based on problem solving in a real world scenario where the researcher is close to the issues; there is a wider consideration of the research across different disciplines and the outputs from mode 2 research are more readily applicable. A useful counterargument to the notion of Mode 2 knowledge production is provided by Hessels and van Lente (2008).

In relation to higher education, Thomas (2004) noted the movement of the discussion from Mode 2 to Mode 3, citing Barnett as one of the proponents:

Recently, Barnett (2004) has coined the term Mode 3 which refers to “knowing in and with uncertainty” and is a knowledge culture that is about uncertainty, relevant to the age of supercomplexity. It is a mode which attempts to come to terms with an ever complex world, where the conditions for human existence have become more unpredictable than ever. (Thomas, 2004, p.11)

One of the emerging and highly important aspects of the knowledge production discussion in relation to the Mode 1 and Mode 2 debate, and one particularly relevant to this study, is the emergent Mode 3 debate. This may become increasingly relevant because of the changes and disruption which are brought about within the research endeavour by technology and open access, and which lead to digital scholarship. The connections between digital scholarship, open access and Mode 3 knowledge production need to be fully examined, and this is just beginning to happen. While not at odds with Barnett’s super-complexity definition, Carayannis and Campbell (2012) suggest that a more concrete and now increasingly accepted definition of Mode 3 has emerged in tandem with networked technology:

The “Mode 3” Knowledge Production System is in short the nexus or hub of the emerging twenty-first century Innovation Ecosystem, where people, culture and technology, meet and interact to catalyze creativity, trigger invention, and accelerate innovation across scientific and technological disciplines, public and private sectors (government, university, industry, and non-governmental knowledge production, utilization, and renewal entities as well as other civil society entities, institutions, and stakeholders), and in a

top-down, policy-driven as well as bottom-up, entrepreneurship empowered fashion. (Carayannis and Campbell, 2012, p.4)

A further dimension is that the university is seen as one strand of the Triple Helix which has been the accepted innovation model in combining the key protagonists of knowledge production, the other two being industry and government. This model too is coming under examination as factors such as technology, and possibly open access, become more prominent. Again, Carayannis and Campbell make suggestions about why this is happening:

The Triple Helix is being contextualized by the broader innovation model of the Quadruple Helix, which is blending in features of the public, for example civil society and the media-based and culture-based public. The Quintuple Helix innovation model, finally, contextualizes the Quadruple Helix (and Triple Helix). The Quintuple Helix brings in the perspective of the natural environments of society and the economy for knowledge production and the innovation systems. (Carayannis and Campbell, 2012, p.17)

Further exploration of this emerging area is not within the scope of the present research. It is mentioned here to illustrate the context within which academic research and the scholarship of teaching and learning (Servage, 2009) take place, and to demonstrate the wider economic and political motives and constraints within which the university, its researchers and its librarians operate.

2.4 Academic Library Supporting Research

It is interesting to note that the history of the academic library goes back to the founding of the university itself. However, in reviewing the literature which relates to academic libraries' support of research it is not necessary to go back that far; rather, a scan back through the past three decades provides ample perspective on what can now be regarded as significant upheaval. A good starting point is the Follett Report (1993). Reviewing a decade of academic libraries to the year 2000, Naylor (2006) identifies four factors that contributed to dramatic change in academic libraries. The first of these was, understandably, the growth in student numbers; the second was the accelerating pace of the information technology

development which, he noted, showed no signs of abating; the third was the change of infrastructure within the Higher Education sector, specifically the merger of the polytechnic and university sectors which took effect in 1994 following the 1992 Education Act. Naylor notes that these three, what he calls 'change factors', were in fact driven by an external agenda:

All three of these change factors were driven from outside the libraries themselves, and the libraries' task was to assimilate the consequences and respond accordingly. In structuring their response the libraries were guided – driven might not be an inappropriate word – by the outcome of the fourth factor, a special committee of investigation set up by the higher education funding authorities of the four home countries. (Naylor, 2006, p.83)

This 'special committee', which was led by Professor Brian Follett, produced the report which became known as the Follett Report and which represented a key turning point for UK academic libraries. Of critical interest to this particular study is the explicit mention of academic libraries' role in supporting research, which represented a new departure in policy (Joint Funding Council's Libraries Review Group 1993). The noticeable shift in the perspective of academic librarianship evident in the literature can be attributed to the findings and subsequent recommendations of the Follett Report. Essentially the report was conceived as a response to various external drivers, namely a changing political agenda, an increasingly knowledge-based economy and, of course, technological development. Up until this point librarians had perhaps been more preoccupied with direct, local issues such as buildings, budgets and books.

Writing some years later, in 2007, Follett reflected that within this technological disruption universities needed to understand the crucial importance of the academic library:

These technologies have genuinely transformed libraries and have also been deeply disruptive of traditional processes – although thankfully libraries still retain their most important social characteristic of providing an environment where scholars and students can read and reflect.
(Carr, 2007. p. ix)

In their high-level appraisal of the university library sector, Atkinson and Morgan (2007) identify a series of key areas of interest in the literature from 2000 to 2005. They outline various key movements and initiatives, but they refer only in passing to the way in which the role of libraries in supporting research had been or might in the future be developed; they include just a short paragraph outlining work done by a handful of universities on institutional repositories. What is more often noted in the literature within these five years is the rising concern with e-journals and the e-book (Armstrong, Edwards and Lonsdale 2002), open access (Ayrís 2001) and, to some lesser degree, institutional repositories (Jones, Andrew and MacColl 2006).

By 2009, writing from the Canadian librarian's perspective, Richard et al. highlight the changing role of the academic librarian: 'As new models of scholarly communication emerge, librarians are situated to play a key role in the development of these models for academic publishing and dissemination.' (Richard et al., 2009, p.35) Perhaps echoing the voice of the wider profession in the face of such relentless change, the following claim to a new and expanding territory was made and the experience and expertise of librarians endorsed:

With expertise and interest in copyright law, creative commons licensing, and scholarly communication in general, librarians, with a solid grounding in the organization and dissemination of information, have a distinct advantage in assisting scholars in taking control of their intellectual property, disseminating it, sharing it, making it findable, and preserving it. These are some of the new pursuits for librarians. (Richard et al., 2009 p.35)

One could understand, at that time, the need for the librarian to be looking for other work. Not only was the concept of the physical collection of books beginning to look threatened by digitisation in general, but also the shifting parameters of scholarly communication were causing the library as an entity to look, for the first time in hundreds of years, decidedly unstable. Writing in 2011 Sullivan employed an interesting device, stepping forward to the year 2050 to write 'an autopsy' of the academic research library:

The academic library died alone, largely neglected and forgotten by a world that once revered it as the heart of the university. On its deathbed, it could be heard mumbling curses against Google and something about a bygone library guru named Ranganathan. (Sullivan, 2011)

In the same year, with an approach more fundamental to the overall information economy, Anderson suggests:

The academic research library, as currently configured, is designed and organized to solve a problem that its patrons no longer perceive: the problem of information scarcity. When information is scarce, it presents two primary difficulties: first, it is hard to find; second, it is expensive. These may seem like trivial observations, but they go to the heart of a growing crisis in librarianship. (Anderson, 2011, p.289)

In one sense, the literature argues (Brevik and Gee, 2006) that the library has lost its monopoly on information and knowledge management; the creation, management, manipulation and disclosure of digital materials has become integral to a far broader range of university activities. In another sense, it argues that the opportunities provided by the deluge of data seem to play to the traditional strengths of the library role (Nicol 2004). Within the world of university research, the requirement for researchers to manage large data sets, for example survey data, and to collaborate across a range of institutions and online digital repositories as part of the dissemination process, indicates that the traditional tasks of librarians are being spread far more widely, and that because of this the role of the library itself is being transformed (Corrall 2012). The shifting boundaries that lead both to new service configurations and also to new professional skills represent a theme for exploration within this study.

Other themes that emerge from the Library and Information Science literature relate to the library as a physical space (McDonald 2010), and to the library's symbolic presence as gatekeeper of knowledge with a central role to play in the storage and management of that knowledge. In the US, the ACRL, (Association of College and Research Libraries), in a conscious reaction to increased levels of performance management within education as a whole and to the ongoing

uncertainty about the academic library's role within this context, urged that libraries 'must demonstrate their value'. (ACRL 2010)

The positioning of the library within the university's organisational structure, for example in a role merged with IT services, student support services or, more latterly but less frequently, research support services, is an issue that is covered in the literature to varying degrees by Levy and Roberts (2005); McKnight (2010), most notably Hanson (2005) and, more recently and in a practical way, Joint (2011) and Bulpitt (2012). Organisational restructure and convergence is a pattern familiar to libraries, many having expanded, contracted or shifted shape in the light of altering demands. Dempsey notes:

The library has a persistent institutional role; however we have seen other areas emerge with overlapping, similar or converging functions. These have included IT, e-learning, publishing, e-research and digital humanities support, writing centres, research and publication administration. As the information management function becomes integral to more activities, and these activities are unified by the network, then the university may realign information management support. (Dempsey, 2011)

Despite the immense distance travelled by the library profession since the introduction of networked technologies, it appears that the questions raised by the Follett Report of 1993, relating to the library's role in supporting research, have yet to be answered fully. Now, though, with the recent upheaval in the world of research brought about by technology and open access, it would, as Tenopir notes, seem timely for libraries to engage:

Increased reliance on technology in all parts of scientific endeavor, or cyberinfrastructure, and the establishment of data management and data sharing mandates by many research funding bodies have motivated academic libraries to take action with regard to the shifting needs of their faculty and students and consider how best to engage in e-science through the development of library-based research data services (RDS). (Tenopir et al., 2014 p. 84)

As might be expected, academic libraries again find themselves in a state of flux as a consequence of the many changes currently taking place (Dale, Beard and Holland

2011). The university now has less control over the boundaries of knowledge and the requirements of students and researchers; as knowledge transcends the limits of the university the library must face fundamental changes in its role within education. Borgman (2010) encapsulates the changing academic library landscape with some passion:

The proliferation of digital content is part of the evolution, revolution, or crisis in scholarly communication, depending on the perspective taken. Authors, libraries, universities, and publishers are wrestling with the trade-offs between traditional forms of publisher-controlled dissemination and author-or institution-controlled forms of open access publishing. At issue are the forms of peer review, the speed of dissemination, the ease of access, the cost, who pays the cost (e.g., the author, library, or reader), and preservation. (Borgman, 2010, p. 9)

2.5 Emerging Theme One: Open Access Policy and Strategy

Three of the main themes that have emerged from the literature review are particularly pertinent in answering the research questions. The purpose of this and the following two sections is to outline these themes. They relate to the core question of this research, which is to examine the nature of the changing relationship between the academic library and the researcher. The themes and their sub-themes provide the basis of the supplementary questions within the Delphi study.

THEME	SUB-THEME	Question Areas
Open Access policy and strategy		A1, A2, A5; B2, B4, B5, B6
	OA and library leadership	B2, B6
Scholarly communication		A2, A3 A4 A5; B6
	Research Data Management	A2, A3; B4, B5, B6
	institutional repositories	A3 + A4; B4

	Bibliometrics	A4
Role of library		B1 and B2
	library positioning (and perception) for research support	B1
	library skills and workforce development	B2, B3

Table 1. Themes and Sub-themes derived from review of literature

The first theme is structured around policy and leadership, and relates to the leadership role within universities and libraries as they encounter the changing external environment. As noted at a policy and leadership level, there are concerns about the leadership and advocacy roles that are needed to ensure that the library plays a key part, is involved and is valued. In general, the literature outlines challenges such as implementing and managing the transition to an open access model.

There continues a steady rise of the Open Access movement and the impact that this is having on university economic models as the policy documents emerge. This is new, appears to be confusing and is challenging to implement, so one of the key themes from the literature that should be tested in the empirical study is the level of awareness of open access. Also worth examining empirically is the adoption of open access within universities, both in their libraries and among their researchers.

Another aspect that is covered within the theme of leadership is how the other themes might be considered, because it is the library leader who is responsible for turning many of the changes on the horizon into pragmatic operational initiatives. So, rather than merely having a view on changes in scholarly communications, for instance, the library leader needs to be able to apply the policy in an effective and efficient manner. There is a need to explore strategies that could be developed by librarians and researchers to accommodate, or reposition for, the emerging changed relationship.

Because of the uncharted nature of the subject matter and the newness of the challenges, some of the arguments set out in the literature can be complex, interwoven and inconclusive. There is a further need to look at how policy and strategy relating to the changes in the knowledge economy, and indeed changes in research practice generally, are understood. A key aspect of the literature that should be tested in the empirical study is that of how open access policy is understood at all levels within universities, in their libraries and among their researchers.

2.5.1 Open Access and Library Leadership

How best to respond in an innovative way to the changing landscape, while at the same time understanding the direction of policymakers and sustaining current services, is the challenge that presents itself to the library leader. There is a sense that academic libraries are caught in a transition period between two academic publishing models (Levy and Roberts, 2005). Across the literature, the area of library leadership that relates specifically to the research support function within this rapidly changing environment does appear to be under-researched. The gap may be addressed to some extent through this study and may provide some understanding of how the landscape might look in the future.

2.6 Emerging Theme Two: Scholarly Communication

One of the first significant emerging themes is that of scholarly communication, the part of the research lifecycle concerned with the dissemination of research outputs. Academic publishing and intellectual property rights, and indeed copyright generally, seem set to emerge as contentious issues. The management of large datasets across institutional boundaries presents considerable challenges, for example access control, questions of rights issues, archiving and preservation of data. Leadership and management of organisational strategy need also to be considered, along with the operational aspects of supporting research and learning. Leading on from these considerations, scholarly communications has in fact been of

interest to librarians for many years, though more recently it has become urgent:

The open access movement exists in the broader context of a complex scholarly publishing system. It is widely believed by academic librarians and others that this system is in a state of crisis due primarily to the increasing cost of scholarly journals far in excess of inflation, the proliferation of new journals that are ever more specialized, the failure of library budgets to keep up with these cost and journal proliferation factors, and the resultant increasing restriction of access to journal literature as libraries cancel existing journals and fail to add new specialized ones. Although the open access movement will clearly have a very significant impact on the library “serials crisis” if it succeeds, many of its primary advocates do not see the resolution of this crisis as its primary mission, but, rather, as a desirable potential side effect.” (Bailey, 2005, pp.xii)

Shifts in publishers’ business models, economic change within the library and concerns about the transition from subscription-based article access to open access to journals raises concerns across the university generally. For example, there is the issue of double-dipping by publishers where there is no offset in subscriptions charges where article processing charges are introduced, essentially forcing the university library to pay twice (RCUK 2015). Another concern is the rise of predatory journals which bring their own challenges. Here the librarian is probably the best-placed professional to provide advice for researchers keen to disseminate their research legitimately and with optimum impact.

The literature would suggest that there is significant movement in the area of scholarly communication, much of it based on technology and open access (Reinsfelder, 2012). What appears to concern the academic library leader is the matter of subscription costs, and this may be at the expense of the wider interests of a transformed journals market (JISC 2016). The tradition of peer review and the associated publishing regimes that are the perceived bedrock of academic quality are being challenged more seriously by open access publishing models. The model of peer review, with its protracted timeframe and often opaque workings, has been coming under increasing scrutiny. Of particular interest within scholarly

communication, due to the emphasis by funders on research impact, has been the journal impact factor. The peer review process itself has been explored in the past, by for example Rowland (2002), and again recently by publishers Taylor & Francis (2015).

2.6.1 Research Data Management

The first sub-theme to emerge within scholarly communication is RDM, and looks specifically at how libraries might provide support for the management of research data. The policy levers and mandates set by funding bodies, which stipulate that research must be placed in the public domain, coupled with the parallel growth of big data and the challenges of managing data while adhering to the principles of open access, have all led to a significantly increased need for RDM (Pryor, Jones and Whyte, 2013).

Up to this point the term open access has been used indiscriminately. However, it is important to distinguish between open access to scholarly communications and open access to (research) data. In their survey of the literature on research data management (using the US term research data services (RDS)) Tenopir et al. consider the alignment between library directors and their librarians, posing the question: 'But are library directors and librarians on the same page regarding RDS? In other words, do library policies in this regard align with librarians' perceptions? Misalignment can hinder effective start-up of RDS.' (Tenopir et al., 2014). Similarly, Cox and Pinfield (2014) question whether it is feasible for libraries to get involved in the enterprise of RDM at all.

Cox and Pinfield (2014), also concerned with the library's role in supporting research, look at precisely how this might develop and posit different ways in which it may be achieved. They explore what the barriers might be to the library taking responsibility. Their research covers some ground similar to that of this study, though with a narrower focus on RDM and a different methodology and approach. Lewis (2010) explores the role of the library in supporting RDM, while Erway and Reinhart (2016) look at making RDM sustainable. Wilson et al. (2011) provide an

institutional approach to infrastructure and the practicalities of setting up an RDM service. The increased demands and administrative overheads associated with RDM and placed on researchers should not be underestimated, Pryor et al. note:

More recently, the realization has emerged amongst those responsible for funding, hosting and supporting research that this data deluge could represent by far the most challenging aspect of 21st-century research administration that they are likely ever to encounter. As formative experiences go, it appears to be an eminently larger and more complex phenomenon, most acutely characterized by its exceptional rate of growth, than has previously been experienced in the engines of knowledge creation that are our universities. (Pryor et al., 2013, p.vii)

2.6.2 Institutional Repositories

The rollout of institutional repositories has been a by-product of open access over the past decade. Within the literature there are various approaches to such developments, ranging from highly technical explanations of the challenges of networked systems to more straightforward and interesting treatments of the impact on library and research activities. Prosser (2004) takes the view that repositories used in tandem with journals will transform scholarly communications. More recently, universities are linking their institutional repositories to their commitment to the REF mandate to deposit research outputs and make them available online. The administrative overhead of maintaining such repositories is an area of work that typically requires significant input from the library. In addition, there are questions around the economics of maintaining an institutionally based repository as opposed to a more efficient model that might use a collaborative approach across disciplines or based on geography. Ball (2015) notes the staffing implications:

Repositories are served by between 3 and 6 FTE staff in 80% of institutions. Most have a full-time repository manager, with varying types and levels of support. Two institutions have integrated repository work with other responsibilities: one might see this as a continuing trend as the novelty of IRs declines. (Ball, 2015, p.14)

2.6.3 Bibliometrics

Bibliometrics is a branch of librarianship that at the most basic enumerates citations within published material to identify correlations with a view to supporting claims of research impact. In more complex approaches whole bodies of literature can be analysed on the basis of cross citation and referencing. This has given rise to the Journal Impact Factor (JIF) a ranking formula that purports to identify the most influential journals on an annual basis. The implication being that to ensure the highest impact for a researcher's output they must publish in a journal that has a high JIF score.

Bibliometrics is emerging as a significant area, although the literature on how this relates specifically to the academic library has yet to develop. The literature does not treat it as a separate entity, but rather to link it with, for example, RDM (Corrall et al., 2013). For this reason, the exploration of bibliometrics is limited in this study. The likelihood is that bibliometrics and altmetrics will have greater influence in the future. The area of endeavour that has become known as altmetrics (Tattersall 2016; Konkiel et al., 2016) is a direct consequence of the way in which technology and digital scholarship have enabled impact factors to be measured. Altmetrics is a term that originally related to alternative metrics used to measure the impact of scholarship within the online and social media environment. Altmetrics has evolved from its alternative status to being one that is complementary to the traditional metrics used to evaluate research. Altmetrics can provide an early indication of how research outputs are consumed because of its focus on the online world where, for example, the number of times a paper is read online can now be measured. This finer level of granularity offers 'article level' metrics which is sometimes attributed to the etymology of the term.

2.7 Emerging Theme Three: Role of the Library

Libraries have always supported research. It is fundamental to their role, and the relationship between the library and researchers is crucial. Reviewing the literature to find out what researchers want from the library and how the library responds to

this provides much recent material. Library research support is at the core of this, something that is noted in the Research Information Network (RIN) and Consortium of University Research Libraries' (CURL) joint report into researchers' use of academic libraries and their services, (Brown and Swan 2007). This is an important piece of research. Its methodology is significant because of the size of the population used and it comprehensively covers the relationship between libraries and researchers. Crucially it asked researchers what they want and expect from the library; these views of researchers are, of course, an important consideration in the literature. Tautkeviciene et al., (2013) explore specifically early career researchers' views of open access. It is useful to look beyond the UK to get a broader perspective. For example, Keller (2015) provides a valuable insight as she 'examines the ongoing changes within Australian university libraries to support research'. Her work is supported by Thomas (2011), who looks at future-proofing the academic library's role in e-research.

2.7.1 Library Positioning and Perception for Research Support

Anderson (2015) suggests that there is currently 'a quiet culture war in research libraries', and goes on to examine 'what it means for librarians, researchers and publishers'. Perhaps this gives an indication of the need for greater clarity on the position the library might take as part of the growing research support function. Daland and Walmann-Hidle (2016) seek to address the expectations for research support. The challenge for the library leader in positioning the library correctly and in a timely fashion should not be underestimated. This area of the literature is critical to the study, and it is important to triangulate aspects of the debate within the Delphi study.

2.7.2 Library Skills and Workforce Development

The changing environment of the academic library, seen from the perspective of library skills development, is an important theme to emerge from the literature. Harris (2012) provides a significant contribution by asking a series of questions about the library's role in relation to open access. Marsh and Evans (2012) consider the increasingly diverse role of the academic librarian, particularly in the way it

relates to research support and involvement in university projects and applied research.

Pryor and Donnell (2009) explore the change in the skills needed to support research, and ask who is best equipped to perform this role. Auckland's (2012) much-cited work in this area points clearly to the challenge:

Most significantly, the findings indicate that there is a high skills gap in nine key areas where future involvement by Subject Librarians is considered to be important now and is also expected to grow sharply. (Auckland, 2012, p.42)

Auckland lists the areas in which she has identified a skills gap, and notably she suggests that these are areas in which decisions are made with respect to training, development and recruitment. The nine areas are listed below:

- Ability to advise on preserving research outputs (49% essential in 2-5 years; 10% now)
- Knowledge to advise on data management and curation, including ingest, discovery, access, dissemination, preservation, and portability (48% essential in 2-5 years; 16% now)
- Knowledge to support researchers in complying with the various mandates of funders, including open access requirements (40% essential in 2-5 years; 16% now)
- Knowledge to advise on potential data manipulation tools used in the discipline/ subject (34% essential in 2-5 years; 7% now)
- Knowledge to advise on data mining (33% essential in 2-5 years; 3% now)
- Knowledge to advocate, and advise on, the use of metadata (29% essential in 2-5 years; 10% now)
- Ability to advise on the preservation of project records e.g. correspondence (24% essential in 2-5 years; 3% now)
- Knowledge of sources of research funding to assist researchers to identify potential funders (21% essential in 2-5 years; 8% now)
- Skills to develop metadata schema, and advise on discipline/subject standards and practices, for individual research projects (16% essential in 2-5 years; 2% now). (Auckland 2012 p.42-43)

2.8 Conclusion to Literature Review

The review of the literature provides the origins for the themes that are taken forward in the study. An initial broad survey identified three main areas of the literature as identified in Figure 1. These three areas were seen to be the interconnected 'places of enquiry'; essentially looking at the academic library supporting the open access and digital scholarship aspects of research within the context of academic research in a knowledge economy. The neatness of the Venn diagram oversimplifies the challenge of engaging with the complex relationships within the literature. The purpose served by the diagram is to identify the overlapping nature of the three aspects. Having engaged in detail with the literature this broad survey has

The theme of open access is seen as overarching because it is fundamental to the research process for two main reasons. The first is that open access fundamentally changes the use of research resources by making literature and datasets available more widely and more quickly. Related to this the second reason is that researchers need to have a sound understanding of the many ways in which open access might apply to the dissemination of their own work. From this there is a need to explore how open access is being addressed strategically within the university and by extension the academic library. Within the literature this is signalled by a range of policy making developments. These have been identified in sections 2.2.1 and 2.2.2; the key authors identified as forming the theme of open access within this study are Eve (2014); Harris (2012) and Jubb (2011). The literature that pertains to the development of open access policy at a national level is outlined by identifying the various policy initiatives; central to this is the work undertaken by Finch, (2012). One clear development, which this literature review has confirmed, is that the Open Access movement is having an impact on the way research is being conducted and on the way the outputs of research are being organised and managed. What is even more interesting is how one might quantify this and consider the impact it has on the academic library Breivik and Gee, (2006); Harris, (2012) and Bent, (2016). One

question that comes into focus is that of library leaders who may be waiting to see what happens rather than actively making it happen. The strategic and leadership consequences of open access on the academic library are explored in the empirical collection of data.

The emergence of the term digital scholarship in relation to the academic library is not well represented in the literature. The work of Weller (2011) is of high importance in introducing new practices and explaining 'how technology is transforming scholarly practice'. Much of the work of Weller informs how the traditional approaches to research will be transformed. Key areas of interest to this research, and explored in the Delphi study, are how the emerging practices of digital scholarship become embedded; at the moment they are overlaid on the current, traditional framework for research. This study aims to fill the gap by presenting a conceptual framework predicated on the new research approaches of digital scholarship.

Scholarly communication is one of those areas that is changing significantly due to open access and digital scholarship. A key text relating to this is that produced by Shorley and Jubb (2013) a collection from 'renowned international experts' that looks at the changing roles and responsibilities of all the key actors. The preface concludes: 'Only the foolish would dare to predict exactly what the future holds for scholarly communication. But one thing is certain: it is far too important to leave to chance.' (p. v).

The sub-themes for scholarly communication relate to the processes that are derived from or enable open access. RDM through the open access and digital developments might be described a novel to the researcher given the new challenges of actually managing large dynamic datasets was prevalent within the literature for example - Erway and Rinehart (2016); Jones, Pryor and Whyte, (2013); Cox and Pinfield (2014); Cox, Pinfield and Smith (2016).

The role of the academic library within RDM explored by Pinfield, Cox and Smith (2014) is an aspect that requires further exploration in the Delphi study.

A further dimension and one that is identified in the 'role of the library' sub-theme below, is that of the libraries position, Verbaan and Cox (2014).

As a sub-theme the institutional repository is located in the literature of Jones, Andrew and MacColl (2006) and Ball (2015), it is an important aspect because it represents a common space where the skills of librarianship encounter the practices of open access, Prosser (2004). Moreover, the institutional repository as noted are 'becoming essential tools for universities, to enhance the visibility and impact of their research on a national and international stage.' (Dale, Beard and Holland 2011 p. xxi).

The literature that formed the bibliometrics sub-theme relates in the main to Corral, Kennan and Afzal (2013) where citation analysis is traced back to the work of the librarian in the 1970's, also there is an assertion that it is important to the role of the librarian supporting digital scholarship and research because it 'is based on librarians' competence in handling bibliographic data and electronic databases, and their institutional position as independent interdisciplinary units.' (p. 642).

As noted above in relation to the RDM sub-theme the question of the academic library's jurisdiction is raised by Verbaan and Cox (2014). A further source is Dempsey (2011) who looks at the internal boundary changes of the library in the institution. Other sources include Hanson, (2005) and more recently Bulpitt, (2012) with the contribution by O'Connor, (2009) looking more generally at the issue of professional jurisdiction. Of interest in this sub-theme is how the library may need to change to become appropriate to the role of research support and what perceptions of the library help or hinder this change.

The final sub-theme, relating to library skills and workforce development, has as its main source the work carried out by Auckland (2012) and to a lesser degree by Brewerton (2012) both examine in detail the skills required to support research and conclude that there are challenges ahead. In a similar way Corral identifies skills

across librarianship while Harris, (2012) is focused on skills to support research.

In outlining the origins of the themes and sub-themes, by identifying their key sources from the literature, the transition from Figure 1. to Table 1. is made explicit. What appears less well covered in the literature is the relationship between the emerging modes of knowledge production that support the university's position within the knowledge economy and the changing role of the library itself – what might be termed 'the big picture'. For this reason, there is no theme seeking to explore the knowledge economy context.

Most of the issues identified in the literature have been applied to the questionnaire rounds of the Delphi study in order to gain insight from a practical viewpoint and to sense-check the issues emerging from the literature. For example, the literature suggests that the resources being put into RDM are lacking, (Cox and Pinfield, 2014) so a specific question is asked via the research instrument to test this view. There is a linkage between the themes, their sub-themes and the statements in the Delphi; column three of Table 1. places the questions in their various themes.

CHAPTER Three – Methodology

3.1 Introduction

This chapter outlines the methodology used in addressing the research questions. It seeks to provide a clear link and progression between the context of the research problem, the stated aims of the research, the research questions and the philosophical approach used to administer the research method.

Within educational research, as in the broader world of research, different value systems operate and sometimes compete. Researchers have different motivations in planning, carrying out, managing and disseminating educational research. When such motivations are set against each other, or against work that has been undertaken previously, conflicts can arise, sometimes even before the research itself begins. The premise upon which a research approach is founded can often betray an understanding of the values and motivations of the researcher. These values and motivations should be considered as having influenced the research process, whether consciously or unconsciously. It is important, however, to note that such influence does not necessarily relate to the methodology, or to methods used in the research, having more to do with the philosophical position of the researcher.

Methodology is the act of deciding upon the various methods available for use in a research exercise. The choice should be determined by the research question, and indeed by the aims of the research and, vitally, the methods used should be fit for purpose. The literature in the area of educational research is extensive, with bodies of work addressing general research and educational research to varying degrees of breadth and depth; it is not possible to review here the myriad methods available to the researcher. As well as outlining the methodology, this chapter includes a positionality statement presenting this researcher's perspective and inherent bias.

The chapter covers a full explanation of the Delphi technique used in the research and explains how this method can be used to generate empirical data to support the

overall discussion of the research questions. It describes how the web-based Delphi study was constructed and implemented for the purposes of this research across a group of thirty-five participants, and leading from this description it presents a rationale and outline of the conceptual framework approach used. In its conclusion, the chapter provides an outline of the ethical dimensions of this research study.

3.2 Research Philosophy

All researchers have different ways of looking at the world, and all hold certain beliefs or values that will orientate and guide their research approach. The way in which research is conducted, and the knowledge that is considered valid, are important factors in differentiating research approaches. For example, what might be considered a correct way to obtain knowledge can differ from one researcher to the next. Also of fundamental importance are the many ways in which knowledge might be analysed and presented, i.e. quantitatively or qualitatively, and a further difference still can arise in the way a researcher's role is represented in each part of the research workflow. The various approaches to research are sometimes called research paradigms and can be identified as: pragmatist, positivist, realist and interpretivist. Ontology and epistemology are two ways of understanding the philosophical approaches that researchers can take. In the section that follows both are explored, and the various choices within each are outlined in relation to the research questions.

3.2.1 Ontology and Epistemology

Ontology deals with the nature of reality. It is sometimes defined as the study of being, and it seeks essentially to question whether an entity should be viewed objectively or subjectively. This nature of reality problem allows for two choices: objectivism and subjectivism, choices which in their turn are important in perceiving research problems and appraising the possible ways of addressing such problems. Objectivism, also referred to as positivism, supports a notion that social entities, phenomena and their meanings can exist independently of and outside any social context. This is the classic scientific approach that sets out to discover what already

exists 'out there'. Set against this is subjectivism, also referred to as interpretivism, which supports the opposite notion, that social entities cannot exist outside a social context; social phenomena are perceived through, and brought to reality by, their social context.

From the interpretivist viewpoint, phenomena are socially constructed, subjective, open to change and may have many parts. Just as meaning can be drawn from social contexts, environmental, historical and cultural context are also significant within an interpretivist paradigm, and this allows that the 'constructed' reality of those who participate in research provides a valid version of the truth. In the positivist approach, on the other hand, research will seek to identify and test variables.

Generally speaking, within the literature associated with research methodology there is an accepted, or certainly more common, way of understanding the tensions associated with research, which is to view the positivist and the interpretive approaches as being opposed (Maykut and Morehouse 1994a). Research approaches are built on assumptions or postulates which are based on either the positivist or interpretivist side, the formation of these approaches supporting either a traditional (dominant) paradigm or the alternative paradigm, and this represents a fundamental dichotomy. Positivist approaches set out, through quantitative or qualitative methodologies, but mainly quantitative, to confirm or explain a particular phenomenon. In a classic scientific approach, positivism seeks explanation by relating an observed event to a general theory and, in so doing, can effectively reinforce an established paradigm. Researchers, primarily from the scientific tradition, who use this approach believe that their research can be objective, structured and free of values, or at least that those values can be set aside. In the opposing position, taken by the interpretive researcher, the alternative paradigm is characterised.

