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Academic Administrator Influence on Institutional Commitment to Open Access of Scholarly Research

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ACADEMIC ADMINISTRATOR INFLUENCE ON INSTITUTIONAL COMMITMENT TO OPEN ACCESS OF SCHOLARLY RESEARCH

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This quantitative study investigated the interrelationships among faculty researchers, publishers, librarians, and academic administrators when dealing with the open access of scholarly research. This study sought to identify the nature of any relationship between the perceived attitudes and actions of academic administrators and an institution's commitment to open access as reported by library directors. A survey research design was used to collect data based on perceptions of library directors at four year colleges and universities in the United States. Results of this study show that as academic administrator attention to open access increases so do the open access activities of faculty and librarians. Information presented may benefit members in each stakeholder group by allowing them to better position their organizations for future success in a complex environment. This study may also benefit advocates of open access who wish to expand services and other initiatives that encourage the greater accessibility of scholarly work.

Some of the ideas presented in this dissertation also appear in:

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Scholarly communication in today's academic institutions involves complex interrelationships among key stakeholder groups including researchers, librarians, academic administrators, and publishers. Scholarly communication is often described as a system -- a complex environment intended to facilitate intellectual exchange through a wide variety of practices. Scholarly publishing makes up one very important part of this system and open access publishing is a specific form of scholarly publishing that has received a great deal of attention in recent years.

Each stakeholder group plays an important role in the scholarly communication system and also any transition toward open access. Researchers, who are the primary producers of new scholarly knowledge, depend on publishers to evaluate and distribute their work. They also expect librarians to purchase and provide access to current and past knowledge. In addition, researchers rely on the financial support and leadership of academic administrators. Meanwhile, academic administrators depend on researchers to help build and maintain an institution's reputation. Administrators also depend on librarians and expect them to provide researchers with the tools necessary for success. These academic leaders must carefully balance many competing interests when allocating resources. Librarians have a responsibility to meet the needs of researchers by acquiring, organizing, and preserving the scholarly record. To do this successfully librarians frequently must interact or negotiate with publishers serving as the providers of scholarly content. Similar to researchers, the work of librarians often depends on financial support of academic administrators. Finally, publishers provide important services such as collecting and distributing scholarly knowledge, but also rely on the researchers to supply

content and on librarians to purchase the products being sold. Chapter two contains a more detailed analysis of these roles and interdependencies.

As shown in the literature cited throughout this study, many of these stakeholders believe the traditional system of scholarly communication is unsustainable. This concern stems from the increasing amounts of research scientists produce, combined with the increasing costs of subscriptions needed to access published research articles. With tightened library budgets reducing access to research journals, the quality of future scholarly work may suffer. Furthermore, publishers of academic journals worry about increased competition due to the growing number of alternative publishing opportunities available to authors. Ultimately, publishers' survival depends on the ability to provide valued products or services at a reasonable price. The individual and collective actions of all stakeholders will shape the future environment.

The system of scholarly knowledge production and distribution receives a great deal of attention from those stakeholders wishing to benefit from the greater sharing of information. Stakeholders include those mentioned above as well as those outside of the academy such as individuals, corporations, and government agencies. Because of modern technology and the widespread ability to distribute information electronically, authors and readers no longer need to rely as heavily on commercial publishers to distribute printed copies of research journals. The fact that researchers generate much of the content appearing in journals for little or no compensation from the publishers also troubles many academics. Similarly, scholars frequently carry out the intellectual work involved in the peer review process with no payment from a journal publisher. Meanwhile, commercial journal publishers realize substantial profits by selling these intellectual and creative works back to university libraries and individual readers, effectively limiting access to those who can afford to pay. Therefore, advocates for change argue

that faculty authors at universities should do more to retain ownership of their work by avoiding restrictive copyright agreements with publishers. Authors who maintain a level of control over their intellectual property enjoy greater flexibility in reusing their material thereby exposing a larger number of readers to their ideas.

Academics produce so much scholarly information that no organization can purchase it all through subscription-based publishers, whether in print or electronic format. As it stands now, librarians engage in a huge duplication of effort. Each university interested in providing access to a journal must purchase a separate costly subscription. Collectively universities could reduce costs and obtain greater access by choosing to finance journal articles upon their creation rather than upon their consumption. The proponents of open access, a model proposing the open sharing of knowledge, expect its wide implementation to reduce costs and increase access to research, while concomitantly maintaining the quality and integrity of original scholarship. Open access advocates envision a world that provides researchers with access to a majority of all academic scholarship through free electronic open access. Within universities much of the motivation and urgency for pursuing open research results from the struggle librarians face when needing to provide access to an increasing number of journals, while commercial publishers continue to raise subscription prices well beyond the rate of inflation (Yiotis, 2005). For a further introduction to the core concepts of open access see the work of Peter Suber (2012a), one of the foremost scholars on the subject.

A system of open access would shift the costs of knowledge distribution from the individual reader, or subscriber, to the creator -- meaning the authors, or more likely the institutions with which they are affiliated. As a result, an unlimited number of readers could enjoy free and immediate access to information, regardless of location or ability to pay.

Institutions such as universities and research funding agencies can help offset publishing costs for open access journals by using funds previously directed toward journal subscriptions. First, institutions may repurpose subscription fees to pay for their own authors' contributions to open access journals. Alternatively, institutions may commit funds formerly used for subscriptions to help convert a journal or set of journals to open access. For authors continuing to publish work in journals requiring subscription fees, the open access movement calls for researchers to retain sufficient ownership of their intellectual property and make a copy available online through a personal webpage, an online database maintained by their university, or another similar outlet.

One analysis estimates the average large research university in the United States could save over $2 million per year if it were to convert all current journal subscriptions to the open access publishing model, assuming the same level of quality achieved through a similar process of review and editing (Getz, 2005). A more recent estimate agrees with this potential to save approximately $2 million per year for a large university library (Morrison, 2012a). Thousands of colleges and universities could realize substantial savings using the same strategy. Industries and government agencies would also now have free access to this information, further enhancing the economic benefit. The following numbers illustrate the potential economic benefits of switching from a subscription model to an open access model where article publication fees can support the costs. The assumptions used in this analysis come from the work of Getz (2005).

- If 2,000 libraries/individuals/agencies/corporations subscribe to Journal X for $240, we as a society collectively pay $480,000 per year to support limited access to just one journal title.

- If 21,000 academic journals have an average subscription price of $240, that is a cost of $5.04 million to access just one copy of each journal. If that is multiplied by the average circulation of 2,000 copies the cost becomes **$10.08 billion being spent on limited access to academic journals each year**.

- If the journal publishing system switches to non-profit open access and a $1,500 author publication fee for each article replaces the $240 subscription fee Journal X, the cost to produce one year (93 articles) of Journal X becomes $139,500. A savings of $340,500 per year per journal, plus free online access for anyone.

- Multiply this $340,500 in savings by 21,000 journals and this becomes **$7.15 billion per year saved** in overall access to academic journals – plus the unknown but substantial economic benefit of free access to the individuals, libraries, agencies and corporations who did not have access through the initial 2,000 subscriptions of each journal.

Admittedly, under the subscription model, most individuals, libraries, agencies, and corporations could purchase copies of most articles if needed or obtain a copy through one of the subscribing libraries. However, the open access model can greatly reduce the barriers of time and cost for the reader. As Getz (2005) notes, larger universities would bear much of the cost under such an arrangement. Institutions with more authors also have more readers and would pay more. At the same time, smaller schools can still contribute their fair share based on a smaller number of authors and readers. The Public Library of Science (PLoS.org) serves as one successful example of the open access strategy supported by fees paid at the time of publication.

Under such a system, the use of publication fees has the potential to lead to challenges related to integrity and fairness. Will the acceptance of articles be impacted by one's ability to pay? McCabe and Snyder (2005) concluded that publishers can address this concern through a careful balance of fees. Publishers might successfully charge one fee for article submissions and another at the time of acceptance and publication. Ultimately, the editors must play the key role in determining the quality of content published and, in the longer term, the reputation of the journal (Mccabe & Snyder, 2005). If open access journal publishers can identify other models of financial support, they can reduce or even eliminate author fees. Additionally, many current open access journals do not require the payment of author publication fees. This transition to open

access is underway but moving slowly due to the many variables and competing interests of stakeholders.

The open access debate raises a philosophical question of who has the responsibility to absorb the costs of communicating scholarly information. Is it the sender, meaning an author or author's institution, or the receiver, meaning an individual reader or a library? The answer to this question may depend on the value of the information being transmitted as described by Tanner (2010). For example, some information is of relatively low value to the receiver but high value to the sender. Consider any corporation that spends a great deal of money on marketing plans to communicate messages to a targeted demographic. On the other hand, the receiver will sometimes value information more than the sender. The value a receiver places on information depends greatly on variables such as relevance to a current need and the urgency with which one requires or desires the information. The party placing the greater value on an information transaction will be most willing to pay.

When it comes to scholarly research proponents of the open access movement argue that it is more valuable for the sender or creator of scholarship to pay in order to make access to this information easily available to all receivers at the time of need. Much of the open access argument assumes that colleges and universities need to use much more research than can be produced on any one campus. If all institutions contribute by making local scholarship available in an open access format, the cost to each college or university could be significantly less than trying to acquire and store all of the published scholarship researchers need now or may need in the future. The pure or basic research that seems trivial now may be deemed invaluable later when it is needed for a specific application or in applied research. Therefore, as both creators and receivers of scholarly information, academic institutions and libraries will potentially realize a

greater benefit by paying to distribute locally produced research upon creation and supporting open access publishing systems than by purchasing scholarly information for consumption by local readers. In theory, the merits of open access scholarly publishing seem obvious and deserving of support from all parties. In reality, things are much more complex.

The modern Open Access Initiative originally began at a 2001 meeting of the Open Society Institute in Budapest (Budapest Open Access Initiative). Participants represented a wide range of views, disciplines, and nations, all committed to the idea of open research. Resulting recommendations strongly supported the concepts of open access journals and the self-archiving of research by making copies available online. Since this 2001 meeting, support for open access increased steadily and continues to build as evidenced by the ongoing work of Heather Morrison (2012b) and Peter Suber (2012b) documenting growth in interest and adoption of new practices. The Budapest Open Access Initiative recently reaffirmed the initial commitment to open access and proposed recommendations for the next ten years (Budapest Open Access Initiative).

Some early advocates of electronic publishing and open access seemed to expect fairly rapid progress toward change. However, legitimate concerns and illegitimate fears on the part of researchers, librarians, and publishers often prevent new practices from evolving more quickly. Organizational cultures along with individually held perceptions and attitudes prevent a large-scale shift toward this new publishing paradigm much more than the technical requirements. Social aspects of this nature almost always accompany technological innovation. Restivo and Croissant (2008) remind us that research addressing social environments and new technology suggests we often socially construct many elements of our lives based on the context and the meanings we assign. More specifically, the theory known as social construction of technology helps explain how relevant social groups, such as researchers, publishers, librarians, and

university administrators may have different interpretations of the meanings attached to new technology (Pinch & Bijker, 1987). These interpretations will determine how various groups assign meaning to new technology based on unique experiences.

Differing experiences and priorities often lead to a level of tension and conflict among stakeholders. This conflict increases or decreases as organizations exert varying levels of power over others while also maintaining some degree of dependence on outside groups. New technologies can also serve as a source of conflict as they replace old practices. In some cases conflict can even be a driver of positive change.

According to some tenets of conflict theory, power tends to harm society by causing individuals and groups to collectively respond in a manner that seeks to protect the interests of those in power at the expense of those with less power (Powers, 2004, pp. 155-169). A conflict theorist's perspective might characterize the system of scholarly publishing as a situation in which powerful corporate publishers enjoy excessive profits at the expense of the many libraries and universities operating on a not-for-profit basis.

In many situations involving conflict, the "powerful do not loosen the grip of exploitation without being pressed" (Powers, 2004, p.163). As time goes on, advocates for change including researchers, librarians and university leaders continue to apply increasing pressure from different directions in an attempt to shift the balance of power (Falk, 2004; Morrison, 2012b; University of California, 2010).

Scholarly communication resides within a complex network consisting of numerous relationships. Similar to many organizations, the social, cultural, legal, political, economic, and technological elements interact to characterize the environment encompassing this network (Hatch 2006, p.68). French and Raven (2005) describe power relationships among groups using

five bases of power. The next chapter will explore these helpful and important perspectives in greater detail in an attempt to present an understanding of the relationships between primary stakeholder groups.

Each group, whether researchers, publishers, administrators or librarians, exerts some power over the others through alliances and avenues of reward and coercion. At the same time, each individual group uses available resources and their position in the system to enjoy legitimate, referent, and expert forms of power. Each group also depends on the success of others within the system. The network of scholarly publishing and communication would not function adequately in its current form without the participation and contributions of all.

Numerous scholars widely accept and use Pfeffer and Salancik's resource dependence theory (2003) in the study of interorganizational relationships. This theory argues that a group will attempt to increase its own power by minimizing dependence on external organizations. Simultaneously this same group will attempt to increase its power over external organizations by creating or enhancing the dependence of others. These "dependencies are often reciprocal and sometimes indirect" and patterns of interdependence often change over time (Pfeffer & Salancik, 2003, p. xii).

To reduce dependence on the external environment, Pfeffer and Salancik predicted that organizations would use joint ventures or mergers, as well as marketing or lobbying efforts, to improve their position. The Hathi Trust Digital Library and the SCOAP 3 project represent recent examples of collaboration among librarians. Meanwhile, programs like LOCKSS and CLOCKSS bring together publishers and librarians to address common concerns. It is likely that stakeholders will continue to seek out additional partnerships and pursue those that promise to be most beneficial. Boissy and Schatz (2011) provide further analysis of the publisher perspective

on changing conditions and explain how publishers are evolving to remain an important part of the system. Furthermore, Georg Simmel, an early sociologist, observed that conflict is not always negative and can alert people when things are not working well and need to change (Powers, 2004, p. 162). Expanding upon Simmel's ideas, Coser (1964) explained how "conflict acts as a stimulus for establishing new rules, norms, and institutions" making "the readjustment of relationships to changed conditions possible" (p. 128). The establishment of new rules and norms is now ongoing as administrators, librarians, researchers, and publishers seek to form newly collaborative or complementary relationships to adapt to the changing environment. The next chapter discusses these current conditions and challenges in terms of barriers facing each of the primary stakeholder groups.

The idea of open access publishing is now available and in demand only because of the widespread adoption and use of technology for online communication. Pinch and Bijker (1987) label the final stage of technology adoption as a time of 'stabilization.' However, with open access, a period of stabilization remains elusive due to social and economic conflict. The studies of Rieger (2008) and Guedon (2009) apply the theory of social construction of technology to the adoption of institutional repositories or local online databases, one method universities use to make research articles publicly available. These two works further highlight and explore some of the complex relationships among these stakeholders.

No one can predict with certainty what the future of scholarly publication will look like. An open access model brought about by economic and technological conditions will require numerous shifts in the long established academic culture. Academics highly value a system that measures and rewards faculty productivity based on the number of publications accepted in select journals with a long-standing reputation. Therefore, faculty feel constant pressure to create

and share original works within a culture often described by the phrase “publish or perish”, since those who do not publish will not receive the rewards of continued employment including promotion and tenure. Scholars will view any change that could threaten this system with skepticism, but not all are opposed to alternative options. Such changes in organizational culture occur slowly over time and gain momentum only as a result of collective action (Cook & Yanow, 2005). However, at some point in the not too distant future, we will likely reach the tipping point where open access does become the “new normal” according to Heather Joseph (2009), executive director of the Scholarly Publishing and Academic Resources Coalition (SPARC). As colleges and universities develop new strategies for transmitting and archiving scholarly research produced by faculty, academic leaders need to better understand the relationships among all interested parties.

Statement of the Problem

The current economic and cultural environment, heavily influenced by technology, is forcing academics to reevaluate how scholarly research is created, transmitted, and archived for later retrieval. Nearly all of the authors writing on transitions occurring with scholarly communication and open access continue to focus on the practices and attitudes of researchers, librarians, and publishers (Boissy & Schatz, 2011; Carter, Snyder, & Imre, 2007; Palmer, Dill, & Christie, 2009; Way, 2010). With the exception of one study over seventeen years ago (Lancaster, 1995), the literature on the topic largely overlooks the role played by academic administrators, such as deans and provosts, who often oversee both faculty and librarians.

This study considers the role of these academic administrators who have the responsibility to pursue the best interests of the institution and coordinate activities across departments and disciplines. Birnbaum (1992) observed that “on many campuses, the academic

vice president had as great or even greater effect on the campus than did the president" (p. 113). Through the allocation of limited financial resources and various positions on key policies, these influential individuals can significantly impact the work of librarians and faculty, including initiatives related to open access scholarly publishing.

Significance of the Problem

Heather Morrison (2012b) provides quarterly updates offering data and commentary related to what she calls the "Dramatic Growth of Open Access". She documents various trends and measures that show the increasing adoption of open access. Laakso et. al. (2011) also document the "rapid growth" of open access journal publishing. If the proposed transformation toward open access continues on its current trajectory, free and easy access to this information will be significant for two major reasons. First, researchers and the public could more quickly and easily view the results of scholarly research created by universities, with much of this work intended to benefit all, not just those who can afford to pay. University-created knowledge is largely meant to be shared, unless restricted for national security reasons, or for reasons of intellectual property or proprietary arrangements with private corporations (Vest, 2007). Because it takes knowledge to create knowledge, greater access, as proposed by the open access model, has the potential to result in increased discovery leading to further innovation. On the other hand, restricting knowledge to a limited number of readers may result in missed opportunities to advance knowledge and apply it in ways that solve real problems. Second, according to the earlier analysis, the financial costs of limiting access appear to be much higher than a system of open access. These savings would allow university leaders and librarians to see some relief to their budgets as a result of lower subscription fees required to access scholarly journals. This approach could allow librarians to more effectively provide greater access to other services and

information sources. However, any path to open access must maintain critical elements of the established publishing system such as the process of peer review, editing, systematic distribution, and preservation, all while operating under a new business model capable of financing a new system. While scholars respect the many current open access journals that do this well they also have a responsibility to expose those that do not.

Many individuals within colleges and universities are increasingly looking for opportunities to move closer toward an environment of open access to scholarly research through steps such as the creation of open access journals, institutional repositories, funds dedicated to support open access initiatives, hiring of employees for new positions, and the adoption of official policies related to the creation and distribution of scholarly work. One might expect many of these new practices to have a limited impact without support from deans, provosts, and presidents along with financial commitments from these same administrators. While provosts or chief academic officers are somewhat limited in their ability to issue direct orders to faculty or librarians, they can certainly ask questions, frame questions, appoint committees, and provide financial support (Holyer, 2010).

One might also assume that an institution needs top-level administrative support to make substantial movement toward the open access of scholarly work. However, librarians and faculty at the departmental level can and do independently implement many initiatives. It is indeed possible that some institutions are successfully exploring open access issues without strong direct support from administrators because even though "formal leaders can make a difference …institutions can improve without them, or despite them" (Birnbaum, 1992, p. 120). Chapter two outlines in detail the issues and concerns of each group, including administrators, librarians, faculty and researchers. This study analyzes some of the power imbalances among the four

stakeholder groups identified and addresses unanswered questions about the relationship between open access initiatives and the influence of academic administrators. The results and conclusions of this study may help open access advocates and library leaders better understand the role played by academic administrators. Librarians and faculty will also be able to make more informed decisions when moving forward, especially when interacting with administrators.

Research Questions and Related Hypotheses

This study outlines the premise behind open access and investigates the complex interrelationships involved with a special focus on the perceived influence of the academic administrator on the actions of researchers and librarians. The following research questions are proposed in an effort to better understand the complex interactions among all stakeholders in the transition to open access, with a special focus on academic administrators:

Research Question 1

- Among researchers, publishers, librarians, and academic administrators, how much influence do library directors perceive each stakeholder group as holding in the transition toward open access?

Research Question 2

- As perceived by library directors, to what extent do the current attitudes and actions of academic administrators of colleges and universities in the United States influence institutional commitment (the actions of researchers and librarians) toward open access of scholarly research?

The proposed research seeks to address these questions by testing the assumptions made in the following hypotheses:

- **Hypothesis 1.**
  As administrator attention to open access increases (controlling for differences in decision making influence across organizations), faculty and librarian actions (institutional commitment) toward open access will increase.

Hypothesis 2.

- As colleges and universities increase in size, faculty and librarian actions (institutional commitment) toward open access will increase.

Researcher Positionality

Even though a researcher may take strict precautions to ensure an objective scholarly investigation, personal beliefs and experiences can still influence decisions, assumptions, and interpretations throughout the design and analysis of a study. Patton (2002) explains the importance of acknowledging these subjective tendencies and encourages writers to reflect upon their own perspective to help the reader consider a work within the context of the author's background.

As a librarian working at a university, I frequently assist students and faculty with locating and gaining access to scholarly journal articles. Many of these journals require subscriptions costing hundreds or thousands of dollars each year. These expenses limit the amount of material that any single library can offer. If an article is not available locally or through a library's online subscriptions, the faculty member or student can usually obtain a copy through interlibrary loan, but I have often seen the frustration and anxiety of a student or faculty member who has a deadline to meet and cannot obtain a needed resource in time. Like many librarians, I feel it is no longer necessary to rely solely on traditional publishing practices because technology enables many opportunities for electronic communication. In the past, librarians had no choice but to pay steadily increasing subscription fees for the printing and distribution services offered by publishers. Given economic constraints and recent technological advances, now is the time to explore the many opportunities and possibilities for producing and accessing scholarly knowledge.