As illustrated in Table 2. Maykut and Morehouse present both paradigm approaches within the context of six key questions, an exercise which delineates the dichotomy well.

Questions	Postulates of the positivist approach (dominant paradigm)	Postulates of the phenomenological approach (alternative paradigm)
How does the world work?	Reality is one. By carefully dividing and studying its parts, the whole can be understood.	There are multiple realities. These realities are socio-psychological constructions forming an interconnected whole. These realities can only be understood as such.
What is the relationship between the knower and the known?	The knower can stand outside of what is to be known. True objectivity is possible.	The knower and the known are interdependent.
What role do values play in understanding the world?	Values can be suspended in order to understand.	Values mediate and shape what is understood.
Are causal linkages possible?	One event comes before another event and can be said to cause that event.	Events shape each other. Multidirectional relationships can be discovered.
What is the possibility of generalisation?	Explanations from one time and place can be generalized to other times and places.	Only tentative explanations for one time and place are possible.
What does research contribute to knowledge?	Generally, the positivist seeks verification or proof of propositions.	Generally, the phenomenologist seeks to discover or uncover propositions.

Table 2. Defining questions for postulates of positive and interpretive approaches (Maykut and Morehouse 1994b, p.12)

Examining the positivist and interpretivist dichotomy can be useful, yet in many cases it is too shallow an analysis of the world of educational research. There are not necessarily simple mappings from research methodologies to methods – in the sense that a positivist approach will be supported by quantitative methods. To illustrate this, Griffiths (1998), through her declared position as an educational researcher for social justice, has explored the shortcomings of the

positive/interpretive dichotomy. She sees one strand of the debate as relating to facts and values and the other relating to the way in which knowledge is connected to power structures within society. In terms of facts and values, she considers four viewpoints. The first views facts as value-free. The second suggests that researchers expect values to influence research, but that the more these values can be eliminated, the better the research. The third acknowledges the notion of bias, but prefers to call it perspective, given that the term bias supposes that a neutral position is unattainable, and because the personal perspective is unavoidable it becomes an integral part of enquiry. The fourth viewpoint accepts that all knowledge is constructed by and derives its meaning from the personal and that, rather than trying to eliminate such values, one should consider them useful and informative. In summarising this last position, Griffiths says:

Holders of this view are impressed by the political and social dimensions of individuals' value systems. Thus for this group, knowledge gets its meaning from the political position of the knowers, as well as from other value systems. (Griffiths, 1998, p.46)

A wider view would look also to the role of culture, values, history and power within the construction of knowledge. Instead, then, rather than striving for an objectivity that is unhindered by personal values, interpretive research accepts the position of the researcher and makes explicit that the values that the researcher brings to the enquiry provide validity. In accepting that absolute objectivity is unattainable, subjectivity becomes accepted, but it places an onus on the researcher to ensure a level of reflexivity that will make implicit values explicit. Subjectivity, moreover, does not come about simply as a result of capitulation to the problem with neutrality of viewpoint, but rather is, in its own right, an attempt to understand and create knowledge based on the premise that knowledge itself cannot exist outside the person. With the insight provided by Griffiths, the complexity of research values becomes evident. Perceptions of reality do affect the way in which the researcher will enquire about human behaviour.

Epistemology, the theory of knowledge, is related to questions of how a researcher perceives knowledge, how and where knowledge 'happens' and what its

relationship is with the knower, all highly important because the way knowledge is understood influences how research is considered. Believing that knowledge operates 'outside the human' dictates that research is undertaken with methods primarily chosen from the sciences. Conversely, seeing knowledge as solely placed within a personal context, and one that is interpreted by the individual, suggests that a subjective approach is dominant and requires qualitative methods. Moving one step further towards analysing the knowledge of individuals is to understand the way in which their narratives might operate. As Heikkinen et al. (2000) point out:

These days, human knowledge is no longer regarded as "a grand narrative" which tends to draw together a coherent and universal view on reality, based on the correspondence between the "things-in-the-world" and sentences. Rather, it is a plurality of small narratives, local and personal in nature, which are always under (social and psychological) construction. (Heikkinen et al., 2000)

These 'small narratives', together with the potential that new knowledge has to shift the focus of research, mean that assumptions held by the researcher at the outset of the enquiry may differ from those reached at its conclusion. A further dimension is added by the potential shift in values that sometimes accompanies new knowledge. Atkinson (2000), in an attempt to 'get behind the inquiring mind', notes that the perspective of the researcher can alter because of the research activity; she has revisited her external research and in doing so has discovered this further dimension. She explains:

This paper describes the transition of a research project from external inquiry, focusing on observable events, to internal inquiry, focusing on the development of my own reflective consciousness as a researcher. The paper is presented on two levels: the main text appears as it was first 'finished', but it is overlaid with additional interpretations in the light of subsequent readings, particularly in relation to postmodern thinking. (Atkinson, 2000, p.149)

Atkinson's exercise is interesting, not simply because it explores the shift in values, but also because it suggests that the act of writing can constitute a further refinement of the inquiry process.

3.2.2 Educational Research

At the core of educational research methodology are debates about the nature of knowledge, about how knowledge relates to and interacts with the education system, wider policymaking and value systems and, ultimately, how knowledge relates to truth. As well as taking into account the preferences of theorists and policymakers in this field, educational research needs to consider its impact and influence on practice and process. One aspect is the consideration of the wider context of values within the arena of educational research. This is essentially about knowledge making, and as such prompts a debate about the nature of knowledge and how it relates to values, and ultimately to the truth. Epistemology or knowledge debates are important, and are interrelated with research methodology; indeed an understanding of the nature of knowledge can be a key determinant in shaping research values.

The motivations for educational research are also interesting. Griffiths (1998), looking at the subject of methodologies from a social justice perspective, suggests that educational research has two motivations. The first relates to action that has an effect:

Educational research lays no claim to abstract neutrality or to being a curiosity driven search for knowledge, of the sort that, for instance, sociology, history or philosophy might profess. Rather, in the long run (and sometimes in the short run), it is action oriented. So it follows that educational research is not necessarily research about education or its processes. Rather, it is research which has an effect on education. (Griffiths, 1998 p.67)

The second motivation that Griffiths identifies relates to change and improvement:

Educational research is aiming not just at improvement but also at personal and political improvement. Therefore there must be a strong ethical and political underpinning to the framing of any research which is undertaken ... it is crucial to acknowledge the significance of ethical and political values, and why the debates about values, power and knowledge are always particularly relevant in educational research. (Griffiths, 1998 p.67)

Griffiths does make the point that research that is 'action oriented' does not imply or require a specific methodology or method. She suggests instead that a variety of methods can be used to deliver improvement, be they immediate or longer-term. Among the methods that she lists as appropriate within educational research are those of asking the hard questions and testing ideas and practices. She also suggests information gathering, philosophising, interviews and ethnographies, action research, journal keeping and critical reflection.

3.3 Positionality Statement

In order to outline the personal dimension of the research, this section of the chapter introduces the author of the study. The researcher can be seen as the primary research instrument, and perhaps because of this the relationship between the researcher, the subject and the participants is significant. Furthermore, the collection of primary source data, and all interactions with the participants, including their selection, have been conducted through one researcher's lens. The purpose of this statement is to acknowledge any assumptions and biases that might be held by the researcher and in so doing to provide readers with reference points that will encourage an open interpretation of the research. Similarly, the positionality statement aims to provide pointers towards what might not have been said. Failure to observe data or to associate meaning, relevance or indeed appropriate emphasis, may be equally deemed to carry bias albeit unconsciously.

It is intended that this positionality statement will provide insight to the researcher's approach. Within the interpretivist paradigm there is an acceptance that much of the approach is largely value-laden, and the implications of this can be viewed from several perspectives. The first is in the choice of topic and the framing of the topic's boundaries, essentially what should and should not be included. The second is in the choice of research questions and in the assumptions about what are valid and reasonable questions. The third is in the interpretation of context and environment including, for example, what might be considered important drivers for policy. The fourth sheds light on how the philosophical and methodological

approaches have a bearing on the analysis of the data and the presentation of the findings and how these follow through to the discussion and ultimately to the conclusion of the study. It is therefore important that, with the author being the sole and principal investigator in this research, some detail of his own positionality is outlined and made clear.

A critical dimension to making researchers' positionality clear is that the lens, or the set of values and beliefs through which they observe their research, becomes explicit. Furthermore, if there are any relationships between the researcher and the participants, and indeed a shared background, the positionality statement should bring these to the surface. This exercise should also identify any possible influences the researcher might have on the research process.

3.3.1 Biographical Information

First, I will provide a brief autobiographical outline, followed by an explanation of my purpose and motivation for engaging in this research study. Then I will outline my research philosophy in the light of the previous sections of this chapter. Finally, I will justify my choice of methods. The values that most need to be explored are those that have a direct impact on my research topic. However, there are also less obvious, perhaps hidden values and biases which may indirectly play a part. I believe that being mindful and indeed examining my biases strengthens my self-awareness and effectiveness as a researcher.

I was born in Dublin in 1963 and brought up in a middle-class family with two brothers, one older and one younger. My father was an architect, and part-time lecturer at the Dublin Institute of Technology. A Fellow of the Royal Institute of Architects of Ireland, he was also Editor of their monthly journal, the *Irish Architect*. My older brother and I were educated by the Jesuits at a fee-paying school in Dublin's city centre. My father had attended the same school, and his father had taught English and Greek there for 35 years. Indeed, my paternal grandfather was President of the trade union, the Association of Secondary Teachers of Ireland for

two successive terms, in 1930 and 1931. My mother worked as a university administrator and has an interesting family history: her grandfather was Editor of the national daily newspaper, *The Freeman's Journal*, his sister Fanny Gallaher, a secondary school teacher and novelist, had at one time been personal private secretary to Mary Russell, the 'flying' Duchess of Bedford.

While an emphasis on religion was a central feature of my schooling, for me the influence of the Jesuits was more evident in their intellectual approach, because it encouraged questioning and debate and embodied a moral rather than a dogmatic approach to Irish Catholicism. My school experience has been key to opening my interest in and understanding of education, and education has been similarly important to my own family now. My wife attended Warwick University and achieved a degree in English and Latin Literature and my three children, two sons and a daughter, have all attended university, the fourth generation in my own family to do so.

In 1983, at the age of twenty, I left Ireland to seek better opportunity. I migrated to London and in 1985 began working in public libraries. Working as a library assistant in Tottenham gave me an insight into the value of a library as a community resource. During this period, I became interested in and involved with various political campaigns for social justice.

I came late to my own university education. It coincided with the dawn of the internet age in 1993, the beginning of a huge upheaval in printed information sources and the emergence of online information. It was an exciting time to be undertaking a degree in Library and Information Studies. By 'working my way up through the system' in different types of libraries, I have gained an insight into how the library operates as an organisation. Also, even more importantly, my experience has given me a sound appreciation of the role information plays in supporting people's life opportunities and how debilitating a lack of information, or indeed an inability to use information effectively, can be for an individual.

For seven years I wrote a regular monthly column for a librarianship journal which allowed me to reflect on the changes brought about by the world-wide-web and on library professionals' response to these changes. My growing interest in the mechanics of learning and teaching, and in the technology used increasingly to support this, prompted me to undertake a Masters of Education degree in the study of computer-supported collaborative learning, later known ubiquitously as e-learning. I completed this study in 2003. It had an impact on my professional identity, as my knowledge of online learning and librarianship provided what was then considered a unique and useful combination. I perceived there to be many different angles from which to view the rapid changes taking place. I became interested in self-directed learning as a logical extension to placing more information and educational resources, and the means to access them, on the internet. The appeal of this for me was in empowering learners.

In 2007 I moved from public libraries to a large Further Education college with a significant percentage of higher education provision. My remit was to lead library and learning technology services, initiate and launch a virtual learning environment and develop a modest research and scholarly activity agenda in preparation for the college's application for Taught Degree Awarding Powers. While in this role, I began to appreciate the synergies between research, teaching and learning and the delivery of library services. In my current position as University Librarian and Head of Learning Services within a Higher Education setting, my role is very much engaged with the challenges of supporting research. This involves developing policy related to the Research Excellence Framework (REF), dealing with and interpreting open access developments and negotiating with publishers. Such first-hand engagement contextualises my position in relation to the wider enquiry of this research study.

3.3.2 Purpose and Motivation

Having reviewed my background, experience and identity, I now outline the values and motivations for engaging in this topic of research. From a professional

perspective, my engagement in this doctorate provides me with the opportunity to gain deeper knowledge with which to consolidate my own practice, creating a capstone across the various pillars of my endeavour, so there is motivation in being able to enhance my professional life and develop my career potential. It also offers an opportunity to enhance my personal identity and self-esteem. However, the opportunity to engage, in my own professional context, with what might be termed 'useful' research that is squarely focused on real-world problems, rather than being theoretically or practically removed, is probably my strongest motivation. I find the complementary approach of combining professional career development with high-level academic endeavour deeply engaging.

Reflecting on my own practice, I noted the growing impact of information and communication technologies on the research process and the links with my own library profession. I was motivated by the challenges that were emerging in the area of open access and I decided to develop my area of enquiry to address these. Put simply, I am responding to what I observe in my practice as a professional. My observation of the way in which developments in information management and librarianship unfold and become challenges suggests to me that there are short-term planning cycles within the world of academic libraries which fail to anticipate the impact of change; the more immediate challenges often take up significant resources and distract from fundamental problems. My experience suggests that while it is pragmatic to consider the constituent elements of problems, there should also be a holistic consideration of the complex nature of problems. Looking at the short and medium-term implications of a wide interpretation of research support seems to me to be a valid approach. The literature shows studies that look at individual aspects of the upheaval in research support, such as RDM or bibliometrics. However, I believe there is a need for a holistic understanding of how these parts might work together in an organised and cohesive manner.

3.3.3 Research Approach and Method Choice

It is perhaps useful to state my philosophical paradigm formally, in line with the

explanation of research philosophy given earlier in this chapter. My approach falls within the interpretivist paradigm, and my investigations aim to access a reality that is socially constructed; I understand this reality to be made up of the personal perceptions that I have gained through my experience. In my research, I value the perspective of the research participants and their own sense of meaning and understanding of the phenomena that are being studied. As an interpretive researcher, I place importance on the typically complex interactions between subjects, interactions which are sometimes compounded by context and environmental factors. My focus is on understanding the dynamics of relationships within an emerging research landscape where the demands of research support provided by libraries will become more challenging. I am inclined to develop scenarios as a device to explore these challenges and their possible solutions more deeply. The advantages and benefits of using this type of approach fit more comfortably with my overall view of the world of education. I would accept that my values are evident in all phases of the research process and that I therefore have a strong presence within the research.

Another aspect of my approach which chimes in with the interpretivist paradigm comes from my belief that truth is negotiated through dialogue. Dialogue is important to me. A problem-solving approach based on negotiation, rather than vested power, appeals to my sense of justice, and I believe that more solid and sophisticated meanings can be found through such dialectical processes.

I believe it important to base interpretations within a particular time frame, and that those views that are of significance should be seen within the context of that time-bound context. Socially constructed viewpoints are of course negotiable and open to re-interpretation. Again, I place value on a dialogic process that seeks to negotiate through conversation and is influenced by a shifting external environment.

My methodological approach has led me to choose a Delphi study technique which will enable me to examine more fully the themes identified in the literature review. I have also chosen to employ a conceptual framework to tackle what might be

termed 'the bigger picture'. Both methods are outlined in more detail below. Research approaches are often said to be either deductive or inductive. Deductive implies that the researcher takes a general view or theory and sets out to prove a hypothesis by uncovering evidence, and inductive that the researcher works an observation into a theory to explore whether what was suspected is actually the case. According to these definitions, my approach can be said to be inductive. I move from the data to the theory and my observation precedes theory and interpretation.

In concluding this discussion on my research approach I can say that my philosophical angle is interpretivist rather than positivist (post-positivist) but that it might also be described as reformed-interpretivist because I use numbers within the analysis of the Delphi study. I would also submit that by using both a conceptual framework and a Delphi study I can be seen to be extending the traditional dichotomy of research paradigms.

A key motivation for choosing the Delphi technique is that it uses informed participants who are immersed in the academic library at leadership level. Their opinions on and understanding of the areas of focus, and their ability to relate closely to the research questions, all provide accurate first-hand knowledge. This method allows me to call upon my professional contacts and to use my own reputation within the sector to encourage participation. A further advantage is that it provides an opportunity for each participant to be heard and, because of its feedback mechanism, also enables participants to consider the contributions of others. This approach ensures an adequate dialogue between me as researcher and those with whom I interact; it allows a reality to be constructed collaboratively.

Many of the experts participating in the Delphi study are, of course, commenting based on their own experience and so presenting personal case studies. Consideration should be given to the way in which the value perceptions and critical evaluations of the key informants in a Delphi study might be bound up with their experience (rather than expertise) and might therefore, in essence, be seen as 'mini case studies'. This would lend weight to an argument that, despite the tendency to

measure quantities, there is a considerable interpretivist dimension to the implementation of the Delphi technique. One disadvantage of the method is that the practicalities and logistics do present their own challenges, specifically in the administrative overheads required; these are discussed below.

In reappraising the methods used, choosing case studies might have yielded a richer context in which to enhance the Delphi study. I did consider doing so but rejected the idea, primarily because of the historical nature of case studies and also because there were insufficient resources available to conduct a meaningful number of such studies across the range of issues. There are variations of approach within the Delphi technique that can be developed, explored and used effectively, for example those outlined by Rowe and Wright (1999).

In planning the Delphi study, I was mindful of the words of Linstone and Turoff, who warn: 'The statements which comprise the elements of a Delphi exercise inevitably reflect the cultural attitudes, subjective bias, and knowledge of those who formulate them.' (Linstone and Turoff, 2002, p.226)

3.4 Explanation of the Delphi Study Method

There follows an explanation of the Delphi technique, and a consideration of its relevance to and suitability for the research questions outlined in Section 1.4 of Chapter One.

The Delphi method is well-documented, and a significant number of research projects have used the technique, which perhaps provides some evidence that it is considered a valid approach. As a method, Delphi can be seen as qualitative, and yet it can generate a considerable amount of quantitative data, which requires analysis. Its use is favoured in the study of future policy development, and it is seen to overcome many of the disadvantages of focus groups, highlighted below. Within educational research, and in the field of librarianship, the Delphi technique has been used to look at issues within academic libraries, for example Kochtanek and Hein's (1999) study of digital libraries, Baruchson-Arbib and Bronstein (2002) and,

more recently, Secker and Coonan (2011). One of many definitions of the Delphi technique states:

The Delphi is an exercise in group communication among a panel of geographically dispersed experts that allows experts to deal systematically with a complex problem or task. (Ziglio, 1996)

A further definition, given nearly ten years later, conveys a similar explanation:

Delphi is a structured group communication method for soliciting expert opinion about complex problems or novel ideas, through the use of a series of questionnaires and controlled feedback. (Day and Bobeva, 2005, p.103)

Recent developments in social networking, such as crowdsourcing, that are based on concepts of 'group-think' and the 'wisdom of crowds' (Surowiecki, 2004 and Shirky, 2009) have renewed an interest in the ability of groups of informed participants to arrive at a consensus that may prove useful in solving a problem.

Delphi studies can be conducted and implemented in different ways. This study uses an instrument that is based fully online within the modified virtual learning environment known as Moodle. From a design perspective, it is possible that conducting a Delphi study with such a research instrument may be of wider interest because of the innovative use of the online environment and associated technologies.

Norman Dalkey who, together with Helmer, introduced the idea of iteration with controlled feedback into group estimation techniques at the Rand Corporation in 1953, can be viewed as the creator of the Delphi technique. Over 20 years later, in the face of the growing popularity of the method, Dalkey was still wrestling with a definition:

The term "Delphi" has been extended in recent years to cover a wide variety of types of group interaction. Many of these are exemplified in the present volume. It is difficult to find clear common features for this rather fuzzy set. Some characteristics that appear to be more or less general are: (1) the

exercise involves a group; (2) the goal of the exercise is information; i.e., the exercise is an inquiry, (3) the information being sought is uncertain in the minds of the group; (4) some preformulated systematic procedure is followed in obtaining the group output. This vague characterization at least rules out group therapy sessions (not inquiries), team design of state-of-the-art equipment (subject matter not uncertain), brainstorming (procedure not systematic), and opinion polls (responses are not treated as judgments, but as self-reports). However, the characterization is not sufficiently sharp to permit general conclusions, e.g., concerning the effectiveness of types of aggregation. (Dalkey, 2002. p.231)

Linstone and Turoff, themselves pioneers in the use of Delphi, found it equally difficult to pin down a definition despite, or perhaps because of, the increased use of the technique. They do note that the search for the definition goes hand in hand with the technique's progress and sophistication:

There is in addition a philosophical perspective that when something has attained a point at which it is explicitly definable, then progress has stopped; such is the view we hold with respect to Delphi. In 1969 the number of Delphi studies that had been done could be counted in three digits; today, in 1974, the figure may have already reached four digits. The technique and its application are in a period of evolution, both with respect to how it is applied and to what it is applied. (Linstone and Turoff, 2002, p.3)

Today, more than forty years later, the Delphi technique is still evolving, and it is impossible to put a figure on the number of studies that have been carried out using the method. Incidentally the two authors, in spite of their reticence, do in fact provide the following definition:

Delphi may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem. (Linstone and Turoff, 2002, p.3)

Another way in which to gain a definitive understanding of the Delphi technique is to examine the process and appraise its advantages and disadvantages. The technique can first be identified by the following characteristics:

- typically, a relatively small group of expert participants is used

- a series of rounds leads to a consensus
- the anonymity of respondents is assured
- the participants as individuals are made aware of the group results to each round
- participants do not (and need not) meet face-to-face within this group process
- the researcher maintains a controlled feedback process
- various statistical analysis techniques can be used to interpret the data

Dalkey (1969) conducted a further series of experiments at the Rand Corporation in the spring of 1968 in order to investigate the use of Delphi and to make a comparison with face-to-face methods. Specifically, he was exploring ‘the nature of the information processes occurring in the Delphi interaction’. Although his experiments did not yield a clear outcome, he did observe that:

The negative conclusion that discussion does not display an advantage over statistical aggregation appears well confirmed; and the overall weight of experiments tends to confirm the hypothesis that, more often than not, discussion leads to a degradation of group estimates. (Dalkey, 1969, p. 24)

Dalkey concludes by conceding that ‘further experiments are desirable to establish the effect of face-to-face discussion more firmly.’ (Dalkey, 1969, p. 24)

Relatively early in Delphi’s development, Delbecq et al. (1975) identified how the technique could be used across a range of settings to achieve the following generic objectives:

- To determine or develop a range of possible program alternatives;
- To explore or expose underlying assumptions or information leading to different judgments;
- To seek out information which may generate a consensus on the part of the respondent group;
- To correlate informed judgments on a topic spanning a wide range of disciplines, and;

- To educate the respondent group as to the diverse and interrelated aspects of the topic. (Delbecq et al., 1975, p.10-11)

Because it does not require the participants to meet face-to-face, the Delphi method of group interaction avoids disadvantages typically encountered in face-to-face focus group discussions: the bandwagon tendency; deference to the most prestigious or powerful member of the group; vulnerability to manipulation and reticence of individuals to change their minds in front of others.

The Delphi technique is now used fairly widely to gather data from a group with a particular sphere of expertise, and those who participate are often given the label 'experts'. The study is essentially a group process, its aim being to gather rich information from those experts through a series of consultations, or iterative rounds. By providing participants with feedback on each round in turn, the researcher and the participants together achieve a convergence of opinion on specific research questions. The process can yield knowledge about current issues and future-based scenarios. What makes Delphi different from other questionnaire-based data gathering exercises is that it uses iterations, instigated by a feedback loop between researcher and expert, to develop a consensus on a specific topic. This facility to inform the direction of the research during the process, and to respond to the experts' responses, provides a significant attraction for investigators. The feedback process is important to the Delphi study as it provides the key strength of this method, which is that it offers the opportunity for the participants to reflect upon and possibly reassess their original views. It allows reflection on the views of others and encourages a change of opinion from that held in previous rounds.

An overall statement by the researcher on the comments of all participants informs the group of the range of opinions held, and might also provide reasons why such opinions are held. It should again be stressed that the process is anonymous throughout, none of the participants being aware of the identity of others within the selected group.

A helpful text in implementing Delphi studies is that of Day and Bobeva (2005), whose area of interest is specifically the process of developing a Delphi study. They outline a framework and provide a toolkit study; the example they use derives from the field of information science. Their treatment of the issues associated with the Delphi technique offers a sound framework against which the Delphi study here has been based. Day and Bobeva (2005) use a three-stage model to break the Delphi process into manageable parts and so ensure a robust and structured approach. The three stages are exploration, distillation and utilisation. In addition, they provide a list of nine critical issues required for implementation, some of which are used in developing this Delphi study.

3.4.2 Limits of the Delphi Technique

Most of the challenges inherent in the implementation of a Delphi study are logistical and operational. For example, because the Delphi technique uses multiple iterations to collect data from a panel of selected subjects, time frames for conducting and completing a study and the possibility of low response rates need to be anticipated and monitored carefully. Another challenge is the initial selection and ongoing management of the panel. Day and Bobeva (2005) note that: 'A Delphi panel should consist of individuals with knowledge about the substantive area of research, the motivation to engage with the inquiry process and be able to articulate judgements.' (Day and Bobeva, 2005, p.107)

Careful consideration needs to be given to the recruitment of members of the panel of experts. The number of participants is typically expected to decrease by between 20% and 30% per round. Day and Bobeva recommend that the minimum number of experts in any round should be seven. Ludwig (1994) suggests the number to be 'generally determined by the number required to constitute a representative pooling of judgments and the information processing capability of the research team.' (p.52).

Hsu and Sandford (2007) note a lack of consensus on the actual figures:

However, what constitutes an optimal number of subjects in a Delphi Study

never reaches a consensus in the literature. Delbecq, Van de Ven, and Gustafson (1975) suggest that ten to fifteen subjects could be sufficient if the background of the Delphi subjects is homogeneous.
(Hsu and Sandford, 2007 p.3)

Adler and Ziglio (1996) suggest that Delphi participants should meet four “expertise” requirements. These amount to: a good knowledge and experience of the issues under investigation; the capacity and will to participate; sufficient time, and effective communication skills.

The process of distributing information to and collecting information from the participants needs to be efficient, because it is a process that will be repeated several times, and the developments in information technology have certainly improved the efficiency of such logistics. However, in addition to the care that needs to be taken over the distribution and collection of data, considerable attention must also be paid to handling feedback from the respondents and managing feedback to the group. Each round of the study needs to build on the previous round, and the facilitator or researcher requires an appropriate level of expertise in the subject matter to be able to understand and respond to participants at the required level.

There are some concerns raised by those to whom Linstone and Turoff refer to as ‘skeptics from the hard sciences’, about the analysis of data collected for a Delphi study. One common feature of the statistical analysis of the Delphi method is the use of the Likert scale. This often contains a neutral value, i.e. a ‘don't know’ or ‘neither agree or disagree’ that is available if such an option is appropriate to a group of experts. Moreover, in the use of such Likert-type scales, convergence from the extremities can acceptably be interpreted as a movement towards a point of not knowing.

Considerable work has been done on analysing data in terms of standard deviation and the interquartile range of responses to questions, as well as on the way in which responses converge and cluster through the rounds of the study. However, the standard deviation in a five-scale configuration is relatively unimportant, because figures can only deviate by a maximum of 1 – 5.

Another aspect of using Delphi that might cause concern is that of the number of rounds that need to be conducted in order to gain convergence of opinion, although much of the literature suggests that two or three rounds yields enough data and enough convergence on which to base solid findings. Planning and allocating resources for the administration of the Delphi, where the number of participants may decrease and the number of rounds to be carried out is at the outset unknown, presents a logistical difficulty. An appreciation of this and also an understanding of how far the goodwill of the participants will extend is helpful when considering how many rounds will be appropriate. Again, Linstone and Turoff offer advice:

It was also observed in all early forecasting Delphi that a point of diminishing returns is reached after a few rounds. Most commonly, three rounds proved sufficient to attain stability in the responses; further rounds tended to show very little change and excessive repetition was unacceptable to participants. (Linstone and Turoff, 2002, p.223)

The business of identifying, engaging and ensuring the suitability of experts is a crucial part in the initial setting up of the Delphi process. The selection of experts and the criteria for this selection, together with a clear method for selecting one expert over another, are areas which should be considered carefully when designing and implementing a Delphi study. The issues and risks associated with each of the potential participants need to be assessed and their buy-in to the study needs to be assured and sustained.

In assessing the suitability of experts and their area of expertise, it should be recognised that some flexibility is required. Many of the participants' fields of endeavour or knowledge overlap, widen, emerge, merge and diverge. The engagement of participants in the Delphi study can be difficult to sustain and their motives need to be understood from the outset and factored into the analysis of the findings. Another aspect that ought to be noted is that some experts become constrained in their thinking and in their ability to respond to some parts of the inquiry because they consider these to be outside their domain of expertise. It can be argued that where convergence of opinion takes place it will do so at the

periphery of an expert's domain. These factors place a considerable onus on the researcher to ensure that the line of enquiry remains tight and focused.

Creating an electronic version of the Delphi technique, using social networking tools, might provide an innovative approach that would streamline the process and reduce resource overheads considerably. However, an overview of the as yet limited literature, for instance Hatcher and Colton (2007), highlighted several technical challenges that would need to be considered with this approach, for example hosting, servers, login/passwords, anonymity, speed of response, data storage and security, to name just a few.

Key to understanding the usefulness of the Delphi method is an appreciation of the way in which it refines the collective views of a group of experts over a period of enquiry and feedback and then draws these towards a consensus. It would be wrong, though, to think that a Delphi could make any predictions for the future. While it has certainly been used to forecast, it is important to accept that there is a difference between a consensus and an accurate view of the future. The process, and the thinking that is a product of that process, are more important than the possible fulfilment of any forecast or prophecy.

Gordon and Helmer's 1964 study of the use of Delphi in forecasting the future suggests that different definitions of, or timescales for, 'the future' might offer different degrees of consensus. They observed two trends:

- (1) For most event statements the final-round interquartile range is smaller than the initial round range. In other words, convergence of responses is more common than divergence over a number of rounds.
- (2) Uncertainty increases as the median forecast date of the event moves further into the future. Near-term forecasts have a smaller interquartile range than distant forecasts. (Linstone and Turoff 2002 p.223)

In the final analysis, despite its limit and with specific caveats, such as the level of input from the experts and the validity of their apparent consensus, a Delphi study does appear to provide a valid method through which to pursue this research inquiry. Day and Bobeva (2005) provide a useful summary:

Although the experience of using the Delphi has encouraged the authors to expand their personal research repertoire, generally the power of Delphi as an effective research method has unfortunately remained obscured through a lack of understanding. The contributions of other researchers are therefore vital to break through this conceptual barrier. Their efforts will be well-rewarded since they will acquire a flexible and simple way for exploring and evaluating many challenging topics in the realm of technological, managerial and organisation studies. (Day and Bobeva, 2005, p.114)

3.5 Research Design

This section explains how the research is designed and undertaken. The organisation of the research process forms three phases, as outlined below in Figure 3. Phase one begins with a review of the literature. This provides an outline of the themes and issues pertinent to the aims of the research and to the research questions. Following the literature review, themes are derived to inform a structured approach to the Delphi study, the duration of phase one was six to eight months. Phase two contains the Delphi study and the empirical data collection; there were two rounds to the study and the phase lasted ten weeks. Phase three contains the findings and the analysis and discussion of the empirical data. This phase also combines the syntheses of the literature with the empirical data and arranges elements and aspects of the study into a coherent format to construct a conceptual framework. This phase lasted for twelve months.

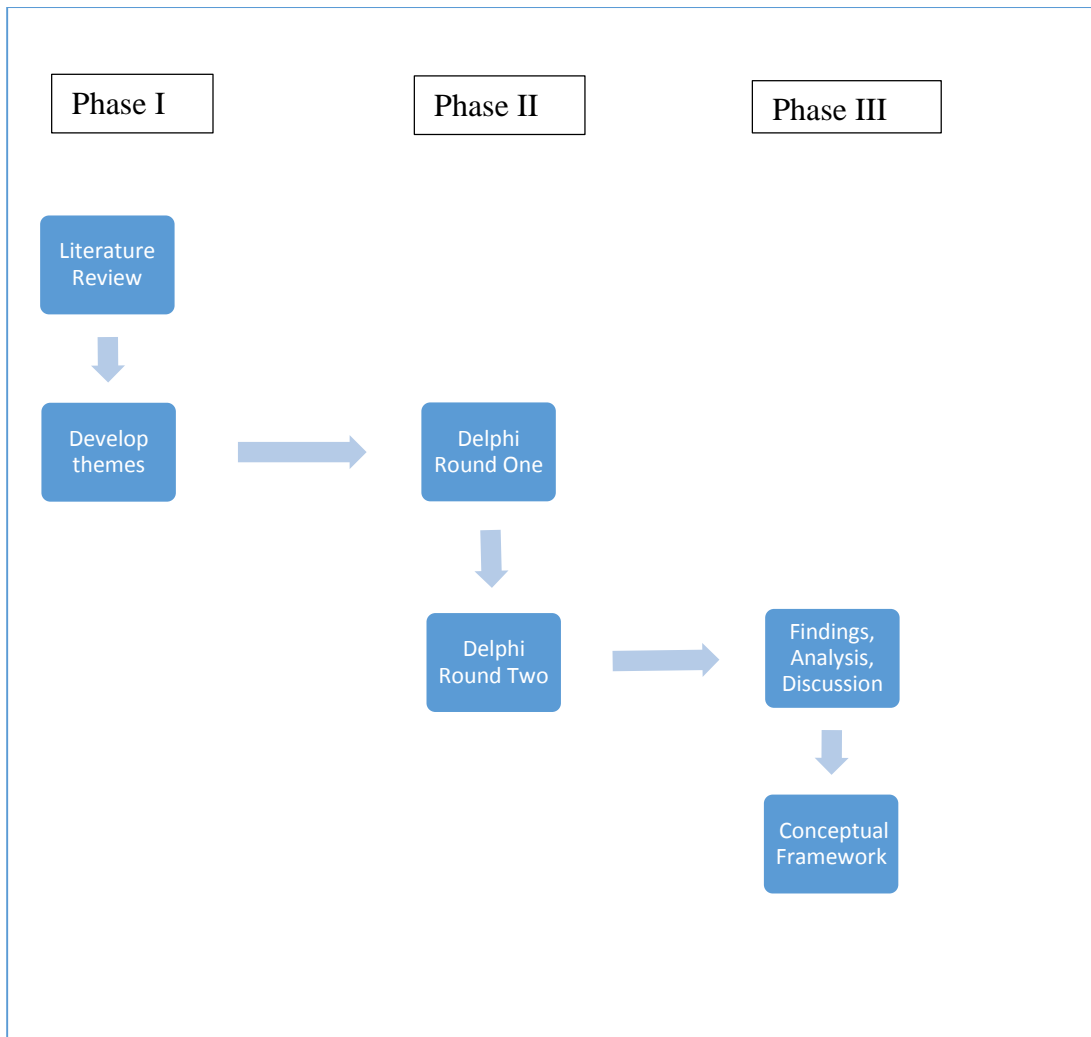


Figure 3. Overview of phased approach to research study

The features of an online web-based system were considered to be highly beneficial, particularly in terms of managing the communications with participants and the flow and considerable quantity of data. The virtual learning environment, or learning management system, Moodle, was used as the web-based user interface. A specialist module within Moodle enabled the design and presentation of the questions for each round. The approach of using Moodle in preference to a dedicated survey tool, such as SurveyMonkey, can be justified by the relative user experience enjoyed by the participants. Within the sector there are many surveys that circulate on mailing lists using proprietary software, most heavily used is SurveyMonkey, often these have poor completion rates. There is a misconception that the less intrusive such surveys are the more likely it is that the rate of response

will be high.

Both Moodle and SurveyMonkey have conditional branching, known as skip logic in SurveyMonkey, which creates a custom path through the survey that varies based on a respondent's answers. There are some important differences between the systems. In SurveyMonkey there is branding which can only be removed within the premium version. In Moodle however, there is no corporate branding, moreover it is possible to customise the appearance of the questionnaire in a way that is appropriate to the survey audience.

Another important difference is that SurveyMonkey does not provide a progression bar to allow users to estimate how far into the survey they might be. Probably most important for this Delphi study was the facility in Moodle to save and continue. In Moodle, setting this option allows users to save their answers to a questionnaire before submitting them. Users can leave the questionnaire unfinished and resume from the same point at a later date. In the Delphi study this feature gave considerable flexibility for the participants who were required to provide a more engaged and considered response. From the outset participants were required to login and navigate through information that contextualised the research. This greater sense of belonging, created by logging in to the system, possibly gave participants a deeper commitment. Moreover, participants were able to re-visit their answers and, when the first round was complete, they were given access to the combined, not individual, results of the group. Again, this is a feature not available in SurveyMonkey.

A forum was available for participants to engage anonymously in discussion however, this option was not taken by any of the participants. It is likely that the relatively high level of engagement, maintained across two Delphi rounds can be attributed to the provision of a suitable online environment.

While the computerised approach saved considerable labour, there were some technical issues that needed close attention and these were addressed in three iterative pilots of the research instrument. Those taking part in a pilot were given a

login and password to the system and asked to complete a series of questions. The first pilot was with a small group of five fourth-year Geography and IT students from the University of Bristol. This first pilot provided an effective usability test, highlighting small errors and prompting some improvements to the mechanics of the system. It allowed an insight into how real experts might engage with the research instrument. It also tested the graphical user interface, the language used in relation to understanding the instruction, the ease of completion and generally the way in which the system worked, i.e. its intuitive nature. A second pilot was undertaken with a group of six staff engaged in technology-type roles within a Further Education college. This initiated further suggested changes and improvements. The third pilot involved a group of ten librarians working in an educational setting. The librarians were concerned less with the design and functionality of the system and more with the sense of the language, so this pilot tested the terminology used. Using librarians with expert knowledge that was pertinent to the areas that were being examined was a beneficial exercise which resulted in important changes to the substance of the questions. After all three pilots, it was decided that the Moodle system was technically fit for purpose and robust enough to be scaled up to cope with larger numbers of participants.

In addition to the benefit of being able to pilot the user interface, it was helpful to observe the data that was generated from all three pilots. This 'back-office' aspect of the data collection process was extremely useful. The automated collation of the data and its manipulation into readable content were also key advantages of the chosen system; they transformed the data into visually accessible charts that allowed analysis from a variety of viewpoints. Further benefits of the online Moodle Delphi were that: participants were able to log in securely; they were able to return to and check their answers prior to submitting them; they were able to view their completed answers online, and they were able to view the complete set of answers to the previous round.

As noted earlier, the Delphi study literature stresses how important the selection of

participants can be for a successful research exercise. For this study, a non-probability, purposive sampling approach was used. An initial list of possible participants, based on expertise profile, was compiled over a period of approximately six months. Indicators such as papers published and contributions to conferences were used to select experts according to their prominence within the field of Library and Information Science. A selection was also made of senior-level post-holders from universities. Participants were identified in the period during which the literature review was being undertaken. They were typically heads of departments or directors of library or research support services. A hundred people were identified as potential participants for the Delphi study; a profile of those selected is available at the beginning of the Findings chapter.

Each of the hundred potential participants received an individually addressed email rather than a blanket email, and this allowed a personal greeting to be included. Within the email a personal login and password were included, as was the link to the website for this study. On following the link and logging in, participants were given an outline of the research study. The letter of invitation to participants is available in Appendix 2. A further facility that was developed but, as it transpired, one that was not used, was an online forum. The intention here had been to allow participants the facility to communicate and discuss aspects of the study with one other.

A key challenge within the approach to the study was that of basing the Round Two questions on the responses to the Round One questions. Overall the study ran for a period of three months, and the amount of time allocated to organise it needed to be sufficient for the researcher to fully comprehend the results of Round One while at the same time not so long that interest among participants would wane between rounds.

3.6 Conceptual Framework

A conceptual framework is a tool used to construct an understanding both of the

different phenomena relevant to a piece of research and also of their relative organisational positioning. The conceptual framework is developed over the course of the study. This approach allows the relationships between different functions to be drawn graphically, and so provides a visual representation of the emergent situation within their context. According to Miles and Huberman:

A conceptual framework explains, either graphically or in narrative form, the main things to be studied – the key factors, constructs or variables – and the presumed relationships among them. Frameworks can be rudimentary or elaborative, theory-driven or commonsensical, descriptive or casual. (Miles and Huberman, 1994, p.18)

As material emerges from the literature and from the empirical data collection phase, it influences the conceptual framework. Themes emerging from the literature are considered in relation to current practice, and are in turn presented to experts as a series of challenges. Then, following analysis and discussion of these issues, a conceptual framework is developed.

The clear rationale for the use of the conceptual framework is to develop a perspective from which to view the various relationships within the topic of enquiry. The framework can be used to formulate questions about what might be happening now and in the future. It is the shifting relationship between the concepts in the framework – the various agencies and phenomena – that provide a basis for this study, an exploration of the implications of such shifts for the future of the academic library and its role in supporting research.

3.7 Conclusion

Having defined the major theoretical and philosophical domains of research, this chapter has outlined the researcher's positionality, with details of his biography including a résumé of his professional career. A logical sequence has in turn led to a rationale for the Delphi technique as the investigation method selected to address the research questions. To provide balance, the limits of the Delphi technique have also been considered. There was then a brief discussion of the conceptual

framework and how this could be useful in developing the means of viewing the overall relationships between the various entities and agencies within this research study. In addition, there now follows a brief consideration of the ethical dimension of this study.

The ethical considerations of any research should be calculated to avoid doing any harm. The empirical aspect of this research, the Delphi study, takes place online, so there is minimal potential for physical or psychological harm or distress to participants. The research raises no threats to participants' personal safety.

Following good practice, an outline was derived for how potential participants in the project were: (i) identified, (ii) approached and (iii) recruited. An explanation follows.

i) Potential participants were identified through their public profile as experts in the fields of librarianship and/or research management. The sampling frame used was non-probability sampling using purposive sampling. This is a common approach for Delphi studies and is justified through reference to a range of studies which have used similar approaches.

ii) Each potential participant was approached via a direct, individually addressed email to their work-based email address which was retrieved from a public website, for example a university website.

iii) All potential participants received a single email, addressed only to them, which briefly introduced the research, its aims and its methodology. A hyperlink, together with a unique username identity, directed participants to a secure website where, following a login process, they would gain access to further information and a series of questions which formed the first round of the Delphi study. Participants could log in and engage with the process at any time.

The process for obtaining informed consent was outlined to all participants. To gain access to the research questions in the online environment, participants were asked to read an informed consent statement (Appendix 1) and to agree (by ticking a box)

to the terms of informed consent. It was not possible to proceed unless consent was given in this manner.

To ensure appropriate protection for their well-being, participants were invited to enrol to the Delphi group using a username that was generated randomly by the system administration and was unique for each participant. The following measures were put in place to ensure appropriate confidentiality of personal data.

Participants' personal data amounted to: name, job title, employer, email address; in order to ensure appropriate confidentiality of personal data this was kept in one secure storage place. A master file which links participants' real names, email addresses and usernames has been kept and maintained only by the researcher.

Participants' identities cannot be revealed by their system usernames. The researcher remains the only person to hold the usernames of the participants, together with a master file of those who participated.

This concludes the Methodology chapter. The next chapter will outline in detail the findings from the Delphi study and this, in turn, will be followed by the Analysis and Discussion chapter.

CHAPTER Four – Findings

4.1 Introduction

The primary purpose of this chapter is to outline, organise and report the findings of the Delphi study. It also provides a brief summary of, and rationale for, the way in which these findings are analysed, and it further aims to identify any additional issues and explain any unexpected or inconsistent data.

The empirical aspect of the research, exercised through the Delphi technique, has yielded much rich data. This data can be described as qualitative insofar as it provides details of perceptions held by experts in relation to the themes, and although numeric techniques are used to analyse the data, as outlined in the Methodology chapter, the overall approach is qualitative. The data provides current and future insight into the overarching purpose of the study, and it is hoped that it provides some pertinent answers to the research questions from the perspective of the study's participants. The discussion provided in the following Analysis and Discussion chapter will illuminate the relationship between the theory, as represented in the literature, and the practice, as represented in the findings of the Delphi study.

The main body of the chapter is arranged around the themes identified by examination of the literature; this thematic arrangement differs from the sequence of the questions in Rounds One and Two of the online Delphi study. The findings are stated in a neutral way that informs the study and allows for deeper analysis and synthesis with the literature. Tables are integrated into findings and a full list of Round One questions as they appeared in the online Delphi system, together with all participant answers, is included in table format in Appendix 3, and a full list of responses to Round Two is provided in Appendix 4.

There are three main themes, each having a number of sub-themes which are

considered within their parent theme sections. The themes are all related to research support, and are categorised in Table 1 in Section 2.5 of the Literature Review chapter.

In the questionnaire, each question was allocated a theme from Table 1. Some data and questions did not fit neatly into only one theme, and where this was the case a subjective judgement was made. While such a categorisation process may be open to suggestions of inherent bias, the impact of any such bias is limited, because all themes and sub-themes are considered within the more detailed discussions of the following chapter. The questions were fairly evenly distributed across the themes, with Theme One having 20 questions, Theme Two 18 questions and theme three 14 questions.

There were three styles of inquiry in the online questionnaire which is reproduced in full in Appendix 3 and Appendix 4. The first invited participants to place a statement on a Likert scale, which included a 'don't know' option, and this was used for questions in Round One, Part A, Questions A1 and A2 and in Part B, for Questions B1, B2 and B3. The second style of inquiry used was prediction-based, developed from the work of Baruchson-Arbib and Bronstein (2002), and involved placing statements on a prediction axis that had four reference points: likely/desirable; likely/undesirable; unlikely/desirable and unlikely/undesirable. This approach was used in Round One, Part A Questions A3, A4 and A5 and in Part B Questions B4, B5 and B6. There was no 'don't know' option available for the prediction questions. The third style was used exclusively in Round Two, where the focus was on future scenarios. Participants were asked their view on what they thought was important now, in 5 years' time and in 10 years' time. For each time span they were given the task of ranking five statements in order of importance, and they could also choose to include one 'other' statement in their ranking. This is discussed in more detail below, under the Round Two Responses heading.

4.2 Participants

All 35 participants who took part in Round One of the Delphi study were identified as having an interest in library and research support issues. The participants comprised 15 males and 20 females. Eight of the 35 used the title Doctor and one used the title Professor, and 31 were either based at a university or used a university-affiliated email address. One worked in journal publishing, one was a consultant, one worked in the health service and one was unknown. An analysis of the participants' job titles yielded the following information: the words 'Director' or 'Associate Director' appeared in eleven participants' details; the word 'Librarian' appeared six times; the words 'Head of' appeared six times and the words 'research' or 'consultant' appeared eleven times.

One clear risk of using the Delphi technique, identified earlier on in the Methodology chapter, is that potentially a low number of responses may be received. As noted in that chapter, there is no consensus within the literature as to the optimum number of respondents (Hsu and Sandford, 2007). In considering the validity of this study it was anticipated that ten or more participants would generate enough data to provide an insight into the issues identified.

While 35 participants (R1n=35) completed Round One, this dropped to 24 (R2n=24) participants in Round Two, so the number of participants completing both rounds of the Delphi study was 24. In Round One, 35 participants answered 49 questions, which yielded 1,715 answers. In Round One, participants made a total of 41 comments, and in Round Two 24 participants ranked 18 statements and made 26 comments. Taking both rounds together, a total of 2,147 responses were provided, together with a total of 67 comments. Comments varied in length, the shortest being four words and the longest 370 words. The comments from both rounds amounted to a total of approximately 3,500 words. Not all participants commented.

There was an option to generate additional data through online interviews, and participants were asked to indicate whether they were prepared to be interviewed.

This question was included within the instrument, and 26 out of 35 participants agreed to take part in a further online interview. However, due both to resource constraints and also to the quantity and richness of the data that was collected, it was deemed unnecessary to proceed with the suggested online interviews. It would also have been possible, using the online Delphi system, to retrieve each participant’s questionnaire answers for Rounds One and Two. However, it was deemed unnecessary, for the purposes of this study, to add such a level of granularity to individual participants’ returns.

The relevant questions and related answers to each theme are described in this chapter in full, with any ambiguities noted and explained. For ease of identification, each question or statement is numbered according to the following convention: Round 1, Part A1, Question [A1.3].

For Part ‘A’ and Part ‘B’ of the data collection instrument, participants were asked to rate their own expertise in relation to the content of the statements. They could choose one of three options: ‘Focused on’, ‘Adjacent to’ or ‘Separate from’. The two pie charts below show how the expertise of the 35 participants in Round One is distributed across the three self-rating headings.

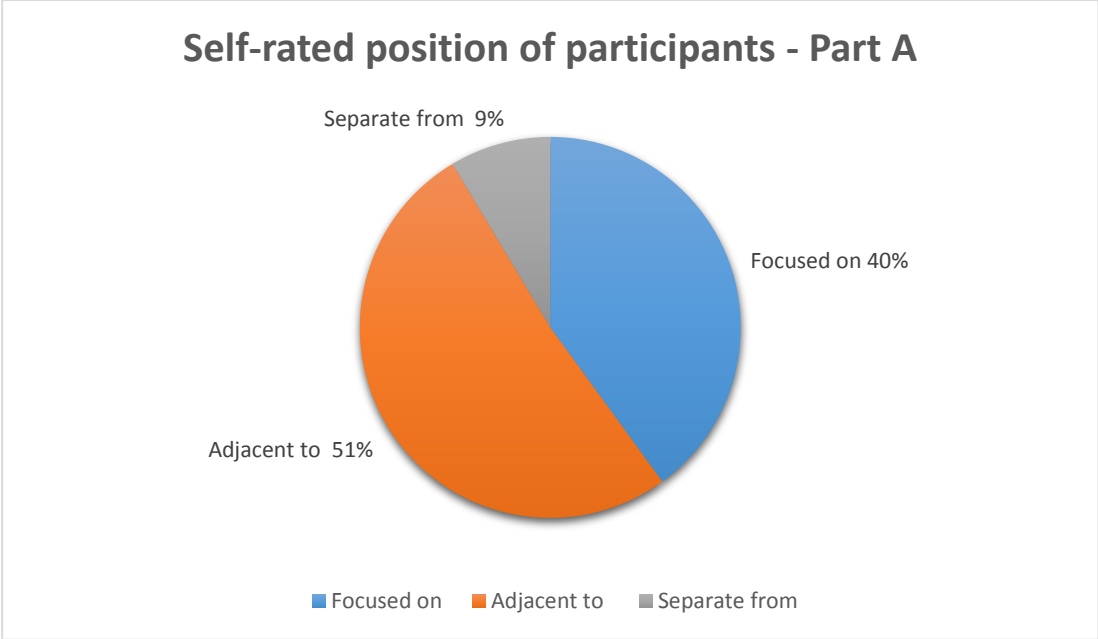


Figure 4. Respondents in Round One Part A

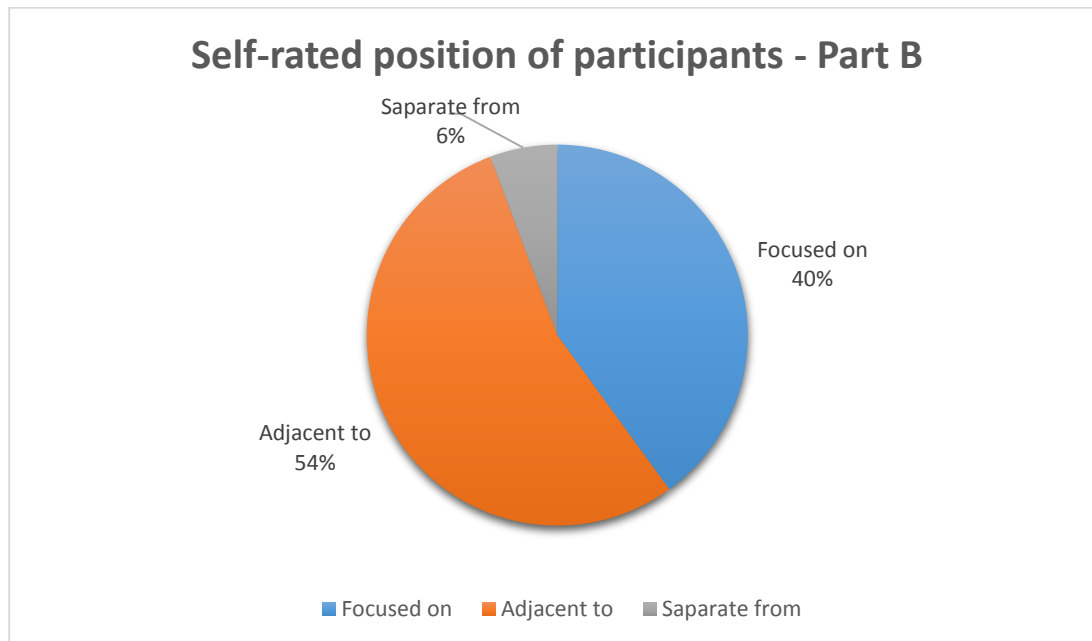


Figure 5. Respondents in Round One Part B

Narrative data has also been provided in the form of free text comments within each round of the survey, and this data is divided into two categories. First are the process-focused comments which relate to the process and structure of the research instrument; typically they relate to perceived ambiguity within the questions or statements, or to the participants' need to qualify their responses. Second are the theme-focused comments which relate to the content of the statements; these add to or qualify the participants' contributions. The theme-focused comments are found together in a separate section below, and in the following chapter they are discussed within their themes. Appendix 5 contains all comments from Rounds One and Two.

The participation rates outlined below are sufficient to suggest that the data collection process was valid. It was also anticipated that at least two rounds of the study would need to be completed to ensure that the issues were considered sufficiently. Enough data was generated from the first two rounds to provide

adequate materials for discussion across the themed areas of inquiry. Given this level of response, it is considered that the data is valid and represents enough viewpoints to merit further discussion.

4.2.1 Comments on the Research Instrument

All comments received through the two rounds of the Delphi study are recorded in Appendix 5. Before outlining the responses to the questions, it is useful first to look at the comments made by participants. In the section below, these comments are divided into two groups: comments that relate to each of the themes, outlined by theme, and comments relating to the structure and design of the online Delphi questionnaire. To begin with the latter, these comments can be seen to be useful in a number of ways: they provide the context within which participants understood and approached the questions; (where participants suggested the specific area was outside their area of knowledge they demonstrate the breadth of the subject}, and they also reveal the sense that, although they were regarded as practitioners and experts, some participants simply did not 'know' or feel able to comment on some issues.

The first aspect considered in examining the study was that of whether the participants were equipped to answer the questions. A small number of comments suggested that there were a few who struggled with some questions on the basis that their area of expertise lay too far from the focus. One participant expressed this well:

Although this isn't necessarily a main focus of my work, I have an understanding from two differing perspectives. Firstly, I am a researcher myself and therefore have some understanding from this perspective (though the majority of my research is practice-based rather than academic in focus). Secondly, I am involved in a number of projects relating to access to research, so stay abreast of developments relating to open access and institutional repositories. Participant 500

Another participant explained:

There are a few questions, especially around future developments in repositories that I didn't feel I could answer with any authority (3.4, 4.1) - but I had a go. It was hard to answer some questions as "researchers" aren't a homogenous bunch – but I've answered thinking about the majority.

Participant 510

Another participant noted:

I am not engaged directly in research support through an academic library. I am a publisher observer, engaged in providing publishing services to researchers via a professional set-up which is external to universities and academic libraries. I therefore have no role in university strategy or policy.

Participant 515

Another participant stated:

I have had some difficulty knowing how to answer some of these questions: I am fairly well informed about what is going on in my own institution, but I can't honestly say I know much about other institutions. Participant 575

I like the two-dimensional questions - they should yield some interesting answers - but in several cases my truthful answer is that things are neither desirable nor undesirable, simply neutral. Participant 575

Then there were those who felt that a 'don't know' option should have been included in some sections of the questionnaire:

The 'predictions' questions lack any 'don't know' indication, which would be useful. Participant 509

The predictions questions would have benefited with a "don't know" option.
Participant 561

I am not sure that my responses to Questions 3-5 are quite so binary. A don't know option would be useful or one which allows respondents to say 'it depends on the detail'. The majority of statements in Q5, for example, are dependent in my view on how much of this operates and what safeguards are in existence and so forth. I am not sure I find these unacceptable or undesirable per se and further not sure I am in a position to be categorical in terms of probability. Participant 518

There was also some clear criticism of the questionnaire design:

There's a good deal of uncertainty associated with the issues covered in Section A, and the questionnaire should have allowed respondents to reflect that. 'Don't know' (as in Qns 1 and 2 and others subsequently) is not the same thing as allowing the respondent to reflect uncertainty; and Qns 4 and 5 do not allow for any uncertainty at all. You should therefore allow for non-responses to some questions. Participant 558

This participant also commented on a specific question:

The last question under 4 is bizarre in equating peer review with the 'scholarly communication model'. Participant 558

Then there were those who found ways to overcome their uncertainty, as the following three comments illustrate:

The limited choice of answers forced me to state an opinion that might not be my real opinion. Participant 570

A lot of the above answers (e.g. on legislation, policy) are guesses.

Participant 506

I don't understand first question in A4. Participant 523

The following comment outlines a number of difficulties with the questionnaire. It is concerned primarily with the 'future-gazing' nature of the questions but also makes the point about the lack of reference to publishers:

Quite a difficult set of questions to give a definite answer to as future-gazing in this area is so difficult and dependent in many ways on outside influences - I wanted to answer possibly to a number and was surprised to see no mention of publishers explicitly as they are big players in this whole area.

Participant 550

This participant again (see earlier comment from participant 558 above) was critical of the questionnaire design:

The questions here are poorly conceived, and the options do not provide for all the possible answers. Many of my answers should be disregarded.

Participant 558

Another participant raised the issue of limited options:

The limited choice of answers forced me to state an opinion that might not be my real opinion. Participant 570

Round Two prompted fewer comments about the process, perhaps because it required a more straightforward ranking exercise, but again participants highlighted ways in which the survey could be answered and described the constraints of the online questionnaire tool:

6 only ticked because I had to! Participant 533

1 & 2 are equally important, but the software will not allow a tie.

Also Participant 533

Not sure what the difference between 1 and 2 is. Participant 570

I had to fill in 5 and 6 to return the questionnaire but I am not sure what was being asked so the answers not necessarily meaningful. Participant 570

While taking into consideration the nature of these participants' comments as they related to the whole dataset, the validity of the empirical data nevertheless remains intact. The number of complaints made regarding participants' inability to complete some questions is not deemed to have been too detrimental; in point of fact, such comments provide useful insight into the nature of the research challenge. One option might have been to remove from the study participants who had made the more negative comments outlined above, but this would have meant disregarding all of their data, and given the resources required to collect the data, and the high premium placed on it as a consequence, it was decided that excluding participants was not a viable option. Moreover, by including these comments it is possible to indicate the transparency of the process and the level of rigour that has been achieved within this framework. In defence of the design of the questionnaire, there are various arguments in favour of providing a 'don't know' option, particularly in the case of expert respondents. Indeed, it is argued here that greater validity has been gained through omission of the 'don't know' option where typically 'satisficers' would have used this option, Krosnick et al. (2002). These issues have been described in more detail in Chapter Three, which is concerned with research methodology.

4.3 Round One Responses: Theme One – Open Access Policy and Strategy

The open access theme, together with its policies and strategies, is of central

importance to this research study, and one of the aims of the study is to assess the impact that open access is having now, and will have in the future, across the changing research and library support relationships. Open access, as noted previously, is a key driver in changing working practices across the research landscape, and one which presents a range of challenges as well as solutions for the university and its research structures, processes and administration. For the purposes of this study’s empirical data collection, the term open access has been interpreted in its widest sense.

The open access policy and strategy theme can be seen as overarching in that it seeks to understand respondents’ attitudes to and knowledge of the policymaking environment in relation to the other themes. The questions in the Delphi study are intended to look at national policymaking and at policy that is evident more locally at university level; they also look, to a lesser degree, at strategy within departments.

The first of the statements, *Open research and open access are challenging areas for policymaking at a national (funding councils, funding bodies) level [A1.1]*, was answered positively, with 92% of respondents agreeing that open research and open access were challenging. Those who strongly agreed made up the majority (49%). Only 3% disagreed, and no respondents strongly disagreed.

Question A1	Strongly Agree	Agree	Don't know	Disagree	Strongly disagree	Total
A1.1 Open research and open access are challenging areas for policy-making at a national (funding councils, funding bodies) level	17 (9%)	15 (43%)	0	3 (9%)	0	35
A1.2 In the last 3 years there has been growing clarity about national policy for	4 (11%)	24 (69%)	1 (3%)	5 (14%)	1 (3%)	35

open access						
A1.3 Open research is a contentious issue within universities	7 (20%)	21 (60%)	3 (9%)	4 (11%)	0	35
A1.4 The policy issues associated with research outputs and open access are understood by university leaders	1 (3%)	8 (23%)	3 (9%)	21 (60%)	2 (6%)	35
A1.5 Gold and green open access are fully understood by those involved in research	0	2 (6%)	0	21 (60%)	12 (34%)	35

Table 3. Round One – Part A - Agreement Statements A1.1 to A1.5

The second statement, *In the last 3 years there has been growing clarity about national policy for open access* [A1.2], was also answered positively, with 80% of respondents being in agreement, the split being 69% ‘agree’ and 11% ‘strongly agree’. Those who disagreed with the statement made up 6%, with just one person, representing 3%, strongly disagreeing. In the ‘don’t know’ category one person (3%) was also recorded.

The third statement suggested that *Open research is a contentious issue within universities* [A1.3]. Those who agreed with this statement made up 80% of the responses, with 20% strongly agreeing. The percentage of those who disagreed was 11%, although none strongly disagreed. Three participants, representing 9%, chose the ‘don’t know’ option.

When asked about leaders’ understanding of policy issues in the statement, *The policy issues associated with research outputs and open access are understood by university leaders* [A1.4], 66% of respondents disagreed, with 6% strongly disagreeing. Just one person, representing 3%, strongly agreed with this statement.

Three participants, representing 9%, stated that they did not know.

The remaining statement in this set, *Gold and green open access are fully understood by those involved in research* [A1.5], prompted a significant amount of disagreement. Of the 94% of participants who disagreed, 34% strongly disagreed, and only two participants, representing 6%, agreed with the statement.

Moving to the second set of questions in Round One, Part A, Question A2, three statements were seen to be directly relevant to the Policy and Strategy theme. The statement, *Those responsible for research at a strategic level within colleges and universities fully appreciate the importance of Research Data Management (RDM)* [A2.1], was answered mainly in the negative, with 60% disagreeing and of these 9% strongly disagreeing. Of the 11% who agreed, none strongly agreed. There were three participants, representing 9%, who chose the ‘don’t know’ option.

Question A2	Strongly Agree	Agree	Don't know	Disagree	Strongly disagree	Total
A2.1 Those responsible for research at a strategic level within colleges and universities fully appreciate the importance of Research Data Management (RDM)	0	11 (31%)	3 (9%)	18 (51%)	3 (9%)	35
A2.2 The role of supporting RDM is clearly defined within colleges and universities	0	0	2 (6%)	24 (69%)	9 (26%)	35
A2.3 Everyday tasks associated with RDM are understood by researchers	0	3 (9%)	3 (9%)	21 (60%)	8 (23%)	35
A2.4 The policy issues related to RDM and open access are understood by	0	0	4 (11%)	20 (57%)	11 (31%)	35

researchers						
A2.5 Most researchers are aware of the potential impact of open access on scholarly communications	1 (3%)	9 (26%)	3 (9%)	18 (51%)	4 (11%)	35

Table 4. Round One – Part A - Agreement Statements A2.1 to A2.5

A closely related statement in the Policy and Strategy area, *The role of supporting RDM is clearly defined within colleges and universities* [A2.2], received an overwhelmingly negative response, with 94% of participants disagreeing, and of these 26% strongly disagreeing. Neither of the two participants remaining, representing 6%, agreed; both chose the ‘don’t know’ option. In effect, all participants who felt able to respond disagreed with this statement.

Participants were asked to consider researchers’ knowledge of policy issues in the statement, *The policy issues related to RDM and open access are understood by researchers* [A2.4]. Again, the response was predominantly negative, with 57% disagreeing and 31% strongly disagreeing. None of the participants agreed and 11%, four participants, chose the ‘don’t know’ option.

In Round One, Part A, Question A2, the focus was on the impact of open access: *Most researchers are aware of the potential impact of open access on scholarly communications.* [A2.5] The response was split, with 51% of participants disagreeing and a further 11% strongly disagreeing. Nine people, representing 26% of participants, agreed, and just one person strongly agreed. The remaining three participants opted for ‘don’t know’.