In an educational environment, authors of scholarly articles rarely seek to profit from the use of scholarly publications, so both readers and authors would benefit from greater access to this work. The use of computer and Internet technology now allows scholars to share their

material quickly and directly with a vast network of colleagues and other interested individuals. I believe that alternative publishing methods can meet the requirements of authors and researchers at a lower cost. Many faculty, researchers, and administrators seem to remain unaware of significant developments in the field of scholarly publishing, especially in the area of open access.

Previous studies examine how authors are responding to changes in publication practices, but the research proposed here has a slightly different focus. I contend that in most educational institutions librarians work closely with academic administrators and depend on their support. Therefore, I am very interested in understanding more about how these individuals might influence issues related to the open access of scholarly research, an area mostly neglected in the literature.

University libraries may evolve to support some of the roles traditionally performed by publishers through services like institutional repositories and locally supported scholarly journal operation, hosting, and archiving. Current librarians have an opportunity to redefine their role within the larger university setting. These experiences and observations have led to my interest in the research questions presented above.

Definition of Terms, Assumptions, and Limitations

- Academic Administrator(s) - individual(s) responsible for overseeing the library who also has/have responsibility for overseeing other academic and/or academic support functions of the university; the individual(s) the library director reports to and turns to for policy and financial support. These individuals may hold one of several job titles including provost, chief academic officer, or vice president.

- Librarians – individuals employed by a college or university library to acquire, organize, preserve, and make accessible information needed by scholars.
- Open Access Journals – Open access journals make scholarly articles available online at no cost to the reader, conduct peer review and frequently let authors retain copyright. Some open access publishers are non-profit and some are for profit. Some publishers require authors to pay a publication fee, but most do not and rely on other methods of support (Suber, 2012a).
- Open Access Publishing – A specific form of scholarly publishing that has received a great deal of attention in recent years. Open Access literature is digital, online and free of most copyright and licensing restrictions. “The legal basis of OA is the consent of the copyright holder (for newer literature) or the expiration of copyright (for older literature)”. “Open access is compatible with peer review, and all the major open access initiatives for scientific and scholarly literature insist on its importance”. Open access can be achieved through open access journals ("gold OA") and open access repositories (“green OA”) (Suber, 2012a).
- Open Access Repositories / Institutional Repositories – an online database designed to store and make scholarly work available. A repository may “be organized by discipline or by institution” (Suber, 2012a). Many works are peer-reviewed with a similar version also appearing in a research journal. Other works may not be peer reviewed but still hold some intellectual value.
- Publishers – individuals who are part of for profit or not-for-profit organizations that facilitate the scholarly communication process by soliciting contributions, selecting

suitable content, coordinating peer-review, editing written work and preparing articles for distribution, electronically or in print.

- Researchers – individuals employed by a college or university who engage in research activity and publish the results in scholarly journals. These individuals are frequently but not always faculty members.
- Scholarly Communication – a complex environment intended to facilitate intellectual exchange through a wide variety of practices.
- Scholarly Knowledge / Scholarly Research - information or ideas obtained as the result of academic or scientific activities. These activities normally follow well-defined methods and undergo a process of peer review before being published and widely shared.
- Scholarly Publishing - one very important part of the system of scholarly communication that uses many different practices and models for distributing scholarly knowledge.

As with all research, this study makes several assumptions and has certain limitations. First, many types of researchers produce work that could be classified as scholarly when using the definition offered earlier including government scientists or researchers working within private industry. However, the primary concern of this study rests with academic research and individuals working within institutions of higher education.

Second, although the system of scholarly publishing is certainly international in reach, the writing here takes a perspective focusing primarily on current practices and trends within the United States.

Third, while the system of scholarly publishing does include books, conference presentations and proceedings, as well as other formats of information, this paper limits its focus

to scholarly journal articles because this communication medium stands to benefit greatly from current efforts to move toward open access.

CHAPTER 2

LITERATURE REVIEW

This chapter reviews the literature relevant to the scholarly communication environment of the past and the present. It also considers the positions and challenges of four key stakeholder groups: researchers, librarians, publishers, and academic administrators.

Information and Knowledge as Public Good

A widely agreed upon definition for the idea of knowledge remains elusive. Long ago, Plato attempted to define knowledge but struggled to arrive at an adequate explanation (Lemos, 2007). Philosophers continue to debate various aspects of the concept and the many ways one may know something (Steup, 2008). This paper focuses on the form of knowledge described as propositional knowledge, which refers to knowledge of facts or true propositions (Lemos, 2007). The pursuit of facts and the desire to know what is true motivates many of the scholars conducting research in academic settings.

As individuals create and record new pieces of information, this knowledge becomes available for later use and often becomes the foundation for future knowledge. The past discoveries and intellectual contributions of others help make possible nearly all new discoveries by today's researchers. In his nine events of instruction, Robert Gagne (1985), a pioneer of learning theory, drew attention to the importance of building upon existing knowledge through the recall of prior learning. Bruner (1961) also discusses how careful consideration of prior knowledge allows one to internalize information and generate new ideas for use in problem solving, often leading to new discoveries. For complex ideas, when attempting to recall what is already known, "the larger and more well organized this previously learned knowledge is, the better" (Gagne, 1985, p. 250).

Incremental steps toward knowledge, when compounded over time, can result in astonishing advances as seen in fields such as technology, medicine, and social sciences. However, the progression from one discovery to the next is not always direct or obvious because "the potential application of a piece of pure thought can never be predicted" (Gleick, p. 113). An illustration helps clarify this point. Benoit Mandelbrot, a twentieth-century mathematician, made use of a nineteenth-century mathematical discovery known as the Cantor set to solve the engineering problem of reducing noise in telephone lines transmitting computer data (Gleick, 1987). In this case, the answer to a very real engineering problem came not from engineers, but from the work of a mathematician many years earlier. Without access to prior information, engineers would have needed to rely on less efficient techniques. Clearly, the limited distribution of information or failure to communicate knowledge has the potential to minimize the impact of new ideas. Therefore, the broad dissemination of knowledge should remain a priority for all researchers and those supporting their work.

Sociologist Robert Merton asserted that scientific knowledge is meant to exist as "common property" (1968, p. 611). In the United States, our society generously funds the pursuit of scientific knowledge. In 2009, federal, state, and local governments spent over $36 billion per year to support research and development at colleges and universities (National Science Foundation, 2009a). In addition, colleges and universities commit over $11 billion of their own money each year to support research, with at least some of this money likely originating from state governments. Yet, colleges and universities, and anyone else interested in this research, must pay again to access many of the scholarly journals reporting the results of this publicly funded research. Most authors of scholarly articles do not prefer to see their work handled this way. Merton also noted that "the scientist's claim to his intellectual property is limited to that of

recognition and esteem" (p. 611). The possibility of making significant contributions to society seems to motivate most scholars and scientific researchers more than the possibility of a direct financial gain. A scientist can also benefit from recognition that often accompanies notable contributions to a field of study. New opportunities to advance one's research and career interests will often follow. For these reasons, the wide distribution of scholarly work is almost always in a researcher's best interest. This desire to share information seems to support Merton's view of scientific knowledge as a form of common property that should be accessible to all.

Political philosopher John Rawls argued that a society should distribute social primary goods equally (1999). Rawls included in his description of social primary goods items that society shapes like civil rights, power, and opportunity. According to this view of fairness, one could think of access to information and knowledge as a social primary good that society should also distribute equally. In support of this notion, Machlup (1984) described knowledge as a social or public good of the "purest type" (p. 159). This perspective becomes especially relevant when talking about information and knowledge created for the benefit of all and not just a few, as is most often the case with academic researchers working to advance our understanding of the world.

Scherlen and Robinson (2008) supported the idea of open access to knowledge as a matter of social justice, stating that "international law suggests that all human beings have a right to knowledge…and an equal right to benefit from advances in knowledge" (p. 68). John Willinsky, a scholar and supporter of open access, identified knowledge as a public good when it "can be provided to everyone who seeks it, without their use of it diminishing its value" (2006, p. 9). This underlying theme of knowledge as a public good exists throughout the history of scholarly communication as academic researchers, scholarly journal publishers, academic

administrators, and librarians all desire to share the results of scholarly work as widely as possible. The current struggle we now face represents opposing forces of the market and the polis, or an environment of community interest and effort (Stone, 1997). In a capitalist free market environment, citizens buy and sell goods that hold an agreed upon value. On the other hand, in the polis a community wishes to pursue what is best for society and to provide access for those who cannot pay.

At this point, it makes sense to acknowledge the difference between knowledge created and intended for wide distribution and knowledge requiring restrictions due to commercial or other purposes. One can make many good arguments for restricting access to information when a competitive or security related reason is present, especially when the author or owner desires to restrict access. However, when the author or owner prefers to share information widely the publication process should not stand in the way. The discussion becomes more complicated when publicly supported universities receive financial resources from private entities for the purposes of conducting research. Consider one dispute involving public and private funds illustrating the tension between those who desire the equal distribution of knowledge and those who seek a free market environment: At Cornell, the University of Minnesota, and the University of Washington, tax-payer funding largely supports the research and development of new apple varieties. While many feel the improvements resulting from this investigation should be shared with all, licensing agreements between the universities and apple growers restrict access to this new knowledge and limit who can legally grow or sell the newly developed apples (Sparks, 2011). Controversies of this nature evolve into complex disputes, and new debates will likely continue to emerge. Further analysis of this specific point extends beyond the scope of this paper as these issues are neither increased nor decreased through the adoption of open access. Complex

legal issues of intellectual property and technology transfer will persist in either system of knowledge dissemination, open or traditional. However, the idea of knowledge as a public good as described in this chapter remains one of the primary drivers of the open access movement.

Historical Context

Before examining the current roles of researchers, librarians, publishers, and academic administrators in the transition toward open access, it is important to understand the historical and organizational context of each group. This section reviews key developments in the system of scholarly communication over time and explains why each group is highly influential when it comes to open access concerns today.

Researchers

Scholarly journals as a means of communication.

Nearly 350 years ago, a small group of scientists created the most familiar format for communicating developments in research, the scholarly journal. Before this time scholars communicated somewhat informally through the writing of letters. Historians recognize a scientific publication from Europe, the *Journal des Scavans*, as the first scholarly journal to regularly print and share new ideas among scientists. Brown (1972) describes the development of this publication and the circumstances surrounding its creation in Paris in 1665. Just a few months later, the Royal Society of London published the first issue of *Philosophical Transactions* and established the practice of using a committee or editorial board to select articles for publication (Willinsky, 2006). The Royal Society continues to publish *Philosophical Transactions* today, making it one of the longest running scholarly journals.

Isaac Newton, one of the early authors to appear in *Philosophical Transactions*, published an article in 1672 discussing his reflecting telescope that generated discussion and critique within the scientific community. In an effort to concentrate all criticisms on the science

and not the personalities, Henry Oldenburg, editor of *Philosophical Transactions*, saw the need to institute a form of blind review (Willinsky, 2006). This practice of blind review, now commonly known as peer review, remains a core element of many scholarly journals.

Peer review, defined as the "evaluation of research findings for competence, significance, and originality by qualified experts" (Brown, 2004, p. 7), is now perhaps the one quality that characterizes a publication as "scholarly" more than any other factor. Prior to the twentieth century scholars relied on peer review only occasionally. Peer review did not become the standard for review of research projects and scholarly publication in the United States until after the Second World War (Rockwood, 2009). The process of peer review remains a crucial piece of the system and according to Benos et al. (2007), researchers value the benefits of peer review which often outweigh the weaknesses. They discussed in detail the history and evolution of peer review, the role of editors and reviewers, the benefits, and the perceived weaknesses, including the potential for bias and unnecessary delays in publication. Further, Benos et al. (2007) evaluated some variations to peer review such as preventing reviewers from knowing an author's identity, identifying reviewers to authors, and open review, where anyone may critique a manuscript after publication. They then concluded that "with peer review so ingrained in the publication process it would be impractical, detrimental, and unwise to abolish it" (Benos et al., 2007, 148). Therefore, in order for open access to gain acceptance it must secure validity through peer review. Otherwise, the work of researchers and the reputations of their institutions may be called into question.

Tenure system and journal prestige.

While some faculty conduct research and share findings out of altruistic desires to make the world a better place, other pressures lead academics to pursue research and publication. First,

recognition goes along with having one's name attached to a particular research project or discovery. A well-established professional reputation allows a researcher to enjoy enhanced status as one of the experts within his or her field. The second major force driving university faculty to conduct and publish research is the academic tenure system. Academic tenure provides reasonable assurance that a university will not terminate one's employment, except in certain extraordinary circumstances. Along with promotion to a higher rank, tenure represents one of the most common rewards for successful performance over a period of time. Achievement of tenure often requires substantial publication of original work in well-respected scholarly journals.

Academic tenure, as understood today, evolved from the concept of academic freedom, an idea embedded in the culture of higher education. Academic freedom, discussed in detail in the work of Brubacher and Rudy (1997), allows researchers to freely pursue topics of intellectual interest without fear of reprisal from an employer. Tenure is a means to academic freedom and economic security that is used to attract and retain talented individuals (Metzger, 1973). While universities did not fully develop current practices surrounding tenure until the twentieth century, the 1800s saw a culture of "up or out" where faculty either received a promotion or dismissal after a period of time (Metzger, 1973). Professors in the United States did not come together until 1913 to form the American Association of University Professors that would later define standards for tenure (Metzger, 1973). In 1915, the association's committee on academic freedom and tenure produced a statement titled "A Declaration of Principles" (Joughin, 1973). A decade later in 1925 the American Council on Education authored another statement on academic freedom and tenure. Finally, in 1940 the Association of American Colleges and the American Association of University Professors published a third statement promoting academic freedom and issuing guidelines for tenure (Joughin, 1973).

When deans, sponsors, and employment panels judge the effectiveness of faculty, the number of articles published in the "right" journals may serve as a greater measure of success than success in teaching or the actual quality of research conducted (Abbasi, 2004). A number of factors go into determining the "right" journals or publication outlets for a research article, one of which is whether or not the submitted article is subject to peer review. Peer review, also referred to as refereeing, refers to the process where others in the field critique a written work before publication. This practice allows a published article and its author to receive a certain level of respect and acceptance among peers. One Canadian study found that academic administrators viewed publications in refereed serials as significantly more important than publications in non-refereed serials when making promotion and tenure decisions (O'Neill & Sachis, 1994). Similarly, findings of Suppa and Zirkel (1983) indicated that 89% of respondents in a survey of the American Association of Colleges for Teacher Education considered publication in refereed journals significant for promotion compared to 52% when asked about non-refereed journals. Interestingly, Suppa and Zirkel also noted that, in some cases, respondents rated publications in non-refereed publications of national scope as being more important than local or regional refereed publications.

Each discipline recognizes certain core journals as more prestigious than others. These highly visible publications in the field can help a researcher become well known and highly respected. The more prestigious journals also tend to carry more weight during performance evaluations. A number of other methods can help evaluate a particular journal for quality. Acceptance rates, citation data, indexing data, and peer review of a journal quality can all quantify a journal's value (Nelson, Buss, & Katzko, 1983). Scholars and evaluators also use a journal's impact factor to determine the importance of a publication. The Institute for Scientific

Information, now known as Thomson Reuters, developed this method for determining a journal's impact in the 1960s (Thomson Reuters, 2012). But, some difficulties arise when trying to assess the impact of one's research based on these measures, especially when those doing the evaluating are not intimately familiar with the field of study of the individual under evaluation (Nelson, Buss, & Katzko, 1983). The value of impact factors and similar measures are frequently debated in the scholarly literature. In fact, the entire August 2012 issue of the journal *Scientometrics* is dedicated to discussions of various aspects and assessments of the journal impact factor. Although potentially useful to some degree, many of these measures contain flaws or might mislead evaluators. Nevertheless, current conditions still motivate scholars to publish their work in widely recognized, well-established journals with a prestigious reputation, even if readers or their supporting institutions must pay a high price to read that work. Because of this, open access publications must maintain a certain level of perceived quality, or prestige, to gain the ongoing support of researchers.

Beginnings of electronic scholarly communication and open access.

Today, electronic distribution serves as the primary means of access to scholarly journal articles for most individuals. Although we may think of this as a modern development, the idea of electronic communication and management of information is not new. In 1945, an article appeared in the *Atlantic Monthly* in which Vannevar Bush made a number of predictions about the future and described a device "in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility" (p. 106). Bush envisioned something very similar to the computers and complex databases we now use every day for a variety of information management tasks. Bush also introduced a concept for retrieving information similar to what we now know as hyperlinking.

Later, in the 1960s and 1970s, researchers conducted some experiments and shared ideas about the electronic storage and transmission of information, but the technology was not yet suitable for large-scale use (Tenopir & King, 2000).

Scholars had always found ways to communicate among themselves, but in the 1960s, they attempted to better coordinate the exchanges that were typically less formal than what would appear in the peer-reviewed and published journals. Information Exchange Groups (IEGs) were based on a list of members who received copies of items submitted by others. When one message was sent by mail to a central location staff produced multiple copies to mail to all on the list (Houghton, 1975). IEGs did not survive once they became too large and too costly to manage (Houghton, 1975). The email lists and online forums that now exist for practically every subject would later replace and improve upon this idea for sharing information.

In the late 1970s another fascinating article appeared and quite accurately predicted the current research environment in which articles are regularly submitted, reviewed, made available electronically by publishers, and stored in research databases for later access. Senders (1977) described a process by which a researcher would type into a typewriter connected to a television screen, dial up to communicate with computers of colleagues, then post the final work to a publisher's central computer. Subscribers to a journal could then be given a code to access the contents immediately from this central site (Senders, 1977). Around this time, members of the American Council of Learned Societies also envisioned a system in which "a scholar may turn to a console in the corner of the office and summon up through a national network the images of the pages that are of greatest interest" (American Council of Learned Societies, 1979, p. 31). The basic technology needed to carry out this vision existed in the 1970s, but such a drastic change does not happen quickly. Similar to current challenges, the National Enquiry into Scholarly

Communication observed that the problems in establishing a new "system are not mainly technical; they are organizational and behavioral" (American Council of Learned Societies, 1979, p. 34).

Eventually, peer-reviewed electronic scholarly journals began to appear in the early 1990s. Stevan Harnad, who remains one of the most vocal advocates of open access and electronic scholarly publishing, is often credited with the creation of the first refereed electronic journal. Harnad, with cooperation from the American Psychological Association, launched *Psycoloquy* in 1989 and distributed the journal through email and a Usenet newsgroup (Harnad, 1992). By 1991 six peer-reviewed scholarly e-journals had developed but concerns over issues like archiving and quality prevented others from moving too quickly (Wilson, 1991). In addition, the limited number of heavy computer users and the limits of computer systems were likely reasons others were not ready to invest in new publishing methods.

Throughout the 1990s, the number of electronic publications increased rapidly. According to measurements by the Association of Research Libraries 73 peer-reviewed electronic journals and newsletters existed by 1994, 417 by 1996, and 1,049 by 1997 (Mogge, 1998). At the end of the decade, the number rose to over 3,000 peer-reviewed electronic journals (Mogge, 1999). In the mid-1990s, when the technology of the World Wide Web was still developing readers often accessed electronic journals on CD-ROMs or in complicated online systems requiring assistance from a librarian (Woodward & McKnight, 1995). Some scholars even predicted that future journal articles would include related animations, audio, or video (Wilson, 1991). The use of such enhanced features is not yet standard practice but may be at some point in the near future.

In recent years researchers have also seemed more open to sharing their work though personal websites or central databases known as repositories that are normally maintained by universities or other scholarly organizations. This practice does not necessarily mean scholars are avoiding the peer review process. It simply provides opportunities to share additional creative works that might otherwise go unread. In some cases, authors even retain the rights to post a copy of previously published and peer-reviewed work. As noted earlier, in order for open access publishing to be successful it must maintain critical elements of the traditional system, including peer review and perceived quality, or prestige.

Academic Administrators

Growth of universities and research in the United States.

Research did not become a central component to the work of American universities until the mid-nineteenth century. During this time, American educational leaders adopted many elements from German universities. Under the German model, influenced heavily by scholars such as Wilhelm von Humboldt, Johann Gottlieb Fichte, and Friedrich Daniel Ernst Schleiermacher, universities developed as institutions with a purpose greater than simply distributing information to students. These German scholars shared a belief that the professors and students of a university also had a responsibility to create new knowledge for the benefit of society (Rohrs, 1995). American universities reflect other characteristics of the German university model, including the unity of research and teaching as well as the idea of academic freedom (Rohrs, 1995). The nineteenth century exposed numerous American students and professors to the German culture of education, resulting in new ways of thinking. Rohrs (1995) highlighted three American universities where this German philosophy was quite influential. First, at the University of Michigan, President Henry Philip Tappen placed an emphasis on

research over professional training and established the first graduate program in the United States. Second, at Johns Hopkins University in Maryland, President Daniel Gilman visited German universities and incorporated elements he observed to help further establish a new style of American university. In addition, many of the early professors at Johns Hopkins studied in Germany. Third, administrators at Cornell University also established strong ties to German education by creating a graduate school that closely followed the German model.