Question B1	Strongly Agree	Agree	Don’t know	Disagree	Strongly disagree	Total
B1.1 Academic libraries have the potential to play a greater role in	27 (77%)	6 (17%)	1 (3%)	1 (3%)	0	35

supporting research						
B1.2 Developments in scholarly communication influence the direction of the academic library	21 (60%)	11 (31%)	2 (6%)	1 (3%)	0	35
B1.3 Academic library leaders are closely involved with wider institutional research strategies	5 (14%)	18 (51%)	3 (9%)	9 (26%)	0	35
B1.4 The future of the library is an issue that is discussed within universities	1 (3%)	19 (54%)	4 (11%)	11 (31%)	0	35
B1.5 Those responsible for research administration understand the library function	0	12 (34%)	3 (9%)	19 (54%)	1 (3%)	35

Table 5. Round One – Part B - Agreement Statements B1.1 to B1.5

The results for Round One, Part B are outlined as follows. The first statement, *Academic libraries have the potential to play a greater role in supporting research* [B1.1], received a positive response. Of the 35 respondents, 77% strongly agreed and 17% agreed, and of the remaining two, representing 6%, one disagreed while the other chose the ‘don’t know’ option.

The statement in Section B1, *Developments in scholarly communication influence the direction of the academic library* [B1.2], received a positive response. Those who strongly agreed made up 60% and those who agreed made up 31%. One participant disagreed and two people (6%) chose the ‘don’t know’ option.

The statement on library leadership behaviour, *Academic library leaders are closely involved with wider institutional research strategies* [B1.3], received a

predominantly positive response, with 65% of participants agreeing and 14% of these agreeing strongly. Of the remaining participants, 26% of participants disagreed and 9% opted for 'don't know'.

The suggestion that *The future of the library is an issue that is discussed within universities* [B1.4] received agreement from 54% of participants, with one person strongly agreeing. A further 31% of participants disagreed, and four chose 'don't know'.

In Round One, Part B, Question B2, two of the four statements were directly relevant to the theme of open access and library leadership. The first was *Library leaders are confidently repositioning the library to support the open research agenda* [B2.2]. There was a relatively even response to this statement, with 49% of participants agreeing and 6% agreeing strongly, making the total of those in agreement 55%. The total of those who disagreed came to 37%, with 34% disagreeing and 3% disagreeing strongly. A total of 9% was recorded for the 'don't know' option.

The next statement, *Issues associated with open research and open access are well-understood by library leaders* [B2.3], received a positive response, with 51% of participants agreeing and a further 26% strongly agreeing, making the total of those in agreement with the statement 77%. Conversely, 14% disagreed and 1% disagreed strongly. The number of participants who chose 'don't know' was two, equalling 6%.

Question B2	Strongly Agree	Agree	Don't know	Disagree	Strongly disagree	Total
B2.1 The role of the university library in supporting research is well understood	1 (3%)	15 (43%)	0	18 (51%)	1 (3%)	35
B2.2 Library leaders are confidently repositioning the library to support the open research	2 (6%)	17 (49%)	3(9%)	12 (34%)	1 (3%)	35

agenda						
B2.3 Issues associated with open research and open access are well understood by library leaders	9 (26%)	18 (51%)	2 (6%)	5 (14%)	1 (3%)	35
B2.4 The academic library is well placed institutionally to participate in the research lifecycle	8 (23%)	21 (60%)	0	5 (14%)	1 (3%)	35

Table 6. Round One – Part B - Agreement Statements B2.1 to B2.4

4.4 Round One Responses: Theme Two – Scholarly Communication

The second theme identified from the literature and used here as a category for the empirical data is Scholarly Communication. Within this there are three further sub-themes: RDM, institutional repositories and bibliometrics. The first statement considered directly relevant to Theme Two, on Scholarly Communication, appears in Section A3.

The statement, *Costs associated with research dissemination will impede scholarly communication* [A3.3], was considered undesirable by an overwhelming 97% of participants. Within this group, 66% thought the statement a likelihood, while 31% thought it unlikely.

The statement on change in scholarly communication, *The scholarly communication model (i.e. peer review) will undergo radical change* [A4.4], revealed that 34% thought it likely and desirable and 37% that it was unlikely and desirable. Those who thought it likely and undesirable made up 6%, while 23% thought it unlikely and undesirable.

As an example of a possible change in this area, the statement *Most academic researchers will operate directly with business and independently of universities* [A5.1] revealed that 80% of respondents thought this unlikely and undesirable and that 9% thought it likely and undesirable.

The statement *Direct publishing to the web by academics will mean university presses will no longer be viable* [A5.2] provided a response of 57% who considered it unlikely and undesirable, 20% who thought it likely and undesirable and a further 17% who thought it likely and desirable.

4.4.1 Research Data Management

In Round One, Part A, Question A2, the response to the statement, *Everyday tasks associated with RDM and open access are understood by researchers* [A2.3], prompted 60% of participants to disagree and a further 23% to disagree strongly. With 9% agreeing and none strongly agreeing, a remaining 9% selected the ‘don’t know’ option.

Prediction Questions A3	Likely/ desirable	Likely/ undesirable	Unlikely/ desirable	Unlikely/ undesirable	Total
A3.1 Researchers will get closer to and more involved in data management activities	22 (63%)	0	13 (37%)	0	35
A3.2 All those involved in research will understand the implications of RDM	15 (43%)	0	20 (57%)	0	35
A3.3 Costs associated with research dissemination will impede scholarly communication	0	23 (66%)	1 (3%)	11 (31%)	35
A3.4 Institutional repositories will begin to form consortia	12 (34%)	1 (3%)	9 (26%)	13 (37%)	35

Table 7. Round One – Part A - Agreement Statements A3.1 to A3.4

In Prediction Questions A3, participants were asked to predict, within the context of a two-year timescale, whether statements were ‘likely’ or ‘unlikely’ and whether they felt they were ‘desirable’ or ‘undesirable’.

In response to the statement, *Researchers will get closer to and more involved in data management activities* [A3.1], the responses gave an indisputable sense that this was desirable, as there was a 100% positive return. Of these responses, 63% thought it would be likely while 37% said it was unlikely.

The statement, *All those involved in research will understand the implications of RDM* [A3.2], also drew a 100% positive response as a desirable outcome within the two-year period. However, 57% of participants thought it would be unlikely and a lower percentage at 43% that it would be likely.

Prediction Questions A4	Likely/ desirable	Likely/ undesirable	Unlikely/ desirable	Unlikely/ undesirable	Total
A4.1 The majority of institutional repositories will be linked according to subject discipline	6 (17%)	1 (3%)	19 (54%)	9 (26%)	35
A4.2 Funding will be dependent on researchers' re-use of their own or others' data	12 (34%)	2 (6%)	4 (11%)	17 (49%)	35
A4.3 Bibliometrics will have a greater influence on the research agendas of institutions	14 (40%)	16 (46%)	1 (3%)	4 (11%)	35
A4.4 The scholarly communication model (i.e. peer review) will undergo radical	12 (34%)	2 (6%)	13 (37%)	8 (23%)	35

change					
--------	--	--	--	--	--

Table 8. Round One – Part A - Prediction Statements A4.1 to A4.4

In the prediction section set within the five-year timeframe, the statement, *Funding will be dependent on researchers' re-use of their own or others' data* [A4.2], there was a slightly stronger sense that this was undesirable, with 55% of participants selecting this option against the 45% who thought it desirable. As for likelihood, 60% thought it unlikely and 40% likely.

Prediction Questions A5	Likely/ desirable	Likely/ undesirable	Unlikely/ desirable	Unlikely/ undesirable	Total
A5.1 Most academic researchers will operate directly with business and independently of universities	1 (3%)	3 (9%)	1 (3%)	30 (80%)	35
A5.2 Direct publishing to the web by academics will mean university presses will no longer be viable	6 (17%)	7 (20%)	2 (6%)	20 (57%)	35
A5.3 Legislation across national borders will prevent large amounts of research data from being shared globally	1 (3%)	22 (63%)	0	12 (34%)	35
A5.4 Research data will be stored and made accessible independently of 'published papers'	30 (86%)	1 (3%)	2 (6%)	2 (6%)	35

Table 9. Round One – Part A - Prediction Statements A5.1 to A5.4

The statement *Legislation across national borders will prevent large amounts of*

research data from being shared globally [A5.3] was seen to be likely but undesirable by the majority, at 63%.

In the prediction section set within the ten-year time frame, the statement *Research data will be stored and made accessible independently of ‘published papers’* [A5.4] achieved an 86% approval as both a likely and desirable outcome. Those who thought it was likely and undesirable amounted to 3%, with those who thought it was unlikely and desirable, and also those who thought it was unlikely and undesirable, each coming to 6%.

Prediction Questions B4	Likely/desirable	Likely/undesirable	Unlikely/desirable	Unlikely/undesirable	Total
B4.1 Library strategy will shift towards supporting research data management	30 (86%)	2 (6%)	2 (6%)	1 (3%)	35
B4.2 Librarians will add value (e.g. enhance discoverability) to research data	25 (71%)	1 (3%)	8 (23%)	1 (3%)	35
B4.3 Universities will have effective institutional repositories	23 (66%)	1 (3%)	10 (29%)	1 (3%)	35
B4.4 The RDM function will fall within the remit of a dedicated research support unit	15 (43%)	6 (17%)	8 (23%)	6 (17%)	35

Table 10. Round One – Part B - Prediction Statements B4.1 to B4.4

In considering the two-year timescale, the statement relevant to Theme One, on Policy and Strategy, was: *Library strategy will shift towards supporting Research Data Management* [B4.1]. Those responding that this was likely/desirable made up 86%. The remainder of the responses were split between likely/undesirable at 6%, unlikely/desirable at 6% and unlikely/undesirable at 3%.

In Part B, the statement, *The RDM function will fall within the remit of a dedicated research support unit* [B4.4], received a fairly even response. Those who thought this likely and desirable amounted to 43%, while the percentage of those who thought it likely and undesirable was 17%, giving a total of 60% who thought it likely. Against this there were 23% who thought it unlikely but desirable and 17% who thought it both unlikely and undesirable; a total of 34% thought the prediction undesirable.

Prediction Questions B5	Likely/ desirable	Likely/ undesirable	Unlikely/ desirable	Unlikely/ undesirable	Total
B5.1 Researchers and librarians will work together closely at many points on the research lifecycle	16 (46%)	0	16 (46%)	3 (9%)	35
B5.2 Large datasets will become de facto electronic libraries managed by specialists	19 (54%)	4 (11%)	8 (23%)	4 (11%)	35
B5.3 The role of research data management will be central to the academic library	16 (46%)	0	11 (31%)	8 (23%)	35
B5.4 The curation and aggregation of research data will occur across / between different academic institutions	18 (51%)	1 (3%)	14 (40%)	2 (6%)	35

Table 11. Round One – Part B - Prediction Statements B5.1 to B5.4

In Section B5, concerning a prediction for five years’ time, two statements are relevant to the RDM sub-theme. The first, *The role of Research Data Management will be central to the academic library* [B5.3], found 54% of participants considering it unlikely, 31% that it was unlikely but desirable and 23% that it was unlikely and undesirable. To balance this, 46% suggested that it was likely and desirable.

Notably, none of the participants thought this a likely yet undesirable outcome.

The second statement in this section was: *The curation and aggregation of research data will occur across/between different academic institutions* [B5.4]. The participants were markedly in agreement with this statement, with 91% concurring that it would be a desirable outcome. In terms of its likelihood, however, while 54% of participants considered it likely, 46% thought it unlikely to be the case in five years' time.

Prediction Questions B6	Likely/ desirable	Likely/ undesirable	Unlikely/ desirable	Unlikely/ undesirable	Total
B6.1 Most RDM tasks will be fully automated which will obviate the need for librarians	5 (14%)	2 (6%)	13 (37%)	15 (43%)	35
B6.2 Use of content sourced from open institutional repositories will surpass content sourced from behind pay-walls	13 (37%)	2 (6%)	17 (48%)	3 (9%)	35
B6.3 Licensing and IPR (Intellectual Property Rights) issues associated with research data will be challenging	4 (11%)	28 (80%)	1 (3%)	2 (6%)	35
B6.4 With technology delivering intelligent solutions the academic library will be in decline	3 (9%)	6 (17%)	0	26 (74%)	35
B6.5 Costs associated with the academic library will be reduced significantly through use of open access material	5 (14%)	0	28 (80%)	2 (6%)	35

Table 12. Round One – Part B - Prediction Statements B6.1 to B6.5

Section B6, looking to the position in ten years' time, considered the statement, *Most RDM tasks will be fully automated, which will obviate the need for librarians* [B6.1]. The response suggested that this was an unlikely prediction, with 80% of participants choosing one of the 'unlikely' combinations and there being a fairly even distribution, within this, between desirable (37%) and undesirable (43%). Of the 20% of participants who deemed it a likely outcome, 14% said that it was desirable and 6% that it was undesirable.

For the statement, *Licensing and IPR (Intellectual Property Rights) issues associated with research data will be challenging* [B6.3], there was 80% agreement that this was likely and undesirable; 11% agreed that it was likely and desirable.

Within the ten-year timescale, the statement relevant to Theme One, on Policy and Strategy, was: *With technology delivering intelligent solutions, the academic library will be in decline* [B6.4]. Those responding unlikely/undesirable made up 74%, those responding likely/undesirable made up 17% and a further 9% chose the likely/desirable option.

4.4.2 Institutional Repositories

The statement on the future development of institutional repositories, *Use of content sourced from open institutional repositories will surpass content sourced from behind pay-walls* [B6.2], found 37% of respondents thinking that it was likely and desirable, 48% that it was unlikely and desirable, 6% that it was likely and undesirable and 9% that it was unlikely and undesirable.

The statement, *Institutional repositories will begin to form consortia* [A3.4], was thought to be desirable by 60% of participants. Within this result opinions were polarised, with 34% suggesting that it was a likely and desirable outcome and 37% that it was unlikely and undesirable.

The closely related statement, *The majority of institutional repositories will be linked according to subject discipline* [A4.1], was considered unlikely by 80% of participants. A high proportion of these 54% suggested that this was desirable but unlikely, and 26% agreed that it was unlikely but also considered it undesirable. A total of 17% participants considered it likely and desirable.

A further statement exploring institutional repositories, *Universities will have effective institutional repositories* [B4.3], found that 66% thought it likely and desirable while 29% thought it desirable but unlikely.

4.4.3 Bibliometrics

The single statement on this area, *Bibliometrics will have a greater influence on the research agendas of institutions* [A4.3], identified 46% participants who said that this was likely and undesirable and 40% who said that it was likely and desirable, 86% in total believing it was likely.

4.5 Round One Responses: Theme Three – The Role of the Library

The third theme to be explored was the role of the library. Within this there were two sub-themes, library positioning (and perception) for research support and also library skills set and workforce development.

The statement which explored research administrators' understanding of the library, *Those responsible for research administration understand the library function* [B1.5], prompted 54% responses that disagreed and 34% that agreed, while 9% did not know.

A similar statement, *The role of the university library in supporting research is well-understood* [B2.1], received a similar response, with 51% of participants disagreeing and one strongly disagreeing.

The statement suggesting that *The academic library is well placed institutionally to participate in the research lifecycle* [B2.4] found 83% in agreement, and of these, eight participants strongly agreed.

Question B3	Strongly Agree	Agree	Don't know	Disagree	Strongly disagree	Total
B3.1 Researchers appreciate the services provided by the library	8 (23%)	22 (63%)	3 (9%)	2 (6%)	0	35
B3.2 Librarians are well placed to carry out the task of digital curation and research data management	6 (17%)	19 (54%)	3 (9%)	6 (17%)	1 (3%)	35
B3.3 Librarians need to adapt or extend their skills to deal with open data	20 (57%)	14 (40%)	0	1 (3%)	0	35
B3.4 The research support role is a contentious issue within universities	3 (9%)	13 (37%)	8 (23%)	10 (29%)	1 (3%)	35
B3.5 Librarians lack the information technology skills to support 'Big Data' effectively	9 (26%)	18 (51%)	2 (6%)	6 (17%)	0	35

Table 13. Round One – Part B – Agreement Statements B3.1 to B3.5

The statement, *Researchers appreciate the services provided by the library* [B3.1], was supported by a majority of 86%, with just 6% disagreeing and a further 9% choosing the 'don't know' option.

The statement exploring whether *Librarians are well placed to carry out the task of digital curation and research data management* [B3.2] received considerable support, with 54% agreeing and a further 17% strongly agreeing. Those disagreeing made up 20%.

The statement suggesting that *Librarians need to adapt or extend their skills to deal with open data* [B3.3] received almost unanimous agreement, with just one participant disagreeing. Of the 97% who agreed, 57% did so strongly.

The broad statement, *The research support role is a contentious issue within universities* [B3.4], saw a relatively high number (23%) of participants choosing the 'don't know' option. Those who agreed amounted to 48% and those who disagreed to 32%.

The statement exploring specifically the areas where skills were needed, *Librarians lack the information technology skills to support 'Big Data' effectively* [B3.5], received 77% agreement, while 17% disagreed and 6% did not know.

For the statement suggesting that *Librarians will add value (e.g. enhance discoverability) to research data* [B4.2], 71% thought this both likely and desirable, while 23% agreed that it was desirable but nevertheless thought it unlikely.

In the five-year timescale, the statement relevant to Theme One on Policy and Strategy was: *Researchers and librarians will work together closely at many points on the research lifecycle* [B5.1]. Those responding that this was likely/desirable made up 46%, and those that it was unlikely/desirable also made up 46%, so the statement that this would be desirable was supported by 92%, with just 3 participants opting for unlikely/undesirable.

The statement exploring whether *Large datasets will become de facto electronic libraries managed by specialists* [B5.2] prompted 65% to say that this was likely, with 77% agreeing that it was also desirable.

The statement suggesting that *Costs associated with the academic library will be reduced significantly through use of open access material* [B6.5] was thought by 80% of participants to be desirable but unlikely.

4.6 Round Two Responses

The Second Round of the Delphi study presented the participants with three ranking-type questions. The statements were informed by the responses to Round One and took an approach which sought to narrow the area of inquiry in order to focus on the important aspects of the themes and to reflect a sense of the urgency associated with each of the themes.

It is important to note that, of the 35 respondents who participated in Round One, the number who participated in Round Two was reduced to 24. The full dataset of responses to Round Two appears in Appendix 4.

The first group of statements focused on the present and asked participants to identify which issues they felt were currently most important. The second focused on a point five years into the future and offered a series of statements relating to this period. The third asked participants to look further into the future, ranking statements about the importance of issues in ten years' time.

The statements were ranked by the participants in order of perceived importance; that is to say participants considered each statement and ranked it first as the highest in importance, second as next highest and so on, the least important being ranked in sixth place. The ordinal data from Round Two has been analysed and presented in Table 3, Table 4 and Table 5 below, based on the data returned and recorded in Appendix 4.

The mathematical method used to assign an overall position in the rankings will now be explained. To provide a collated representation of all responses, i.e. the overall group response, each individual statement was scored according to the frequency of '1st' ranks from all respondents. For each statement the number of 1st, 2nd, 3rd, 4th, 5th and 6th rankings were counted, the sum of this count becoming the multiplicand. For each rank a multiplier was used to separate the data. For 1st rank the multiplier was 6; for 2nd it was 5; for 3rd it was 4; for 4th it

was 3; for 5th it was 2 and for 6th it was 1. For example, if a statement was ranked in 1st place by five participants, then the calculation would be based on five participants' ranks multiplied by the multiplier 6 for a first-place rank, and would receive a score of 30 points.

Participants were allowed to choose the content for one 'other' option and then to rank this in their return. The content of each 'other' option is outlined in the appropriate section below. It should be noted that the majority (88%) of respondents' 'other' comments were ranked 6th in each time frame: present time, five years' time and ten years' time.

Question 1 explored the current situation and asked participants to rank the optional statements in order of most to least important. The results of this exercise are outlined below and provide the rankings across all 24 responses:

Rank	Present time statements	Score*
1 st	Developing capacity in institutions to manage research data	118
2 nd	Effective policymaking in areas associated with open research	94
3 rd	Increasing the data management skill levels of researchers	93
4 th	Ensuring librarians and researchers work together effectively	92
5 th	Clarifying the role of the library in relation to research support	74
6 th	Other	33

Table 14. Ranking of statements on present time issues

Ranked highest was the statement, *'Developing capacity in institutions to manage research data'*, which scored 118 points. Ranked second highest, with 94 points, was *'Effective policymaking in areas associated with open research'*. Ranked in third place, with 93 points, was *'Increasing the data management skill levels of researchers'*. Ranked in fourth position with 92 points was the statement *'Ensuring librarians and researchers work together effectively'*. The second, third and fourth options are ranked closely together. The statement *'Clarifying the role of the library*

in relation to research support' took fifth position.

The 'other' option in this section of the Round Two questions included the following comments:

Nothing else to add really. Participant 518

Establishing costs of RDM and how it is paid for. Participant 523

Clarifying the funding bodies approaches to RDM. Participant 528

Hard question. Depends whose point of view you are adopting. I might have put other top, and put researchers' awareness/ attitudes rather than skills.
Participant 532

6 only ticked because I had to! Participant 533

Ensuring the University has an effective support system for researchers.
Participant 554

Working with RCUK (Research Councils UK) and other bodies using data to agree method to synchronise/bulk upload to avoid duplicate hand or auto updates and the cost of this to tax payer as well as the level of mistrust and confusion over correct versions. Participant 570

Re clarifying the role of the library in relation to research support I just did a short session on this at SCONUL on Thursday and plan to follow up with ARMA (Association of Research Managers and Administrators). Happy to discuss. Participant 570

Financing open research and open access in a sustainable way. Where does or should the funding come from (government, research councils, institutions or individual academics) and where does it go (universities, repositories or publishers)? What about the gaps - research conducted without research council funding, academics outside universities, open access journals which don't charge APCs (Article Processing Charge)?
Participant 582

The situation expected in five years' time was explored in Question 2 which asked experts to rank a series of statements in the order they considered most to least important. The results for this second question are outlined below and provide the rankings across all 24 responses:

Rank	Five years' time statements	Score*
1 st	An effective open scholarly communications mode	124
2 nd	An effective research funding model	116
3 rd	Increasing the data management skill levels of librarians	79
4 th	Sharing research outputs across institutional repositories	77
5 th	Repositioning the library to respond to research support issues	73
6 th	Other	35

Table 15. Ranking of statements on issues in five years' time

General and other comments were recorded as follows:

My only caveat is that 5 years is too long almost for any realistic assessment of what will be important – depends how preparations for REF 2020 pan out to be frank. Participant 518

Inclusion of RDM approaches in further research assessment exercises. Participant 528

I might have put "other" and emphasised not just research funding but also incentives structures. Participant 532

The terminology is distinctly 'library' scholarly communications means 'making research outputs available' in my head but perhaps it does not in the context above. I can't really make sense of prioritising the issues above. What does 'effective research funding model' mean in this context? I've

marked it 6 as I don't know what is meant. Participant 570

It is vital that the library is positioned to respond to research support issues but I would hope that this will happen before 5 years' time. Indeed, our library has been doing this for several years already and will continue to do so. Participant 575

I think teaching will continue to be the main focus of academic library work. Some repositioning towards research support is already happening and I think this will be needed sooner than 5 years from now. Similarly, to have significant impact when it is most needed (i.e. whilst researcher data management skills are still being developed), I think the data management skill levels of librarians specialising in research support need to be a priority now. Participant 582

Not exactly an effective research funding model, but rather an effective publishing and research selectivity model... Participant 600

The expected situation in ten years' time was explored in Question 3, which asked experts to rank, in order of the most important to them, the following statements:

Rank	Ten years' time statements	Score*
1 st	Scholarly communication and models of academic publishing	113
2 nd	Models for funding research	105
3 rd	The open research agenda	99
4 th	Preservation of research data	88
5 th	The role of the academic library	68
6 th	Other	31

Table 16. Ranking of statements on issues in ten years' time

General and 'other option' comments were as follows:

A development of the answer to 4 above - in 10 years' time we will have REF 2020 results and so on - that will have an enormous impact on the research landscape. Participant 518

Difficult to say at this point. Participant 528

other could be engagement of research with publics / impact. Participant 532

6 only ticked because I had to! Participant 533

We hope that many of the 10 year issues will be solved by then! Participant 554

Not sure what the difference between 1 and 2 is. I had to fill in 3-6 to return the questionnaire but my answers to that don't mean anything clear here..... Participant 570

Other - data synchronisation as per 2. Participant 570

I'm struggling a bit to decide how to answer these. If we are looking at the bigger picture then things like scholarly communications models and the open research agenda will be more significant than the interests of a single stakeholder group (such as the academic library). If this is about me, then my day-to-day life is more directly bound up in the role of the academic library and the wider environment takes a back seat. Participant 575

Potential for further disruptive innovations in scholarly communication / publishing and for the commoditisation of "open research" in new ways. I think the role of research in other library sectors (e.g. access to research in

public libraries or health libraries) will also be a priority, facilitating public access to research outputs and providing opportunities for cross-sector collaboration by libraries. Participant 582

Indexing and retrievability of data. In 10 years there's going to be skads of this material. Given the issues today around identification and location of research literature which is far more readily understandable by most people, data is far more arcane and mysterious (and often formatted in a way only PIs (Principal Investigators) and original researchers understand). I fear we'll have a morass of information that we labour hard to store, preserve and make accessible....and that no one quite understands what it is. Participant 587

I feel as though in answering these questions I am being forced to imply that libraries are not so important - this is not so, it is just about dependencies. So without funding models none of us have money, issues like preservation need shared collaborative approaches for support so libraries as important and are part but not all of the picture. Participant 602

4.7 Comments Arranged by Theme

Inviting participants to comment throughout the questionnaire allowed the generation of contextual data relevant to each theme. Comments relating to the design and implementation of the study were outlined earlier in this chapter, and in the following section comments on the substance of the questions are arranged by appropriate theme. Choosing a theme for each comment was achieved simply by reading the comment and judging which theme was most appropriate; no automated tools or system were required, because the amount of data was of a manageable size. Also, the comments were made in the context of the overall questionnaire, for example at the end of Section A in Round One and at the end of Round Two, providing pointers to the purpose of the comments.

4.7.1 Theme One – Open Access Policy and Strategy

The clarity of research policy was a concern for this participant, whose comments extend to copyright, embargo periods and disciplinary boundaries:

A1 Research Policy: I think there has been an increased clarity that open research is desired by policy makers and funders, but not necessarily a clarity on how this will be delivered. Over the last 12 months, OA policy requirements have failed to reach a consensus on embargo periods, deposit requirements and how repositories will work together to reduce the administrative burden on academics. Participant 512

The above lack of clarity, and a general lack of awareness of open access options, copyright generally and the costs of research across the academic community, as well as an innate reluctance to work towards any "one-size-fits-all" solution across disciplinary boundaries appear to be the main reasons for an (often misplaced) suspicion or concern from academic colleagues. Participant 512

The issue of resources planning was raised in these comments on general policy:

A2: Whilst some lip service from senior levels outside of library services has been played as to the importance of engaging with RDM, I do not believe this has been matched by the provision of resources internally to deliver upon this - and in our institution this has seen a long term battle to get that resource confirmed and in place. Similarly, whilst the awareness of the value of data is there in many areas this is still not backed up by a willingness to engage with the extra initial effort required, in part due to perhaps an underestimation or lack of certainty of any pay-off or future benefit of doing so. Participant 512

This participant noted the scale of resource planning and the pace of change while

differentiating some aspects of the research lifecycle:

Rate of change of policy and practice, nationally and internationally, in this area is significant. OA to outputs has a head of steam; RDM is only just beginning. Participant 522

At the same time this participant drew attention to variation among researchers and warned against linking RDM with open access:

I disagree with some of the wording of the questions, e.g.

- I think the variation among researchers about their understanding of RDM is extremely high and likely to continue

- I am not sure open access and RDM should be as closely linked as sometimes implied by the questions. Participant 532

A similar comment was made by this participant:

For many of these statements 'some' academics and researchers are very aware of issues relating to research data management and open access, but many are not. This ambiguity was difficult to reflect using these scales.

'Don't know' is also problematic because often I do know and the answer is 'yes and no'! Participant 595

The following is a locality-specific comment outlining one approach taken:

I have little impact on this area at university X, save at department level, where I'm trying to get these issues on the agenda and understood by faculty and researchers. University X faculty have the sense that they are above legislation, policy, in fact any sort of constraints. They expect the library or other support staff to deal with this stuff for them. Participant 578

The variation in researchers' approaches was reflected also in this comment:

Researchers' views and understanding of OA vary widely across disciplines - generally more aware and supportive in STEM (Science, Technology, Engineering and Maths), less so in humanities where publications take much longer to develop. Participant 574

One comment, broad in its scope, draws various aspects together coherently:

Overall, I think current practice in all areas of research data management and open access is patchy, with some examples of excellent practice significantly outnumbered by poor or neutral practice in these areas. I would like to believe that there will be radical change in scholarly communication models, but fear that the current system is too deeply embedded to shift significantly. I think that the commercial publishers which currently dominate scientific communication will continue to find ways to maintain their position. I think that open access models based on author processing charges will have a detrimental effect on scholarly communication, particularly for researchers who are outside the academy, in the early part of their career or in institutions with smaller or less effectively managed publication funds. I also think that there is a danger that an over-reliance on quantitative measures of researcher output (eg bibliometrics or analysis of data re-use statistics) will inhibit some research which may have other types of impact. Participant 582

4.7.2 Theme Two – Scholarly Communication

The comments relating to scholarly communication were focused on institutional repositories, peer review and research data management. No comments were made on bibliometrics. It was interesting to note the number of comments on university presses in relation to institutional repositories.

Starting with institutional repositories, this comment anticipates the technical challenges as well as the way in which repositories will be used to comply with open

access policies.

A4: The linking of repositories requires technical and administration resource as well as addressing issues of copyright. Given the priority from new policy to increase engagement with the basic act of depositing in a repository, I suspect a lack of resource will be a major barrier to linking of many institutional repositories where links do not already exist, in tandem with academics existing and long term relationships with subject repositories in many disciplines. Participant 512

A further comment on the scalability and configuration of repositories was:

Q3 -about institutional repositories froming consortia - I'm not quite sure whether it would be desirable or undesirable. I haven't thought it through to be honest. Participant 589

Also this comment, which noted the as yet unfulfilled potential held by repositories:

I think much more could be made of institutional repositories, especially if there were a clear national strategy for connecting and managing these in a sustainable way. Participant 582

This comment too, suggests that there is potential for a more effective approach to developing repositories:

I was slightly unsure about how to interpret question 4 "The majority of institutional repositories will be linked according to subject discipline". I think having more effective ways of cross-searching and linking between related content (including content related by subject) in a range of different repositories is important in order to maximise the potential role of repositories in the scholarly communication process. Participant 582

The related area of the university press drew several comments from participants. The first noted that such presses were valued but that opportunity for their development was uncertain:

A5: I would see an increase in the importance of University Presses although again perhaps a lack of actual resource behind this in some cases. There have been repeated mentions of restarting our University Press, and praise for department level models of OA publishing already in place, but no indication of who or how this will be led, or any sense of such initiatives being awarded. Participant 512

This next comment noted the distinction between print and online approaches and suggested that researchers would be in favour of a branded approach:

I have interpreted the question about University Presses to refer to the traditional print based Press; it is very likely and in my view desirable for universities to develop their own online, open access presses as part of their overall brand. I think that academics would rather have the impact of a brand name than publish individually. Participant 574

Further support for such presses was voiced in this comment:

Re. university presses - I believe there is considerable scope for open access university presses, which will make them viable into the future. Participant 601

This participant noted that several approaches could exist utilising different operating models:

Direct publishing to the web is desirable and it does not mean the end of university presses - new models of direct publishing could lead to more university presses with a different operating model. Participant 602

The same participant also suggested:

It is desirable for data underpinning papers to be linked to the publication, but data publication in its own right is also a good thing where data is the main component with accompanying text on methodology and reuse.

Participant 602

In the area relating to peer review of journal articles, two comments were made.

The first accepted the inevitability of changes to the current peer review model:

Q4 - I think there will be radical changes in peer review, but probably not in the next 5 years. There is a lot of inertia in this area, not the least because there is a risk/price to pay to be the first mover. But this change is badly needed. Participant 589

The second comment concurred with that inevitability, but acknowledged also that there were difficulties that needed to be overcome:

I am reading a lot about all this; in my own institution it's proving difficult to get a "voice" on these issues. I am strongly in favour of open access research, and would like to see researchers publishing directly to the web or through other open access routes. The day has to come when the large publishers are bypassed by individuals – but we have to solve the peer review / professional credibility problems first. Participant 569

In relation to the area of RDM there were only two comments. The first was:

I'm focused on RDM and adjacent to OA and scholarly publishing.

Participant 581

The second raised the issue of research within specific disciplines:

"Legislation across national borders will prevent large amounts of research data from being shared globally" - yes, but only in specific sectors) primarily related to defence. Participant 597

4.7.3 Theme Three – The Role of the Library

There were general comments within this theme which related to academic libraries. The first noted discussions on future strategy:

As my department sits within an academic library in a University, I am aware of some of the discussions about the future strategy for our own library. As a researcher working with a number of other academic libraries, and with many connections to those working within academic libraries, I also have a perspective from others within the sector. Having said that, RDM is only really on the periphery of what I do on a day-to-day basis and not widely discussed with my contacts. Participant 500

This comment noted a variation between institutions, expressing concern that the minimal response being made by some might prevent the potential of the library from being realised:

I think these issues vary widely by institution, with some HEIs having restructured library services to specify support from learning/teaching and support for research activities, and others creating a nominal 'research' post, which may end up being largely diverted to dealing with only one aspect of support (training, open access). This can in turn reduce the visibility of the potential the library can offer. Participant 512

And again, a comment was made on the variation between what is known in one's own institution and what is the case elsewhere:

Again, I was struggling a bit to separate what is happening in my library from

what is happening in academic libraries generally. Sorry. Participant 575

Two comments on Question 11 referred to a support unit:

In 11, the dedicated research support unit should be at the interface between the Library and Academic departments and researcher-led. Participant 523

In Q11, I have assumed that the specialist RDM unit could be in the Library, probably as a joint service with the Research Office and IT. Participant 574

Two further comments were made regarding this question:

In question 11 "The RDM function will fall within the remit of a dedicated research support unit", I assumed this referred to a research support unit outside the library. I think this is quite a likely approach, but I think giving this role to a unit in the library - drawing on library expertise and enabling RDM to be integrated more closely with the rest of the research information lifecycle - would be preferable. Participant 582

Difficult to answer some of these questions e.g. 11 final point: library here is working in partnership with research unit, and very effectively. Demarcation of responsibilities is less clear cut than in the past, and i would envisage this fluid partnership working continuing. Participant 601

The following comment suggests a clearer demarcation of roles:

In Q 12, who are the specialists referred to? Librarians? In most cases data will be better managed at source by those who created it (specialist data managers); the role of librarians could be to provide policies, guidance and support on how to make the data available to others, but it would be impossible for us to understand the huge variety of data formats. We need

to work alongside the specialists on this. Participant 574

A further comment highlighted the fluidity of the roles:

In some ways I identify with academic libraries and in some ways I don't (being a specialist). Participant 581

The final comment in the section noted the forces which influence the library position:

Again, I think that academic library practice in this area is patchy and I think this will remain the case over the next 10 years. I think there is a big opportunity for libraries to position themselves as the central resource for the whole of the research lifecycle. However, university administrators may not see the library in this way and university librarians may be reluctant to argue strongly enough about their ability to take on these roles. Participant 582

4.8 Conclusion

This chapter aimed to outline and report the findings of the Delphi study and to organise the data in a logical manner. It did not, however, set out to compare findings with the wider literature, because that is the task of the Analysis and Discussion chapter which follows.

A key outcome of the Findings chapter has been to illustrate that the research methodology has been systematically applied. Furthermore, it should demonstrate that the research design and implementation have been successful, and this is evident through the following characteristics: first, there has been full cooperation from the participants with, according to the literature on Delphi studies, a lower than expected rate of disengagement between rounds, and second, confirmation that the cohort of participants has been appropriate has been identified through

their own estimation of their suitability to the areas of enquiry. This was further confirmed in the data collection phase. For example, no participants abandoned the questionnaire outright and, while there was a reduction in participation for Round Two, this was expected and did not adversely affect the data. Moreover, the data was collected in a timely fashion and all participants' identities were kept anonymous. All of their comments have been faithfully recorded through the system. For these reasons it is submitted that the data collection was successful and that the findings outlined above have provided rich data upon which a discussion can be based. By drawing data from the perceptions and preferences of the participants in this study, it has been possible to frame the discussion around the opinions of those currently involved in practice. In assessing the validity and reliability of the data, it is noted that the comments do provide an insight into each participant's approach. In general, the questions have been well-understood, and they seem to have been appropriate for this group of professional and academic staff.

The use of a virtual learning environment tool to conduct the data collection was experimental. The aim was to offer an environment that made it possible for participants to log in securely to a reliable system and consider a range of questions. It may be that by using this vehicle for data collection, with participants being required to log in to the system with a username and password, a heightened sense of responsibility was created; participants certainly allocated time and effort to the data collection exercise. Typically, online surveys avoid the need for participants to log in, seeing this as a potential barrier to completion. The Delphi approach is different, seeking to exploit participants' levels of engagement by ensuring that they have confidence in a secure environment which allows them also to engage on their own terms by completing the questionnaire in stages.

What did not work was the online forum intended for wider discussion by participants. This might have been over-ambitious, in view of time constraints on the participants, but in addition to this premium on participants' time, such discussions would have generated a considerable amount of qualitative data, and

the anticipated resources required to analyse this additional data were not available for this study.

A significant amount of data, perhaps more than expected, was generated through participants' comments. These revealed a finer level of detail, and in many instances provided contextual information that has been useful in qualifying the questionnaire. A number of comments addressed or criticised the structure of the questionnaire, but the majority focused on the themes themselves and provided rich data.

It is worth mentioning some of the assumptions made within the research instrument. The first was the assumption, throughout the whole study, that research support was homogeneous across all disciplines. This of course is not the case, and further consideration of this assumption is made in the Conclusion chapter. There was also an assumption that RDM would be addressed prevalently in the comments, but this was not so either. It is possible that a more accurate definition of RDM would have been useful for participants, and this is discussed in the next chapter.

Finally, an important feature of the method used was, as discussed earlier, that it provided participants progressing to Round Two with access to the results of the earlier Round One exercise. There is an assumption that those participants who continued did take this opportunity, and moreover that they were inclined to use the data to further inform their approach to the second round. The study did not provide any means to confirm or measure this assumption. On the one hand, this might be a structural fault of the Delphi technique - though in the dozens of Delphi studies observed through the literature this is an aspect that is poorly reported. On the other hand, it is reasonable to assume that participants who had engaged sufficiently to progress to Round Two would naturally be inclined to explore the feedback on Round One. The following chapter will analyse the findings further and synthesise them with the wider body of literature outlined in Chapter Two.

CHAPTER Five – Analysis and Discussion

5.1 Introduction

The significant change being experienced by the research lifecycle is occurring in tandem with the various upheavals and disruptions happening externally and the academic library, traditionally a place of support for researchers, needs to respond to this change. In order that it can do so effectively, and inform the strategic direction of libraries in the future, a full understanding of the challenges should be achieved; this task falls to the leaders of university libraries.

This chapter aims to analyse the findings of the study, together with their implications, and through discussion to develop some propositions. The propositions are drawn from the points within the Delphi process at which consensus was reached (though identifying points on which there is no consensus was equally illuminating) and are used to explore possibilities for the future. Propositions are developed within the context of the original research questions, which were:

- How is the external environment disrupting and changing the research process?
- How is open access instigating change in the structure and functional support of research?
- What might be the impact of open access on those stages of the research lifecycle supported by the library?
- How might disruptive changes reshape the library?
- What is the response of the library to the changes in open access research?
- What are the important and pressing issues library leadership needs to address?

The structure of this chapter is arranged around the three main themes identified from the literature. For each theme and sub-theme, a commentary is provided that relates to the literature and to the Delphi findings, and this commentary ultimately reaches a position in relation to the research questions. This position may simply define the research questions more accurately, or indeed it may shed light on the topic generally. Following the analysis there is a discussion and, through synthesis with the literature, further insight is achieved. The discussion generally leads from the specific to the general: from the Delphi findings to the literature, to theory and on to practice.

5.2 Theme One - Open Access Policy and Strategy

As noted previously, the open access policy and strategy theme can be seen as overarching. The Delphi study data, related to this first theme, suggests that open access is a challenging area both at the level of national policymaking and also across university leadership. This is supported by the literature, which reports that there is a significant level of confusion around policy development. In its review of its own open access policy, 16 months after implementation, Research Councils UK stated:

Open access was, and still is, a transformative and fast-moving policy area. Particular areas of concern in the academic community included the impact of embargo periods and the use of particular licences as well as the amount of effort and education there would need to be to support the implementation of the policy. (Research Council UK, 2015, p.5)

In the face of the significant and far-reaching upheaval that open access is likely to create, this lack of clarity in policymaking is likely to have a detrimental effect on research administration. Related to this is the, perhaps inevitable, suggestion from the Delphi study that understanding of open access is inconsistent across university leadership, something which is a matter of concern. While, more recently, various policies do seem to be crystallising, there is no evidence, either in the Delphi study

or in the literature, that greater understanding and clarity will reduce the challenge. Indeed, the contrary may be true: 'The challenge for institutions is to meet and demonstrate compliance with the range of different requirements from funders' (JISC 2015)

It is generally accepted that the open research agenda can be contentious, and this is likely to present as a barrier within the policy implementation stage, particularly in the area of scholarly communications. It is further accepted that, although initially confusing, the policies are gaining greater clarity. However, the literature indicates that further recent delays to their implementation, specifically the arrangements for using open access within the Research Excellence Framework, have not helped this. To compound the situation, there are policies being developed not only at national funding level but also at publisher and institutional level. In practice, there is much work being done to implement the national policy at local university research department level. So, it is not just a matter of accounting for the funders' requirements, but also the further challenge that: 'institutions must also ensure that the publishers' requirements are met, which may sometimes conflict with the requirements of funders.' (JISC 2015) It would be expected that by interpreting and applying policies at this level a fuller understanding might eventually emerge. These sentiments are expressed in the Delphi study, where in the opening questions [A1.1] and [A1.2] there is agreement. There is also an acceptance [A1.3] that the issue of open access is contentious within the university, and this perhaps relates to conflicts of interest between researchers, their funders and their publishers. More significant is the strong perception by participants that policy issues associated with research outputs and open access are not understood by university leaders [A1.4].

The Delphi study participants' perceptions of how researchers understand open access and its policies is worth noting. For example, only 6% thought that the difference between green and gold open access was well understood by those involved in research [A1.5]. None agreed that the policy issues related to RDM and open access [A2.4] were understood by researchers, and just over 60% disagreed

that researchers were aware of the impact of open access on scholarly communications [A2.5]. It is also useful, however, to put forward a more nuanced position than that expressed by the Delphi participants. For example, MacMillan (2014), rather than implying that researchers are not keeping abreast of developments in open access, suggests that the problem lies with 'what librarians need to know about how scientists manage and share their data.' His research is 'intended to help librarians become more engaged and integral partners in research and education' (MacMillan 2014, p.541) and he concludes with a set of recommendations, one of which is that:

Librarians need to develop skills that bridge traditional liaison work with the increasingly data-driven demands of scientific research, so that we can support researchers with their data management needs and help users discover data across myriad collections and resources. (MacMillan 2014 p.541)

Across the literature, in the camps of both researchers and librarians, there is a sense that knowledge and skills are lacking as the new theories and practices of open access take hold. (Brewerton, 2012)

In Round Two of the Delphi questionnaire, participants ranked 'Effective policymaking in areas associated with open research' as their second highest issue of importance. As illustrated in recent literature, policymaking difficulties continue. (Marques 2015)

Library staff and repository managers have a vital role to play, both in supporting or prompting the creation and adoption of policies, and in ensuring the deposit of items. A range of pointers to good and effective practice was produced by a recent survey of the managers of 24 of the most successful repositories in a range of countries. Of the respondents 83% have a formalised institutional strategic plan or co-ordinated approach for open access; a plan is in preparation for a further 8%. 58% have a formal preference for Green OA; none has a preference for Gold OA; the rest express no formal preference. (Ball, 2015, p.13)

5.2.1 Library Leadership and Open Access

The library leadership sub-theme is closely related to the library positioning sub-theme, which is treated as a part of the third theme. The discussion in this section is confined to library leadership and open access. Data drawn from Round One Part B of the Delphi study indicates that the academic library is responding positively to the changing research environment. There was significant consensus that the academic library had the potential to play a greater part in supporting research [B1.1]. This is also outlined in the library literature, for example Breivik and Gee, 2006; Harris, 2012 and Bent, 2016. Furthermore, there was agreement among the Delphi participants that the academic library is influenced by external developments in scholarly communications [B1.2]. On the matter of influencing within their own institutions [B1.3], and also on the matter of discussing the future of the library [B1.4], the participants showed some consensus, although there were noticeable percentages of disagreement, 26% and 31% respectively.

Focusing on the library leader, the Delphi study indicated some agreement that leaders were confidently repositioning the library [B2.2], although 37% disagreed with this statement. There was, however, more confidence in the statement [B2.3] that library leaders understood the issues well; a total of 77% agreed with this. Again, this reading might suggest that, although library leaders are well-versed in the complexities of open access, their ability to influence is uncertain. Related to this, for the statement 'research support is a contentious issue within universities' [B3.4], there was a fairly even spread of responses, with 46% agreeing, 32% disagreeing and yet, somewhat surprisingly, 23% of participants declaring that they did not know. Nevertheless, the total of those who felt it was likely and desirable that library strategy would shift towards supporting RDM within two years [B4.1] reached 85%, with a further 6% thinking that it was likely but undesirable. This perhaps indicates a sense of the library 'ending up with' the hot potato of RDM. Since this Delphi study was conducted, SCONUL (the Society of College, National and University Libraries) has published and disseminated a briefing paper on RDM for library leaders, suggesting that they should ensure their libraries participate in RDM. (Taylor, 2014)

On the statement 'Licensing and IPR issues associated with research data will be challenging' [B6.3], 91% of participants reached a consensus in agreement. The literature would suggest that the statement 'Legislation across national borders will prevent large amounts of research data from being shared globally' [A5.3] represents an area of significant complexity in terms of lawmaking and legal challenge. The Delphi participants were almost unanimous that this scenario was undesirable, at 97%, but then split, with 63% saying that this was likely to happen while 34% thought it unlikely.

The transformative change associated with open access and the consequent impact on research seem somewhat distant from university leaders and, perhaps to a lesser degree, library leaders. This may be because of a lack of clarity in policy, or perhaps simply because it takes lower priority than other challenges and is not deemed likely to have an immediate impact on current practice. The literature relating to various aspects of open access is now expanding, providing definition and outlining new opportunities and challenges. However, it is still sparse in relation to the impact that this upheaval will have or is currently having on university services that support and must also respond to research.

Despite the ever-growing impact of technology, there was consensus within the Delphi study responses that this was unlikely to place the library in decline [B6.4]. However, with 26% agreeing that this was indeed likely, there was a suggestion that some transformation was likely, required and accepted. A clear problem is the resource needed to reshape libraries so that they can adapt to the future. Even if library leaders are aware (and have the capital to influence), additional effort and resources are needed to make change happen. It is important that academic library leaders are able to influence the open access agenda more effectively, within their institutions and more widely. However, in terms of ranked priorities, the Delphi study places the role of the library last in all three timeframes, two years, five years and ten years.

5.3 Theme Two - Scholarly Communication

This section looks at research dissemination, article publishing and peer review. Despite pressure to retain the current proprietary publishing model, the move towards openness is gaining traction, particularly as government-funded research now more often than not mandates the use of green open access repositories. In tandem with this, there is an increase in the number of hybrid journals and in those institutions using gold open access.

Scholarly communication activity is a critical part of the overall research lifecycle. Its key components have been identified as peer review, bibliometrics, institutional repositories and research data management, and these are all discussed below.

As noted in the review of the literature relating to scholarly communication, significant upheaval is created by open access and the increased use of information technology and social networking. As Shorley and Jubb (2013) point out, there has been a growing tension between libraries as consumers of knowledge and publishers, traditionally seen as producers of knowledge. This flawed micro-economic model has in effect been pushed wide open by the emergence of open access. More significantly, questions are being asked about the use of public funding for research which ultimately generates profit for private sector publishers. A subsequent, and perhaps more pressing, question that librarians and their leaders might ask is that of why university libraries have to pay such high prices to publishers to purchase the product of their own research.

Exploring the pressures of the economic model within the Delphi study revealed some interesting findings. For the statement 'Costs associated with research dissemination will impede scholarly communication' [A3.3], 66% of respondents conceded that this was likely to be the case. All those who thought it was likely also agreed that it was undesirable. Of those twelve participants who thought it was an unlikely scenario, only one considered it desirable. This is a significant finding because it may suggest, given the transition to open access, in which a publisher is

using a gold model and requesting article processing charges to be paid, that some additional institutional funds will need to be found. It further suggests that this situation will need to be managed to provide a fair system for researchers. Questions need to be raised within universities about how research dissemination can be supported in an equitable way. This finding also brings into question how the two models of, on the one hand, journal subscriptions and, on the other, article processing charges might work together. Already there are the concerns about publishers 'double-dipping' rather than off-setting journal subscription charges.

Related to the journal subscription model, the statement 'Costs associated with the academic library will be reduced significantly through use of open access material' [B6.5] prompted a strong 80% of participants to agree that this was desirable but unlikely. A further 14% said that it was desirable and likely. The remaining 6% said it was unlikely and undesirable. The significance of this is that while open access should, in theory, move journal articles from behind pay-walls, there appears to be little confidence within the participant group that this will happen in practice.

The questions concerning the market and economic models for the library have been around for some time. Writing in 2002, MacColl and Pinfield noted:

Over the last 15 years journal prices have risen by about 10% a year at a time when library budgets have grown by no more than 2 or 3%. Libraries have often had to divert money from other budgets to maintain subscriptions or simply cancel titles. In most cases, they have done both. (MacColl and Pinfield, 2002).

Nor has the financial situation improved in the fifteen years since this was written. However, the new impetus brought by open access practice may provide a genuine challenge to the strong position currently held by the big academic publishers. German universities are now negotiating their terms of open access with publishers, and in the UK similar discussions are likely. JISC's consideration of the academic journal markets, their limits and the consequences for a transition to open access all demonstrate a clear connection between the emerging open access market and the

financial difficulties facing academic libraries:

As long ago as 2006 a European Commission report noted the anti-competitive potential of big deals that, while constraining short-term costs for universities and increasing the content available, locked them into a market structure largely dominated by a decreasing number of increasingly large international publishing companies. (JISC 2016)

Continuing discussion of the future of research dissemination, some statements explored how the model might change more fundamentally. The statement 'Most academic researchers will operate directly with business and independently of universities' [A5.1] was not supported by participants, with 86% thinking that this was unlikely and also undesirable. The statement 'Direct publishing to the web by academics will mean university presses will no longer be viable' [A5.2] gained a fairly even reaction among the 37% who thought it likely, with 17% saying it was also desirable and 20% that although likely it was undesirable. The significance of this result is that it suggests a recognition that some aspects of digital scholarship, for example researchers using their own blog posts or twitter accounts, are becoming not just acceptable but commonplace practice.

Perhaps the most interesting aspect of the changes relating to research outputs and dissemination comes from the deconstruction of the actual unit of publication, the journal article itself. The statement 'Research data will be stored and made accessible independently of 'published papers' [A5.4] explored this notion, albeit in a fairly superficial way. The result was interesting. A high proportion of participants, 89%, thought that this was likely to happen within the next ten years. It is in fact happening already to some extent, particularly within the hard sciences, so the ten-year projection is perhaps misleading. What it does indicate, however, is that the journal article of the future will differ from what is currently understood by the term. The move towards a dynamically evolving scholarly record related to a topic of inquiry is perhaps one way in which to envisage future research outputs, and this approach might also be extended to ongoing commentaries, critiques and

interpretations on a shared and dynamic dataset.

Within the wider discussion of scholarly communications, the question on the process of peer-reviewing article submissions to journals was interesting. The statement, based on a five-year projection, 'The scholarly communication model (i.e. peer review) will undergo radical change' [A4.4], met with consensus. Participants were spread across the options fairly evenly, with 34% suggesting that this was likely and desirable and 37% that it was unlikely but desirable, providing the consensus of 71% feeling that this was desirable. Of the 29% who thought radical change was undesirable, 23% also thought it unlikely to happen. The significance of this finding is that the literature provides examples of an increasing interest in post-publication peer review. This was also a facet of the open access discussion undertaken by the Finch working group:

(The) Working Group did not accept, nor do I, that community sourced, post-publication peer review can readily replace traditional pre-publication peer review. The assurance of quality in the article at the time of publication will continue to be essential for those who use the content, whether in business, professional practice, in policy or public realms. There is also little doubt in my mind that the majority of scholars will continue to wish to publish in highly rated journals with well-developed international reputations and rigorous peer review, despite assertions by the Higher Education Funding Council for England (HEFCE) that journal status is irrelevant in the Research Excellence Framework (REF) process. (Gardner, 2013, p16)

Initiatives in this area include F1000Research, an Open Science publishing platform which offers 'immediate publication of posters, slides and articles with no editorial bias. There is a transparent peer review process where the comments and suggestions of reviewers are visible. Also included is all source data.' (F1000 Research 2017). The main arguments for and against post-publication peer review relate to issues of perceived quality. Interestingly, quality perception was also a barrier in the early days of open access journals. In emerging disciplines such as the Digital Humanities there is greater acceptance of the post-publication peer review model (Coble, Potvin and Shirazi, 2014). Moreover, the growth of Wikipedia is cited

as one large-scale example of how a post-publication or ongoing evaluation process might benefit some aspects of academic publishing (Cohen 2010).

5.3.1 Institutional Repositories

With universities increasingly using institutional repositories to store and disseminate their research outputs, the tasks of development and ongoing maintenance often fall to the library team, and as the open access landscape matures, broader questions arise about how universities will use their repositories and how they will interact with the library as its role changes. Statements within the Delphi study sought to elicit from participants their perception and understanding of the role of the institutional repository. The statement 'Institutional repositories will begin to form consortia' [A3.4], divided the participants into two distinct camps, with 34% suggesting that this was likely and desirable and 37% taking the opposing view that it was unlikely and undesirable. There were 26% of respondents who agreed that it was unlikely but felt it was desirable. The significance of this finding, with the overall figure of 63% suggesting it unlikely, is that some universities have already developed consortia, for example the White Rose Research Online based in Yorkshire. The statement is closely linked to the later statement, 'Universities will have effective institutional repositories' [B4.3]. A total of 66% supported this, saying that it was both likely and desirable. Of the 32% who thought it unlikely, only 3% (one person) thought that it was also undesirable. Clearly there is an opportunity for universities to exploit the content of their own repositories as an alternative to paying publishers to publish it in journals and then having to purchase it back from the publishers through subscriptions to those journals. A logical step would be to develop consortia of institutional repositories. Given that the research councils stipulate that research outputs should be made available via open access, it seems likely that institutional repositories might cluster around disciplines. The statement 'The majority of institutional repositories will be linked according to subject discipline' [A4.1], which had a timeframe of five years, was seen as unlikely by 80% of participants, and of these 26% thought it undesirable.

With funding rules increasingly stipulating that data should be deposited and re-used, this is one of the challenging areas of open access implementation, particularly in relation to the REF exercise. Testing it with participants, again using the five-year timeframe, the statement 'Funding will be dependent on researchers' re-use of their own or others' data' [A4.2] was used. The response generated was that 40% thought it likely while 60% thought it unlikely. It is interesting that 40% of participants thought this development likely, because it ties in with moves towards an evolving scholarly record, as noted above in discussing statement [A5.4]. The response to the statement 'Use of content sourced from open institutional repositories will surpass content sourced from behind paywalls' [B6.2] is of interest because of the high number (85%) suggesting that this was desirable – although the consensus was that this was unlikely to happen.

5.3.2 Bibliometrics

The question of how the matter of bibliometrics relates to the academic library's support for research has yet to emerge fully (Bent 2016). Currently, what might be considered the general work associated with bibliometrics falls within the remit of the librarian, but the growing branch that specifically analyses citation references with a view to supporting claims of research impact, is likely to be of significance to the research office. This may change in the future and the librarian may become more central to the process. Also, the use of bibliometric tools as a method for demonstrating impact may increase. There was one general statement relating to this in the Delphi study: 'Bibliometrics will have a greater influence on the research agendas of institutions' [A4.3]. The total of those who thought that this was likely came to 86%, but this percentage was then divided between 40% who thought it was desirable and 46% who thought it undesirable. Of the remaining 14% there were 3% who thought it unlikely but desirable and 11% who thought it both unlikely and undesirable. Interesting here is the marked split between those who, agreeing it likely to happen, thought it desirable or undesirable. It would be useful to conduct further research into this aspect to ascertain the reasons for these differing perceptions.

To say that bibliometrics will have greater influence is perhaps too broad a statement to have any wider significance across this study and yet, in terms of scholarly communication, measuring the impact factor of journals looks to be an increasingly important consideration for researchers, particularly for those working within the Research Excellence Framework. Altmetrics provides alternative ways of measuring impact and is more prevalent within digital scholarship and among those who make significant use of social media (Tattersall, 2016).

It should be noted here that an important independent review of the role of metrics in research assessment and management was published after this Delphi study data collection was completed. The Metric Tide Report (Wilsdon et al., 2015) raised awareness of the use of metrics within research evaluation considerably, and included a range of recommendations for research managers and administrators. It should also be noted that there is a strong counterargument against the use (or misuse) of certain metrics, for example the Journal Impact Factor (JIF), which measures the average number of citations to articles published in any journal. This, it is argued, is used as an indication of the relative importance of one journal over another; the higher the JIF the more esteemed the journal. The San Francisco Declaration on Research Assessment (DORA 2012) seeks to ensure that metrics are used appropriately. It further 'intends to halt the practice of correlating the journal impact factor to the merits of a specific scientist's contributions' and suggests that in some cases the impact factor calculation can be (inaccurately) used as a 'measure of the quality of individual research articles, or in hiring, promotion, or funding decisions'. (DORA 2012).

5.3.3 Research Data Management

The RDM theme looks at the issues which data and its management bring to the research field, and explores the subsequent challenges faced by researchers and librarians. Although managing research data has always been part of the researcher's role, many funding regimes recently introduced mandatory stipulation

to put in place a formal research data plan. The primary reason for this is that the plan facilitates the re-use and sharing of data in an open research environment but additionally the move recognises the potentially ephemeral nature of digital data, the tendency of data to exist in many diverse formats and the growing amounts of data generated through research. The record of scholarship and research is increasingly likely to evolve in a digital environment.

RDM, a sub-theme within scholarly communications, was identified in the literature at the outset as a theme that was becoming increasingly important for the library. It should be noted that there is a difference in the interpretation of the role of RDM between those in the hard sciences and those in the Social Sciences and Humanities. In the hard sciences, the concern is with raw data, generally big data, and here mechanisms are in place for generating, managing, storing and presenting this type of data, which can typically be adapted and repurposed so that, once it becomes open, it becomes useful to a diverse range of groups. In the humanities, on the other hand, the range of data may be smaller and generally does not require specialist technology to manage it. Both science and humanities data is re-usable, and indeed its re-use, together with the provision of guidelines on this re-use, is now stipulated by funding councils. It is worth bearing in mind the relevance of such variations in how RDM is understood and applied by participants in the Delphi study. The statements relating to RDM that appeared in Theme One were discussed to test broader policy and strategy, rather than to explore RDM per se. RDM is just one aspect of a changing world of research in which open access makes a strong impact. Several statements relating to RDM-focused policy and strategy found no consensus either way on an appreciation of the importance of RDM among those responsible for research at a strategic level [A2.1]. However, when asked if there was a clearly defined role for the library in supporting RDM [A2.2], there was fairly strong disagreement. In general, the literature suggests that librarians are well placed to engage with RDM. However, it is also accepted that there are significant challenges and complex problems that need to be solved (Cox and Pinfield, 2014; Cox, Pinfield and Smith 2016).

To open the discussion on RDM as its own sub-theme, the following statement, which aimed to explore how well it was understood, was presented to participants in the Delphi study: 'Everyday tasks associated with RDM are understood by researchers' [A2.3]. There was definite disagreement with this statement, the 83% of respondents who disagreed splitting into 'disagree', 60%, and 'strongly disagree', 23%. Of the remaining participants, 9% agreed and 9% selected the 'don't know' option. A further statement predicting the position in two years, 'Researchers will get closer to and more involved in data management activities' [A3.1], inspired a unanimously positive response, with 100% believing that this was desirable. Within this percentage, 63% thought it was likely while 37% thought it unlikely. The third related statement, 'All those involved in research will understand the implications of RDM' [A3.2], again met with a positive response, 100% agreeing that this was desirable, and within this 43% thinking it likely and 57% unlikely. The significance of the responses to these three statements is that it demonstrates an expectation by the participants that the, largely unknown, administrative burden of managing research data will be the responsibility of researchers. Moreover, there is a strong feeling from the responses of the participants that researchers do not fully understand the implications of this burden. There is a real danger that research data and its management will fall between two stools.

A further set of statements, concerning the role of RDM, was examined in the Delphi study. Placed within the timeframe of two years, the suggestion that 'The RDM function will fall within the remit of a dedicated research support unit' [B4.4] was thought likely by 60% participants, with a split between 43% considering it desirable and 17% undesirable. Of the 40% who felt it was unlikely, 23% thought it desirable and 17% undesirable. Significant here is the spread of opinion, which perhaps suggests that there is more clarity needed on the way RDM relates to strategy within the library and beyond. To emphasise this difficulty, the statement relating to a five-year timespan, 'The role of research data management will be central to the academic library' [B5.3], prompted the following responses. Those who agreed that it was likely and desirable came to 46%, while against this 54% believed that it was unlikely, and of these 31% thought it desirable and 23%

undesirable. Again, there was an evident lack of consensus on the role of RDM in the future. Looking at a ten-year timescale the scenario, 'Most RDM tasks will be fully automated which will obviate the need for librarians' [B6.1], was thought unlikely by 80% of respondents. This percentage was split between 37% who thought it unlikely and desirable and 43% who thought it unlikely and undesirable.

The final statement relating to RDM can be linked to the discussion on institutional repositories, in which it was suggested that collaboration and consortia might provide economies of scale and shared opportunities. In response to the statement 'The curation and aggregation of research data will occur across/between different academic institutions [B5.4] there was 91% agreement that this was desirable. Across this 91% there was a split, with 51% feeling that it was likely and 40% that it was unlikely. From statement [A3.4] discussed above, 63% thought the introduction of institutional repository consortia unlikely and 46% thought research data curation across institutions was unlikely. On the desirability scale, statement A3.4 suggested 60% in favour and statement [B5.4] suggested 91% in favour. There is of course potential for the institutional repository to be the system through which research data may be managed. For example, the publisher Elsevier has a system called PURE which claims to carry out these functions in an integrated way.

Perhaps the overriding question for librarians to consider in relation to RDM is that of how relevant it is to the core services they are delivering to support research. Certainly, the literature would suggest that there is opportunity for the academic library to extend its portfolio of services into the realm of RDM (Erway, 2013; Jones, Pryor and Whyte, 2013). Pinfield, Cox and Smith (2014) also explore the feasibility and note that 'there is uncertainty and variation in the relationship with other stakeholders such as IT services and research support offices' (p.1). The advice, or perhaps suggestion, offered by SCOUNL is that 'The academic library may take a lead in developing research data management policies and position these in ways that reflect institutional priorities' (SCOUNL, 2015 p.8).

5.4 Theme Three – Role of the Library

The preceding discussion leads into this section which centres on the role of the library. The literature on this theme is considerable and relates mainly to the future role of the library in relation to the reduction in print-based information sources. Discussion on this is now to some degree redundant, as most academic libraries have passed the tipping point and it is fairly typical for electronic resources to make up 85% of total resources used. Of more emerging interest is the growth within UK universities of the library as a technology-rich social learning space. However, the focus of this theme is the role of the library, and its librarians, in relation to research support. The Delphi study statement ‘Those responsible for research administration understand the library function’ [B1.5] sought insight into how the library was perceived by those whose primary role was research administration. The response to this statement saw 34% in agreement, with none agreeing strongly and 54% disagreeing. A further statement, ‘The role of the university library in supporting research is well understood’ [B2.1], saw 43% agreeing and a further 3% agreeing strongly. Those disagreeing were made up of 51% disagreeing and 3% strongly disagreeing. It would appear, based on this low level of understanding, that the library is considered a less-than-obvious candidate for the role of supporting research.