With the Morrill Act of 1862, the federal government granted land to each state to create a university with a mission of developing new knowledge and subjects with practical utility such as agriculture and mechanic arts (Geiger, 1986). In the early years of their existence, these research universities struggled to find the appropriate balance between the teaching and research activities of faculty. The most prestigious research universities required only six to eight hours of teaching per week, while others required around 10 to 12, with sabbaticals becoming fairly standard practice around the turn of the century to encourage faculty to spend more time on research (Geiger, 1986). The late nineteenth century saw the "rise of an academic culture" (Wiegand, 1990, p. 79). Because of this, university faculty needed access to the work of other researchers. This growing number of researchers also needed an effective way to communicate their accomplishments with others, thus increasing the reliance on journal publishers and librarians. Academic administrators rely on the system of scholarly publishing because it allows academic institutions to grow and maintain strong reputations based on the work of faculty. Institutional leaders hold a strong interest in seeing scholarly publishing succeed over the long term. A shift toward open access can contribute significantly to that goal.

Librarians

History of academic libraries.

Scholars clearly need to communicate their work with others. These researchers also need to access the scholarly work of others. Ainsworth Rand Spofford, Librarian of Congress in the late 1800s, observed that "to pursue one subject through many authorities is the true way to arrive at comprehensive knowledge" (Wiegand, 1990, p. 72). Librarians, especially at colleges and universities, work to fulfill this role of acquiring, organizing, and preserving the scholarly record of many authorities for later use.

Along with colleges and universities in the United States, academic libraries developed independently with unique characteristics reflecting the needs of local populations. Over time, libraries from many institutions influenced each other and evolved into a complex network. Librarians came together to address common problems and develop their own culture, leading to the creation of the American Library Association in 1876, one of the first professional associations in the United States (Dain, 1990). Librarians strive to provide access to and preserve as much knowledge as possible at the lowest possible cost. As a result of the research and knowledge explosion over the past century librarians face large challenges in trying to keep up with the greater number of publications, especially as price increases for individual journal titles grow much more rapidly than would be expected due to normal inflation (Tenopir & King, 2000). The greater availability of research journals through open access can allow librarians to more efficiently perform their roles by freeing up funds necessary to acquire and preserve those materials that are not available through open access. Librarians continue to remain in a period of transition in which new practices and technologies are evolving to allow the effective management of information produced by scholars.

Conditions leading to a need for change.

Libraries exist to collect and preserve information. From the earliest days librarians also worked to disseminate knowledge as widely as possible (Willinsky, 2006). The current movement toward open access represents the present day approach to fulfilling this goal. Changing conditions in the scholarly communications environment require librarians, researchers, and universities to look for new and more efficient ways of doing their work. Open access publishing has the potential to distribute knowledge in ways not possible before the widespread use of computers. Readers with a need or desire for information, including workers in government or industry, can enjoy much faster access to much more information, thus resulting in a more informed and productive society. Another often-mentioned benefit of open access is the potential impact on developing countries with limited resources to subscribe to a large number of expensive scientific journals (Christian, 2008; Willinsky, 2006). Open access models can also offer researchers, librarians, and academic administrators an opportunity to become more involved in local publishing initiatives intended to share work produced by local scholars.

Along with the goal of expanding the reach of information, increasing costs help fuel the desire for change. While the period leading up to and including the 1960s saw large budgets for research, as well as for universities and libraries, this era did not last through the 1970s. The many commercial scholarly journal publishers had an incentive, and responsibility, to provide a return to inventors and did so by charging the highest prices the market would bear. One analysis by Tenopir and King (2000) showed that between 1975 and 1995 journal prices increased much faster than inflation. An average $39 journal in 1975 would have cost $110 in 1995 dollars, but actually cost $284. To compound the problem, when journal prices rise, librarians cancel

subscriptions, leading to higher prices for the remaining subscribers. In response to price increases of journals, librarians reduce book purchases to cover these costs, a reduction that has a major impact on book publishers and university presses. A university press book that would regularly sell 3,400 copies in the 1960s sold as few as 400 copies by the 1970s (Goellner, 2002).

The so-called crisis in scholarly publishing was noted as early as the 1970s due to significant concern about the future and sustainability of academic books and journals. The report of the National Enquiry into Scholarly Communication observed, “the challenge now, as at any time, is to adapt intelligently to new circumstances” (American Council of Learned Societies, 1979, p. 3).

Until recently, most faculty who expect access to the highest impact journals in their field through the university library paid little attention to price increases (Willinsky, 2006). As librarians make difficult decisions about which journals to keep and which to drop, faculty are becoming more aware of problems that exist and are more willing to help identify solutions. The idea of open access scholarly publishing is continuing to gain momentum and support from faculty researchers as librarians work to point out the need for change and demonstrate the benefits of the open access model.

Publishers

Beginning with the creation of the first scholarly journals in 1665 the number of academic publications grew steadily. With knowledge becoming more specialized, academics needed additional outlets for research in each discipline and, eventually, in sub-disciplines. Accordingly, the late nineteenth century saw a rapid expansion in the number of journals published. Some of the organizations and professional associations established during this time that helped researchers communicate with others in their field through specialized journals

included the American Historical Association (1884), American Economic Association (1885), and the Geological Society of America (1888) (Wiegand, 1990). Much of this growth happened during the period from 1885 through 1905, and many of the prominent journals first produced during this time still exist (Geiger, 1986). Estimates placed the number of journals in 1885 around 5,100 with about 8,600 by 1895 (Houghton, 1975). Over the next century many journals began with some surviving for long periods and others ceasing publication or merging with other journals. The steady growth of research continued with the number of print publications and scientific papers doubling about every 15 years since World War II (Zhou, 2001).

In the mid-twentieth century researchers at the nation's universities conducted much of the country's research with funds primarily from government agencies, but also from private industry. The Department of Defense, National Institutes of Health, NASA, and the National Science Foundation all had university-based research programs (Vest, 2007). Federal government spending on research in 1953 totaled $138 million, or $1.11 billion in 2009 dollars, while private industry contributed $19 million, or $1.53 billion in 2009 dollars (National Science Foundation, 2009b). By 2009 federal government expenditures exceeded $32 billion with industry funding topping $3 billion (National Science Foundation, 2009b). As a result of this growth in research activity some of the existing nonprofit society journals could not handle the increased volume of research activity and turned over their operations to commercial publishers who saw an opportunity to provide a needed service (Willinsky, 2006). Both nonprofit and commercial publishers continue to respond to the needs of scholars by regularly introducing new titles. The Ulrich's Periodical Directory estimates there are now over 31,000 journals worldwide classified as Academic or Scholarly and also refereed, or peer-reviewed (UlrichsWeb, 2012).

In the 1970s, a growing level of concern about the status of scholarly publishing led the American Council of Learned Societies (1979) to assemble a group of scholars, publishers, editors, and research librarians, to identify areas needing improvement. The primary issues of discussion centered on the large number of journals in existence. This led to questions about the quality of research. The group made one recommendation to limit the number of new journals and place an emphasis on quality over quantity. Representatives of the American Council of Learned Societies also explored several ideas in an attempt to deal with the large amounts of information scholars were generating. The council considered the possibilities of using microfilm to store supplementary data and journals to print shorter articles or using a central collection center to distribute individual papers rather than entire journal issues (Houghton, 1975). Over thirty years later this concern of quality versus quantity still exists. This debate continues unresolved with little progress toward a resolution as scholars continue to produce massive quantities of research. A recent article in the Chronicle of Higher Education made yet another argument for limiting the quantity of information scholars are sharing due to a concern about "the amount of redundant, inconsequential, and outright poor research" that is robbing scholars of the time they could instead be using to focus more intently on the most promising new developments in their fields (Bauerlein, Gad-el-Hak, Grody, McKelvey, & Trimble, 2010). Even more interesting than the case made by Bauerlein et al. (2010) are the comments generated in response where academics strongly expressed their frustration with a system that can seem to encourage quantity over quality. In contrast, many readers shared opposing views that caution any limits on research because what seems insignificant now could later become recognized as a valuable contribution in a particular field. The debate of quantity versus quality may eventually lead to some changes in how peers and administrators evaluate and reward scholars. Open access

can help to alleviate some of the problems associated with locally purchasing and storing a continually growing number of journals. In the future scholarly journal publishers will continue to play an important role in a system where open access is more common. However, as noted earlier, the preservation of quality in these new and open formats is crucial.

Current Conditions and Barriers to Open Access

Before entering a discussion of the interrelationships and interdependencies among the four key stakeholder groups and the influence they hold related to the topic of open access a review of the current environment is necessary to provide additional background and context. This section identifies current conditions, including those that further open access goals, as well as those that serve as barriers to progress. The following pages also describe some important economic conditions and acknowledge the potential impact of politics and governmental policies.

Researchers

Researchers, who are often university faculty, are perhaps the most important element of the system that creates and distributes scholarly knowledge. These researchers, who both produce and consume information, generally support new developments in scholarly communication such as open access but can face pressures to publish in certain journals and feel unable to challenge the status quo (University of California, 2007).

As for current practices, when accessing the work of others, academic researchers, especially younger faculty, clearly prefer online journals over print journals (Gould, 2010). In addition to online journals, researchers typically use many different formats when obtaining information electronically. When asked about the primary types of digital scholarship used, the most common responses, other than online journals, were reviews, preprints, encyclopedias,

data, blogs, discussion forums, and professional hubs (Maron & Smith, 2008). Clearly, today's researchers seem very comfortable using and creating new methods of sharing information and in the future they will need to possess a certain level of comfort with digital communication in order to remain competitive.

When it comes to the publishing activities of authors, conventional thinking through much of the literature holds that younger and pre-tenured faculty hesitate to publish in open access journals because of concerns about perceived quality. However, some evidence suggests that junior faculty avoid open access publications at the same rate as tenured faculty (Nowick, 2008).

Supporters of open access often claim that because articles distributed through open access channels do not require a subscription or payment, they will attract more interest, leading to more citations and an overall greater impact. This may be a strong motivator for some authors. In a recent review of 31 studies seeking a correlation between open access and citation rates, Swan (2010) found an advantage for open access in 27 of these (Swan, 2010). With the increased number of ways available for sharing scholarly knowledge those involved are starting to discuss more frequently how work published in alternative venues or formats should be evaluated, especially for purposes of promotion and tenure. Some organizations have established guidelines to assist committees in evaluating the digital work of scholars that may not be in the familiar format of a journal article. According to guidelines developed by the American Association for History and Computing, adapted from the *MLA Guidelines for Evaluating Work with Digital Media in the Modern Languages*, some steps that review committees should follow include: engaging qualified reviewers, reviewing work in the medium in which it was produced, and seeking interdisciplinary advice (as cited in Trinkle, 2004). In a more recent report the MLA

Task Force on Evaluating Scholarship for Tenure and Promotion (2007) issued recommendations for tenure and promotion evaluation and recognized that traditional requirements may require modifications to reflect the changing environment. Most importantly, in the summer of 2012 the Modern Languages Association announced its journals would allow copyright to remain with article authors, "enabling them to post versions in open access repositories, or on individual or departmental websites" (Jaschik, 2012). Other discussions within the scholarly community focus on the peer review process and a perceived need for change. Some reviewers and editors are exploring new methods to improve upon existing practices. In a move toward a more open system of peer review, most experiments, so far, incorporate reader comments and reactions to submitted articles (Rockwood, 2009). Similarly, Gould (2010) described an open peer review system in which users can directly comment on and rate the quality of research articles. Online and open reviewing of research may one day become standard practice, but the time has not yet come for such a radical shift from the traditional closed system relying on expert reviewers as mediators.

While current conditions are certainly important to consider, the attitudes and opinions of researchers can also provide an indication of where things may go in the future. In past years, numerous studies sought to learn more about what researchers from different countries and disciplines think about open access journals and their role. A review by Xia (2010) closely examined studies conducted between 1992 and 2008 that focused on author attitudes and behaviors toward open access journals. Xia found that awareness of open access journals increased over time. However, many researchers remain unaware of the open access concept and open access publishing possibilities (Schroter & Tite, 2006). For these authors, the current system works well enough for their needs and there is no strong motivation to seek change.

When Xia examined attitudes, authors' overall reasons for publishing remained constant. The most common reasons for publishing in open access journals include the extended reach and increased readership as well as the faster publishing process. Xia noted no noticeable change for these motivations over time. Yet, other reasons for not publishing in open access journals held steady from 1992-2008 and included concerns over peer review, quality, and prestige. Finally, Xia noted a gradual increase in open access journal publishing and agreed with the conclusion reached by Morris and Thorn (2009) that researchers are generally much more supportive of open access journals in principle than in practice.

In addition to open access journals, authors may also choose to make their work freely available through self-archiving, the other path to open access. Self-archiving refers to the practice of posting, on a personal website or in an online database, a version of a paper previously accepted for publication in a peer-reviewed journal. This approach allows additional readers to access research findings and data without being required to purchase a subscription to the journal in which it formally appears. In one survey, 42% of randomly selected respondents indicated that in the past three years they had uploaded their work to either a personal website, an institutional repository, or a discipline based repository (Swan & Brown, 2005). This number should continue to rise steadily with new opportunities to contribute to repositories, a greater understanding of the practice, and institutional policies encouraging or requiring use of a repository. But, in a more recent survey measuring open access attitudes and behaviors, results continued to indicate uncertainty and low levels of awareness about the self-archiving process (Morris & Thorn, 2009). A perceived lack of direct benefits causes faculty to question the idea of self-archiving and institutional repositories, but as understanding of the issues increases, there is slightly more interest (Bell, Foster, & Gibbons, 2005). Librarians work to build online

repositories for faculty research, but, in most cases, the results are disappointing due to limited faculty participation (Burris, 2009; Foster & Gibbons, 2005).

Much of the activity surrounding institutional repositories is occurring internationally where universities or other entities often encourage or require authors to upload a copy of published articles. In the United States open access adoption remains sluggish, possibly due to the low number of institutions with official policies directing faculty to provide copies of their work to the central database. However, this is changing as more American universities institute formal open access policies or mandates. In addition to institutional repositories, faculty may choose to submit works to an established subject-based repository for their discipline. For example, physicists heavily use arXiv, one of the first and most successful databases of this type. The subject-based repositories tend to be more popular among researchers as they can help establish connections with others with similar interests around the world. Andrew (2003) observed that the disciplines with a high percentage of self-archiving are the ones with well-established subject repositories. Meanwhile, many institutional repositories without a mandate requiring faculty to submit copies of published articles struggle to gain acceptance (Armbruster & Romary, 2009). Researchers, as a group, do not oppose new developments, although they remain cautious about embracing new forms of publishing too quickly. Nevertheless, as digital scholarship evolves, its acceptance is likely to increase even further.

Because only a limited number of researchers directly experience the strains on the publishing system little thought is given to the complexity of who owns or controls a piece of written work. Authors of journal articles frequently sign copyright agreements with a limited understanding of their impact. Approximately one third of respondents surveyed admitted to signing a publisher's copyright agreement without understanding the details (Swan, 1999). If all

rights are transferred to a publisher this lack of understanding can prevent authors from using their own work in other ways. At a later date, an author may need to seek publisher permission to reuse their own content. Fortunately, although not realized by many authors, current publisher policies often grant some flexibility, allowing various uses of the original version of a submitted work. But, more restrictions regulate the use of the edited and formatted version appearing in the journal (Morris, 2009). An awareness of publisher agreements and policies becomes important in allowing an author to reuse a same work in other venues without violating contracts or copyright agreements. Authors sensitive to copyright concerns may successfully negotiate more favorable terms when granting a publisher permission to distribute an article. For further details on publisher policies, see the discussion of SHERPA's ROMEO database on page 60.

Finally, concerns about the quality of electronic journals explain why some faculty may resist open access opportunities (Speier, Palmer, & Wren, 1999; Tenopir & King, 2000). Sweeney (2000) provides evidence of a period of uncertainty and confusion about the status of electronic scholarship. The success of established e-journals, along with a cultural shift toward the greater use of online information, alleviated many of the initial concerns about electronic journal quality. Now, when researchers decide where to publish their work, factors likely to impact a decision include journal quality, journal reputation, and topical relevance (Park & Qin, 2007). Some other barriers previously identified by Speier, Palmer, and Wren (1999) no longer present problems, including the availability of computers and networks, document formatting, graphics quality, and strong reader preferences for a print version. Still, for many faculty members, publishing in open access journals and contributing to online repositories is not yet seen as important or necessary.

Table 1

Researcher Related Conditions and Barriers to Open Access

Attitudes	• Desire to maintain quality through peer review (Benos et al., 2007; Xia 2010) • Motivated to publish in high quality/prestigious journals (reward/tenure) (University of California, 2007). • Understanding of the benefits of electronic publishing (Maron & Smith, 2008) • Prefer to access journals electronically (Gould, 2010) • With increasing awareness, an increasing interest in maintaining control over published works • Increasing acceptance of open access (Xia, 2010) • *Different motivations and expectations than librarians (Maness, Miaskiewicz, & Sumner, 2008; St. Jean, Rieh, Yakel, & Markey, 2011)* • *Perceived lack of a need for change (Bell, Foster, & Gibbons, 2005).* • *Concern about journal quality and reputation (Xia, 2010)* • *Changes in organizational culture take time and occur slowly (Cook & Yanow, 1993)* • *Uncertainty about future environment*
Awareness	• Increasing awareness of open access (Xia, 2010) • *Low awareness about publishing issues and open access opportunities (Morris & Thorn, 2009; Schroter & Tite, 2006)* • *Confusion over copyright (Morris, 2009; Swan, 1999)*
Action	• Constant adjustment to rapidly evolving conditions • Experimenting with new forms of scholarship (Maron & Smith, 2008) • Service as journal authors, editors, and reviewers • Establishing new relationships with publishers and librarians • *Continue to publish in well-established/traditional journals with expensive subscriptions* • *Continued dependence on services of commercial publishers (Gooden, Owen, Simon, & Singlehurst, 2002)*

Note. Barriers in italics.

Academic Administrators

One of the key missions of a university is to conduct research for society's benefit. Newly generated knowledge can potentially lead to solutions to some of our biggest problems. The wider a university can disseminate this knowledge the greater the impact it can make. In earlier times the printing press allowed knowledge to spread outside of universities to readers

regardless of location (Drake, 1970, as cited in Willinsky, 2006). Eisenstien (as cited in Willinsky, 2006) called the introduction of the printing press a revolution leading to great social change. In a way, the digital age offers similar opportunities to extend the reach of university-created scholarship and open access models may help take us one step further by removing barriers that prevent or discourage readers from accessing information.

Greater dissemination of research can also increase the reputation of a university. Administrators do have an incentive to encourage faculty contributions to the highest profile journals in order to maintain or increase reputations and institutional prestige, even though many of these journals are not open access (Holley, 2009). Over time, the conversion of journals to an open access model is likely to reduce this barrier, but for now, this desire for institutional prestige remains an obstacle.

Individuals at many colleges and universities contribute greatly to ideas of open access and new methods for managing knowledge. Yet, some express concerns about such dramatic changes. Universities are large organizations with strong cultures and traditions where individuals holding positions of power can unintentionally discourage faculty from pursuing innovative forms of publishing by reinforcing the expectation that researchers must contribute to the small set of well-known and highly rated journals in their field. Academic administrators and faculty are right to demand quality and rigorous review, but high quality research should be recognized and rewarded even if not published in conventional outlets. Critics sometimes blame promotion and tenure committees for penalizing faculty who do not publish in the “right” journals. To prevent review committees from acting as a barrier to open access in this way, academic administrators may need to help refine the peer review processes to support and encourage new forms of scholarship (Harley, Acord, Earl-Novell, Lawrence, & King, 2010).

One survey asked faculty and administrators at Florida universities if the "the peer-review process is as thorough in electronic journals as with paper journals" and if "electronically published articles should be counted in the tenure and promotion process" (Sweeney, 2000). Most respondents indicated that, while it depends on what exactly is meant by an e-journal, they are not opposed to electronic scholarship as long as it meets traditional standards for quality. Administrators seem to generally agree and accept that e-journal quality can be equivalent to that of more traditional print journals. It should be the review process and reputation of a publication that matter, not the format of publication. Current promotion and tenure committees also seem to be more aware of and more accepting of changes in the environment of digital scholarship. However, the perception still exists among many faculty that review committees may question the quality of newer electronic formats during performance evaluations.

Some academic administrators are cautiously taking steps toward open access of research in several ways. One of the most common is to support a database, or repository, to house information created or owned by the institution and to support researchers who wish to self-archive their work. Librarians often maintain these repositories, which typically hold documents such as official university reports and publications, images, data, and research papers of students and faculty. Currently over 1,800 institutional or departmental repositories exist worldwide with approximately 276 in the United States and this number is rapidly growing (Registry of Open Access Repositories, 2012). A majority allow faculty and students to voluntarily submit materials. However, some institutions adopt policies, or mandates, establishing an expectation that faculty will contribute to the repository. Of course, institutions may find it difficult to establish an absolute mandate. The few universities in the United States requiring faculty to deposit a copy of research articles to an institutional database have not yet tested the enforcement

of these policies and the long-term impact is still unknown. In practice, universities may have limited power to require compliance because in most cases faculty can only be encouraged, not forced, to retain the copyright necessary for this use of their work (Holley, 2009). Therefore, under most policies, academic deans possess the authority to grant exceptions.

In recent years, faculty in the United States approved open access policies on departmental levels as well as on institutional levels. In February of 2008 the faculty of Arts and Sciences at Harvard University adopted an open access policy, the first in the United States (Guterman, 2008). Soon after, faculty in departments like the University of Oregon's Department of Romance Languages and the Stanford University School of Education followed with similar actions. Large universities like the University of Kansas as well as smaller schools like Trinity University and Rollins College successfully passed institution-wide open access policies with many more currently considering the same approach. The Registry of Open Access Repository Material Archiving Policies (ROARMAP) attempts to track the growing number of current and proposed open access policies from around the world and is updated frequently with details of new developments (University of Southampton, 2012). Steven Harnad (2008), a strong supporter of open access, maintains that universities and authors are capable of making the world's research accessible to all and calls upon universities to mandate self-archiving in online repositories as soon as possible. Administrator support can go a long way toward creating a climate that encourages such open access initiatives.

Academic administrators also contribute to the open access movement through other actions. Some may help establish or support the operation of an open access journal. This may be done by a university department or in conjunction with the library or university press. Other administrators might support open access journals through a fund established to cover author

fees for researchers who wish to publish in open access journals. More than a dozen institutions maintain open access funds to cover some or all of the costs involved in this type of publishing and, in the process, need to address policy issues, such as who is eligible to receive funds and what type of publishing is eligible for financial support (Tananbaum, 2010). In the fall of 2009, several universities joined together to establish a Compact for Open Access Publishing Equity (COPE), which calls on universities to make a commitment to support open access publications and encourages institutions to sign the compact (Compact for Open-Access Publishing Equity, 2009). So far, university open access funds impact relatively few faculty with only 9% indicating any financial assistance received when paying a publication fee to make an article available through an open access journal (Primary Research Group, 2009). In early 2012, 11 provosts from large research institutions stated their support for open access and expressed the importance of faculty taking action to ensure their work is accessible to readers (Wheeler et al., 2012). With open access options becoming more common, universities will need to identify stable sources of funds for these types of initiatives. Working with librarians, administrators may need to begin shifting funds from periodical subscriptions to central open access funds to cover author fees for publishing. Similarly, funding agencies supporting research may need to include open access publishing costs in awarded grants (Pinfield, 2010).

The idea for universities to support publishing systems through methods other than subscriptions is not new. In the 1970s, the National Enquiry into Scholarly Communication suggested that universities without presses should somehow become involved in publishing the work produced on their campus to help subsidize costs of publication (American Council of Learned Societies, 1979). More recently, a 2007 report called upon universities to develop a local publishing strategy (Brown, Griffiths, & Rascoff, 2007).

Finally, academic administrators can contribute to new modes of scholarship through financial support of open access publishing projects coordinated by various organizations. For example, arXiv, the database of open access physics articles, is hosted by the Cornell University Library. Other universities that heavily use the database recently agreed to contribute toward ongoing maintenance and operation costs (Cornell University Library, 2010). In a separate effort, researchers in the field of physics are seeking to "flip" the publication model for a group of core journals in high energy physics by gathering financial commitments from universities that subscribe to the journals. Once a certain level of support is reached, the goal is to convert the journals from a subscription model to an open access model. Universities would still fund the journals at the same level, but the publications would then be open for all to read. If successful, more than 150 libraries from the United States would commit over $3.2 million toward this initiative (Sponsoring Consortium for Open Access Publishing in Particle Physics, 2010). By late 2012 the Sponsoring Consortium for Open Access Publishing in Particle Physics ($SCOAP^3$) received sufficient support to begin formal negotiations with publishers. The future is still uncertain but this model seems like it will be successful. The next logical question to ask is, can this work for other journals or other disciplines? The initiative being pursued by physicists sounds like a promising model, but there may be difficulties. High energy physics is a small field in which coordination among many institutions is workable, but when dealing with more and larger disciplines, adoption of this model on a large scale is less likely (Mele, Morrison, D'Agostino, & Dyas-Correia, 2009).

Academic leaders typically move slowly and strategically toward open access due to the large costs involved. Many hesitate to invest in new systems or models, especially in a time of tight budgets and competing priorities. Some choose to take a "wait and see" approach, learning

from the experiences of others and letting other universities carry some of the risks associated with experimentation. Whether the long-term solution is online repositories for research or new models for scholarly journals, these developments will need the input and support of academic administrators in addition to that of librarians and faculty.

Power and influence of administrators in the university.

As noted in the first chapter, although academic administrators in the role of provost or chief academic officer occupy a position of substantial authority and responsibility, various constraints limit these administrators' ability to exert a great deal of direct influence or power. Even the strongest and most competent leaders "may still fail in the end if their initiatives do not coincide with those desires of faculties" (Bensimon, Neumann, & Birnbaum, 1989, p.3).

Numerous writings describe elements of successful academic administration. Ranta (1985) lists the powers typically held by a dean, including the powers to make, enforce, and create exemptions for rules; control budgets; approve or deny requests; communicate and influence; make adjustments to personnel; and bring together diverse individuals and resources. When asked about the primary responsibilities of a chief academic officer, faculty leaders at multiple universities identified the following items as the most important: short and long range academic planning, policy development, coordination of deans, and management of the general academic budget (Mangieri, 1991). In the same survey, faculty indicated that the "coordination, supervision, and advancement of research activities of the faculty" should be one of the lowest priorities for these administrators (p. 13). Presumably because others, such as deans and department chairs, are usually more directly involved with the activities of individual faculty.

With academic leaders spending so much time on planning and policy development they are clearly in a position to influence key decisions, guiding the institution in a particular direction

even when they are not directly involved in departmental actions. In fact, one assessment concluded that “on many campuses, the academic vice president had as great or even greater effect on the campus than did the president” (Birnbaum, 1992, p. 113). Previous work also makes it apparent that the job of an academic administrator requires one to be a strong coordinator of many different interests. Once priorities for the institution are set, the academic administrator needs to work with deans and others to develop strategies consistent with these goals (Ehrlich, 1997). Each dean and academic unit on campus will lobby for support of its own programs and initiatives, but the provost or chief academic officer must decide how to balance the many often conflicting voices in a way that best serves the institution as a whole (Ehrle & Bennett, 1988). Edelstein (1997) suggests that faculty usually cannot be pushed in a certain direction by administrators but that a more successful tactic may be to nudge or pull these faculty members by focusing not on the details of specific positions but on the larger context of what is desired (p. 74-75).

The work of Lynch et al. (2007) explains how academic leaders often recognize libraries as important physical and symbolic spaces on campus but expect library directors to compete for resources just as other deans must. In this political process the voices of faculty and students matter a great deal to administrators controlling resources. Ultimately, “to secure support, the library must show how it serves the university’s mission” (Lynch et al, 2007, p. 226).

Table 2

University Administrator Related Conditions and Barriers to Open Access

Attitudes	• Desire to share locally created knowledge • Desire to increase reputation and status of the institution (Holley, 2009) • Not opposed to new forms of scholarship if quality is maintained (Sweeney, 2000) • Librarians must compete for university resources (Lynch et al., 2007) • *Changes in organizational culture take time and occur slowly (Cook & Yanow, 1993)* • *Desire to maintain institutional prestige through contributions to certain journals (Holley, 2009).* • *Uncertainty about future environment*
Awareness	• General awareness of issues facing librarians (Wagner, 1995; Jenkins, 1998)
Action	• Constant adjustment to rapidly evolving conditions • May financially support open access journals, author funds, or other open access publishing activities • May offer policy support for open access initiatives • Must ensure compliance with legal or regulatory requirements • *Power over faculty may be limited (Bensimon, Neumann, & Birnbaum, 1989; Edelstein, 1997; Holley, 2009)*

Note. Barriers in italics.

Librarians seem to acknowledge that provosts are generally aware of and concerned about issues facing libraries, especially the significant costs of acquiring and maintaining access to information resources (Jenkins, 1998; Wagner, 1995). However, more urgent issues often demand the attention of provosts and limit the time and energy available to address the library's role in supporting faculty and students (Wagner, 1995). In relation to the concept of open access and new publication opportunities Wagner (1995) observed that "the provost could be influential in promoting a shift in emphasis in the writings put forward for tenure and promotion" but it would take time to persuade faculty and review committees of the importance of such a shift (p. 45).

The role and influence of a provost or other academic administrator is likely to vary greatly across institutions due to unique institutional circumstances, cultures, and personalities. However, all of these leaders must manage multiple organizational functions while various pressures limit how much attention any one may receive.

Librarians

As libraries are in the midst of a massive shift from print materials to electronic information, access versus ownership has emerged as an issue of great concern (Budd, 2005). With printed materials, a library purchases a copy of a book or other document and owns it. One can then assume the material will be accessible indefinitely, pending the availability of space. On the other hand, with electronic information, librarians often purchase access to information yet maintain no real ownership or control of that information. If, in the future, a library no longer continues an electronic subscription, it could have nothing to show for money spent for past access. Another risk is that a publisher or electronic information provider will decide to discontinue offering a service. When this happens, a library may lose access not only to current information but also to the archive of past knowledge (Budd, 2005). This causes much concern over the preservation, or long-term access, to electronic information and e-journals. Uncertainty and unsolved problems related to long-term preservation, such as who should maintain an archive and how it should be managed, also contributed to the slow adoption of e-journals (Schaffer & Calkin, 1996). Currently, several operations seek to solve the problems of preservation and access to electronic materials. Nonprofit organizations like JSTOR, Portico, LOCKSS, and CLOCKSS work with both publishers and librarians. These groups seek to help librarians shift back toward the ownership of content by providing assurance that electronic

information will remain accessible in the future in the event that a publisher ceases to offer access.

Librarians continue to increase efforts to educate faculty and staff about important challenges, changes, and opportunities related to the distribution of research. At the same time, college and university librarians in the United States are exploring new options with the support of key organizations committed to open access. Such organizations include the Scholarly Publishing and Academic Resources Coalition (SPARC), the Association of Research Libraries (ARL), and the Association of College and Research Libraries (ACRL). A great deal of support also comes from the international research community.

Through outreach and education by librarians and other open access supporters, the level of awareness and concern about scholarly publishing appears to be on the rise, especially among faculty researchers. When a library must decide to cancel subscriptions to important but very expensive journals, faculty feel the impact directly. A high-profile case comes from the response of leaders at the University of California who considered a price increase from the Nature Publishing Group highly unreasonable. The California Digital Library issued a letter to all university faculty outlining the impact of these higher costs while explaining the possibility of reduced access to these journals (University of California, 2010). The letter also noted that researchers from the university system contribute a great deal to the content and review process for Nature journals and suggested faculty may want to consider a system-wide boycott of Nature publications while looking for alternative publishing outlets.

Although awareness is on the rise generally and many librarians strongly support open access, others in the library profession are either not aware of current issues or are not convinced of the potential benefits enough to take action. Carter, Snyder, and Imre (2007) found the level

and interest of librarian authors no greater than that of all researchers. Palmer, Dill, and Christie (2009) concluded from a study of librarians' perspectives on open access that overall support is positive but a discrepancy exists between stated support and actual actions being taken to support open access. In addition, two recent analyses of articles published in the professional journals of the library field report that a majority of authors who are librarians are not making their own work available through open access options such as online repositories or open access journals (Mercer, 2011; Way, 2010).

Current practices within libraries can also act as barriers preventing greater openness and accessibility to scholarly work. When considering open access, the factors motivating librarians are often different from those motivating researchers. Library staff want to minimize price increases of journals and make more information available to readers at a lower cost. Researchers, on the other hand, want their work published in the most appropriate outlets and are not often impacted directly by issues of cost or access. This difference of perspective can slow progress toward open access. For example, with institutional repositories, librarians have different needs and interests than those who would contribute to and use such a database (Maness, Miaskiewicz, & Sumner, 2008; St. Jean, Reich, Yakel, & Markey, 2009). Librarians want to obtain and preserve as much information as possible while most faculty do not yet see the value of an institutional repository for their research. Therefore, these institutional repositories often require some sort of formal policy or mandate in order to achieve success, whereas the subject-based research repositories, like arXiv for physics, are considered very useful and are heavily used by faculty (Armbruster & Romary, 2009). This disparity is an indication that librarians involved in setting up repositories must display a greater awareness of and pay more attention to a broader range of researcher needs and perspectives.

The costs of information and concern over library budgets partially motivate librarians to favor open practices for sharing information. However, the idea of knowledge as a public good is another motivator. The desire of librarians to share information widely is not new. In early nineteenth century England the government encouraged the deposit of scholarly works in all university libraries for the public benefit rather than requiring university students to pay a fee so the library can purchase a copy (Christian, 1807). For some time this was common practice but due to the growing number of universities it became impossible for authors and publishers to donate a copy of books and journals to each one. Further, universities would often be the only purchasers of such material. Today, however, technology allows us to transmit many additional copies of a work at very little cost, and we now see efforts encouraging authors to "donate" an electronic copy of their work to the university's online repository where it will become publicly accessible.

While cost is one of the driving forces of open access it remains one of the largest barriers to implementation and funding is always a concern due to limited budgets. Unfortunately, although the potential cost savings are huge, any individual institution cannot afford to subsidize open access publishing of scholarship on a large scale. A switch to open access requires a collective move with contributions made by many. Therefore, librarians and academic administrators must set priorities and make strategic investments. Although trying their best to support some of the most promising projects, some library directors and deans remain hesitant to take on the risk of creating new positions or committing funds to new open access initiatives without external support or funding from other units of their university.

Through all of this change, the roles of libraries and librarians are evolving in interesting ways. Librarians are becoming more active in publishing services and the distribution of

information. Increasingly, university librarians are developing and hosting online journals, establishing scholarly publishing offices, disseminating works created on campus, and establishing stronger partnerships with university presses (Hahn, 2008a). As for the changing role of librarians, in addition to many other duties, library staff fill a growing demand for expertise and advice on copyright issues, publishing, and other opportunities in scholarly communication (Hahn, 2008b).

Table 3

Librarian Related Conditions and Barriers to Open Access

Attitudes	• Desire to acquire, organize, and preserve information • Desire to disseminate knowledge widely • Interest in providing greater access at lower cost • *Different motivations and expectations than researchers (Maness, Miaskiewicz, & Sumner, 2008; St. Jean, Rieh, Yakel, & Markey, 2011)* • *Changes in organizational culture take time and occur slowly (Cook & Yanow, 1993)* • *Uncertainty about future environment*
Awareness	• Some librarians are very aware of and interested in open access • *Some librarians are not aware of or interested in open access (Carter, Snyder, & Imre, 2007)*
Action	• Constant adjustment to rapidly evolving conditions • Development of new services to support scholarly publishing • Balancing of information ownership with information access (Budd, 2005) • Development of new services to preserve electronic information • Establishing new relationships with publishers and researchers • *Low support for open access among some librarians (Carter, Snyder, & Imre, 2007; Palmer, Dill, & Christie, 2009; Way, 2010)* • *Dependence on publishers as a supplier of information (Henderson & Bosch, 2010; Gooden, Owen, Simon, & Singlehurst, 2002)*

Note: Barriers in italics.

Publishers

Librarians are not the only ones facing challenging conditions. Many journal publishers struggle to maintain enough revenue to cover publication and distribution costs in an environment in which much of the customer base is shrinking, largely due to limited library

budgets. A recent financial analysis of Reed Elsevier, one of the largest commercial academic journal publishers, noted that their substantial profit margin was "increasingly vulnerable as the open access movement matures" and this "substantial profit margin has persisted for as long as it has partly because of the lack of awareness and the apathy among stakeholders; those factors are changing" (Woodard, 2012). Commercial and nonprofit publishers alike are in a period of transition and need to establish sustainable services and business models. In response to customer demand, most journals now also offer an electronic version of their printed publication, and some are completely electronic. Some predictions forecast that financial pressures will eventually bring both publishers and librarians to abandon print versions of most journals (Johnson & Luther, 2007). This prediction is given credence daily as publishers create new electronic journals and libraries cancel print subscriptions in favor of electronic access.

The term e-journal is commonly used to describe online journals, although multiple definitions have been used over the years. Kaur (2007) reviewed some of these definitions and described an e-journal as a publication produced only in electronic format and subject to peer review and stringent quality standards. But an e-journal can also refer to a journal produced in print that also offers electronic access to articles. Some e-journals may require a subscription but others are frequently free to access on the Internet and published as open access journals. According to the Directory of Open Access Journals, over 8,000 scholarly open access e-journals are now available (Directory of Open Access Journals, 2012a). Various organizations around the world publish open access journals, but in the United States there were at least 16 by 2002, 438 by 2006, and 1,187 by 2011 (Directory of Open Access Journals, 2012b). Laakso et. al. (2011) also documented the rapid growth of the number of open access articles and journals from 1993-2009.

Some, but not all, open access e-journals operate by charging fees to authors or an author's sponsoring institution upon publication. BioMed Central, based in London, is one of the largest open access publishers using this method. Operating since 2000, this publisher now produces over 200 well-established and respected journals (BioMed Central, 2012). BioMed Central waives publication fees for researchers affiliated with a member institution. In addition, authors unable to pay the fee may request a waiver. Numerous other open access e-journals do not require author fees and instead receive financial support from a related organization or scholarly society.

Many more electronic journals exist as extensions of traditional print journals. These titles often require a subscription or payment for online access. Researchers and universities rely on these key publications in various fields so librarians and individuals continue to pay a high price for access. This dependence on established journals makes the shift to open access more difficult.

In addition to open access e-journals publishers must address self-archiving as another common path to making research more accessible. Using this method, a researcher deposits a copy of his or her work in an institutional repository or other similar online database in addition to publishing an article in a traditional journal. Publisher reactions to this practice vary. Traditionally, publishers rejected any previously published materials, including online publication. This practice, known as the Ingelfinger Rule, is in decline (Morris, 2009). In the past researchers often signed away all rights to publishers giving them exclusive rights to the intellectual materials submitted. Now, researchers more commonly maintain some rights so they may have a greater say in how their work is used in the future. Under pressure from researchers

some publishers are moving away from complete "copyright transfers" to a more limited "license to publish" (Morris, 2009).

Nearly all scholarly articles exist in at least two versions. The first version is the pre-print, defined as the initially submitted manuscript prior to peer review. The second is the post-print, or the version of the manuscript that has undergone peer review, editing, and formatting (Securing a Hybrid Environment for Research Preservation and Access, 2006). How either version of a work may be used by an author depends on the agreement made with a publisher. To help researchers track the different policies of publishers a consortium of universities in the United Kingdom known as SHERPA maintains an online database. SHERPA's ROMEO database classifies publishers into one of four categories (green, blue, yellow, or white) based on how an author may or may not reuse work appearing in a specific journal (Securing a Hybrid Environment for Research Preservation and Access, 2006).

While publishers frequently express objections to some specific practices associated with open access not all oppose new models of scholarly communication. The Association of American University Presses (2007) issued a statement saying they have never been averse to change and they play an important part in the process of changing scholarly communication. Yet, they also urged caution against moving too quickly to a system like open access without considering other alternatives. The urgency for university presses to identify new business models and to collaborate with other entities is highlighted in a more recent report (AAUP, 2011). Boissy and Schatz (2011) also explain that "though initially fearful, the publishing community is rapidly coming to terms with the open access movement" (p. 482). They do acknowledge challenges related to maintaining quality, managing peer-review, and archiving content in an open access environment but expect that "publishers will continue to be a key link

in the scholarly communication chain" (p. 483). Similarly, Sutton (2011) believes "that we will see new services and tools developed by publishers and others in order to meet the challenges of offering free content while remaining in business" (p. 645).

Some commercial publishers now experiment with a variety of open access options. Major publishers such as Springer, Taylor and Francis, Elsevier, and Blackwell all offer options in which authors or their supporting institutions can pay to convert articles to open access. If enough authors pay this fee subscription prices should go down (Oppenheim, 2008). Stephen Pinfield (2010) provided a list of 69 publishers offering open access options. So far, the true impact on subscription prices remains largely unknown, but Springer claims that in 2009 "over 30 journals published a significant share of paid open access articles" and "this will be reflected in these journals' subscription prices" (Springer, 2010).

As the responsibility for producing and distributing some scholarly knowledge moves from for-profit commercial publishers to an open access model, there is no single approach that benefits all parties while covering necessary costs. After years of work toward a new model of scholarly communication the traditional publishing system proves quite resistant to change. Open access initiatives in early 2010 had "only a modest effect on the publishing industry as a whole" (Henderson & Bosch, 2010, p. 39). However, both commercial and noncommercial scholarly publishers will continue to face greater scrutiny and will need to discover new ways to offer valuable services.