5.4.1 Library Positioning and Perception for Research Support

Through this statement, the Delphi study sought to explore the perception of the library’s position within the institution: ‘The academic library is well placed institutionally to participate in the research lifecycle’ [B2.4]. The statement met with a positive response, 60% agreeing and a further 23% strongly agreeing. Of the 17% who disagreed, just one person (3%) strongly disagreed. Addressing the statement ‘Librarians are well placed to carry out the task of digital curation and research data management’ [B3.2], 54% participants agreed and a further 17% strongly agreed, which provides a positive sense that librarians believe themselves to be competent in this relatively new and untested area of work. A further statement, ‘Researchers appreciate the services provided by the library’ [B3.1],

received a very positive response. In total 85% agreed, 23% of them strongly, while 9% stated that they did not know and just 6% that they disagreed. Looking at a more practical aspect against a two-year timeline, participants were asked whether they thought 'Librarians will add value (e.g. enhance discoverability) to research data' [B4.2]. The response was that 71% thought this both likely and desirable and 23% that it was desirable and unlikely. This meant that a total 94% of participants considered it desirable, illustrating clearly that the participants considered their role important in supporting research in the near future. Perhaps the fact that the specific example given in this statement, that of enhancing discoverability, is a core part of the librarian's role both inside and outside the arena of research support, may have influenced responses.

For the statement addressing the five-year timeframe, 'Researchers and librarians will work together closely at many points on the research lifecycle' [B5.1], the response in terms of likelihood was tied. Of the 92% who thought this desirable, 46% thought it unlikely and 46% likely. This was followed immediately by the statement 'Large datasets will become de facto electronic libraries managed by specialists' [B5.2], to which the response was that 77% thought it desirable while 34% thought it unlikely.

In considering the question of where the support for research might be positioned, libraries do not hold any exclusive rights within the territory of research support. This is a point made well by Verbaan and Cox (2014) who note that, particularly in the area of RDM, research administrators, IT services and researchers themselves will all have a part to play. The authors go on to suggest that a critical factor for success is how these professional service teams can work together effectively, a point which is supported by practical experience from the field (Voog and Wiklund, 2013; Wittenberg and Elings, 2017). Taking this approach further, which for many library directors, particularly those in charge of the more traditional libraries, may seem a step too far, Foutch (2016) suggests that the librarian is most effective when embedded within a faculty research team. Focusing on the dynamics within the university's professional services, Verbaan and Cox (2014) explore the occupational

sub-cultures and challenges, for instance within an IT department, of a collaborative approach to RDM.

It is important for librarians to better understand not just the researchers and their work but also their processes and the systems that they use. This need for greater understanding is demonstrated by MacMillan (2014) who, drawing from science, librarianship and scholarly communications literature, suggests:

...deposition and sharing practices still vary among researchers, journal publishers, data repositories, information providers, and universities. Understanding the dynamic relationships between these stakeholders is critical to providing relevant support to researchers and students in the sciences. Librarians need to develop skills that bridge traditional liaison work with the increasingly data-driven demands of scientific research, so that we can support researchers with their data management needs and help users discover data across myriad collections and resources. (MacMillan, 2014, p.541)

Considering the role of the library, how it is perceived and how it is positioned are all critical factors in answering the broader research questions of this study. Specifically, the initial research questions that ask, 'How might disruptive changes reshape the library?' and 'What is the response of the library to the changes in open access research?' are both informed by the discussion on roles and position.

5.4.2 Librarian Skills Development

As noted in the literature, there is no doubt that the skills needed by librarians to support research and digital scholarship are changing and developing their role. Perhaps most prominent in demonstrating this is the work carried out by Auckland (2012), which looked at researchers' information and data needs and outlined the skills and knowledge required by librarians to meet these:

There is a clear trend towards providing support for research that is driven more by the requirements of researchers than it has been in the recent past, and a movement in some institutions towards a more proactive model of engagement with researchers. (Auckland, 2012, p.58)

Brewerton (2012) provided more detail on the RLUK (Research Libraries UK) project to re-skill the academic library workforce. He highlighted 'the many exciting

opportunities for developing support for researchers', and noted 'but there are some operational issues to be addressed' (p.108). As part of the Research Information Literacy and Digital Scholarship (RILADS) project funded by Research Information Network (RIN) and SCOUNL, Inskip (2013 and 2015) delineated the progression for librarians from information literacy and digital literacy to digital scholarship identifying the opportunities and challenges. Among Inskip's findings were the need for library and information professionals to develop their digital scholarship skills and for these to be recognised within established frameworks such as the Chartered Institute for Librarians and Information Professionals' (CILIP's) Professional Knowledge and Skills Base. Similar work by Keller (2015), looking at Australian university libraries, focused on the job profiles of subject or liaison librarians. Through the use of semi-structured interviews with library professionals, she noted that the job profiles of these staff were changing rapidly.

The Delphi study provided an opportunity to further test how researcher and librarian skills were perceived. In response to the statement, 'Librarians need to adapt or extend their skills to deal with open data' [B3.3], a convincing 97% were in agreement, with 57% of them agreeing strongly. A further statement, 'Librarians lack the information technology skills to support 'Big Data' effectively' [B3.5], also saw considerable agreement, with 51% of respondents agreeing and an additional 26% strongly agreeing. The rate of change in technology and the frequent, often uneven, leaps in progress do regularly render skills obsolete, so it is reasonable to assume, as the data appears to suggest, that while librarians may be well-suited to the tasks of supporting digital scholarship, they do not necessarily have the full range of technical skills required. It would seem, then, unrealistic to expect library leaders to develop their offer and move into the research territory in time and with the appropriately skilled staff ready to support all points on the research lifecycle. The reality is likely to be different.

Consideration should also be given to the required skills and training needs of the researchers themselves, and to the creation of opportunities for library staff to train researchers in the use of repositories, impact bibliometrics and data management.

One area in which academic libraries have made significant progress in recent times has been that of delivering information literacy training to students, and this has also been extended to digital literacy training, with librarians taking responsibility for providing students with skills appropriate and relevant to digital scholarship and research. However, the progress made in developing digital literacy and in gaining acceptance within the university has been relatively pedestrian, and a more rapid development is required for digital scholarship. Moreover, models for extending information literacy are typically resource-intensive in the longer term. Among the potential problems identified by Inskip (2013) in developing the digital scholarship skills and competencies of library staff were: the pace of change, the fuzziness of professional boundaries, encroaching on adjacent areas, lack of understanding of terminology, appropriateness to users' needs, lack of resources and time for staff development.

5.5 Discussion

In the recent past, and particularly in the traditional world of print-based publishing, there has been a clear interdependency between university and publisher. Peer-reviewed publication is well established in academic life, and generally it provides the process through which research is disseminated. It is vital for knowledge production, because when a positive peer review is obtained, knowledge increases in value. Much depends on the publishing cycle and on the various interests of those involved within this.

A further point to consider here is that academic publishers generally rely on academics to form the editorial boards of their journals, and in return for this contribution academics are afforded recognition and the opportunity to progress towards the forefront of their discipline areas. There are anomalies in the traditional academic publishing systems, in particular that perverse equation that sees the publisher effectively selling back to the university, via its library, the rewards of the academic labour undertaken by staff who are employed by that university. Reaction to the way in which publishers are seen to be exploiting the knowledge market and charging libraries such high prices for their journals,

together with, perhaps more fundamentally, the increasing popularity of electronic journals, has resulted in the research market's move towards new models of publishing, notably the open access model. Such developments, while still at a relatively early stage, are presenting new challenges for the university.

In the UK, much of the movement towards open access is being driven by the need to prepare for the REF. This may mean that open access is being implemented, not for its principles of openness, but rather for reasons of compliance. There are many who see open access as being pitched against the big academic publishers, and one of the challenges it faces in its bid to make knowledge freely available lies in its tension with the knowledge-based economy. Generally, the result of this struggle is that momentum is taken from the open access movement.

The sustainability of the university within the knowledge-based economy relies upon its ability to exploit the changes that are currently taking place in academic publishing and scholarly communications. The traditional academic publishing regime is threatened by the fact that anyone can now self-publish, and this same potential for self-publishing could undermine the university's corporate mission by causing it to lose its monopoly on knowledge production. Smith and Webster provide the following contributory factors:

The loss of University's monopolistic position as knowledge holder; the spread of multi-media technologies but in particular the world wide web and its allowance for knowledge to spill out over the walls of the university. (Smith and Webster 1997, p.106).

Adding to this the increasing use of technology and the opportunities offered by collaborative research, for example the huge datasets that reside in virtual cloud-based repositories, there is a realisation that it is becoming increasingly difficult for universities to leverage the holding of property rights to such knowledge.

The statements about whether the library is well placed to support the emerging research agenda, or indeed whether library leaders have the power to influence, link with wider professional debates about jurisdiction. Ray (2001) examined how the jurisdiction of librarians in relation to scholarly communication might evolve. He

looked at how information literacy had become a way for librarians to take on a new jurisdiction but ultimately concluded that this may have undermined their professionalism. Pillai (2010), O'Connor (2009) and Zai (2015) also examined jurisdiction. This aspect of the literature is very interesting, and the findings from the Delphi study would suggest that there is a confidence among participants about the positive role that libraries might play.

Expecting librarians simply to shift roles in the face of changes to the research environment may just be a little too much to ask. Finding the skills needed to support researchers represents a significant challenge for library leaders. Recruiting staff with the appropriate skills and experience is difficult because research support is still new. Moreover, setting up and developing research and open access support services formally within a library department at a university may prove to be a difficult task. This is essentially because while the REF might be a driver for such an initiative, the lack of clarity around open access and the consequent lack of understanding among university leaders makes the library leaders' task too difficult.

5.6 Conclusion

In this chapter the findings from the Delphi study were analysed in relation to each theme. Through discussion, a synthesis was developed with the literature, both the literature that was reviewed prior to the Delphi study and also that which was reviewed after the study had been completed. The synthesis informs the original research questions. Within the complex environment of research and the academic library the themes need to be understood in themselves and also need to be viewed holistically. A conceptual framework is used in the following chapter to consolidate and provide this overview.

CHAPTER Six – Conclusion

6.1 Introduction

Through the introduction of a conceptual framework, this chapter places the discussion of the thesis within a broader context, tying together and integrating the themes and issues raised in previous chapters. It provokes an explanation of the main outcomes and propositions and, where appropriate, reflects further upon the original research questions. It discusses the implications that this study will have for library leaders and, in conclusion, it assesses the study as a whole and identifies its value to the overall area of academic libraries and research.

Before taking the wider view afforded by the conceptual framework, it is important to appreciate that critical element of research, the output or, more precisely, the published paper, which of course is the cornerstone of academic research and the traditional scholarly record. However, the use of networked technologies, social media and the participatory web are changing the way in which the results of research are conceived. Most significantly, what is now emerging is the concept of an evolving scholarly record, one that is not bound by time, format or scope.

6.2 Evolving Scholarly Record

Important, and indeed exciting, outcomes of the various upheavals in scholarly communication are the opportunities which arise as a result of the fundamental change in the record of scholarship from a static to a dynamic entity. The digital research output, in its many forms and through its many communication channels, requires different curation from that required by the traditional print-centric practices left over from the paper journal era. The evolving scholarly record, it is argued, (Lavoie et al. 2014) needs to be managed and administered to a greater degree than the published research paper and will require ongoing management from the researcher in the future; it is quite likely that there will be no final

published version, but instead a continuous digital presence. A further feature of the evolving scholarly record is that the digital footprint, or trail of research, will also need to be managed within an elongated lifecycle of research. Rather than working with the publisher, the researcher will work with the university librarian and will hold a significant stake in preserving the validity of the research outcome.

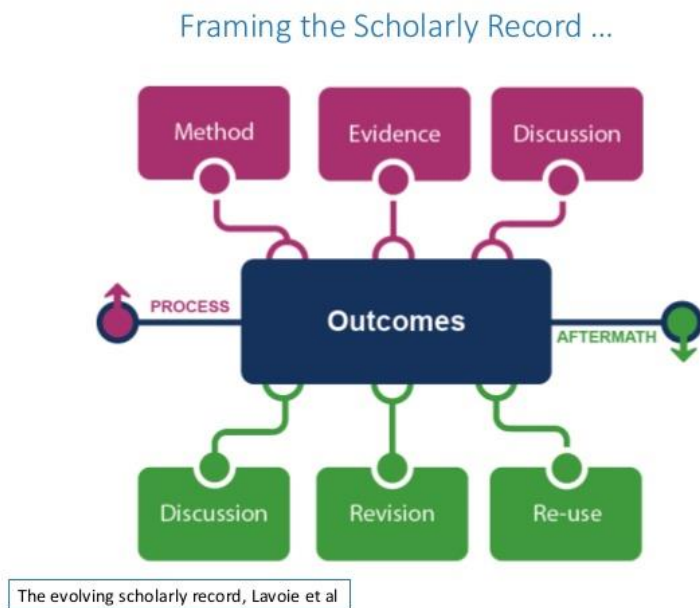


Figure 6. The evolving scholarly record (Lavoie et al., 2014)

The main point to acknowledge is that the evolving scholarly record changes both the temporal and physical characteristics of research outcomes. As illustrated in Figure 6, above, there are two phases. The process phase, represented in the upper area of the diagram, comprises three parts – method, evidence and discussion – and these inform the outcomes. The aftermath phase, represented in the lower area, comprises three parts – discussion, revision and re-use. The discussion continues across both phases, allowing the scholarship to evolve and potentially to lead towards revision and re-use. As well as the temporal extension, Lavoie and Malpas illustrate the physical extension in this way: ‘The boundaries of the scholarly record are in flux, as they stretch to extend over an ever-expanding range of materials’ (Lavoie and Malpas 2015 p.7). They identify three key characteristics of the evolving scholarly record. The first relates to the increasing volume of content,

the second to the increasing diversity and complexity given to that content by advances in information technologies, and the third to the increasing breadth of custodial responsibility, in which the traditional publishing is challenged by emerging models of stewardship.

6.3 Conceptual Framework

The Methodology chapter outlined the thinking behind the use of a conceptual framework, and this section presents the framework that has been envisaged through the literature review, developed through the Delphi study and refined through re-engagement with the literature and the Analysis and Discussion chapter. The conceptual framework depicts the changing research and library landscape. It represents the actors, their activities and processes and the contexts within which they operate. It illustrates how each of these elements is currently configured within research and the library, and suggests changes that are likely to occur in the light of developments within digital scholarship and open access. Moreover, it envisages the way in which the traditional research lifecycle will change to adapt to new digital scholarship practices, in particular the evolving scholarly record.

Other influencing factors that are beginning to have an impact, beyond open access, are crowdsourcing, the participatory web and, more generally the use of social media as a dissemination tool (Costa, 2015). Furthermore, the big data agenda is gathering pace and influencing research on a larger scale than ever before. Open access, despite some resistance and disorganised implementation, is changing the scholarly communications environment. In short, the disruption of digital scholarship is underway.

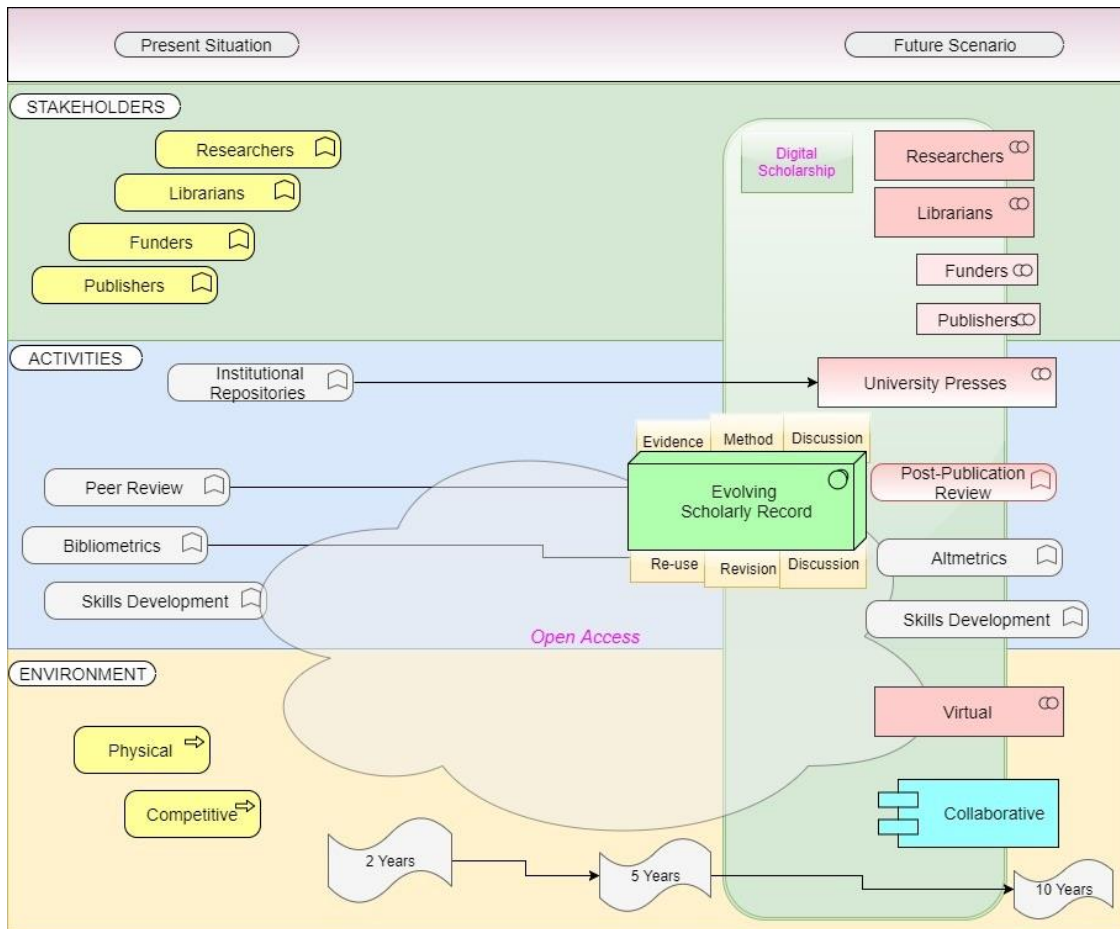


Figure 7. Conceptual framework: the academic library, open access and digital scholarship

The left side of the diagram illustrates the present situation, and the right the future scenario. The movement within the framework is from left to right, from the present to the future. The three horizontal bands represent the stakeholders, the activities and the environment. The current activities are outlined and their relation to the themes of this study identified. The overall aspect of open access, illustrated as a cloud, forms a background to all future activities as well as the environment. The aspect of digital scholarship, represented by the curved vertical rectangle, encompasses all elements of the future scenario. A timeline is included to give an indication of the rate of progress. The conceptual framework is not intended to be definitive, but rather a tool to assist with thinking through potential configurations and scenarios.

In the same way the developing practices associated with digital scholarship and the evolving scholarly record do not fit absolutely neatly within the traditional research lifecycle. Although less useful, the lifecycle will remain relevant with some adjustments. For example, the older pattern of one cycle completing before another commences is less likely within a digital setting, and researchers may well find themselves active at various stages of the cycle, on any number of different research projects and with a variety of research colleagues. A new framework is necessary for illustrating those processes which are ongoing and do not have a precise beginning and ending, as well as for reflecting adequately multiple authors using dynamic datasets. What seems most likely in the future, as access to research data becomes increasingly open, is that researchers will need to maintain a watching brief on both their current and past datasets and on how these are shared and used by others. Indeed, research funding increasingly stipulates the re-use of data as a condition of that funding. As suggested by Lavoie and Malpas (2015), effective stewardship models that are created by the library in relation to the outcomes of research need to be developed in partnership with researchers, a move forward which will alter and possibly extend the role of the institutional repository, and will also address the question of university presses and how well RDM is understood within the university. They explain: 'For the purposes of this paper, *stewardship* is taken to mean a collection of processes that systematically collect, organize, make available, and preserve information resources.' (p.10). There is a link between the new models of stewardship and the Delphi participants' comments on the themes of RDM and institutional repositories. One commented, pertinently:

Aggregation of research data across institutions will develop but over a longer timescale – this is already happening for some disciplinary communities but this has not stemmed from institutional focus. (Participant 602)

Another noted:

I think much more could be made of institutional repositories, especially if there were a clear national strategy for connecting and managing these in a sustainable way. (Participant 582)

Some understandings of current research cycles suggest an evenness of scale in which the distances between the points in the cycle are equal, but this can be misleading. For instance, the pre-award conditions of research are often instigated early in order to optimise the response to funding calls, but the process can sometimes be protracted, with long delays before research projects actually secure funding. Similarly, the dissemination stage of traditional research can take longer if, for example, a monograph is being published. Within the emergent digital scholarship practice, typically that which uses social media, the locus of control moves from the publisher to the researcher, because headline findings can be disseminated around the globe in an instant. While this can certainly be seen as a benefit, there is also an administrative overhead that needs to be considered, with responsibility being placed on the researchers themselves to maintain their own scholarly record as it evolves. This perhaps presents an opportunity for the librarian to broker the partnership between researcher and publisher. A further point to consider is the way in which open access and creative commons approaches to copyright can change activities such as the publishing cycle. The extended element of discussion, evident in the aftermath phase of the evolving scholarly record, invites post-publication review (Cohen 2010). This means that the process of peer review and the role of publishers as the sole distributor of learned or scholarly knowledge are both being called into question by the ubiquitous nature of a technology which, at the press of a button, can publish and distribute research findings globally at a very low cost. This presents a dilemma for universities, because on the one hand it means that the production and distribution of the knowledge that they or their researchers hold is now absolutely within their control, but on the other hand the supposed quality mark, provided by high-impact journal publication, is fundamentally challenged, and with it the cherished prestige opportunities offered to academics.

The conceptual framework is presented as an output of this research, and it aims to provide a guide by which the academic library can reassess its role in supporting research. Its use can be extended to facilitate wider conversations on building institutional capacity around scholarly communication, and it can also be employed

as a tool by which to gauge the changing forces that are at work within the research support dynamic. For example, there are established mechanisms in place which sustain the research tradition and there are others emerging to challenge the status quo. As a research administration system in itself, the REF defines and perhaps constrains some of the developments that might be associated with digital scholarship. The conceptual framework is intended as a starting point for the task of illuminating the emerging arena of research and the complexities that are inherent in the new practices of digital scholarship.

6.4 Future Implications for Library Leaders

Much of the literature written on library and research support so far relates to single aspects of the recent upheaval, and often it presents one-off case studies, typically time-bound and confined to one institution or consortium. Such literature is of course highly interesting, but it is limited because it does not provide a holistic strategic overview and so fails to provide links with the wider policymaking environment. This is one reason why a new conceptual framework is needed. A key question, moving ahead, is that of who will be best placed to manage the evolving scholarly records of researchers, and it is upon this longer game that library leaders need to focus their attention and resources. If libraries are to support digital scholarship by accommodating the curation and discoverability of open data repositories, then they need not only to be well-versed in the quality standards associated with RDM, but also to be able to function effectively at the meta-level which is critical for collaboration and interoperability across repositories and datasets. Library leaders need to understand the potential of the new conceptual framework even if it is currently impeded by the traditional framework, and in fact what they perhaps need to do, rather than passively waiting, is to anticipate what position they will take. While they procrastinate, wishing that the publishers' high charges would go away but failing to put forward an alternative, the crude solution of either cutting out the library or cutting out the publisher may well manifest itself.

Pinfield, Cox and Smith (2014) note the criticality of the changes in digital

scholarship and also remark that there has yet to be an effective response from libraries. It is widely acknowledged that the situation is complex, but it could be argued that if librarians wish to respond appropriately then they must consider solutions over and above the perhaps simplistic re-skilling solution. Viewing this in the light of the Delphi study findings, and also the further discussion, that result from this research, it is apparent that what is required of library leaders in response to changing research is a new approach, a shift in thinking about the relationship between the library, the university, the publisher and the academic author.

A major impediment to the library in planning how it will respond to the open access agenda is the lack of clarity on policy nationally, from funders, from publishers and from academic institutions themselves. This lack of clarity has stifled strategic thinking and has placed the focus on operational aspects, perhaps introducing a complacency and an expectation that problems originating from unclear policy will be solved with appropriate training and skills development. So, libraries are inclined either to make small iterative changes such as appointing a research support librarian or to fiddle with the staffing structure (Hoodless and Pinfield 2016), shifting position, merging or working closely with another department. Participant 512 noted elements of these approaches:

I think these issues vary widely by institution, with some HEIs having restructured library services to specify support from learning/teaching and support for research activities, and others creating a nominal 'research' post, which may end up being largely diverted to dealing with only one aspect of support (training, open access). This can in turn reduce the visibility of the potential the library can offer. (Participant 512)

The view is supported by the statement of another participant:

...library here is working in partnership with research unit, and very effectively. Demarcation of responsibilities is less clear cut than in the past, and I would envisage this fluid partnership working continuing. (Participant 601)

This participant noted that the position of the library and its jurisdiction are likely to remain important:

It is vital that the library is positioned to respond to research support issues but I would hope that this will happen before 5 years' time. Indeed, our library has been doing this for several years already and will continue to do so. (Participant 575)

It remains to be seen whether such preparations are adequate for the pace and scale of the change likely to occur. It is not universally accepted that libraries should be responsible for all aspects of the research lifecycle. For example, the complexities of RDM render it a difficult area for libraries to venture into, particularly if they lack the required ICT support. At the moment, it does not appear that many are prepared to take on the RDM role institutionally without reorganising and reshaping.

Library leadership needs to develop practical responses to policy initiatives in a more cohesive way. It is necessary not only to examine the skills of library leaders and to question whether they have the capacity to manage such significant change, but also to look at their advocacy credentials and question whether they have sufficient authority to influence. Important work in this area (Hernon, Powell and Young, 2002) has been carried out in the U.S, where lists of attributes thought to be required for library leaders have been compiled. However, much of this is probably now out of date. More recently Marcum (2016) made the following observations:

In the digital era, library leadership requires recalibration... I am especially concerned about executive leadership because most of the individuals who are under consideration for these positions have at least one foot in the print world, but they are responsible for articulating the digital library's mission and vision. And most have been trained to focus on local collections, but now a national, even global mindset is key. And this different and necessary perspective requires a different kind of leadership. (Marcum, 2016)

Because of its novelty, there have been relatively few studies specifically focused on how libraries might effectively support digital scholarship (Hoffman 2016). In contrast, across the literature on librarianship there have been many more general studies on the future of the profession, and indeed the tradition of librarians looking at change and trying to anticipate where this might lead is well established. Since

librarianship is a profession that sees itself caught very much in the eye of the digital technology storm there have, over the past thirty years, been numerous attempts to predict its future. In one of these studies Stoffle et al. (2003) highlight a series of issues ranging from economic challenges to the organisational and personnel concerns that were facing academic libraries in the early years of the twenty-first century. What is of particular interest is the direction that the academic library will take in the future, and the question of what the influences upon this future might be. Another particularly useful insight into the future role of librarianship is provided by Sapp and Gilmour (2003), who outline the various predictions and speculations. They discuss, for example, the transformation of scholarly communication and the new models that are likely to emerge.

Exercises in future-gazing have typically been tied in with the future of printed media and the demise of the book, but this is a debate which should now be considered only of passing relevance to the current research question. For library leaders, the explosion of information and data in all formats far outweighs any concerns associated with the reduction in printed materials alone. Furthermore, many university libraries are now engaged in the digitisation of their printed stock, which is in itself a significant undertaking. Any perceptions, then, that libraries are becoming redundant because of a move away from printed materials are themselves outdated. The debate on the future of the library in relation to digital materials has been raging for the past decade; the debate on the library's role within digital scholarship is only just beginning.

6.5 Concluding Remarks

As with all empirical studies there are some limitations and constraining factors associated with the Delphi technique. While these have been fully discussed within the methodology chapter a reminder here is useful. The make-up of the respondents in terms of the attributes that qualify them as participants is crucial. The panel members need to be knowledgeable about the area of research,

motivated to engage over time and able to articulate judgements effectively. In addition to this the actual number of participants is important as this can allow the process to provide a consensus.

The collection of data using a web-based virtual learning environment was effective in engaging participants, yet while this can be viewed as being successful the general issues of online data collection, most notably differences in understanding and interpretation in a technology mediated environment, need to be recognised. Two further aspects of the online survey that proved to be problematic were the desire of participants to skip 'difficult' questions and to a lesser degree, respondents offering an opinion on a topic that was outside their area of expertise. Within this study more rigorous piloting might have refined the questions and sharpened the research instrument.

An important point to be made from this relatively small study and from the Delphi approach taken, is that no attempt can be made to statistically generalise the views and sentiments of the 35 participants into a different setting. In the framework of validity typically associated with quantitative research this study does not make any claim for external validity.

One aim of this research was to identify themes associated with academic libraries and the changing research environment. These themes were drawn from the literature and further developed within the Delphi study. They related aptly to the wider research ambition, providing an advantageous position from which to consider the research questions, and were also accepted by the participants as relevant to their areas of work. The first theme explored the policies concerning open access and found that these were complex, their implementation remaining a challenge for universities and their libraries. The second theme included discussion of the evolving scholarly record which, as explored in detail in this chapter, is set to alter fundamentally much of the current practice. The library in its turn needs to respond to this upheaval. Aspects such as peer review and RDM are likely to require greater support, and the question most important in terms of scholarly

communication is with whom does the challenge of providing this lie?

One unexpected outcome of the Delphi study is that it highlights the prominence of the university press as a component of the institutional repository. A participant noted:

I have interpreted the question about University Presses to refer to the traditional print based Press; it is very likely and in my view desirable for universities to develop their own online, open access presses as part of their overall brand. I think that academics would rather have the impact of a brand name than publish individually. (Participant 574)

Two further comments supported this position:

Re. university presses - I believe there is considerable scope for open access university presses, which will make them viable into the future. (Participant 601)

Direct publishing to the web is desirable and it does not mean the end of university presses - new models of direct publishing could lead to more university presses with a different operating model. (Participant 602)

The reality of the task ahead in reinvigorating the university press was noted in this comment:

I would see an increase in the importance of University Presses, although again perhaps a lack of actual resource behind this in some cases. There have been repeated mentions of restarting our University Press, and praise for department level models of OA publishing already in place, but no indication of who or how this will be led, or any sense of such initiatives being awarded. (Participant 512)

The third theme identified that digital scholarship would be likely to have a significant impact on the academic library and that, as a consequence of this, library leaders need to be aware of the associated opportunities and threats and, most crucially, to place themselves in a position from which they can respond strategically. The overarching issues associated with open access and its impact on research are not yet addressed effectively by university or library leaders. This may be because there is a more general lack of understanding, strategic response and urgency surrounding the impact of digital scholarship within universities. The traditional research lifecycle model is becoming less representative in a digital

scholarship environment, the habitus of digital scholars is complex and inadequately understood and social networks are seemingly becoming more important than formal infrastructures. New ways of understanding research are needed, and the conceptual framework presented here provides a fresh perspective on the library's future role. This study may provide some scenarios for the impact which the emerging open access agenda could have on the arrangements for resourcing scholarship, scholarly communications and publishing, an area of critical importance but one that is typically uncoordinated and spread across multiple university functions.

Given the significance of the overall change brought about by digital scholarship, there is potential for this study to make the modest claim that it provides new insight in the way it explores the nature of the upheaval in higher education. Through its methodology, especially its use of experts who are close to practice, it offers a credible vision of how some of the emerging issues might evolve and have an impact on practice in the near future. There may be a tension between this pragmatic vision and the 'planned' strategic vision often promulgated by policymakers, but by linking the literature with the empirical findings, a new understanding is created that fills a gap by enhancing theory with the first-hand experiences provided by practitioners in the midst of change. A further dimension is added by being able to see the changing environment from the individual library manager's point of view. This research is also timely, and indeed there is a certain urgency evident within the wider research community to respond to policy initiatives put forward by government. In this way, the study provides library leaders with a fitting analysis of a rapidly emerging area and, as such, offers material that is of potential value in planning services and developing strategy.

There are opportunities to undertake further research. For example, developing and refining the conceptual framework to take account of the most recent policymaking could inform future practice of library leadership. The key thread that runs through this study is the emerging concept of digital scholarship, drawn together with the move towards the notion of the evolving scholarly record. This has profound

implications for research and its support by libraries. The curatorial role of the library, not only in relation to scholarly communications, but also in its widest sense, is set to change significantly, as Lavoie and Malpas explain:

An evolving scholarly record implies evolving stewardship models for the scholarly record. Strategies designed to support the stewardship of print materials will no longer suit the “weightless” scholarly record now coalescing in digital, networked spaces. (Lavoie and Malpas, 2015 p.6)

References

Adler, M. and Ziglio, E. (Eds.), (1996). *Gazing into the oracle: The Delphi method and its application to social policy and public health*. London, England: Jessica Kingsley Publishers.