Publishers, the providers of scholarly research journals, hold a great deal of influence and power in the system of scholarly communication. This strong position allows both commercial and non-profit publishers to resist efforts of open access advocates. Publishers firmly committed to operating under the subscription model establish a barrier capable of slowing any

transformation of the current system. A strong incentive exists for publishers to support the current subscription model because it provides stable revenue streams necessary to sustain the operation. A shift to an open access model represents uncertainty and a substantial financial risk. Established journals also enjoy a loyal readership, have brand recognition, and are served by academics who are rewarded professionally for contributing to the peer review and editing process (Gooden, Owen, Simon, & Singlehurst, 2002). Librarians and researchers also depend on publishers for access to key journals in certain disciplines. This makes it very difficult for librarians to walk away by cancelling print or electronic subscriptions.

Table 4

Publisher Related Conditions and Barriers to Open Access

Attitudes	• Motivated to produce revenue and profit • Motivated to establish sustainable business model (Boissy & Schatz, 2011) • *Uncertainty about future environment*
Awareness	• Very aware of current publishing environment including open access initiatives
Action	• Constant adjustment to rapidly evolving conditions • Experimenting with changes to peer review and business models • Developing new technological systems for electronic publishing • Establishing new relationships with librarians and researchers • Implementing expensive electronic storage and software systems which also require specialized labor (Tenopir & King, 2000) • *Regularly increasing subscription prices (Henderson & Bosch, 2010; Yiotis, 2005)* • *Restricting how content can be purchased and used* • *Dependence of librarians and researchers on publishers (Henderson & Bosch, 2010; Gooden, Owen, Simon, & Singlehurst, 2002)*

Note. Barriers in italics.

Economics of Open Access

Among supporters of open access conventional wisdom holds that such a system would reduce the total cost of producing and distributing research. The core elements of this thinking

are outlined in chapter one. However, one must remember that although open access articles are free for readers to view the production and distribution of scholarly research still involves substantial costs. Tenopir and King (2000) examine in detail many of the economic issues surrounding e-journals and highlight the mixed results and experiences reported by both researchers and publishers. Any potential cost savings depends greatly on many different factors. For example, one large variable is whether or not an electronic journal is published in print as well as online. Even if electronic publishing may be more efficient in some ways, electronic storage, software and labor costs can offset any savings achieved through reduced printing and distribution expenses (Tenopir & King, 2000).

One common way publishers are working with researchers, universities, and librarians to cover costs of open access is through the use of author payments for articles in open access journals (gold open access). These contributions may come from universities or other funding bodies on behalf of researchers and authors. In return for these payments publishers make the work available online to everyone without restrictions. Some open access journals require no author payments and receive their funding from other sources.

When journals charge publication fees to authors rather than subscription fees to readers, this raises the question of whether or not open access contributes to the creation of more journals and publications of lower quality. The possibility exists that author fees may tempt editors to accept submissions of a lesser quality to bring in more money. As noted in chapter one, McCabe and Snyder (2005) recommend a careful balance of fees, charging authors one rate for submission and another for acceptance and publication.

If and when the time comes that open access publishing reaches widespread acceptance, many of the traditional costs of staff, equipment, and technology will still remain, but the

services and modes of payment may look very different. Halliday and Oppenheim (2008) proposed several possible economic models to support digital journals. One relies on a traditional method using subscriptions and sales of individual articles. Another is supported by fees charged to authors or institutions with the articles freely accessible to readers. A third model, called the free-market model, would use both author fees and subscription charges and, in this case, "both authors and users would contribute to costs" (Halliday & Oppenheim, 2008). In addition to author fees, other income models that could possibly support open access include use of advertisements, sponsorships, internal subsidies from a supporting organization, external subsidies through grants or government support, donations, endowments, or fees for additional services such as printed copies or enhanced online access (Crow, 2009). These income models apply to both the journals and digital repositories providing open access.

When considering possible cost advantages of open access the academic community must determine the likelihood of sustaining this model at a lower cost than the system currently in place. The analysis by Getz (2005) estimates that the average research university in the United States could save over $2 million per year if all journals followed the gold open access model, assuming the same level of quality achieved through a similar process of review and editing. Open access could save the most money if librarians could very quickly make a transition from the old system, in which consumers (the receivers of information) pay, to an open access system in which authors, universities, or agencies funding research (the senders of information) pay. However, difficulty arises due to the fact that this change cannot occur instantly. During the period of transition costs will likely grow as librarians and academic administrators invest in new systems of knowledge management, many of which are experimental. At the same time,

librarians must maintain access to the many essential research journals under an older more costly but reliable system.

Political Environment and National Policies

Because public funds often support scientific research, many argue that the results of these collective societal investments should be shared with the public, not surrendered to commercial publishers and locked up behind a wall requiring payment, especially when technology exists to share the information widely and cheaply. Researchers in universities and laboratories are not the only ones who can benefit from greater access to public knowledge. Individuals in many different roles may use the results of publically funded research to make a significant improvement to some aspect of their personal life, community, or business.

Each year, the National Institutes of Health provide approximately $31 billion to support research conducted by scientists in universities, research institutions, and government laboratories (National Institutes of Health, 2012). In the past, before modern computer technology, researchers distributed the results of this research in scientific or medical journals that were later stored on library shelves across the country. Access was limited to those able to visit one of these locations and those holding a subscription to the scientific journals.

With the evolution of the Internet, the National Library of Medicine developed a central database called PubMed Central to store research articles and make them available online. The National Institutes of Health encouraged researchers and article authors to submit a copy of completed works to the database through a policy implemented in 2005, but with a participation rate of less than five percent, agency officials and lawmakers realized that a mandate may be needed (English & Joseph, 2008). Congress later enacted the Public Access Policy of 2008 which now requires authors of all published articles resulting from research funded by the

National Institutes of Health to submit a copy to the PubMed Central database within 12 months (National Institutes of Health, 2009). Now, all those receiving research grants from the National Institutes of Health must comply with this form of open access.

The Public Access Policy of 2008 is also significant because it sets a precedent for all unclassified government-funded research. The National Institutes of Health represents just one of numerous agencies funding research but is currently the only one required to make the results of its investments available online. Several years ago, Senator John Cornyn introduced the Federal Research Public Access Act of 2006, but Congress never acted upon the bill (S. 2695, 2006). If passed, the law would have been very similar to the arrangement now in place at the National Institutes of Health but expanded to include other agencies. Senator Cornyn's proposal would require all agencies with a research budget of greater than $100 million to develop a public access policy. Groups such as the Alliance for Taxpayer Access and the library community continue to support efforts for the increased availability of information, especially that which is funded or produced by our government (Alliance for Taxpayer Research, 2010). In the 111th Congress of 2009 and 2010, and in the 112th Congress of 2012 legislators reintroduced the Federal Research Public Access Act, (S. 1373, 2009; H.R. 5037, 2010; H.R. 5253, 2010; S. 2096, 2012). Congressional committees considered the bills but the legislation progressed no further.

Not everyone supports such measures. For obvious reasons, many, but not all, publishers voice opposition to the growth of open access and public access policies. The Partnership for Research Integrity in Science and Medicine (PRISM) is one group that "was established by The Executive Council of the Professional and Scholarly Publishing Division of the Association of American Publishers (AAP) to educate policy makers and the American people about the risks

posed by government intervention in scholarly publishing" (Partnership for Research Integrity in Science and Medicine, 2007a). The response of PRISM to the Federal Research Public Access Act argues that the proposed legislation is unnecessary and would, among other things, jeopardize the peer-review process, be equivalent to government censorship, and impede medical and scientific innovation (Partnership for Research Integrity in Science and Medicine, 2007b). Advocates of public access to research reject all of these claims. Legislators in the United States have also introduced measures backed by the publishing industry such as the Fair Copyright in Research Works Act of 2008 and the more recent Research Works Act of 2011 that would restrict government sponsored open access requirements. This proposed legislation was met by strong opposition from the academic and scientific community (Harvard Open Access Project, 2012).

Judging from past and recent developments, public access to the published results of government-funded research in the United States is likely to become law at some point in the future. In other countries around the world, numerous agencies funding scientific research are regularly requiring that any published results be made publically available and easily accessible. The Registry of Open Access Repository Material Archiving Policies identifies over 50 such policies classified as funder mandates, and many of these funders are governmental agencies in other countries (University of Southampton, 2012). These types of developments will continue to exert some influence over how politicians, government agencies, publishers, and universities plan new services for the future. Some within the library community seem optimistic that open access to publicly funded research will become law for more federal agencies as the political environment seems more favorable now than just several years ago.

Summary of Current Environment and Barriers Related to Open Access

The four key groups of stakeholders influencing the system of scholarly communication are experiencing a period of significant and complex change. These groups also hold the power to shape future practices. The significant amount of progress to date should satisfy open access supporters. However, some proponents expected change to occur more rapidly. Members in each of the four groups dedicate time and resources to further open access projects and experiments. At the same time, members from each group express concern about moving too quickly or can slow progress toward open access publishing. Many of the current conditions and barriers fall into one of the key categories identified by Xia (2010) which include *attitudes, awareness, and action*. Below is a summary of current conditions and barriers.

Common conditions.

A number of the conditions noted previously reach across more than one stakeholder group. Some areas of common interest include a desire to maintain high quality journals, a desire to use and manage new forms of scholarly publishing, and uncertainty about the future.

First, researchers and academic administrators wish to achieve recognition through appearances in high quality journals (Holley, 2009; University of California, 2007). Second, all groups have an interest in the use and management of new forms of scholarly publishing. Researchers who understand and appreciate the benefits of electronic publishing willingly experiment with new forms or scholarship (Gould, 2010; Maron & Smith, 2008). In response, publishers develop new technology and experiment with new services and business models. Meanwhile, librarians seek to share information widely by developing services to support innovative publishing initiatives. Administrators also have an interest in the distribution of locally created knowledge and do not oppose new forms of scholarship as long as these formats

maintain a high level of quality (Sweeney, 2000). Finally, all stakeholder groups must deal with uncertainty about the future and adapt to a rapidly changing environment. These changes are forcing all stakeholders to redefine or establish new relationships with one another.

Common barriers.

As explained in the previous section, some of the common conditions across groups are negative. These negative conditions can serve as barriers to open access acceptance. Barriers reaching across more than one group include differing perspectives, low awareness, concerns about journal quality, confusion about copyright issues, and slowly changing cultures. For example, researchers producing content and the librarians attempting to offer supportive services may have differing perspectives on what is needed and how such services should be provided (Maness, Miaskiewicz, & Sumner, 2008; St. Jean, Rieh, Yakel, & Markey, 2011). Librarians are generally motivated to assemble collections of information and provide reliable long term access. On the other hand, faculty researchers are generally more interested in accessing and sharing information for more immediate uses. At the same time, among researchers and librarians, those with a low awareness of open access, or those who don't see a need for change, can impede progress (Bell, Foster, & Gibbons, 2005; Carter, Snyder, & Imre, 2007; Morris & Thorn, 2009; Palmer, Dill, & Christie, 2009; Schroter & Tite, 2006; Way, 2010). Their lack of action prevents others from moving forward because a large shift to open access requires a significant cultural change and the participation of many.

For researchers and administrators, concerns about journal quality are also of great importance and must be adequately addressed before open access can succeed (Holley, 2009; Xia, 2010). Much progress has been made in this area as a number of open access journals are now establishing their reputations as high quality scholarly publications. Publishers also impact

the growth of open access by entering into a wide range of contractual agreements with authors, leading to confusion about copyright issues and what uses are permitted or not permitted (Swan, 1999; Morris, 2009). This confusion, and even fear, causes authors to refrain from using their work in other venues, such as posting a copy on a personal website, even if permitted by the original publishing contract.

Finally, cultures tend to change slowly marking another challenge to widespread open access. All of these groups are facing a rapidly changing environment. But change does not automatically equal a rapid cultural shift, which is necessary for open access to succeed. Organizations and the individuals within them frequently evolve, or learn, as they adapt to change (Cook & Yanow, 1993). However, organizational cultures are often complex, becoming strong and reinforced over time. This is especially true when discussing the academic culture of scholarship which is strongly rooted in tradition.

The current practices of researchers, librarians, publishers, and academic administrators outlined in this chapter, along with the growth and development of scholarly publishing in general, led Heather Joseph, executive director of the Scholarly Publishing and Academic Resources Coalition, to question whether open access is the new normal (Joseph, 2009). While the collective actions of the scholarly community seem to favor a shift toward open access, supporters must first minimize any existing barriers.

Conceptual Framework

A complex network of relationships exists among researchers, librarians, publishers, and academic administrators. As noted in chapter one, Pfeffer and Salancik's resource dependence theory (2003/1978) helps explain how each group depends to some degree on the actions and influences of the others. For example, librarians depend on administrators for financial support,

rely on publishers as providers of content and exist to serve the needs of researchers. Researchers expect librarians to purchase and provide access to current and past knowledge. Researchers also rely on administrators to support research activities and publishers to facilitate the evaluation and distribution of scholarly work. Publishers depend on researchers to supply suitable content and need librarians to purchase the output. Administrators depend on researchers to make the intellectual contributions that help maintain an institution's reputation. Administrators also depend on librarians, as their work is essential to the success of researchers. Over time these patterns of interdependence develop and change in response to current conditions (Pfeffer & Salancik, 2003 p. xii).

The diagram presented in Figure 1 is a visual display of these interactions in the context of movement toward open access. This illustration places the four stakeholder groups on the same level. Individual librarians, academic administrators, researchers, and publishers directly or indirectly influence members of all four of these groups through their attitudes and actions. As individual attitudes are expressed and actions initiated they serve one of three functions in relation to the open access movement. These attitudes and actions can either increase awareness, serve as a barrier, or result in greater actions leading to the open access of scholarly research. As stated in chapter one, this study is primarily concerned with two questions. First, what influence do library directors perceive each stakeholder group as holding in the transition toward open access? Second, as perceived by library directors, to what extent do the current attitudes and actions of academic administrators influence the level of action of researchers and librarians?

The following pages look at these interdependencies in more detail and examine the specific forms of power each group may exert over the others.

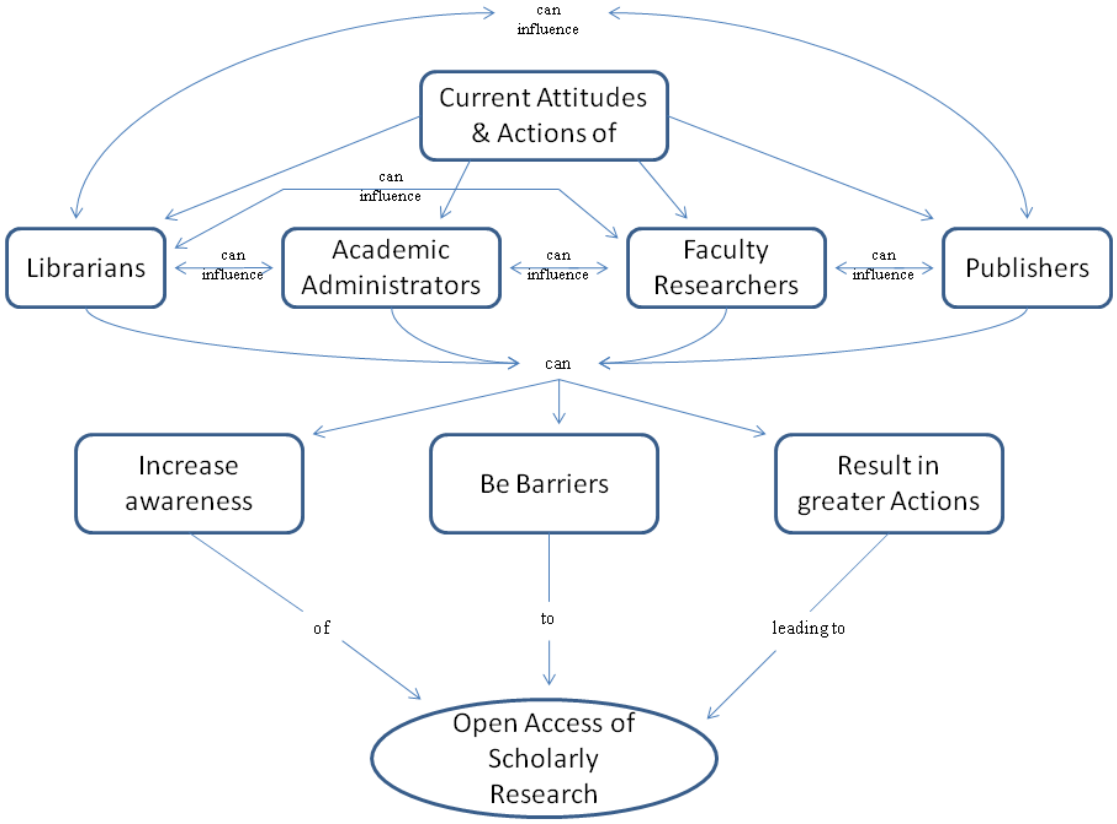

Figure 1. Interactions among key stakeholders and the movement toward open access.

Power Bases and Dependencies

To better understand how each group can influence the others it is helpful to review five common ways a person or a group may exert power over another as presented in the work of French and Raven (2005). Coercive power results from one's ability to punish or introduce negative consequences upon another. Reward power is similar, but is focused on one's ability to encourage certain behavior through positive reinforcement or favorable conditions. Legitimate power describes an environment in which an individual or group recognizes and accepts the authority of another based upon a role or formal position. Referent power describes a relationship in which a subordinate group offers cooperation due to a sense of respect or a desire to please. Finally, an individual or group attains expert power when others recognize and depend upon their knowledge or expertise. Different factors motivate each group under consideration

and can influence the actions of others through a variety of the bases of power. These are described and outlined below.

Faculty researchers' power bases and dependencies.

Academia generally rewards faculty based on their ability to teach effectively, engage in scholarly research, and serve the university, the profession, and the public. Most colleges and universities operate under a traditional culture of shared governance in which faculty actively help shape the future of the institution, especially in regard to academic issues. Because of this, faculty can exert a great deal of influence over others including academic administrators, librarians, publishers, and other faculty. When discussing open access, faculty hold much of the power as their actions directly impact future services offered by librarians and publishers.

Table 5

Faculty Researcher Bases of Power & Influence over Others

	Coercive	Reward	Legitimate	Referent	Expert
(influence over)					
Librarians	---	---	librarians have an official responsibility to respond to faculty needs and to provide desired services	faculty can earn respect and admiration of librarians	faculty are experts on current practices in their fields
Publishers	faculty can abandon journals where there is disapproval of publisher practices	faculty can reward respected publishers by submitting work and serving as editors/reviewers	---	---	faculty provide expert knowledge for content needed by journals
Academic Administrators	as a group, the faculty can pressure a provost to act. Votes of "no confidence" can show disapproval	---	---	faculty can earn respect and admiration of administrators	faculty are experts on current practices in their fields
Faculty Researchers	individual faculty members and/or departmental cultures can discourage other faculty from pursuing certain actions /	individual faculty members and/or departmental cultures can encourage other faculty to pursue certain actions	act as gatekeepers to published research through peer review process	well-respected faculty colleagues can influence attitudes and actions of other faculty	more experienced senior faculty can offer assistance and advice to junior faculty

Faculty researchers might contribute to an increase of open access scholarly publishing by:

- submitting work for publication in peer-reviewed open access journals or serving as editors or reviews
- negotiating copyright terms that favor an author's control over their own work, perhaps using an addendum similar to the one endorsed by the CIC (Committee on Institutional Cooperation)
- archiving copies of published work online in a publically accessible database, repository, or website.
- encouraging other authors to consider open access publication
- adopting policies such as those listed in ROARMAP (Registry of Open Access Repositories Mandatory Archiving Policies) that either encourage or require authors to make their work available through open access.

Academic administrators' power bases and dependencies.

Earlier research reports that on 81% of campuses, the academic library reports to a chief academic officer, making it important to consider how individuals in this administrative role influence issues important to librarians (Martin & Samels, 1997). Academic administrators such as a chief academic officer or provost have a responsibility to meet the needs of students and faculty in a way that ensures the institution remains academically competitive. A primary concern is that of managing budgets in a responsible way while maintaining quality and keeping costs affordable for students. These academic leaders must balance the competing interests of internal and external stakeholders, both for the short term and long term. Ultimately, these individuals are held accountable by university and government officials, private donors, tuition paying students, and faculty.

Of all the groups considered here, academic administrators are unique in their ability to exert all five bases of power on faculty researchers and librarians. At the same time, administrators generally hold little direct influence on publishers as interaction between these two groups is often limited. Any influence that administrators exert on publishers usually occurs through the actions of faculty researchers and librarians. Bensimon, Neumann, and Birnbaum

(1989) observed that the expert and referent bases of power are the most likely sources of power for academic leaders (p.38) and the most likely to lead to success (p.9). While academic administrators do indeed have all five bases of power at their disposal, members of other stakeholder groups prevent excessive influence by simultaneously exerting their own power over administrators.

Table 6

Academic Administrator Bases of Power & Influence over Others

	Coercive	Reward	Legitimate	Referent	Expert
(influence over)					
Faculty / Researchers	administrators can pressure faculty to take action through directives/policies	administrators can increase resources or remove barriers	administrators have official authority in their position	charismatic leaders can earn respect of others	administrators have knowledge of university operations/politics
Librarians	administrators can pressure librarians to take action through directives/policies	administrators can increase resources or remove barriers	administrators have official authority in their position	charismatic leaders can earn respect of others	administrators have knowledge of university operations/politics
Publishers	---	---	---	---	---

Academic administrators might contribute to an increase of open access scholarly publishing by:

- making public statements of support for the concept of open access and related projects
- creating university-wide committees or task forces
- creating or supporting policies/procedures related to enhancing the open access of faculty scholarship
- committing specific resources to the development and support of new modes of scholarly research publication and dissemination

Librarians' power bases and dependencies.

Limited financial resources pressure librarians as they do all other groups. Rapidly changing technology and formats of information storage also lead to additional challenges. The nature of the profession motivates librarians to acquire and make accessible large amounts of information. Economic conditions pressure librarians to acquire this information at the lowest

possible cost. In carrying out this work librarians must support the scholarly work of faculty researchers and respond to the concerns of academic administrators. Although librarians exert limited power over faculty researchers and administrators they can provide information and advice on issues related to scholarly research and publishing issues. Librarians also exert a significant amount of influence over how others approach publishing issues mainly through interactions with faculty, journal publishers, and other librarians. They can raise awareness of publishing issues and opportunities among faculty. At the same time, publishers depend on sales to librarians and, when pressured, will often work to address librarians' concerns.

Table 7

Librarian Bases of Power & Influence over Others

	Coercive	Reward	Legitimate	Referent	Expert
(influence over)					
Faculty Researchers	---	librarians make decisions about whether or not to provide access to books/journals requested by faculty	---	librarians are generally well respected and admired as important members of the institution	librarians are seen as experts in information acquisition, organization and preservation
Publishers	librarians are some of the largest customers of publishers; librarians can pursue other options or choose not purchase content from certain publishers	librarians can direct business to publishers whose practices and terms are considered fair or reasonable.	---	---	librarians are seen as experts in information acquisition, organization and preservation; know what is needed by faculty, researchers and students; often provide input on information management products and services offered by publishers
Librarians			supervisory librarians hold official authority over other librarians	well-respected librarians can influence attitudes and actions of other librarians	more experienced librarians can offer assistance and advice to other librarians

Librarians might contribute to an increase of open access scholarly publishing by:

- serving as advocates of open access and educating faculty, administrators, and other librarians about open access issues
- negotiating with publishers to provide users with greater access to scholarly research
- developing programs and services to support faculty publishing activities
- creating and maintaining an institutional repository where authors can make their work freely available online
- working with faculty and administration to develop policies and practices that support the open access model.

Publishers' power bases and dependencies.

Publishers of scholarly journals depend highly on researchers who provide content for journals, and on librarians who purchase the product being sold. At the same time, the actions of publishers can influence the decisions of faculty researchers and librarians. Generally, publishers interact very little with academic administrators.

Publishers of scholarly journals must adapt to new and challenging circumstances, such as the increasing costs of doing business, and competition from alternative publishing options, such as open access or the direct sharing of information among researchers. Publishers need to secure enough revenue to sustain and grow operations. They can meet this need by offering new and valuable services while maintaining a strong reputation among academics. Through new products, services, and business models, publishers can continue to remain an important piece of the scholarly publishing environment.

Table 8

Publisher Bases of Power & Influence over Others

	Coercive	Reward	Legitimate	Referent	Expert
(influence over)					
Faculty Researchers	publishers can pressure faculty to sign restrictive copyright agreements; can require data to be presented in a certain way before publication	publishers can offer authors wide exposure in the profession	---	many journals are highly respected and admired for their quality/ reputation	journal publishers are highly knowledgeable in their field and offer expert knowledge in publication methods (editing; peer reviewing; marketing; distribution).
Librarians	publishers have what librarians need and can pressure librarians to sign deals for access to content; often set terms of agreements/contracts.	publishers can offer incentives through better prices, products or enhanced services.	---	many journals are highly respected and admired for their quality/ reputation	journal publishers are highly knowledgeable in their field and offer expert knowledge in publication methods (editing; peer reviewing; marketing; distribution).
Academic Administrators	---	---	---	---	---

Publishers might contribute to an increase of open access scholarly publishing by:

- updating products/services and business models to support open access. See Boissy and Schatz (2011).
- negotiating copyright agreements with more favorable terms for authors

Summary

As explained by Gagne (1985), an understanding of prior learning is a necessity for the creation of new knowledge. This concept directly relates to the mission of libraries and motivates librarians to acquire and preserve past knowledge for future users. It is believed that open access publishing can help scholars and librarians more effectively accomplish this goal.

The first chapter presents some of the primary motivations behind the open access movement. This second chapter describes in detail the important functions of researchers, academic administrators, librarians, and publishers, and in the system of scholarly communication. Historical actions shape the current environment and roles performed by each group. With changing technological capabilities and modern practices for sharing information these roles are being challenged and redefined. Many interrelationships and interdependencies are also in action as described in these first two chapters using Pfeffer and Salancik's resource dependence theory. Further, each one of these groups influences or exerts power on the others, as indicated by the analysis using French and Raven's bases of power model. Table 9 depicts a summary of how different bases of power align when all groups are combined and considered in relation to one another. This summary table applies French and Raven's bases of power to the scholarly communication environment using the individual analyses for each group as depicted above in tables 5 through 8.

Clearly, many interactions are at work among these groups with faculty researchers, administrators, librarians, and publishers all exerting power over others in the system through more than one method. The relationship between academic administrators and publishers is the only one where there is little direct interaction. Faculty researchers and librarians both exert some power, or influence, over all three other groups.

Table 9

Summary Table: Bases of Power Enjoyed by Each Stakeholder Group

Influence of	**On**	Faculty Researchers	Administrators	Publishers	Librarians
Faculty Researchers		coercive reward referent expert	coercive referent expert	coercive reward expert	legitimate referent expert
Administrators		coercive reward legitimate referent expert	--	NONE	coercive reward legitimate referent expert
Publishers		coercive reward referent expert	NONE	--	coercive reward referent expert
Librarians		reward referent expert	referent expert	coercive reward expert	legitimate referent expert

Academic administrators are the only group exerting influence on librarians and researchers using all five bases of power. This is also one of the least studied stakeholder groups. This study seeks to learn the extent to which the current attitudes and actions of academic administrators influence the level of action of researchers and librarians, as perceived by library directors. Because librarians are the only group that communicates with all of the other groups, and are frequently the most interested in open access initiatives, a survey will ask library directors to report their perceptions of the open access environment and provide feedback on the contributions of each group: researchers, administrators, librarians, and publishers. Such a survey could also target members of the other groups, but the publisher response rate to a survey on open access would likely be low. Faculty members could also be selected for the study but many

individuals in this group, even those who publish regularly, do not often consider the broad scope of the complex open access scholarly publishing environment. Individual librarians may have a slightly higher awareness than other faculty, but the library directors are in a unique position to evaluate current conditions and the contributions of members of the key stakeholder groups. Details about the methodology for this survey are provided in chapter three. The hypotheses stated earlier assume that administrator attention to open access will lead to greater institutional commitment to open access and that larger institutions will display a larger commitment to open access. The proposed research will use collected data to test these assumptions.

CHAPTER 3

METHODOLOGY

This chapter presents the methodological design of a research project characterizing library directors' perceptions of key stakeholder influences and actions in relation to the open access of scholarly research. As stated at the end of the second chapter librarians represent the only stakeholder group in regular communication with all of the other groups, and librarians frequently have the most interest in open access initiatives. Because of this dynamic this study administered a survey to library directors for the purpose of identifying their perceptions of the current open access environment. These individuals are also in a unique position to evaluate current conditions and the contributions of members of the key stakeholder groups. This data collection effort asked library directors at colleges and universities in the United States to share beliefs and opinions about the influences of the four stakeholder groups in either promoting or deterring action toward open access. The four groups, as described in detail in the previous chapters, include faculty researchers, academic administrators, librarians, and publishers.

Data was gathered in attempt to identify any significant relationships between academic administrator attention to open access and institutional actions taken by faculty and librarians toward open access. Such a relationship underlies a construct referred to in this study as institutional commitment to open access. This important concept and the methods for measuring it are defined further in the variables section below.

Nearly all faculty and academic librarians depend on the support of provosts or similar administrators. These are the individuals who frequently supply the necessary financial and leadership support needed to bring about change or to reinforce the priorities of an institution. However, individual stakeholders know little about the role of academic administrators and the

influence they may or may not have on the open access movement. Data collected from this survey allows for a better understanding of how administrators interact with and influence researchers and librarians on issues of open access. This chapter outlines the research hypotheses, defines the predominant dependent and independent variables, and provides details related to the survey population, survey instrument, survey distribution, and data collection and analysis procedures used.

Research Questions and Hypotheses

The current research gathered data from library directors on their perceptions of academic administrator, librarian, and faculty actions in relation to open access in order to study the extent to which current actions of academic administrators influence actions of researchers and librarians in the area of open access. Two primary research questions exist. First, how much influence do library directors perceive each stakeholder group as holding in the transition toward open access? Second, as perceived by library directors, to what extent do the current attitudes and actions of academic administrators of colleges and universities in the United States influence institutional commitment (the actions of faculty researchers and librarians) toward open access of scholarly research?

Also of interest is the relationship between an institution's size and an institution's commitment to open access. The two null hypotheses of interest for this study appear below.

- Administrator attention to open access has no effect on institutional commitment toward open access when controlling for other variables.
- College and university size (by number of students) has no effect on institutional commitment to open access, when controlling for other variables.

Variables

This section presents and defines specific variables and concepts necessary for addressing the above research questions and hypotheses.

Administrator Attention to Open Access (main independent variable)

This construct gauges the level of academic administrator actions concerning open access, as reported by library directors. Possible academic administrator actions include: public statements addressing a need for new strategies related to open access; use of the institution's strategic plan to address issues related to open access; commitment of funds to support open access initiatives; formation of groups to explore open access; implementation of policies encouraging or requiring faculty to make their published work accessible through open access methods. A Likert-type scale was used to record responses. Scores on relevant items were totaled using an additive index to obtain a measure representing administrator attention to open access for each responding institution.

Institutional Commitment to Open Access (dependent variable)

Institutional commitment to open access was also measured as reported by library directors. Actions taken by librarians and faculty researchers in support of an institution's commitment to open access include: use of the library's strategic plan to address open access; efforts by the library to raise awareness of open access; level of use of an online repository for research; number of staff working on open access issues, financial support for open access initiatives; formation of groups to explore open access; implementation of policies encouraging or requiring librarians and/or faculty researchers to make their published work accessible through open access methods; use of open access journals. A Likert-type scale was used to record

responses. Scores on relevant items were totaled using an additive index to obtain a measure representing institutional commitment to open access for each responding institution.

Decision Making Influence Across Organizations (main controlling variable)

As discussed in chapter two, an academic administrator's influence on others likely varies greatly across institutions due to unique institutional structures, circumstances, cultures, and personalities. Similarly, the interactions and influences of librarians, researchers, and publishers will also presumably vary within and across organizations. In an attempt to control for these differences a variable called decision making influence accounts for different levels of interest in open access and for variations in the political power exerted by each stakeholder group by institution. The decision making influence score for each of the stakeholder groups was computed for each responding institution. This value was arrived at by combining a group's perceived positive or negative interest in open access with the group's perceived power to bring about or resist change. In the current study, ratings of interest and power are reported based on the perceptions of responding library directors. Appendix A explains the method used to calculate this variable, which exists in spreadsheet form. Data input to the spreadsheet includes several important items. First, there is a rating of perceived power of each stakeholder group to influence open access initiatives. Second is a rating of each stakeholder's interest in open access. It is important to note that this interest may be strong or weak. It may also be either positive (in favor of open access) or negative (against open access). The interest and power indicated was then adjusted to account for local interactions among groups. For example, in some institutions, an academic administrator may have a great deal of influence over faculty and librarians, while in other settings faculty may represent the most influential group. See Appendix A for further details.

Demographics (additional controlling variables)

A number of individual respondent and institutional demographic characteristics also control for differences across institutions. Demographic data collected for respondents includes job title, gender, and years of library experience. Institutional demographic data includes geographic region, operational status (public vs. private), and institution size by number of students.

Survey Population

This study distributed a standardized data collection instrument, or survey, to library directors to gather the necessary data for addressing the research questions and hypotheses stated above. Data obtained from the 2009 Directory Information file provided by the Integrated Postsecondary Education Data System (IPEDS) of the National Center for Education Statistics (NCES) represented the survey frame population. This data file listed 7,316 institutions. During the process of sample selection this list was filtered to include public and private not for profit institutions (four year and above), with more than 1,000 students, while excluding associates degree institutions, theological seminaries, military academies, and other special focus institutions (see Table 10). This resulted in a list of 1,182 institutions. Five were removed because they were considered to be out of scope. These included two military institutes, two institutions where instruction is delivered primarily to non-traditional students through distance education and one special purpose institution. Twenty-five institutions located in Puerto Rico one in Guam, and one in the US Virgin Islands were removed. Finally, fifteen records were removed because they represented multiple campuses of the same institution or situations where one library served more than one institution. The final sample is 1,135. A response rate of 288 (25.37%) would be needed to obtain a 5% margin of error with a 95% confidence level and make generalizations from the survey data.

Table 10

Survey Population

Total institutions identified from NCES, IPEDS Institutional Characteristics data - 2009	**7,316**
Data was filtered using the following variables and selecting the values indicated: Sector: (1, 2) Active: (A) Carnegie (15-16, 21-22, 31-33) CCBASIC 2005 (15-23) CCSIZSET 2005 (9-17) See data dictionary file for more details http://nces.ed.gov/ipeds/datacenter/data/HD2009_Dict.zip	**1,182**
Removed	
5 entries considered to be out of scope: Virginia Military Institute Thomas Edison State College Citadel Fashion Institute of Technology Excelsior College	**1,177**
25 entries from Puerto Rico 1 entry from Guam & 1 from US Virgin Islands	**1,150**
15 duplicates / joint libraries College of Notre Dame of Maryland Long Island University - CW Post Campus Metropolitan State College of Denver Morehouse College New York Institute of Technology Penn State University - Erie Penn State University - Harrisburg Pomona College Rutgers University - Camden Rutgers University - Newark Saint John's University Spelman College University of Pittsburgh – Johnstown University of Pittsburgh – Greensburg University of Pittsburgh – Bradford	**1,135**
Final Survey Population	**1,135**
Responses needed for 5% mar. of error; 95% confidence (www.raosoft.com/samplesize.html)	**288**

Survey Instrument

The survey instrument (Appendix B) was designed to collect data from library directors. The instrument adapted several survey items from two previous studies. First, the Association of Research Libraries (ARL) commissioned a survey to assess scholarly communication education initiatives (Newman, Blecic, & Armstrong, 2007). Questions here asked about very specific activities related to educating various audiences about issues such as open access and who was responsible for these efforts. Librarians at Marquette University conducted a second study, which incorporated some elements of this 2007 ARL survey (Deltoro, Mandernack, & Zanoni, 2011). Where the ARL survey studied actions in large research universities, the Marquette survey focused on the actions of librarians at small and medium sized institutions with less than 15,000 students. Table 11 presents the original survey questions and the variations to be used in the current study. Cronbach's alpha and factor analysis were used in chapter four to establish the reliability of survey items during data analysis.

The current survey adds to these previous efforts by considering open access issues and initiatives at libraries of all sizes while focusing on the perceived influences of multiple groups, researchers, academic administrators, librarians, and publishers. Important additional questions asked about interest in open access for each stakeholder group (positive or negative), how much influence each stakeholder group exerts on the other three (based on perceptions at each responding institution), administrator actions related to open access, and librarian and faculty actions related to open access.

Table 11

Adapted Survey Questions

ARL Survey (Newman, Blecic, & Armstrong, 2007)	**Current Survey**
Has your library initiated any education activities on scholarly communication (SC) issues for the library's users or staff since July 2004 **Yes** **No, planning is underway** **No, our institution has not undertaken such initiatives** **No, this is the responsibility of another unit in the institution** Please tell us about SC education activities your library has undertaken since 2004 or plans to undertake in 2007 that are intended for **faculty** **non-researchers** **institution administrators** **graduate students** **undergraduate students** **librarians and other library staff**	Has your library developed any initiatives to raise awareness of open access issues where the **primary audience** is: -Faculty -Academic Administrators -Librarians **No, our library has not** **No, but planning is underway** **Yes, but only once or twice** **Yes, this is done occasionally** **(1 time per semester or less)** **Yes, this is done frequently** **(more than 1 time per semester)**
If there is a scholarly communication group/committee/task force that reports to the library, please indicate the number of members of the group, the title of the chairperson, and to whom the group reports. Please provide any explanatory comments in the box below.	Is there a group/committee/task force within your library that regularly addresses issues related to open access of scholarly research? Has the administrator who oversees your library asked any group/committee/task force to explore issues related to open access of scholarly research? Is there a faculty group/committee/task force that regularly addresses issues related to open access of scholarly research? If Yes, How active is this group? How long has this group been exploring open access issues?

ARL Survey (Newman, Blecic, & Armstrong, 2007)	**Current Survey**
If your library has a **chief SC librarian** who has **primary responsibility** for these initiatives, please indicate the title of that position and the approximate percentage of the chief SC librarian's time that is devoted to SC education–related work. If your library has a position **other than a chief SC librarian** that has **primary responsibility** for these initiatives, please indicate the title of the other library staff member's position and the approximate percentage of that person's time that is devoted to SC education–related work.	How many employees in your library spend at least 50% of their time on tasks related to open access initiatives for scientific or scholarly literature?
Marquette Survey (Deltoro, Mandernack, & Zanoni, 2011)	**Current Survey**
Are issues related to scholarly communication addressed in your parent institution's strategic plan and/or mission statement? Are issues related to scholarly communication addressed in your library's strategic plan and/or mission statement?	To What Extent: does your institution's (not the library's) strategic plan address issues related to open access or scholarly publishing? does your library's strategic plan address issues related to open access or scholarly publishing?
Does your library have an operational institutional repository (IR)?	Does your library maintain an online database (or repository) that makes faculty research openly accessible? How often is this database/repository used by the campus community? How long has this online database/repository been operational?

ARL Survey (Newman, Blecic, & Armstrong, 2007)	**Current Survey**
Has your institution adopted an open access mandate for faculty members' and/or students' scholarship and research publications?	Has your **library** implemented any formal policies encouraging or requiring librarians to make their published work more accessible through open access methods? Has an **administrator** who oversees your library implemented any policies encouraging or requiring faculty to make their published work more accessible through open access methods? Have any **faculty** groups implemented policies encouraging or requiring faculty to make their published work more accessible through open access methods? Compliance with this policy is: -Suggested -Encouraged -Required

Data Collection

Data needed to address the primary independent variable, the dependent variable, and the controlling variable was obtained using the survey instrument. Demographic information for additional control variables was collected through several methods. First, the survey instrument obtained data about respondent job title, job title of the respondent's supervisor, gender, and years of library experience of respondent. Survey responses also identified whether or not librarians from each responding institution have faculty status and whether or not there is a tenure system for librarians. Institutional demographic data including geographic region, operational status (public vs. private), number of students, highest degree offered, and presence of a tenure system for faculty, was also obtained from the National Center for Education

Statistics (NCES) using the Integrated Postsecondary Education Data System (IPEDS) 2009 Directory Information file.

The IPEDS data included information on institutions of higher education in the United States. This data was in spreadsheet format. A unique id identified each institution. The data was filtered to include only the entries noted in the survey population above. In early 2012 email addresses for library directors at these institutions were located by searching relevant web pages of colleges and university libraries and using the American Library Directory (R.R. Bowker, 2011). This information was added to the data file. The spreadsheet including known data for each institution was uploaded to the survey software system designed and supported by the Qualtrics Labs Inc. based in Provo, Utah. Survey responses were merged into one file with the existing data.

The survey was distributed electronically using the survey software Qualtrics. To encourage survey responses a pre-notification email was distributed several days prior to sending the survey request. This pre-notification explained the purpose of the survey, who is conducting it, how it was designed, how participants were selected, and what they would be asked to do. Reassurances of data confidentiality were noted. Up to two follow up emails were sent to non-respondents in an attempt to boost the response rate. After completing the survey all respondents received a follow up email with a note of thanks and details about how the results of the study will be shared. Shortly after data analysis is completed in the second half of 2012 the results and conclusions of this study will be posted online and respondents will be notified be email. Respondents will also receive a brief summary highlighting the most significant findings. Appendix C includes the text of these notices sent to potential respondents.

Table 12

Survey Fielding Timeline

Day 1	June 8	Pre-Notification Email
Day 6	June 13	Survey Request # 1
Day 12	June 19	Survey Request # 2 to remaining non-respondents
Day 20	June 27	Survey Request # 3 to remaining non-respondents
Day 30	July 7	Close Survey

To reduce concerns about privacy participants were assured that confidentiality was to be maintained as required by Institutional Review Board (IRB) procedures. Identifying information was used only to follow up with non-responders and to pair the responses with known data from the same institutions. No identifying information was included in the data analysis or in reports of the results.

Data Analysis

After gathering survey responses data was exported from the Qualtrics survey system and manipulated for use in the statistical software package Stata version 12.1. Each respondent was represented in the data file by one record. This record included data obtained from the National Center for Educational Statistics as well as data provided in response to survey questions. A survey map shows the relationship of survey items to the research variables under consideration (Appendix D). Table 13 below identifies the primary independent and dependent variables, controlling, and intervening variables. Notations in parentheses refer to the variables displayed on the survey map in Appendix D.