Ampuja, M. and Koivisto, J. (2014). From “Post-Industrial” to “Network Society” and Beyond: The Political Conjunctures and Current Crisis of Information Society Theory. *Journal for a Global Sustainable Information Society*, 12(2). Retrieved March 2016 from: <http://www.triple-c.at/index.php/tripleC/article/view/568/595>.

Anderson, K. (2013). The RCUK Open Access Policy Is Revised — Complexity, Confusion, and Conflicting Messages Abound. *The Scholarly Kitchen* Weblog post. Retrieved March 2013 from: <https://scholarlykitchen.sspnet.org/2013/03/07/the-rcuk-open-access-policy-is-revised-complexity-confusion-and-conflicting-messages-abound/>.

Anderson, R. (2011). The Crisis in Research Librarianship. *Journal of Academic Librarianship*, 37(4), 289–290.

Anderson, R. (2015). A quiet culture war in research libraries – and what it means for librarians, researchers and publishers. *Insights*, 28(2), 21–27.

Armstrong, C., Edwards, L. and Lonsdale, R. (2002). Virtually there? E-books in UK academic libraries. *Program: Electronic Library & Information Systems*, 36, 216-227.

Atkinson, E. (2000). Behind the Inquiring Mind: Exploring the transition from external to internal inquiry. *Reflective Practice*, 1(2), 149-164.

Atkinson, J. and Morgan, S. (2007). University Libraries. In J. H. Bowman, (Ed.), *British Librarianship and Information Work 2001-2005* (pp. 57-78). Aldershot, England: Ashgate.

ACRL. (2010). *Value of Academic Libraries: A Comprehensive Research Review and Report*. Retrieved May, 2014, from: www.acrl.ala.org/value.

Auckland, M. (2012). Re-skilling for Research. An investigation into the role and skills of subject and liaison librarians required to effectively support the evolving information needs of researchers. Research Libraries UK. Retrieved October, 2014, from: <http://www.rluk.ac.uk/wp-content/uploads/2014/02/RLUK-Re-skilling.pdf>.

Ayris, P. (2001). Open archives: institutional issues. *Vine*, 31, 34-37.

Bailey, C. Jr., (2005). *Open Access Bibliography: Liberating Scholarly Literature with E-Prints and Open Access Journals*. Washington, DC: Association of Research Libraries. Retrieved December 2014 from: <http://www.digital-scholarship.org/oab/oab.htm>.

Ball, D., (2015). *Open Science, Open Data, Open Access ... A UKeIG White Paper*. London, England: UKeIG, the UK eInformation Group of CILIP, the Chartered Institute of Library and Information Professionals. Retrieved December, 2016, from: http://www.cilip.org.uk/sites/default/files/documents/open_access_white_paper_final.pdf.

Barnett, R., (2004). Learning for an unknown future, *Higher Education Research and Development*, 23(3), 247-260.

Barnett, R. and Griffin, A. (1997). *The end of knowledge in higher education*. London, England: Cassell.

Baruchson-Arbib, S. and Bronstein, J. (2002). A View to the Future of the Library and Information Science Profession: A Delphi Study. *Journal of the American Society for Information Science and Technology*, 53(5), 397-408.

Bell, D. (1974). *The Coming of Post-Industrial Society. A Venture in Social Forecasting*. London, England: Heinemann.

Bent, M.J. (2016). *Practical Tips for Facilitating Research*. London, England: Facet Publishing.

Berners-Lee, T., De Roure, D., Harnad, S. and Shadbolt, N. (2005). Journal publishing and author self-archiving: Peaceful Co-Existence and Fruitful Collaboration. Retrieved March, 2017, from: <http://openaccess.eprints.org/index.php?/archives/20-guid.html>.

BIS (2012). Letter to Dame Janet Finch on the Government Response to the Finch Group Report: "Accessibility, sustainability, excellence: how to expand access to research publications" July 16th, 2012. Government/BIS Response Letter to the Finch Review. Retrieved December, 2015 from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32493/12-975-letter-government-response-to-finch-report-research-publications.pdf.

BIS (2013a). Committee announces an inquiry into Open Access. Retrieved December, 2016 from: <http://www.parliament.uk/business/committees/committees-a-z/commons-select/business-innovation-and-skills/news/committee-announces-an-inquiry-into-open-access/#skipToContent>.

BIS (2013b). House of Commons, Commons Select Committee, Fifth Report - Open Access. Department for Business Innovation and Skills. Retrieved December, 2016 from: <http://www.publications.parliament.uk/pa/cm201314/cmselect/cmbis/99/9902.htm>.

Björk, B. and Solomon, D. (2014). *Developing an Effective Market for Open Access Article Processing Charges*. London, England: Wellcome Trust. Retrieved November, 2016 from: <https://wellcome.ac.uk/sites/default/files/developing-effective-market-for-open-access-article-processing-charges-mar14.pdf>.

Borgman, C. L. (2010). *Scholarship in the Digital Age: Information, Infrastructure, and the Internet*. *Dawsonera* [Online] Retrieved March, 2017 from: <https://www.dawsonera.com/readonline/9780262255783>.

Borgman C. L. (2012). The conundrum of sharing research data. *Journal of the American Society for Information Science and Technology*, 63(6), 1059-1078.

Breivik, P. S. and Gee, E. G., (2006). *Higher education in the Internet age: libraries creating a strategic edge*. Westport, Conn: Praeger Publishers.

Brew, A., (2001a). Conceptions of Research: A phenomenographic study, *Studies in Higher Education*, 26(3), 271-285.

Brew, A. (2001b). *The Nature of Research: inquiry in academic contexts*. London, England: Routledge Falmer.

Brewerton, A. (2012). Re-Skilling for Research: Investigating the Needs of Researchers and How Library Staff Can Best Support Them, *New Review of Academic Librarianship*, 18(1), 96-110.

Brown, S. and Swan, A. (2007). Researchers' use of academic libraries and their services: A report commissioned by the Research Information Network and the Consortium of Research Libraries. Retrieved May, 2015 from: <http://eprints.soton.ac.uk/263868/1/libraries-report-2007.pdf>.

Bulpitt, G. (2012). *Leading the Student Experience: Superconvergence of Organisation, Structure and Business Processes*. London, England: Leadership Foundation for Higher Education.

Carr, R. (2007). *The Academic Research Library in a Decade of Change*. Oxford, Chandos Publishing.

Carayannis, E.G. and Campbell, D.F.J. (2012). Mode 3 Knowledge Production in Quadruple Helix Innovation Systems, *Springer Briefs in Business* 7, 1-64.

Castells, M. (2000). Materials for an exploratory theory of the network society. *British Journal of Sociology*, 51(1), 5–24.

CIBER (2011). *Access to scholarly content: Gaps and barriers* Report for the Research Information Network, JISC and the Publishing Research Consortium. Retrieved May, 2014 from:

http://www.rin.ac.uk/system/files/attachments/gaps_final_report_low_res.pdf.

Coble, Z., Potvin, S. and Shirazi, R. (2014). Process as Product: Scholarly Communication Experiments in the Digital Humanities. *Journal of Librarianship and Scholarly Communication* 2(3).

Cohen, P. (2010). Scholars Test Web Alternative to Peer Review
By Patricia Cohen 23rd August 2010. Retrieved October 2016 from:
<http://www.nytimes.com/2010/08/24/arts/24peer.html?pagewanted=2&r=0>.

Corrall, S. (2012). Roles and responsibilities: Libraries, librarians and data. In G. Pryor (Ed.), *Managing research data* (pp. 105–133). London, England: Facet Publishing.

Corrall, S., Kennan, M. and Afzal, W. (2013). Bibliometrics and Research Data Management Services: Emerging Trends in Library Support for Research. *Library Trends*, 61(3), 636-674.

Costa, C. (2015). Outcasts on the inside: academics reinventing themselves online. *International Journal of Lifelong Education*, 34(2), 194-210.

Cox, A. and Pinfield, S. (2014). Research data management and libraries: Current activities and future priorities. *Journal of Librarianship and Information Science*, 46(4), 299-316.

Cox, A., Pinfield, S. and Smith, J. (2016). Moving a brick building: UK libraries coping with research data management as a 'wicked' problem. *Journal of Librarianship and Information Science*, 48(1), 3-17.

Daland, H. D. and Walmann-Hidle, K. M. (2016). *New Roles for Research Librarians: Meeting the expectations for Research Support*. Oxford, England: Chandos Publishing.

Dalkey, N. (2002). Toward a Theory of Group Estimation. In H. Linstone and M. Turoff (Eds.), *The Delphi Method; Techniques and Applications* (pp. 231-256). Reading, Mass: Addison-Wesley Pub. Co., Advanced Book Program.

Dalkey, N. (1969). *The Delphi Method: An Experimental Study of Group Opinion: Prepared for United States Air Force Project Rand*. Santa Monica: Rand. Retrieved October, 2016 from:
http://www.immagic.com/eLibrary/ARCHIVES/GENERAL/RANDCORP/Rand_RM5888.pdf.

Dale, P., Beard, J. and Holland, M. (2011). *University Libraries and Digital Learning Environments*. Farnham, England: Ashgate Publishing Limited.

Day, J. and Bobeva, M. (2005). A Generic Toolkit for the Successful Management of

Delphi Studies. *The Electronic Journal of Business Research Methodology*, 3:2, 103-116.

Deem, R. (2004). The Knowledge Worker, the Manager-academic and the Contemporary UK University: New and Old Forms of Public Management? *Financial Accountability & Management*, 20(2), 107-128.

Delbecq, A. I., Van de Ven, A. H. and Gustafson, D. H. (1975). *Group techniques for program planning a guide to nominal group and Delphi processes*. Glenview, Ill: Scott, Foresman. Retrieved May 2014 from: <https://sites.google.com/a/umn.edu/avandeven/publications/books/group-techniques-for-program-planning>.

Dempsey, L. (2011). Internal boundary changes - the library in the institution. Blogpost. Retrieved 15 December 2014 from: <http://orweblog.oclc.org/archives/002167.html>.

DORA (2012). San Francisco Declaration on Research Assessment - Putting science into the assessment of research. Retrieved December 2016 from: <http://www.ascb.org/files/SFDeclarationFINAL.pdf>.

Erway, R. (2013). Starting the conversation: University-wide research data management policy OCLC Online Computer Library Center, Inc. Retrieved June 2016 from: <http://www.educause.edu/ero/article/starting-conversationuniversity-wide-research-data-management-policy>.

Erway, R. and Rinehart, A. (2016). *If You Build It, Will They Fund? Making Research Data Management Sustainable*. Dublin, Ohio: OCLC Research. Retrieved June 2016 from: <http://www.oclc.org/content/dam/research/publications/2016/oclcresearch-making-research-data-management-sustainable-2016.pdf>.

Eve, M. P., (2014). *Open access and the humanities: contexts, controversies and the future*. Cambridge University Press. Downloaded from Cambridge Books Online by IP 2.216.190.125 on Mon Mar 02 21:22:31 GMT 2015. <http://ebooks.cambridge.org/ebook.jsf?bid=CBO9781316161012>
Cambridge Books Online © Cambridge University Press, 2015.

F1000Research (2017). <https://f1000research.com/>.

Finch, J. (2012). *Accessibility, sustainability, excellence: how to expand access to research publications*. Report of the Working Group on Expanding Access to Published Research Findings – the Finch Group. Funded by: Department of Business, Innovation and Skills; the Higher Education Funding Council for England; Research Councils UK; the Publishers Association.

Flew, T. (2014). *New media: an introduction*, Melbourne, Australia: Oxford

University Press.

Follett, B. (1993). *The Follett Report* Retrieved 15 Dec 2014 from:
<http://www.ukoln.ac.uk/services/papers/follett/report/intro.html>.

Foutch, L. (2016). A New Partner in the Process: The Role of a Librarian on a Faculty Research Team, *Collaborative Librarianship*, 8(2). Retrieved June 2017 from:
<http://digitalcommons.du.edu/collaborativelibrarianship/vol8/iss2/6>.

Frosio, J. (2014). Open Access Publishing: A Literature Review. CREATE Working Paper 2014/1 Retrieved May 2014 from:
<http://zenodo.org/record/8381/files/CREATE-Working-Paper-2014-01.pdf>.

Gardner, R. (2013). In C. Wickham and N. Vincent *Debating Open Access* London, England: British Academy.

Gargouri, Y., Larivière, V., Gingras, Y., Brody, T., Carr, L., Harnad, S. (2012) Testing the Finch Hypothesis on Green OA Mandate Ineffectiveness. Paper presented at Conference, Open Access Week 2012, University of Windsor, Windsor, Canada. Retrieved November 2014 from:
<https://arxiv.org/ftp/arxiv/papers/1210/1210.8174.pdf>.

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P. and Trow, M. (1994). *The new production of knowledge: the dynamics of science and research in contemporary societies*. London, England: Thousand Oaks.

Godin, B. (2006). The Knowledge-Based Economy: Conceptual Framework or Buzzword? *Journal of Technology Transfer*, 31, 17–30.

Goldacre, B. (2009). *Bad science*. London, England: Fourth Estate.

Griffiths, M. (1998). *Educational research for social justice: getting off the fence*. Buckingham, England: Open University Press.

Guédon, Jean-Claude (2001). In Oldenburg's Long Shadow Librarians, Research Scientists, Publishers, and the Control of Scientific Publishing page 1 Retrieved May 2016 from: <http://www.arl.org/storage/documents/publications/in-oldenburgs-long-shadow.pdf>.

Hancock, S., Hughes, G. and Walsh, E. (2012). Universities and the Informal Knowledge Economy. In P. Temple (Ed.), *Universities in the Knowledge Economy - Higher Education Organisation and Global Change* (pp. 118-136). Abingdon, UK: Routledge.

Hanson, T. (2005). *Managing Academic Support Services in Universities: The Convergence Experience*. London, England: Facet Publishing.

Harnad, S. (1995). A Subversive Proposal. In A. Okerson & J. O'Donnell (Eds.) *Scholarly Journals at the Crossroads; A Subversive Proposal for Electronic Publishing*. Washington, DC: Association of Research Libraries. Retrieved May 2016 from: <http://www.arl.org/scomm/subversive/toc.html>.

Harnad, S. (2013). United Kingdom's Open Access Policy Urgently Needs a Tweak *D-Lib Magazine* 18(9/10) Retrieved May 2016 from: <http://www.dlib.org/dlib/september12/harnad/09harnad.html>.

Harris, S. (2012). *Moving towards an open access future: the role of academic libraries*. London, England: SAGE.

Hatcher, T and Colton, S. (2007). Using the internet to improve HRD research: The case of the web-based Delphi research technique to achieve content validity of an HRD-oriented measurement *Journal of European Industrial Training* 31(7):570-587.

Heikkinen, H.L.T., Huttunen, R. and Kakkori, L. (2000). 'And this story is true': On the problem of narrative truth, Paper presented to ECER, Edinburgh, September, 20th – 23rd 2000. Retrieved May 2016 from: <http://www.leeds.ac.uk/educol/documents/00002351.htm>.

Henderson, M. (2012). *The geek manifesto: why science matters*. London, England: Bantam.

Hernon, P., Powell, R. and Young, A. (2002). University Library Directors in the Association of Research Libraries: The Next Generation, Part Two. *College and Research Libraries*. 63 (1)73-90.

Hessels, L. K., and van Lente, H. (2008). Re-thinking new knowledge production: A literature review and a research agenda. *Research Policy*, 37(4), 740-760.

Hoffman, S. (2016). *Dynamic Research Support for Academic Libraries*. London, England: Facet Publishing.

Hoodless, C. and Pinfield, S. (2016). Subject vs. functional: Should subject librarians be replaced by functional specialists in academic libraries? *Journal of Librarianship and Information Science* Retrieved July, 2016 from: <http://journals.sagepub.com/doi/pdf/10.1177/0961000616653647>.

Houghton, J. and Oppenheim, C. (2010). *The economic implications of alternative publishing models*, Prometheus, 28(1), 41-54, Retrieved April 2016 from: <http://dx.doi.org/10.1080/08109021003676359>.

Houghton, J.W., Rasmussen, B., Sheehan, P.J., Oppenheim, C., Morris, A., Creaser, C., Greenwood, H., Summers, M. and Gourlay, A. (2009). *Economic Implications of Alternative Scholarly Publishing Models: Exploring the Costs and Benefits*, Report to The Joint Information Systems Committee (JISC) by Victoria University &

Loughborough University.

Hsu, C. and Sandford, B. (2007). The Delphi Technique: Making Sense of Consensus. *Practical Assessment, Research & Evaluation*, 12(10), 1-8.

Inskip, C. (2013). 'The key issues affecting the enhancement of digital scholarship skills of information professionals.' PowerPoint presentation delivered at: SCONUL Conference, Dublin, Ireland, June 2013
Retrieved November 2016 from:
<https://www.slideshare.net/sconul/charlie-inskip-the-key-issues-affecting-the-enhancement-of-digital-scholarship-skills-of-information-professionals>.

Inskip, C. (2015). 'From information literacy to digital scholarship: challenges and opportunities for librarians.' PowerPoint presentation delivered at: ARLG Conference, Newcastle University, February 2015. Retrieved November 2016 from: http://www.cilip.org.uk/sites/default/files/Inskip_ARLG-web.pdf.

JISC (2015). *Complying with open access policies* Retrieved June 2017 from: <https://www.jisc.ac.uk/guides/complying-with-research-funders-open-access-policies?platform=hootsuite>.

JISC (2016). *Journal Markets: Academic journal markets, their limitations, and the consequences for a transition to open access: a thought piece* Retrieved December 2016 from: <https://www.jisc.ac.uk/reports/academic-journal-markets-limitations-consequences-for-transition-to-open-access>.

Joint, N. (2011). New perspectives on the convergence of academic libraries and campus information technology departments? *Library Review*, 60 (8).

Joint Funding Council's Libraries Review Group 1993 See Follett, B. (1993).

Jones, R., Andrew, T. and MacColl, J. (2006). *The institutional repository*. Oxford, England: Chandos Publishing.

Jones, S., Pryor, G. and Whyte, A. (2013). *How to Develop Research Data Management Services - a guide for HEIs. DCC How-to Guides*. Edinburgh, Scotland: Digital Curation Centre.

Jubb, M. (2011). Heading for the Open Road: Costs and Benefits of Transitions in Scholarly Communications. *Liber Quarterly*. 21(1), 102–124.

Keller, A. (2015). Research Support in Australian University Libraries: An Outsider View, *Australian Academic & Research Libraries*. Retrieved March 2017 from: <http://dx.doi.org/10.1080/00048623.2015.1009528>.

Kochtanek, T. R. and Hein, K. K. (1999). Delphi Study of Digital Libraries. *Information Processing & Management*. 35(3), 245-54.

Konkiel, S., Sugimoto, C.R. and Williams, S (2016) The Use of Altmetrics in Promotion and Tenure. *Educause Review* Retrieved May 2017 from: <http://er.educause.edu/articles/2016/3/the-use-of-altmetrics-in-promotion-and-tenure>.

Krosnick, J.A., Holbrook, A.L., Berent, M.K, Carson, R.T, Hanemann, M.W, Kopp, R.J, Mitchell, R.C, Presser, S, Ruud, P.A, Kerry Smith, V, Moody, W.R, Green, M.C and Conaway, M. (2002). The Impact Of "No Opinion" Response Options On Data Quality Non-Attitude Reduction Or An Invitation To Satisfice? *Public Opinion Quarterly*, 66(3), 371-403.

Lavoie, B., Childress, E., Erway, R., Faniel, I., Malpas, C., Schaffner, J. and van der Werf, T. (2014). *The Evolving Scholarly Record*. Dublin, Ohio: OCLC Research. Retrieved May 2016 from: <http://www.oclc.org/research/publications/library/2014/oclcresearch-evolvingscholarly-record-2014.pdf>.

Lavoie, B. and Malpas, C. (2015). *Stewardship of the Evolving Scholarly Record: From the Invisible Hand to Conscious Coordination*. Dublin, Ohio: OCLC Research. Retrieved May 2016 from: <http://www.oclc.org/content/dam/research/publications/2015/oclcresearch-esr-stewardship-2015-a4.pdf>.

Levy, P and Roberts, S. (2005). *Developing the new learning environment: the changing role of the academic librarian*. London, England: Facet Publishing.

Lewis, M. (2010). Libraries and the management of research data. In S. McKnight (Ed.), *Envisioning Future of Academic Library Services: Initiatives, Ideas and Challenges* (pp. 145-169). London, England: Facet Publishing.

Leydesdorff, L. (2010). The Knowledge-Based Economy and the Triple Helix Model. *Annual Review of Information Science and Technology*, 44(1), 367-417.

Linstone, H. and Turoff, M. (2002). *The Delphi method: techniques and applications*. Reading, Mass.: Addison-Wesley Pub. Co., Advanced Book Program.

Ludwig, B. G. (1994). Internationalizing Extension: An exploration of the characteristics evident in a state university Extension system that achieves internationalization. Unpublished doctoral dissertation, The Ohio State University, Columbus. Quoted in: Hsu and Sandford, (2007). The Delphi Technique: Making Sense of Consensus. *Practical Assessment, Research & Evaluation*, 12(10).

Machlup, F. (1962). *The Production and Distribution of Knowledge in the United States*. Princeton: Princeton University Press.

Mackenzie, A. and Martin, L. (2016). *Developing Digital Scholarship: emerging*

practices in academic libraries. London, England: Facet Publishing.

MacMillan, D. (2014). Data Sharing and Discovery: What Librarians Need to Know *The Journal of Academic Librarianship* 40(5), 541-549.

Manista, F. (2012). 'Open Don't Mean Free': A Reflection on the Potential Advantages and Disadvantages of Publishing Research via Open Access. *Journal of Librarianship and Scholarly Communication*. 1(2), eP1049.

Manyika, J., Chui, M., Bughin, J., Dobbs, R., Bisson, P., & Marrs, A. (2013). *Disruptive technologies: Advances that will transform life, business, and the global economy*. Washington, D.C., McKinsey Global Institute. Retrieved May 2016 from: <http://www.mckinsey.com/business-functions/business-technology/our-insights/disruptive-technologies>.

Marcum, D. (2016). *Library Leadership for the Digital Age*. New York: Ithaka S+R. Retrieved June 2015 from: http://www.sr.ithaka.org/wp-content/uploads/2016/03/SR_Issue_Brief_Library_Leadership_Digital_Age032816.pdf.

Marques, M. (2015). *A Schema for Open Access Policies*. Retrieved June 2016 from: <https://scholarlycommunications.jiscinvolve.org/wp/2015/11/30/a-schema-for-open-access-policies/>.

Marsh, J. and Evans, G. (2012). Generating research income: library involvement in academic research projects. *Library and Information Research*, 36(113), 48-61.

Maykut, P. and Morehouse, R. (1994a). *Beginning qualitative research. A philosophic and practical guide*, London, England: Falmer Press.

Maykut, P. and Morehouse, R. (1994b). table accessed Dec 2010 from: <http://www.edu.plymouth.ac.uk/resined/beginning/begresed.htm>.

McKnight, S. (2010). *Envisioning future academic library services: Initiatives, ideas and challenges*. London, England: Facet Publishing.

Miles, M.B. and Huberman, A. M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook* Thousand Oaks, CA: SAGE Publications, Inc.

Naylor, B. (2006). University Libraries. In J. H. Bowman, (Ed.), *British Librarianship and Information Work 1991-2000* (pp. 83-101). Aldershot, England: Ashgate.

Nowotny, H., Scott, P. and Gibbons, M. (2001). *Re-thinking science: knowledge and the public in an age of uncertainty*. Cambridge, UK: Polity.

O'Connor, L. (2009). Information literacy as professional legitimation: The quest for professional jurisdiction? *Library Review*, 58(4), 272-289.

OCLC website statement. Retrieved November 2016 from: <https://www.oclc.org/en/about.html>.

Olssen, M. and Peters, M. (2005). Neoliberalism, higher education and the knowledge economy: from the free market to knowledge capitalism, *Journal of Education Policy*, 20(3), 313-345.

Osborne, R. (2013). 'Why open access makes no sense.' In C. Wickham and N. Vincent, *Debating Open Access*. London, England: British Academy.

Peters, M. (2010). Three Forms of The Knowledge Economy: Learning, Creativity and Openness. *British Journal of Educational Studies*, 58(1), 67-88.

Pillai, M. (2010). Locating Learning Development in a University Library: Promoting Effective Academic Help Seeking, *New Review of Academic Librarianship*, 16(2), 121-144.

Pinfield, S., Cox, A.M. and Smith, J. (2014). Research Data Management and Libraries: Relationships, Activities, Drivers and Influences. *PLoS ONE*, 9(12). Retrieved June 2015 from: <http://journals.plos.org/plosone/article?id=10.1371%2Fjournal.pone.0114734>.

Pinfield, S., Salter, J. and Bath, P. (2015). The "total cost of publication" in a hybrid open-access environment: Institutional approaches to funding journal article-processing charges in combination with subscriptions. *Journal of the Association for Information Science and Technology*, 67(7), 1751-1766.

Prosser, D. (2004). The Next Information Revolution—How Open Access Repositories and Journals Will Transform Scholarly Communications. *LIBER Quarterly* 14(1). <http://eprints.rclis.org/1181/>.

Pryor, G., Jones, S. and Whyte, A. (2013). *Delivering Research Data Management Services*. London, England: Facet Publishing.

Pryor, G. and Donnelly, M. (2009). Skilling Up to Do Data: Whose Role, Whose Responsibility, Whose Career? *The International Journal of Digital Curation*, 4(2), 158-170.

Ray, M.W. (2001). Shifting sands - the jurisdiction of librarians in scholarly communication. ACRL Tenth National Conference. Retrieved June 2016 from: <http://www.ala.org/acrl/sites/ala.org.acrl/files/content/conferences/pdf/mray.pdf>.

RCUK (2012). *Policy on Open Access and Supporting Guidance*. Retrieved March, 2016 from: <http://www.rcuk.ac.uk/documents/documents/rcukopenaccesspolicy-pdf/>.

RCUK (2015). *Evolution or revolution? Publishers' perceptions of future directions in research communications and the publisher role A report commissioned by Research Councils UK for discussion among the Global Research Council*. Retrieved June, 2016

from: <http://www.rcuk.ac.uk/documents/international/evolutionorrevolution-pdf/>.

Research Councils UK (2015). Review of the implementation of the RCUK policy on open access (Professor Sir Robert Burgess, Chair of the review panel) Retrieved June 2016 from:

<http://www.rcuk.ac.uk/documents/documents/openaccessreport-pdf/>.

Reinsfelder, T. L. (2012). "Open Access Publishing Practices in a Complex Environment: Conditions, Barriers, and Bases of Power." *Journal of Librarianship and Scholarly Communication*. 1 (1).

Richard, J., Koufogiannakis, D. and Ryan, P. (2009). Librarians and Libraries Supporting Open Access Publishing. *Canadian Journal of Higher Education / Revue canadienne d'enseignement supérieur*, 39(3), 33-48.

Rowe, G. and Wright, G. (1999). The Delphi technique as a forecasting tool: issues and analysis. *International Journal of Forecasting*. 15, 353-375.

Rowland, F. (2002). *The Peer Review Process - A Report to the JISC Scholarly Communications Group*. retrieved March 2016 from <http://www.ra-review.ac.uk/invite/responses/stake/21.pdf>.

Royal Society (1665). Henry Oldenburg (Ed.), *Philosophical Transactions of the Royal Society of London*.

Royal Society (Great Britain). (2012). *Science as an open enterprise*. Retrieved February 2013 from: <https://royalsociety.org/topics-policy/projects/science-public-enterprise/report/>.

Sapp, G. and Gilmour, R. (2003). A Brief History of the Future of Academic Libraries: Predictions and Speculations from the Literature of the Profession, 1975 to 2000 - Part Two, 1990 to 2000. *Portal: Libraries and the Academy*. 3, 13-34.

Sarewitz, D (2016). Saving Science *The New Atlantis*, Special Section: The Integrity of Science (Spring/Summer 2016), 49, 4-40. Center for the Study of Technology and Society. Retrieved May 2016 from: <http://www.jstor.org/stable/43893401>.

Science and Technology Select Committee (2004). *Scientific Publications: Free for all?* HC 399-I July 2004, para 2.

Science and Technology Select Committee (Lords) (2013). (Summary). Retrieved 16th May 2016 from:

www.publications.parliament.uk/pa/ld201213/ldselect/ldsctech/122/122.pdf.

Science and Technology Select Committee (Lords) (2013). *The Implementation of Open Access* HL Paper 122. Written Evidence. Retrieved 16th May 2016 from: <http://www.parliament.uk/documents/lords-committees/science->

technology/Openaccess/OpenAccessEvidence.pdf.

SCONUL (Society for College, National and University Libraries) (2015). *Research Data Management: Briefing for library directors* Retrieved June 2016 from: <http://www.sconul.ac.uk/sites/default/files/documents/SCONUL%20RDM%20briefing.pdf>.

Scott, P. (2010). Higher Education and the Transformation of Society. In P. Peterson, E. Baker and B. McGaw, (Eds.), *International Encyclopedia of Education* (pp. 370-376). Oxford, England: Elsevier.

Secker, J. and Coonan, E. (2011). *A new curriculum for information literacy: curriculum and supporting documents*. Cambridge, UK: Arcadia Programme, Cambridge University Library.

Servage, L. (2009). The Scholarship of Teaching and Learning and the Neo-Liberalization of Higher Education: Constructing the "Entrepreneurial Learner" *Canadian Journal of Higher Education*. 39(2), 25-44.

Shattock, M. (2012). *Making Policy in British Higher Education 1945-2011*. Berkshire, England: Open University Press.

Shirky, C. (2008). *Here Comes Everybody: The Power of Organizing Without Organizations*. London, England: Penguin.

Shorley, D. and Jubb, M. (Eds.), (2013). *The future of scholarly communication* London, England: Facet Publishing.

Slaughter, S. and Rhoades, G. (2004). *Academic capitalism and the new economy: markets, state, and higher education*. Baltimore, MD: Johns Hopkins University Press.

Smith, A. and Webster, F. (Eds.), (1997). *The postmodern university? contested visions of higher education in society*. Buckingham, England: Society for Research into Higher Education.

Stiglitz, J. E. (2003). *Globalization and its discontents*. London, England: Penguin.

Stoffle, C. J., Allen, B., Morden, D. and Maloney, K. (2003). Continuing to Build the Future: Academic Libraries and their Challenges. *Portal: Libraries and the Academy*. 3, 363-380.

Steger, M. B. (2009). *Globalization: a very short introduction*. Oxford, OUP.

Suber, P. (2009). A field guide to misunderstandings about open access In *SPARC*

Open Access Newsletter, no. 132. Retrieved June 2015 from:
<http://www.earlham.edu/~peters/fos/newsletter/04-02-09.htm>.

Suber, P. (2012). *Open access*. Cambridge, Massachusetts, MIT Press. Retrieved June 2015 from: <http://mitpress.mit.edu/books/open-access>.

Sullivan, B. (2011). Academic Library Autopsy Report: 2050 In *The Chronicle of Higher Education* 2 January 2011 Commentary. Retrieved June 2014 from:
http://chronicle.com/article/Death-by-Irony-How-Librarians/125767/?sid=cr&utm_source=cr&utm_medium=en.

Surowiecki, J. (2004). *The wisdom of crowds: why the many are smarter than the few and how collective wisdom shapes business, economies, societies, and nations*. New York: Doubleday.

Swan, A. and Houghton, J.W. (2012). Going for Gold? The costs and benefits of Gold Open Access for UK research institutions: Further economic modelling, Report to the UK Open Access Implementation Group.

Swan, A. (2015). Open Access policy effectiveness: A briefing paper for research institutions PASTEU4OA. Retrieved March 2016 from:
<http://www.pasteur4oa.eu/sites/pasteur4oa/files/resource/Policy%20effectiveness%20-%20institutions%20final.pdf>.

Tattersall, A. (2016). *Altmetrics: a practical guide for librarians, researchers and academics*. London, England: Facet Publishing.

Tautkeviciene, G., Petrikaite, V. and Eidukeviciute, M. (2013). Open access from the perspectives of young researchers. *ScieCom Info*, 9(1).

Taylor, C. (2014). *Research Data Management: Briefing for library directors*. London, England: SCONUL. Retrieved May 2016 from:
<https://www.sconul.ac.uk/page/research-data-management>.

Taylor & Francis (2015). *Peer Review in 2015 A global view A white paper from Taylor & Francis*. Retrieved October, 2015 from:
<http://authorservices.taylorandfrancis.com/wp-content/uploads/2015/10/Peer-Review-2015-white-paper.pdf>.

Tenopir, C., Sandusky, R., Allard, S. and Birch, B. (2014). Research data management services in academic research libraries and perceptions of librarians *Library & Information Science Research*. 36(2), 8-90. Retrieved June 2016 from:
<http://www.sciencedirect.com/science/article/pii/S0740818814000255>.

Thomas, E. (2004). *Knowledge cultures and Higher education: Achieving balance in the context of globalisation*. London, England: Institute of Education, University of London. Retrieved May, 2014 from:

http://www.eldis.org/assets/Docs/20049.html#UcWSsXnz_cc.

Thomas, J. (2011). Future-proofing: the academic library's role in e-research Support. *Library Management* 32(1/2), 37-47. Brisbane, Australia: Queensland University of Technology.

Tight, M. (2012). *Researching higher education*. Maidenhead, England: Open University Press.

Verbaan, E. and Cox, A. (2014). Occupational Sub-Cultures, Jurisdictional Struggle and Third Space: Theorising Professional Service Responses to Research Data Management *Journal of Academic Librarianship*, 40(3-4), 211-219.

Voog, H. and Wiklund, G. (2013). It takes two to tango – making way for relevant research support services at Lund University Libraries (LUB). *ScieCom Info*, 9(1). Retrieved May 2017 from: <http://www.sciecom.org/ojs/index.php/sciecominfo/article/view/6125/5253>.

Weller, M. (2011). *The Digital Scholar: How Technology Is Transforming Scholarly Practice*. London, England: Bloomsbury Academic.

Willets, D. (2013). *Open Access Research Great Britain*. Department for Business, Innovation & Skills, 20 November 2013. Berlin-Brandenburg Academy of Sciences and Humanities, Berlin. Retrieved December 2014 from: <https://www.gov.uk/government/speeches/open-access-research>.

Wilsdon, J. et al. (2015). *The Metric Tide: Report of the Independent Review of the Role of Metrics in Research Assessment and Management*. Retrieved October 2015 from: http://www.hefce.ac.uk/media/HEFCE,2014/Content/Pubs/Independentresearch/2015/The,Metric,Tide/2015_metric_tide.pdf.

Wilson, J., Martinez-Urbe, L., Fraser, M. A. and Jeffreys, P. (2011). An Institutional Approach to Developing Research Data Management Infrastructure. *The International Journal of Digital Curation*. 6(2), 274-287.

Wittenberg, J. and Elings, M. (2017). Building a Research Data Management Service at the University of California, Berkeley - A tale of collaboration. *IFLA Journal* 43-1, 89-97.

Yu, D. and Chang, C. H. (2010). A Reflective Review of Disruptive Innovation Theory. *International Journal of Management Reviews*, 12, 435-452.

Zai III, R. (2015). Neither Fish nor Fowl: A Role Theory Approach to Librarians Teaching *Journal Of Library Administration*, 55(1).

Ziglio, E. (1996). The Delphi method and its contribution to decision-making. In M. Adler and E. Ziglio, (Eds.), *Gazing into the oracle: The Delphi method and its application to social policy and public health* (pp. 3-33). London, England: Jessica Kingsley.

Appendix 1 Ethical Approval Letter



**The
School
Of
Education.**

Ronan O'Beirne
EdD Dublin

Head of School

Professor Cathy Nutbrown
School of Education
388 Glossop Road
Sheffield
S10 2JA

4 January 2014

Telephone: +44 (0)114 222 8096

Email: edd@sheffield.ac.uk

Dear Ronan

ETHICAL APPROVAL LETTER

Notions of knowledge and the library in future tertiary education

Thank you for submitting your ethics application. I am writing to confirm that your application has now been approved, and you can proceed with your research.

This letter is evidence that your application has been approved and should be included as an Appendix in your final submission.

Good luck with your research.

Yours sincerely



Professor Dan Goodley
Chair of the School of Education Ethics Review Panel

CC Prof Gareth Parry

Appendix 2 Letter of Invitation to Participants and Consent Form

Dear participant,

You are being invited to take part in a research project. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Please feel free to ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

This Delphi study intends to provide a better understanding of the relationship between research, knowledge production and the academic library. The primary research question that will guide this study is: What is the nature of the relationship between the academic library and the changing mode of research and knowledge production?

The data collected in this study will be used to better understand the current and future relationship between research and the academic library function. In addition it will be submitted by me in partial fulfilment of the requirements for the degree of Doctor of Education at the University of Sheffield.

Participation is solely online and consists of two rounds of questions. Each round should take no more than 15 minutes. Round two will be informed by responses to round one and will take place soon after. The study will take place during May/June 2014.

Participation is voluntary and you have the right to withdraw at any time. You will be asked for your consent before you will be allowed to continue. A summary of the results will be available to participants upon request. In the spirit of open research a selection of data collected will be made available to participants in due course. All data will be anonymised and no personal details will be published.

Yours sincerely,

Consent Form (online version)

Title of research: Research, knowledge and the academic library

School of Education, University of Sheffield, UK.

Researcher name: Rónán O’Beirne FCLIP, SFHEA email: r.obeirne@bradfordcollege.ac.uk

Supervisor name: Professor Dr. Gareth Parry email: g.w.parry@sheffield.ac.uk

The data collected in this study will be used to draw conclusions to better understand the current and future relationship between research and the academic library function. In addition it will also be submitted in partial fulfilment of the requirements for the degree of Doctor of Education at the University of Sheffield.

In order to participate you need to agree to the following:

I agree to participate in this study, I understand that my participation is voluntary. I understand that data collected will be anonymous and may be made available as an open data-set. I understand that I will not be identified by name in the final research output I am aware that all records will be kept confidential in the secure possession of the researcher. I acknowledge that contact details of the researcher have been made available to me I understand that I may withdraw from the study at any time and if I so wish, any data relating to my participation will not be used.

By clicking on 'go to the questions' (below) you agree that you have read and understood the above information, and will participate in this study:

Appendix 3 Delphi Study Results Round One

Delphi Study Results - Round One - Part A

Question A1	Strongly agree	Agree	Don't know	Disagree	Strongly disagree	Total
A1.1 Open research and open access are challenging areas for policy-making at a national (funding councils, funding bodies) level	17 (49%)	15 (43%)	0	3 (9%)	0	35
A1.2 In the last 3 years there has been growing clarity about national policy for open access	4 (11%)	24 (69%)	1 (3%)	5 (14%)	1 (3%)	35
A1.3 Open research is a contentious issue within universities	7 (20%)	21 (60%)	3 (9%)	4 (11%)	0	35
A1.4 The policy issues associated with research outputs and open access are understood by university leaders	1 (3%)	8 (23%)	3 (9%)	21 (60%)	2 (6%)	35
A1.5 Gold and green open access are fully understood by those involved in research	0	2 (6%)	0	21 (60%)	12 (34%)	35

Question A2	Strongly agree	Agree	Don't know	Disagree	Strongly disagree	Total
A2.1 Those responsible for research at a strategic level within colleges and universities fully appreciate the importance of Research Data Management (RDM)	0	11 (31%)	3 (9%)	18 (51%)	3 (9%)	35
A2.2 The role of supporting RDM is clearly defined within colleges and universities	0	0	2 (6%)	24 (69%)	9 (26%)	35
A2.3 Everyday tasks associated with RDM are understood by researchers	0	3 (9%)	3 (9%)	21 (60%)	8 (23%)	35
A2.4 The policy issues related to RDM and open access are understood by researchers	0	0	4 (11%)	20 (57%)	11 (31%)	35
A2.5 Most researchers are aware of the potential impact of open access on scholarly communications	1 (3%)	9 (26%)	3 (9%)	18 (51%)	4 (11%)	35

Prediction Questions A3	Likely/ desirable	Likely/ Undesirable	Unlikely/ desirable	Unlikely/ undesirable	Total
A3.1 Researchers will get closer to and more involved in data management activities	22 (63%)	0	13 (37%)	0	35
A3.2 All those involved in research will understand the implications of RDM	15 (43%)	0	20 (57%)	0	35
A3.3 Costs associated with research dissemination will impede scholarly communication	0	23 (66%)	1 (3%)	11 (31%)	35
A3.4 Institutional repositories will begin to form consortia	12 (34%)	1 (3%)	9 (26%)	13 (37%)	35

Prediction Questions A4	Likely/ desirable	Likely/ Undesirable	Unlikely/ desirable	Unlikely/ undesirable	Total
A4.1 The majority of institutional repositories will be linked according to subject discipline	6 (17%)	1 (3%)	19 (54%)	9 (26%)	35
A4.2 Funding will be dependent on researchers' re-use of their own or others' data	12 (34%)	2 (6%)	4 (11%)	17 (49%)	35
A4.3 Bibliometrics will have a greater influence on the research agendas of institutions	14 (40%)	16 (46%)	1 (3%)	4 (11%)	35
A4.4 The scholarly communication model (i.e. peer review) will undergo radical change	12 (34%)	2 (6%)	13 (37%)	8 (23%)	35

Prediction Questions A5	Likely/ desirable	Likely/ Undesirable	Unlikely/ desirable	Unlikely/ undesirable	Total
A5.1 Most academic researchers will operate directly with business and independently of universities	1 (3%)	3 (9%)	1 (3%)	30 (80%)	35
A5.2 Direct publishing to the web by academics will mean university presses will no longer be viable	6 (17%)	7 (20%)	2 (6%)	20 (57%)	35
A5.3 Legislation across national borders will prevent large amounts of research data from being shared globally	1 (3%)	22 (63%)	0	12 (34%)	35
A5.4 Research data will be stored and made accessible independently of 'published papers'	30 (86%)	1 (3%)	2 (6%)	2 (6%)	35

Please rate your own expertise in relation to your answers in Part A. Generally were the questions in an area that you are:

Focused on - 40% 14
 Adjacent to - 51% 18
 Separate from - 9% 3
 Total 100% 35/35 respondents

Delphi Study Results - Round One - Part B

Question B1	Strongly agree	Agree	Don't know	Disagree	Strongly disagree	Total
B1.1 Academic libraries have the potential to play a greater role in supporting research	27 (77%)	6 (17%)	1 (3%)	1 (3%)	0	35
B1.2 Developments in scholarly communication influence the direction of the academic library	21 (60%)	11 (31%)	2 (6%)	1 (3%)	0	35
B1.3 Academic library leaders are closely involved with wider institutional research strategies	5 (14%)	18 (51%)	3 (9%)	9 (26%)	0	35
B1.4 The future of the library is an issue that is discussed within universities	1 (3%)	19 (54%)	4 (11%)	11 (31%)	0	35
B1.5 Those responsible for research administration understand the library function	0	12 (34%)	3 (9%)	19 (54%)	1 (3%)	35

Question B2	Strongly agree	Agree	Don't know	Disagree	Strongly disagree	Total
B2.1 The role of the university library in supporting research is well understood	1 (3%)	15 (43%)	0	18 (51%)	1 (3%)	35
B2.2 Library leaders are confidently repositioning the library to support the open research agenda	2 (6%)	17 (49%)	3(9%)	12 (34%)	1 (3%)	35
B2.3 Issues associated with open research and open access are well understood by library leaders	9 (26%)	18 (51%)	2 (6%)	5 (14%)	1 (3%)	35
B2.4 The academic library is well placed institutionally to participate in the research lifecycle	8 (23%)	21 (60%)	0	5 (14%)	1 (3%)	35

Question B3	Strongly agree	Agree	Don't know	Disagree	Strongly disagree	Total
B3.1 Researchers appreciate the services provided by the library	8 (23%)	22 (63%)	3 (9%)	2 (6%)	0	35
B3.2 Librarians are well placed to carry out the task of digital curation and research data management	6 (17%)	19 (54%)	3 (9%)	6 (17%)	1 (3%)	35
B3.3 Librarians need to adapt or extend their skills to deal with open data	20 (57%)	14 (40%)	0	1 (3%)	0	35
B3.4 The research support role is a contentious issue within universities	3 (9%)	13 (37%)	8 (23%)	10 (29%)	1 (3%)	35
B3.5 Librarians lack the information technology skills to support 'Big Data' effectively	9 (26%)	18 (51%)	2 (6%)	6 (17%)	0	35

Prediction Questions B4	Likely/ desirable	Likely/ Undesirable	Unlikely/ desirable	Unlikely/ undesirable	Total
B4.1 Library strategy will shift towards supporting research data management	30 (86%)	2 (6%)	2 (6%)	1 (3%)	35
B4.2 Librarians will add value (e.g. enhance discoverability) to research data	25 (71%)	1 (3%)	8 (23%)	1 (3%)	35
B4.3 Universities will have effective institutional repositories	23 (66%)	1 (3%)	10 (29%)	1 (3%)	35
B4.4 The RDM function will fall within the remit of a dedicated research support unit	15 (43%)	6 (17%)	8 (23%)	6 (17%)	35

Prediction Questions B5	Likely/ desirable	Likely/ Undesirable	Unlikely/ desirable	Unlikely/ undesirable	Total
B5.1 Researchers and librarians will work together closely at many points on the research lifecycle	16 (46%)	0	16 (46%)	3 (9%)	35
B5.2 Large datasets will become de facto electronic libraries managed by specialists	19 (54%)	4 (11%)	8 (23%)	4 (11%)	35
B5.3 The role of research data management will be central to the academic library	16 (46%)	0	11 (31%)	8 (23%)	35
B5.4 The curation and aggregation of research data will occur across / between different academic institutions	18 (51%)	1 (3%)	14 (40%)	2 (6%)	35

Prediction Questions B6	Likely/ desirable	Likely/ Undesirable	Unlikely/ desirable	Unlikely/ undesirable	Total
B6.1 Most RDM tasks will be fully automated which will obviate the need for librarians	5 (14%)	2 (6%)	13 (37%)	15 (43%)	35
B6.2 Use of content sourced from open institutional repositories will surpass content sourced from behind pay-walls	13 (37%)	2 (6%)	17 (48%)	3 (9%)	35
B6.3 Licensing and IPR (Intellectual Property Rights) issues associated with research data will be challenging	4 (11%)	28 (80%)	1 (3%)	2 (6%)	35
B6.4 With technology delivering intelligent solutions the academic library will be in decline	3 (9%)	6 (17%)	0	26 (74%)	35
B6.5 Costs associated with the academic library will be reduced significantly through use of open access material	5 (14%)	0	28 (80%)	2 (6%)	35

Please rate your own expertise in relation to your answers in Part B. Generally were the questions in an area that you are:

Focused on - 40% 14

Adjacent to - 54% 19

Separate from - 6% Total 10

Appendix 4 Delphi Study Results Round Two

ROUND 2 Results

Currently what do you think are the most important issues? Please rank according to priority	1	2	3	4	5	6	Total
Effective policy-making in areas associated with open research	6 (25%)	4 (17%)	4 (17%)	3 (13%)	6 (25%)	1 (4%)	24
Ensuring librarians and researchers work together effectively	6 (25%)	2 (8%)	2 (8%)	10 (42%)	4 (17%)	0	24
Developing capacity in institutions to manage research data	8 (33%)	7 (29%)	8 (33%)	1 (4%)	0	0	24
Increasing the data management skill levels of researchers	2 (8%)	7 (29%)	4 (17%)	8 (33%)	3 (13%)	0	24
Clarifying the role of the library in relation to research support	1 (4%)	4 (17%)	5 (21%)	2 (8%)	10 (42%)	2 (8%)	24
Other	1 (4%)	0	1 (4%)	0	1 (4%)	21 (88%)	24

<i>In 5 years' time what do you think will be the most important issues? Please rank according to priority.</i>	1	2	3	4	5	6	Total
An effective open scholarly communications model	12 (50%)	7 (29%)	3 (13%)	1 (4%)	1 (4%)	0	24
Increasing the data management skill levels of librarians	0	1 (4%)	9 (38%)	10 (42%)	4 (17%)	0	24
An effective research funding model	9 (38%)	9 (38%)	2 (8%)	2 (8%)	1 (4%)	1 (4%)	24
Sharing research outputs across institutional repositories	1 (4%)	3 (13%)	4 (17%)	5 (21%)	10 (42%)	1 (4%)	24
Repositioning the library to respond to research support issues	0	4 (17%)	6 (25%)	6 (25%)	7 (29%)	1 (4%)	24
Other	2 (8%)	0	0	0	1 (4%)	21 (88%)	24

<i>In 10 years' time what do you think will be the most important issues? Please rank according to priority.</i>	1	2	3	4	5	6	Total
Scholarly communication and models of academic publishing	8 (33%)	6 (25%)	7 (29%)	1 (4%)	2 (8%)	0	24
The open research agenda	2 (8%)	8 (33%)	7 (29%)	5 (21%)	2 (8%)	0	24
The role of the academic library	3 (13%)	0	2 (8%)	5 (21%)	13 (54%)	1 (4%)	24
Models for funding research	8 (33%)	5 (21%)	3 (13%)	6 (25%)	0	2 (8%)	24
Preservation of research data	3 (13%)	4 (17%)	5 (21%)	6 (25%)	6 (25%)	0	24
Other	0	1 (4%)	0	1 (4%)	1 (4%)	21 (88%)	24

Appendix 5 Comments from All Rounds

Round One Comments for Part A

Participant 500:

Although this isn't necessarily a main focus of my work, I have an understanding from two differing perspectives. Firstly, I am a researcher myself and therefore have some understanding from this perspective (though the majority of my research is practice-based rather than academic in focus). Secondly, I am involved in a number of projects relating to access to research, so stay abreast of developments relating to open access and institutional repositories.

Participant 506:

A lot of the above answers (e.g. on legislation, policy) are guesses.

Participant 509:

The 'predictions' questions lack any "don't know" indication, which would be useful.

Participant 510:

There are a few questions, especially around future developments in repositories that I didn't feel I could answer with any authority (3.4, 4.1) - but I had a go. It was hard to answer some questions as "researchers" aren't a homogenous bunch – but I've answered thinking about the majority.

Participant 512:

A1 Research Policy: I think there has been an increased clarity that open research is desired by policy makers and funders, but not necessarily a clarity on how this will be delivered. Over the last 12 months, OA policy requirements have failed to reach a consensus on embargo periods, deposit requirements and how repositories will work together to reduce the administrative burden on academics.

The above lack of clarity, and a general lack of awareness of open access options, copyright generally and the costs of research across the academic community, as well as an innate reluctance to work towards any "one-size-fits-all" solution across disciplinary boundaries appear to be the main reasons for an (often misplaced) suspicion or concern from academic colleagues.

A2: Whilst some lip service from senior levels outside of library services has been played as to the importance of engaging with RDM, I do not believe this has been matched by the provision of resources internally to deliver upon this - and in our

institution this has seen a long term battle to get that resource confirmed and in place. Similarly, whilst the awareness of the value of data is there in many areas this is still not backed up by a willingness to engage with the extra initial effort required, in part due to perhaps an underestimation or lack of certainty of any pay-off or future benefit of doing so.

A4: The linking of repositories requires technical and administration resource as well as addressing issues of copyright. Given the priority from new policy to increase engagement with the basic act of depositing in a repository, I suspect a lack of resource will be a major barrier to linking of many institutional repositories where links do not already exist, in tandem with academics existing and long term relationships with subject repositories in many disciplines.

A5: I would see an increase in the importance of University Presses, although again perhaps a lack of actual resource behind this in some cases. There have been repeated mentions of restarting our University Press, and praise for department level models of OA publishing already in place, but no indication of who or how this will be led, or any sense of such initiatives being awarded.

Participant 515:

I am not engaged directly in research support through an academic library. I am a publisher observer, engaged in providing publishing services to researchers via a professional set-up which is external to universities and academic libraries. I therefore have no role in university strategy or policy.

Participant 518:

I am not sure that my responses to Questions 3-5 are quite so binary. A don't know option would be useful or one which allows respondents to say 'it depends on the detail'. The majority of statements in Q5, for example, are dependent in my view on how much of this operates and what safeguards are in existence and so forth. I am not sure I find these unacceptable or undesirable per se and further not sure I am in a position to be categorical in terms of probability.

Participant 522:

Rate of change of policy and practice, nationally and internationally, in this area is significant. OA to outputs has a head of steam; RDM is only just beginning.

Participant 523:

I don't understand first question in A4

Participant 532:

I disagree with some of the wording of the questions, e.g.

- I think the variation among researchers about their understanding of RDM is extremely high and likely to continue

- I am not sure open access and RDM should be as closely linked as sometimes implied by the questions.

Participant 550:

Quite a difficult set of questions to give a definite answer to as future-gazing in this area is so difficult and dependent in many ways on outside influences - I wanted to answer possibly to a number and was surprised to see no mention of publishers explicitly as they are big players in this whole area.

Participant 558:

There's a good deal of uncertainty associated with the issues covered in Section A, and the questionnaire should have allowed respondents to reflect that. 'Don't know' (as in Qns 1 and 2 and others subsequently) is not the same thing as allowing the respondent to reflect uncertainty; and Qns 4 and 5 do not allow for any uncertainty at all.

You should therefore allow for non-responses to some questions.

The last question under 4 is bizarre in equating peer review with the 'scholarly communication model'.

Participant 561:

The predictions questions would have benefited with a "don't know" option.

Participant 569:

I am reading a lot about all this; in my own institution it's proving difficult to get a "voice" on these issues. I am strongly in favour of open access research, and would like to see researchers publishing directly to the web or through other open access routes. The day has to come when the large publishers are bypassed by individuals – but we have to solve the peer review / professional credibility problems first.

Participant 570:

The limited choice of answers forced me to state an opinion that might not be my real opinion.

Participant 574:

Researchers' views and understanding of OA vary widely across disciplines - generally more aware and supportive in STEM, less so in humanities where publications take much longer to develop.

I have interpreted the question about University Presses to refer to the traditional print based Press; it is very likely and in my view desirable for universities to develop their own online, open access presses as part of their overall brand. I think that academics would rather have the impact of a brand name than publish individually.

Participant 575:

I have had some difficulty knowing how to answer some of these questions: I am

fairly well informed about what is going on in my own institution, but I can't honestly say I know much about other institutions.

I like the two-dimensional questions - they should yield some interesting answers - but in several cases my truthful answer is that things are neither desirable nor undesirable, simply neutral.

Participant 578:

I have little impact on this area at university X, save at department level, where I'm trying to get these issues on the agenda and understood by faculty and researchers. University X faculty have the sense that they are above legislation, policy, in fact any sort of constraints. They expect the library or other support staff to deal with this stuff for them.

Participant 581:

I'm focused on RDM and adjacent to OA and scholarly publishing.

Participant 582:

I was slightly unsure about how to interpret question 4 "The majority of institutional repositories will be linked according to subject discipline". I think having more effective ways of cross-searching and linking between related content (including content related by subject) in a range of different repositories is important in order to maximise the potential role of repositories in the scholarly communication process.

Overall, I think current practice in all areas of research data management and open access is patchy, with some examples of excellent practice significantly outnumbered by poor or neutral practice in these areas. I would like to believe that there will be radical change in scholarly communication models, but fear that the current system is too deeply embedded to shift significantly. I think that the commercial publishers which currently dominate scientific communication will continue to find ways to maintain their position. I think that open access models based on author processing charges will have a detrimental effect on scholarly communication, particularly for researchers who are outside the academy, in the early part of their career or in institutions with smaller or less effectively managed publication funds. I also think that there is a danger that an over-reliance on quantitative measures of researcher output (eg bibliometrics or analysis of data re-use statistics) will inhibit some research which may have other types of impact.

Participant 589:

Q3 -about institutional repositories froming consortia - I'm not quite sure whether it would be desirable or undesirable. I haven't thought it through to be honest.

Q4 - I think there will be radical changes in peer review, but probably not in the next 5 years. There is a lot of inertia in this area, not the least because there is a risk/price to pay to be the first mover. But this change is badly needed.

Participant 595:

For many of these statements 'some' academics and researchers are very aware of issues relating to research data management and open access, but many are not. This ambiguity was difficult to reflect using these scales. 'Don't know' is also problematic because often I do know and the answer is 'yes and no'!

Participant 597:

"Legislation across national borders will prevent large amounts of research data from being shared globally" - yes, but only in specific sectors) primarily related to defence.

Participant 601:

Re. university presses - I believe there is considerable scope for open access university presses, which will make them viable into the future.

Participant 602:

Direct publishing to the web is desirable and it does not mean the end of university presses - new models of direct publishing could lead to more university presses with a different operating model.

It is desirable for data underpinning papers to be linked to the publication, but data publication in its own right is also a good thing where data is the main component with accompanying text on methodology and reuse.

Round One Comments for Part B

Participant 500:

As my department sits within an academic library in a University, I am aware of some of the discussions about the future strategy for our own library. As a researcher working with a number of other academic libraries, and with many connections to those working within academic libraries, I also have a perspective from others within the sector. Having said that, RDM is only really on the periphery of what I do on a day-to-day basis and not widely discussed with my contacts.

Participant 510:

I didn't feel able to answer with authority on the role of technology in RDM (13.1)

Participant 512:

I think these issues vary widely by institution, with some HEIs having restructured library services to specify support from learning/teaching and support for research activities, and others creating a nominal 'research' post, which may end up being

largely diverted to dealing with only one aspect of support (training, open access). This can in turn reduce the visibility of the potential the library can offer.

Participant 515:

My statements are based on observation from the outside. I am not directly involved with research support, RDM policy or practice but publish articles about it in the commercial titles which I manage.

Participant 518:

As an academic with an interest in the area I think it is germane, but you may be interpreting 'focused on' as 'working in' and hence I have selected 'adjacent to' for Q14. Several of the responses offered I wished to answer 'possibly' or 'maybe' or 'it depends' especially in relation to Q13 rather than couch it in terms of desirability.

Participant 523:

In 11, the dedicated research support unit should be at the interface between the Library and academic departments .. and researcher-led.

Participant 528:

This is not my main area of research, and as an academic, my knowledge is tangential to some of the questions that you pose. But it is certainly an important issue for all researchers, and I am aware of the key debates and arguments.

Participant 558:

The questions here are poorly conceived, and the options do not provide for all the possible answers. Many of my answers should be disregarded.

Participant 570:

The limited choice of answers forced me to state an opinion that might not be my real opinion.

Participant 574:

In Q 12, who are the specialists referred to? Librarians? In most cases data will be better managed at source by those who created it (specialist data managers); the role of librarians could be to provide policies, guidance and support on how to make the data available to others, but it would be impossible for us to understand the huge variety of data formats. We need to work alongside the specialists on this.

In Q13, bear in mind that there will be OA content available from publishers which is not behind a paywall but not in an institutional repository either.

In Q11, I have assumed that the specialist RDM unit could be in the Library, probably as a joint service with the Research Office and IT.

Participant 575:

Again, I was struggling a bit to separate what is happening in my library from what is happening in academic libraries generally. Sorry.

Participant 578:

I see Parts A & B as too closely aligned for my answers to be any different.

Participant 581:

In some ways I identify with academic libraries and in some ways I don't (being a specialist).

Participant 582:

In question 11 "The RDM function will fall within the remit of a dedicated research support unit", I assumed this referred to a research support unit outside the library. I think this is quite a likely approach, but I think giving this role to a unit in the library - drawing on library expertise and enabling RDM to be integrated more closely with the rest of the research information lifecycle - would be preferable.

Again, I think that academic library practice in this area is patchy and I think this will remain the case over the next 10 years. I think there is a big opportunity for libraries to position themselves as the central resource for the whole of the research lifecycle. However, university administrators may not see the library in this way and university librarians may be reluctant to argue strongly enough about their ability to take on these roles.

I think much more could be made of institutional repositories, especially if there were a clear national strategy for connecting and managing these in a sustainable way.

Participant 601:

Difficult to answer some of these questions e.g. 11 final point: library here is working in partnership with research unit, and very effectively. Demarcation of responsibilities is less clear cut than in the past, and I would envisage this fluid partnership working continuing.

Participant 602:

Aggregation of research data across institutions will develop but over a longer timescale - this is already happening for some disciplinary communities but this has not stemmed from institutional focus.

ROUND 2 COMMENTS

Currently what do you think are the most important issues? Please rank according to priority.

Additional Comments:

Participant 518:

Nothing else to add really

Participant 523:

Establishing costs of RDM and how it is paid for

Participant 528:

Clarifying the funding bodies approaches to RDM.

Participant 532:

Hard question. Depends whose point of view you are adopting.

I might have put other top, and put researchers' awareness/ attitudes rather than skills.

Participant 533:

6 only ticked because I had to!

Participant 554:

Ensuring the University has an effective support system for researchers

Participant 570:

Working with RCUK and other bodies using data to agree method to synchronise/bulk upload to avoid duplicate hand or auto updates and the cost of this to tax payer as well as the level of mistrust and confusion over correct versions.

Re clarifying the role of the library in relation to research support I just did a short session on this at SCONUL on Thursday and plan to follow up with ARMA. Happy to discuss.

Participant 582:

Financing open research and open access in a sustainable way. Where does or should the funding come from (government, research councils, institutions or individual academics) and where does it go (universities, repositories or publishers)? What about the gaps - research conducted without research council funding, academics outside universities, open access journals which don't charge

APCs?

In **5 years'** time what do you think will be the most important issues? Please rank according to priority.

Additional Comments:

Participant 518:

My only caveat is that 5 years is too long almost for any realistic assessment of what will be important – depends how preparations for REF 2020 pan out to be frank

Participant 528:

Inclusion of RDM approaches in further research assessment exercises

Participant 532:

I might have put "other" and emphasised not just research funding but also incentives structures

Participant 533:

1 & 2 are equally important, but the software will not allow a tie.

6 only ticked because I had to!

Participant 570:

The terminology is distinctly 'library' scholarly communications means 'making research outputs available' in my head but perhaps it does not in the context above. I can't really make sense of prioritising the issues above. What does 'effective research funding model' mean in this context? I've marked it 6 as I don't know what is meant.

I had to fill in 3-6 to return the questionnaire but my answers to that don't mean anything clear here.....

Other - data synchronisation as per 2

Participant 575:

It is vital that the library is positioned to respond to research support issues but I would hope that this will happen before 5 years' time. Indeed, our library has been doing this for several years already and will continue to do so.

Participant 582:

I think teaching will continue to be the main focus of academic library work. Some repositioning towards research support is already happening and I think this will be needed sooner than 5 years from now. Similarly, to have significant impact when it

is most needed (i.e. whilst researcher data management skills are still being developed), I think the data management skill levels of librarians specialising in research support need to be a priority now.

Participant 600:

Not exactly an effective research funding model, but rather an effective publishing and research selectivity model...

In **10 years'** time what do you think will be the most important issues? Please rank according to priority.

Additional Comments:

Participant 518:

A development of the answer to 4 above - in 10 years' time we will have REF 2020 results and so on - that will have an enormous impact on the research landscape.

Participant 528:

Difficult to say at this point.

Participant 532:

other could be engagement of research with publics / impact

Participant 533:

6 only ticked because I had to!

Participant 554:

We hope that many of the 10 year issues will be solved by then!

Participant 570:

Not sure what the difference between 1 and 2 is.

I had to fill in 5 and 6 to return the questionnaire but I am not sure what was being asked so the answers not necessarily meaningful

Other - data synchronisation as per 2

Participant 575:

I'm struggling a bit to decide how to answer these. If we are looking at the bigger picture then things like scholarly communications models and the open research agenda will be more significant than the interests of a single stakeholder group (such as the academic library). If this is about me, then my day to day life is more directly bound up in the role of the academic library and the wider environment takes a back seat.

Participant 582:

Potential for further disruptive innovations in scholarly communication / publishing and for the commoditisation of "open research" in new ways. I think the role of research in other library sectors (e.g. access to research in public libraries or health libraries) will also be a priority, facilitating public access to research outputs and providing opportunities for cross-sector collaboration by libraries.

Participant 587:

Indexing and retrievability of data. In 10 years there's going to be skads of this material. Given the issues today around identification and location of research literature which is far more readily understandable by most people, data is far more arcane and mysterious (and often formatted in a way only PIs and original researchers understand). I fear we'll have a morass of information that we labour hard to store, preserve and make accessible....and that no one quite understands what it is.

Participant 602

I feel as though in answering these questions I am being forced to imply that libraries are not so important - this is not so, it is just about dependencies. So without funding models none of us have money, issues like preservation need shared collaborative approaches for support so libraries as important and are part but not all of the picture.