Table 13

Research Variables

- Primary Dependent Variable

  Institutional Commitment to Open Access (C5, C6, C7, C8)
  (as measured by specific faculty and librarian actions reported by survey respondents)

- Primary Independent Variable

  Academic Administrator Attention to Open Access (B3, B4)
  (as measured by library director perceptions of administrator actions and attitudes)

- Controlling Variables

  - Decision Making Influence (A1, A2)
    (as measured by library director perceptions of interest, power, and political alignment of stakeholders and calculated with spreadsheet presented in Appendix A)

  - Respondent Characteristics (D9)
    - Respondent job title
    - Gender of respondent
    - Years of experience

- Intervening Variables

  - Institutional Characteristics (D10)
    - Institution size (total students)
    - Sector (public vs. private)
    - Geographic Region

Multiple regression is used in chapter four to evaluate the dependent variable in terms of the exogenous variables. The general model is listed below and variations of this formula were used to determine the relationship of academic administrator attention to open access to an institution's commitment to open access while controlling for differences across organizations.

- **Institutional Commitment to OA =** Academic Admin Attention to OA + Decision Making Influence of Administrators + Decision Making Influence of Librarians + Decision Making Influence of Faculty + Decision Making Influence of Publishers + Respondent Characteristics + Institutional Characteristics

CHAPTER 4

RESULTS

This chapter analyzes data obtained by a survey of library directors during the summer of 2012. Qualtrics survey management software distributed the pre-notification message by email on June 8, 2012 followed by the survey instrument and follow up messages (Appendices B and C). Potential respondents received the survey link on June 13, 2012 with follow up reminder messages sent on June 19 and June 27, 2012. The survey closed on July 7, 2012. Version 12.1 of the statistical software package Stata was used to analyze the collected data.

Missing Data

Although 298 respondents completed the survey, several individuals did not answer every question, resulting in missing values in the data set. All researchers must carefully consider missing data and choose from various options for handing missing data. For a thorough discussion of these techniques see Graham (2012). Some of the more common approaches include mean substitution or complete cases analysis, also known as listwise deletion. Mean substitution replaces missing values with the mean for that particular variable and is generally not recommended (Graham, 2012). Complete cases analysis uses only the cases where complete data is available, and removes cases with missing data from the statistical analysis. This is an acceptable method especially when the number of cases with missing data is small. Complete cases analysis is used in this study where there is missing data. Thirteen respondents did not provide responses to all survey items.

Survey Demographics

Overall 1,135 librarians were contacted, 368 surveys were partially completed, and 298 were fully completed for a response rate of 26.26%. Table 14 shows individual respondent characteristics. For job title one respondent provided no response and for gender there were two non-responses. For years of library experience, the majority of respondents possessed between 21 and 40 years. Table 15 shows characteristics of represented institutions and includes information on geographic region, sector (public vs. private) and institution size.

Table 14

Respondent Characteristics

	Frequency	Percent
Job Title		
Library director / Head librarian	169	56.71
Dean of library	79	26.51
College / University librarian	24	8.05
Department head / Librarian	11	3.69
Asst. or assoc. dean / Director	9	3.02
Assoc. provost / VP	5	1.68
No response	1	0.03
Gender		
Female	171	57.38
Male	125	41.95
No response	2	0.67
Years of Library Experience		
5 years or less	13	4.36
6-10 years	16	5.37
11-15 years	20	6.71
16-20 years	37	12.42
21-25 years	50	16.78
26-30 years	48	16.12
31-35	58	19.46
36-40 years	49	16.44
More than 40 years	7	2.35

Table 15

Institutional Characteristics

	Frequency	Percent	Percent in Population
Geographic region			
North East	111	37.25	34.71
South East	70	23.49	23.00
Central	83	27.85	29.43
South West	25	8.39	8.90
North West	9	3.02	3.96
Public vs. private (sector)			
Private not-for-profit, 4-years+	150	50.34	57.36
Public, 4-years+	148	49.66	42.64
Number of students			
1,000 – 4,999	131	43.96	52.33
5,000 – 9,999	60	20.13	20.44
10,000 – 19,999	52	17.45	15.07
20,000 and above	55	18.46	12.16

Note. North East (CT, ME, MA, NH, RI, VT, DE, DC, MD, NJ, NY, PA, OH, WV)
South East (AL, AR, FL, GA, KY, LA, MS, NC, SC , TN, VA)
Central (IL, IN, MI, WI, IA, KS, MN, MO, NE, ND, SD, TX, OK)
North West (WA, OR, AK, ID, MT, WY)
South West (AZ, NM, NV, HI, CA, CO, UT)

Factor Analysis

This section aims to clearly identify the variables used throughout the data analysis. The main dependent and independent variables are constructed by using an additive index to combine multiple survey items to measure concepts such as administrator attention to open access, librarian commitment to open access, and faculty commitment to open access. Alpha coefficients are used throughout as a measure of scale reliability. According to DeVellis (1991) alpha coefficients of .70 to .80 are acceptable while those above .80 are considered very good (p. 85).

Administrator Attention to Open Access

Eight survey items were combined using an additive index to arrive at the main independent variable administrator attention to open access (Table 16). The scree plot (Figure 2) shows that these eight individual items clearly represent the one dimension, administrator attention to open access, with the first factor explaining 90.38% of the variability of the eight individual survey items (Eigenvalue = 3.54121). Additionally, the alpha reliability coefficient is .8487.

Table 16

Items Combined to Arrive at Administrator Attention to Open Access

1. Extent to which the institution's strategic plan addresses issues related to open access
2. Extent to which the academic administrator overseeing the library has made public statements related to open access
3. Extent to which the academic administrator overseeing the library has committed funds to support open access initiatives
4. Activity level of committees/groups charged by an academic administrator to explore issues related to open access
5. Age of committees/groups charged by an academic administrator to explore issues related to open access
6. Likelihood of future policies (implemented by academic administrators) encouraging or requiring faculty to make their published work more accessible through open access methods
7. Extent to which academic administrators value publications in open access formats
8. Extent to which academic administrators are willing to invest in alternative scholarly publishing systems that may not always be successful.

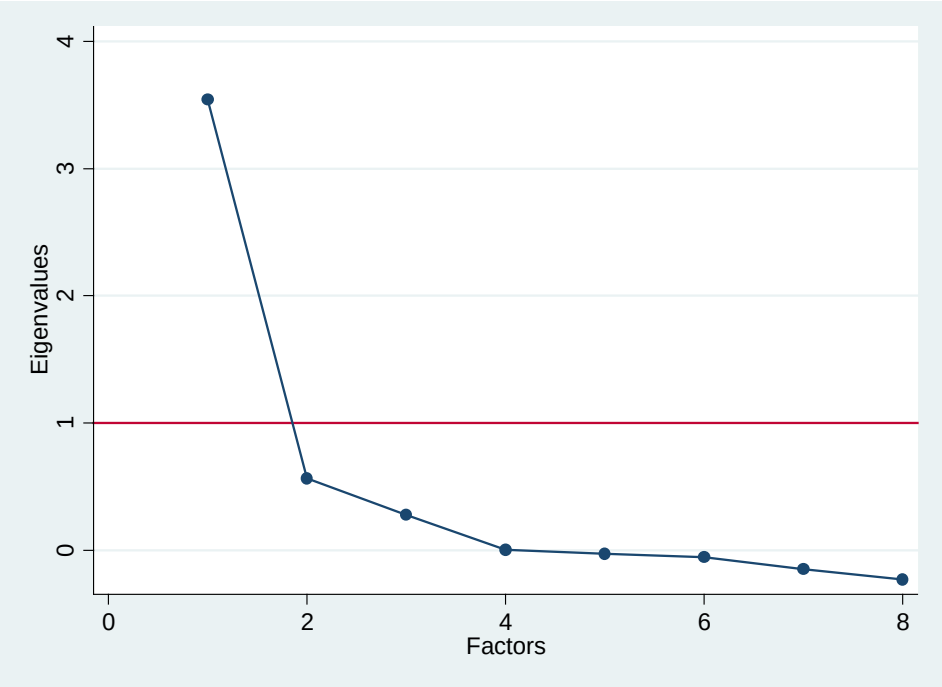

Figure 2. Eigen values after factor analysis for administrator attention to open access.

Librarian Commitment to Open Access

Eighteen survey items were combined using an additive index to arrive at the dependent variable librarian commitment to open access (Table 17). The scree plot (Figure 3) shows that these 18 individual items clearly represent the one dimension, librarian commitment to open access, with the first factor explaining 70.70% of the variability of the 18 individual survey items (Eigenvalue = 7.2079). Additionally, the alpha reliability coefficient is .9143.

Table 17

Items Combined to Arrive at Librarian Commitment to Open Access

1. Extent to which the library provides direct support for open access journals maintained by the institution
2. Extent to which the library provides direct support for open access journals or repositories maintained by another institution
3. Extent to which the library provides direct support for faculty who wish to publish in open access journals requiring publication fees
4. Extent to which the library provides direct support for institutional memberships with open access publishers
5. Extent of library activities to raise awareness of open access – Faculty
6. Extent of library activities to raise awareness of open access – Academic Administrators
7. Extent of library activities to raise awareness of open access – Librarians
8. Level of use of an institutional repository
9. Age of institutional repository
10. Likelihood of future repository use
11. Number of employees with job responsibilities related to open access
12. Activity level of committees/groups within the library to explore issues related to open access
13. Age of committees/groups within the library to explore issues related to open access
14. Likelihood of future policies (implemented within the library) encouraging or requiring librarians to make their published work more accessible through open access methods
15. Extent to which the library's strategic plan address issues related to open access
16. Extent to which librarians have the same priorities as researchers
17. Extent to which librarians support open access in theory AND in practice
18. Extent to which librarians are willing to invest in alternative scholarly publishing systems that may not always be successful

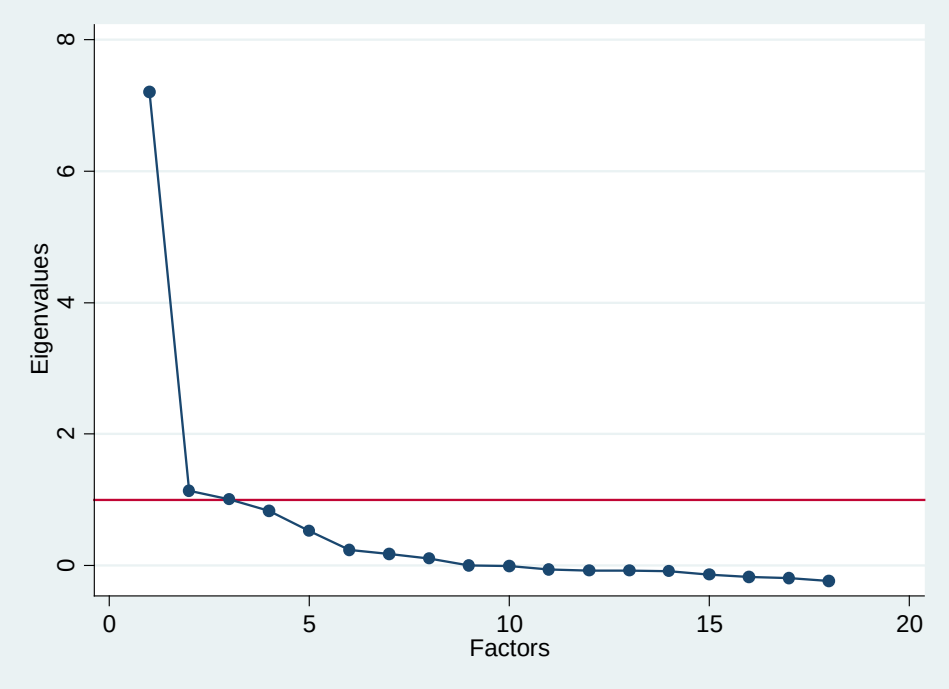

Figure 3. Eigen values after factor analysis for librarian commitment to open access.

Faculty Commitment to Open Access

Twelve survey items were combined using an additive index in an attempt to arrive at the dependent variable faculty commitment to open access (Table 18). The scree plot (Figure 4) suggests there may be two dimensions represented by these 12 individual items. Factor 1 (Eigenvalue = 4.1585) and Factor 2 (Eigenvalue = 1.1748) together represent 93.37% of the variability of the twelve individual survey items. Orthogonal varimax rotation helps make the factor loadings appear more clear (Table 19). These two identified factors are used in the data analysis as the following variables:

- Faculty Adherence to Open Access (Items 1-3, Alpha = .7706)
- Faculty Proclivity toward Open Access (Items 4-12, Alpha = .8314)

Adherence represents strong support or devotion to a cause, such as open access. This construct captures faculty interest and initiative based on demonstrated support through the

formation of special committees. Proclivity represents a tendency or inclination to do something, such as participate in open access scholarship. This construct captures specific faculty actions demonstrating support for open access.

Table 18

Items Combined to Arrive at Faculty Commitment to Open Access

1. Activity level of committees/groups initiated by faculty to explore issues related to open access
2. Age of committees/groups initiated by faculty to explore issues related to open access
3. Likelihood of future policies (initiated by faculty) encouraging or requiring faculty to make their published work more accessible through open access methods
4. Extent to which faculty use a local institutional repository
5. Extent to which faculty use other subject based digital repositories
6. Extent to which faculty negotiate with publishers for more favorable copyright terms
7. Extent to which faculty publish articles in open access journals
8. Extent to which faculty use/read articles in open access journals
9. Extent to which faculty express a strong awareness of open access options
10. Extent to which faculty express a perceived need for change
11. Extent to which faculty express a strong understanding of copyright agreements
12. Extent to which faculty express a strong comfort level with open access journals

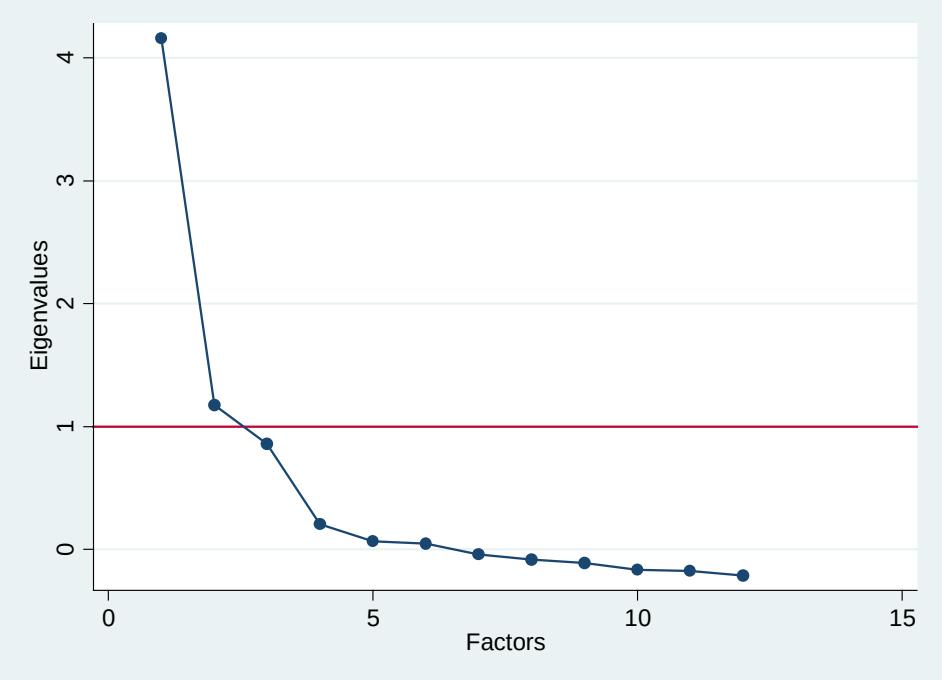

Figure 4. Eigen values after factor analysis for faculty commitment to open access.

Table 19

Factor Loadings and Unique Variances for Faculty Commitment to Open Access (with orthogonal varimax rotation), 2 Factors Retained

Variable/Survey Item	Factor 1	Factor 2	Uniqueness
Item 1	0.1344	**0.9115**	0.1511
Item 2	0.1228	**0.8951**	0.1837
Item 3	0.3051	**0.4391**	0.7141
Item 4	**0.5502**	0.1643	0.6703
Item 5	**0.6021**	0.2216	0.5884
Item 6	**0.5161**	0.1285	0.7171
Item 7	**0.6716**	0.1156	0.5356
Item 8	**0.5672**	0.1486	0.6562
Item 9	**0.6485**	0.3327	0.4687
Item 10	**0.5927**	0.2880	0.5657
Item 11	**0.4382**	0.2656	0.7374
Item 12	**0.5218**	0.2220	0.6785

However, with Eigenvalues for the first two factors of 4.1585 and 1.1748, and the first factor accounting for 72.80% of the explained variability, it could be argued that one overriding factor accounts for all faculty commitment to open access. This factor analysis for faculty commitment may not be as conclusive as librarian and administrator commitment to open access due to measurement error. Respondents are reporting on their perceptions and library directors may simply be more familiar with the work of librarians and academic administrators. Further, faculty researchers represent a far more diverse group. Because of this uncertainty the data for faculty commitment will be investigated in two ways. One approach will use two separate variables (faculty adherence and faculty proclivity). A second approach will use all 12 items as one combined variable. The alpha reliability coefficient for this one overriding factor called faculty commitment to open access, overall, is .8442.

Variable Transformations

In order to correct problems of curvilinearity and heteroskedasticity uncovered via regression criticism techniques after initial analyses the variable distributions were explored. The following transformations corrected the problems thereby producing regression models that reasonably met the underlying assumptions.

Administrator Attention to Open Access

The distributional shape of the variable administrator attention to open access was explored and transformed by raising all values to the power of -.3 to obtain a more normal data distribution to meet the assumptions of ordinary least squares (OLS) analysis (Figure 5). The means, medians, and standard deviations for the original and transformed variable can be seen in Table 20.

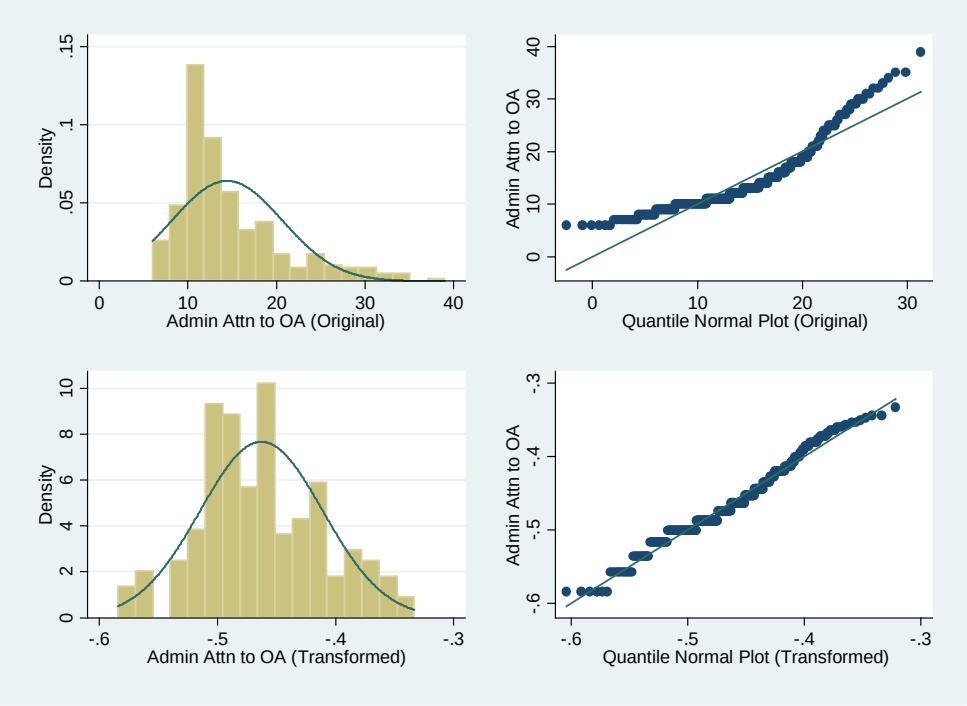

Figure 5. Power transformation of administrator attention to open access. All values raised to the power of -.3.

Librarian Commitment to Open Access

The variable librarian commitment to open access was transformed by raising all values to the power of .3 to obtain a more normal data distribution to meet the assumptions of ordinary least squares analysis (Figure 6). The means, medians, and standard deviations for the original and transformed variable can be seen in Table 20.

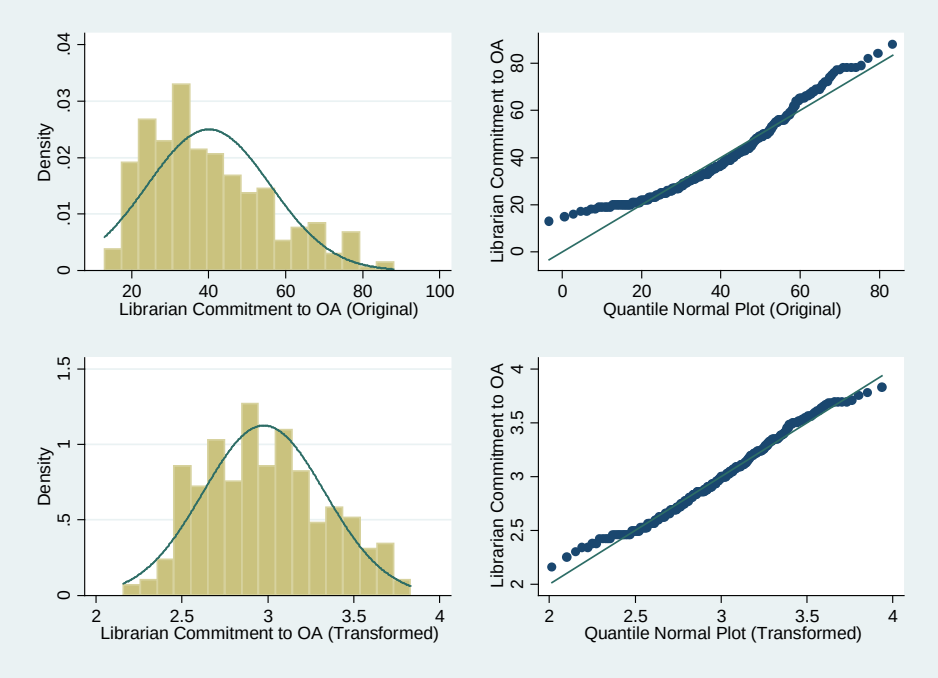

Figure 6. Power transformation of librarian commitment to open access. All values raised to the power of .3.

Faculty Commitment to Open Access

Faculty adherence to open access - Due to the positively skewed distribution of this variable it was not possible to improve the shape of the distribution through variable transformation. Rather, the data analysis used Poisson regression.

Faculty proclivity toward open access – No transformation was needed of this variable to obtain a normal distribution.

Faculty commitment to open access: overall - This variable was transformed using the natural log of each value to obtain a more normal data distribution to meet the assumptions of ordinary least squares analysis (Figure 7). The means, medians, and standard deviations for the original and transformed variable can be seen in Table 20.

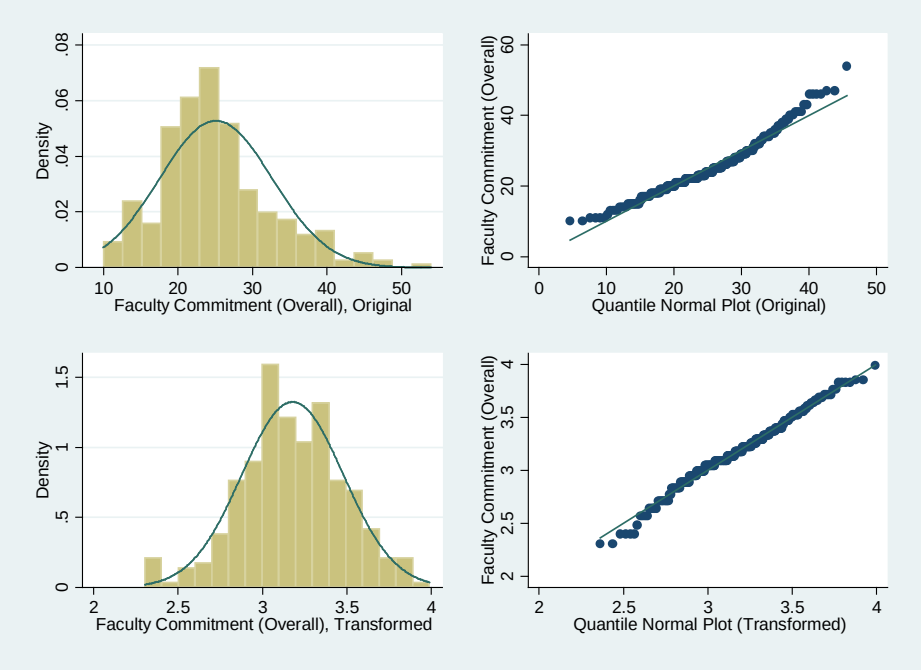

Figure 7. Power transformation of faculty commitment to open access. All values transformed using natural log (ln).

Table 20

Original and Transformed Variables

Variable	Mean	Median	Std. Dev.	Min	Max
Administrator attention to open access					
Original	14.419	13	6.226	6	39
Transformed	-.463	-.463	.052	-.584	-.333
Librarian commitment to open access					
Original	40.064	37	15.977	13	88
Transformed	2.977	2.954	.355	2.159	3.831
Faculty commitment to open access, overall					
Original	25.096	24	7.570	10	54
Transformed	3.178	3.178	.301	2.302	3.989

Note. Administrator attention to open access – raised to the power of -.3
Librarian commitment to open access – raised to the power of .3
Faculty commitment to open access, overall – transformed using the natural log (ln)

Regression

Administrator Attention to Open Access & Librarian Commitment to Open Access

A multiple ordinary least squares regression indicates that a positive significant relationship exists between administrator attention to open access and librarian commitment to open access when controlling for the calculated decision making influence of stakeholder groups (administrators, librarians, faculty and publishers), respondent years of library experience, respondent gender, institution size, geographic region, and sector (public vs. private). The adjusted R^2 (R_a^2) indicates that 61.60% of the variability in the dependent variable librarian commitment to open access can be explained by the included variables. Several tests were run to check for potential problems related to multicollinearity (variance inflation *mean vif*=1.38) and

heteroskedasticity (Breusch-Pagan/Cook-Weisberg test χ^2=1.59, $p > \chi^2$=.2079). Additionally, a leverage versus squared residuals plot and a residuals versus predicted values plot was used to check the data visually. Results show that these data are not impacted by multicollinearity, heteroskedasticity, or unusual leveraging relative to fit. According to this model both administrator attention to open access and decision making influence of librarians statistically predict librarian commitment to open access. Results are displayed in Table 21.

Table 21

Regression Table. Predictors of Librarian Commitment to Open Access

Variable	Coefficient	Standard Error	t	p
Administrator attention to OA	3.805	.3261	11.67	0.00
Decision influence – librarian	0.049	.0191	2.56	0.01
Constant	4.50	.1753	25.67	0.00

Note: Adj. R^2=.616, $F(15, 269)$=31.38, $p < .01$

Figure 8 shows the relationship between the transformed variables of librarian commitment to open access and administrator attention to open access using a predictive margins plot. Figure 9 displays this relationship using original units computed by using the inverse variable transformations. This allows the graph to display the true curvilinear relationship. Librarian commitment to open access continues to increase as academic administrator attention rises. However, librarian commitment to open access rises most sharply at lower levels of administrator attention, then moderates but still rises as administrator attention continues to increase.

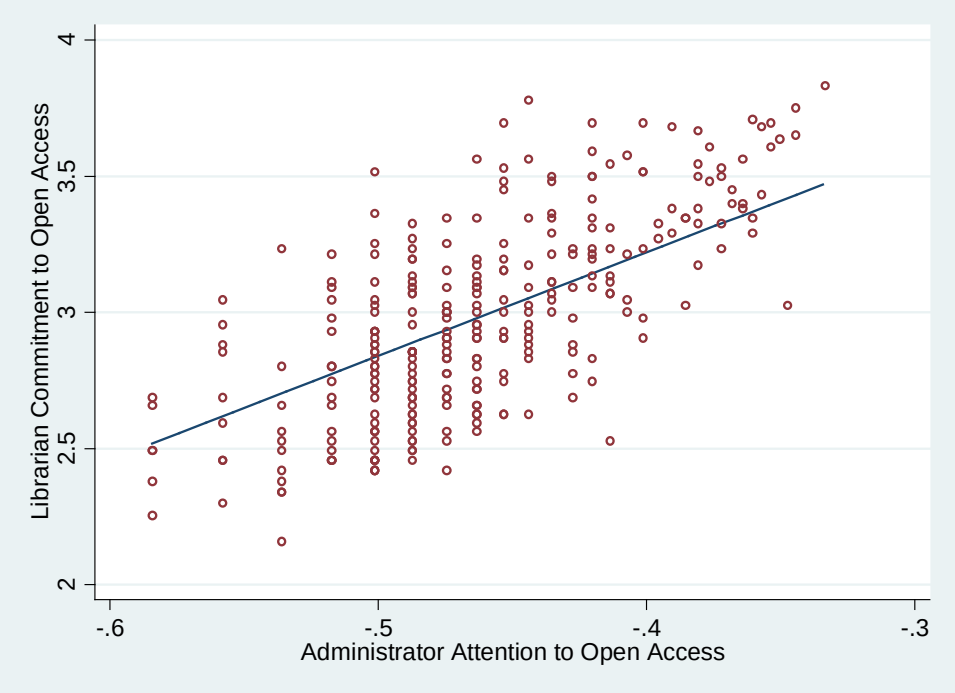

Figure 8. Predictive margins plot of administrator attention to open access and librarian commitment to open access (transformed values).

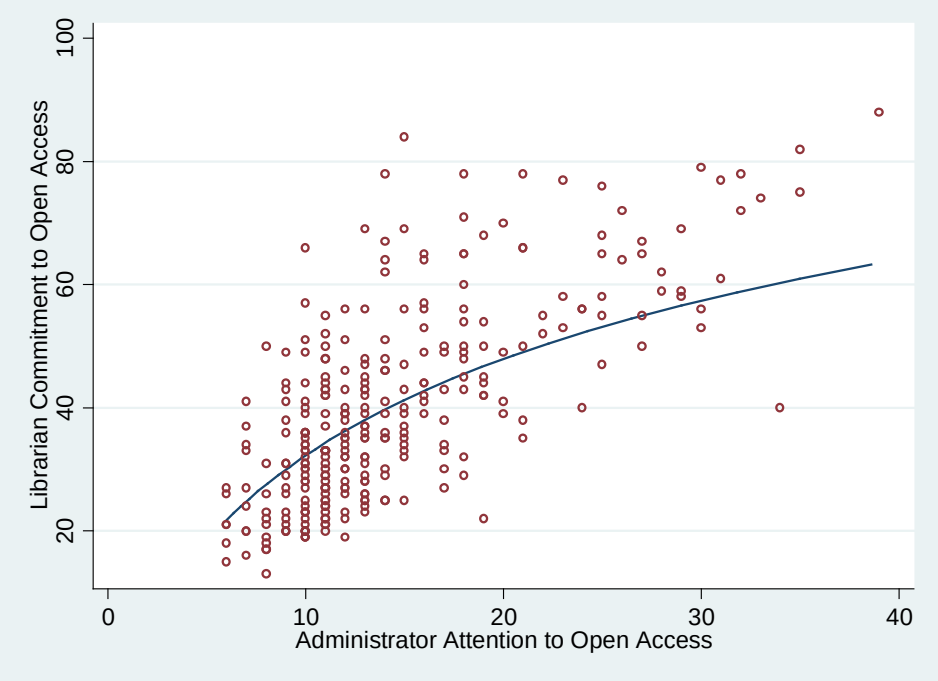

Figure 9. Predictive margins plot of administrator attention to open access and librarian commitment to open access (original values).

Figure 10 shows the relationship between the transformed variables of librarian commitment to open access and decision making influence of librarians using a predictive margins plot. Figure 11 displays this relationship using original units computed by using the inverse variable transformation. This allows the graph to display the true curvilinear relationship. As the decision making influence of librarians increases, librarian commitment to open access rises slowly but steadily.

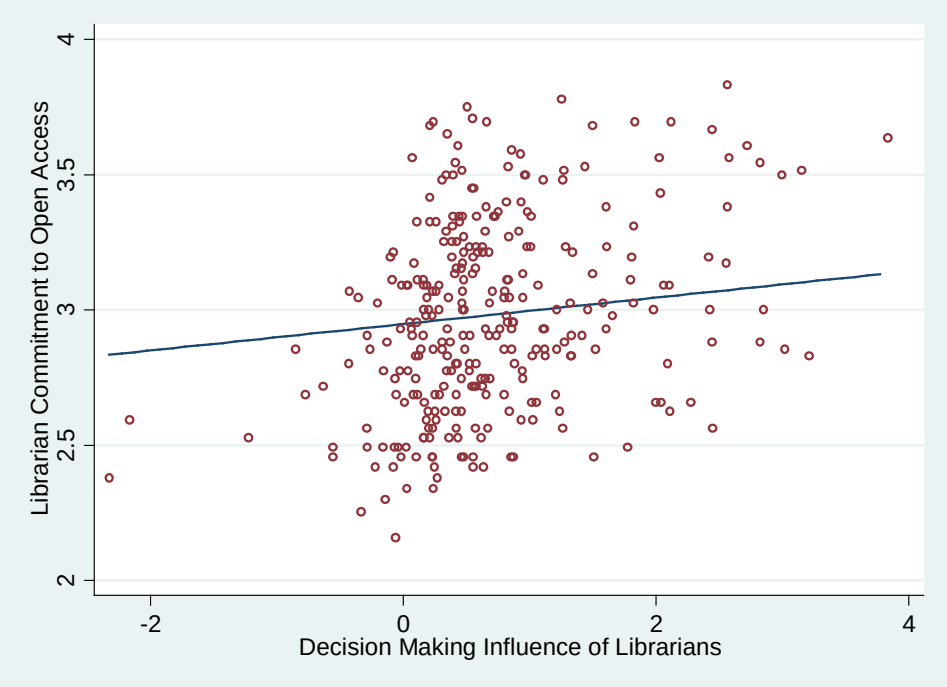

Figure 10. Predictive margins plot of decision making influence of librarians and librarian commitment to open access (transformed values).

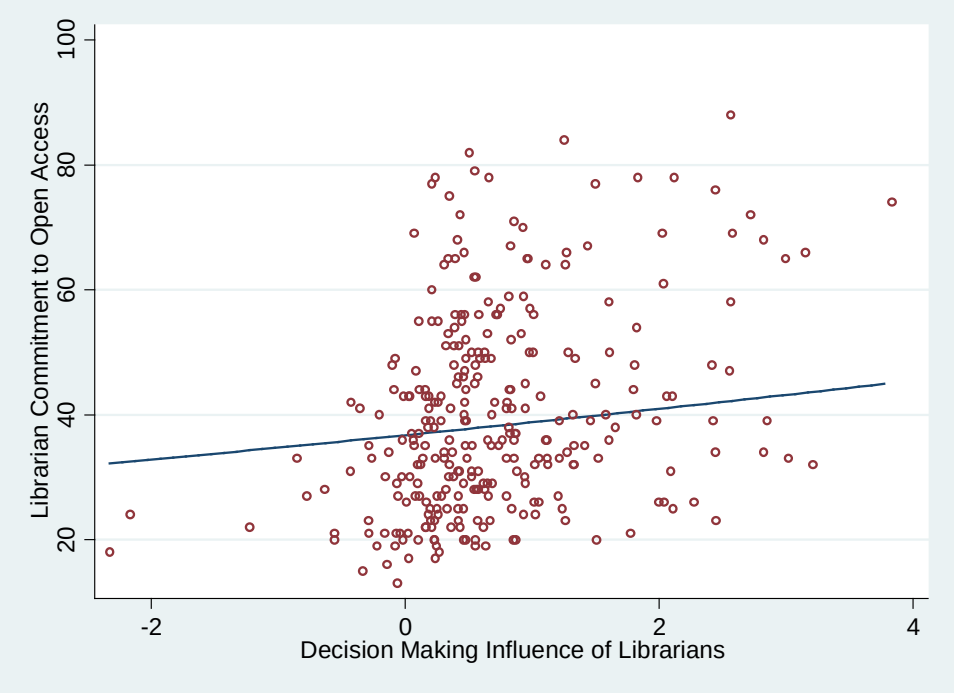

Figure 11. Predictive margins plot. Decision making influence of librarians and librarian commitment to open access (original values).

Institution size is also a statistically significant predictor of librarian commitment to open access. Because the joint effect is significant when examining contrasts of predictive margins using Fisher's protected Least Significant Difference (df =3; χ^2= 62.46; $p>\chi^2$= 0.000) this allows for direct comparisons between individual size categories. Table 22 shows that some differences exist between institutions of various sizes. The smallest category of institution ranks lower than all other categories of institution size when it comes to librarian commitment to open access. At the same time, the largest category of institution size ranks higher than all other categories of institution size. Only the middle two categories of institution size do not differ from other categories on degree of librarian commitment to open access. Table 23 and Figure 12 help illustrate this trend using predictive margins displayed in original, not transformed, units.

Table 22

Pairwise Comparisons of Predictive Margins

	Delta Method		Unadjusted	
Institution Size	Contrast	Std. Err.	z	P>z
1,000 - 4,999 vs 5,000 - 9,999	.0808	.0382	2.12	**0.034**
1,000 - 4,999 vs 10,000 - 19,999	.1422	.0424	3.36	**0.001**
1,000 - 4,999 vs 20,000 and above	.3469	.0445	7.79	**0.000**
5,000 - 9,999 vs 10,000 - 19,999	.0614	.0438	1.40	0.161
5,000 - 9,999 vs 20,000 and above	.2661	.0446	5.97	**0.000**
10,000 - 19,999 vs 20,000 and above	.2047	.0449	4.56	**0.000**

Note. Model VCE : OLS.

Table 23

Predictive Margins, Institution Size

	Delta Method		Unadjusted	
Institution Size	Margin	Std. Err.	z	P>z
1,000 - 4,999	34.797	.9116	38.18	0.000
5,000 - 9,999	38.111	1.264	30.16	0.000
10,000 – 19,999	40.775	1.459	27.96	0.000
20,000 and above	50.600	1.748	28.95	0.000

Note. Model VCE : OLS.

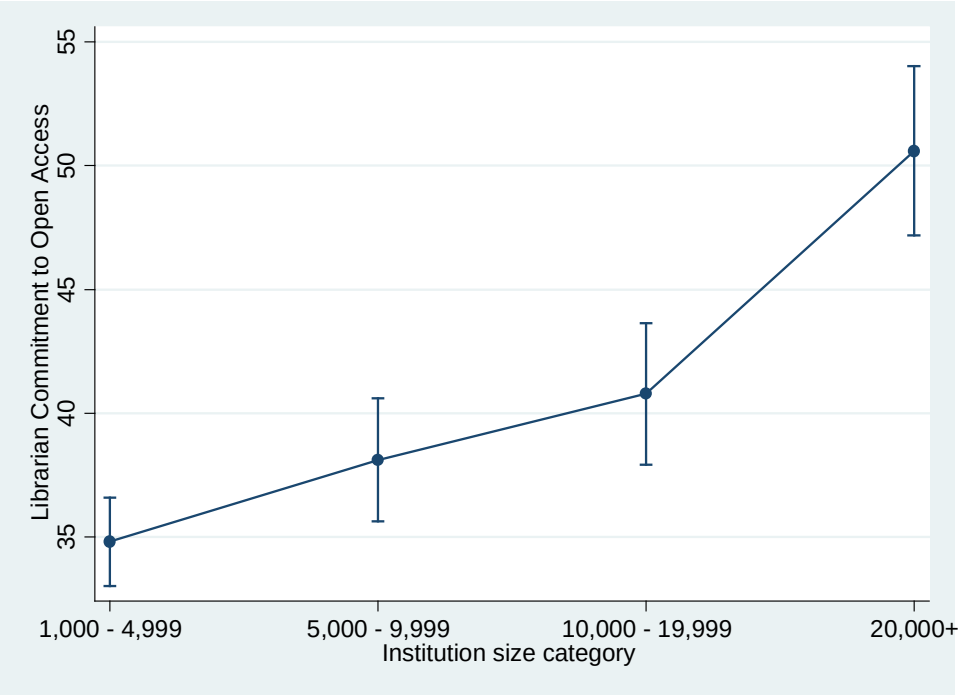

Figure 12. Predictive margins of institution Size category and librarian commitment to open access with 95% confidence intervals.

When considering geographic location as a predictor of librarian commitment to open access the data shows no significant relationship. The joint effect for contrasts of predictive margins using Fisher's protected Least Significant Difference (LSD) indicates no statistically significant relationship between geographic region and librarian commitment to open access (*df* =4; χ^2=7.28; $p>\chi^2$=0.1218).

Administrator Attention to Open Access & Faculty Commitment to Open Access

As noted earlier, the idea of faculty commitment to open access was investigated using three different approaches. One examined faculty proclivity toward open access, another examined faculty adherence to open access, and a third looked at overall faculty commitment to open access - a combination of faculty proclivity and adherence.

Faculty proclivity toward open access.

A multiple ordinary least squares regression indicates a positive significant relationship exists between administrator attention to open access and faculty proclivity toward open access when controlling for the calculated decision making influence of stakeholder groups (administrators, librarians, faculty and publishers), respondent years of library experience, respondent gender, institution size, region, and sector (public vs. private). The adjusted R^2 (R_a^2) indicated that 41.79% of the variance in the dependent variable faculty proclivity toward open access can be explained by the other included variables. Several tests were run to check for potential problems related to multicollinearity (variance inflation *mean vif* = 1.38) and heteroskedasticity (Breusch-Pagan/Cook-Weisberg test χ^2=0.68, $p> \chi^2$=.4104). These tests do not suggest multicollinearity or heteroskedasticity. However, a residuals versus fitted values plot was used to visually check the data and does provide some evidence suggesting the existence of heteroskedasticity (Figure 13). Further, a leverage versus squared residuals plot identifies an outlier in the data (Figure 14).

The option vce(robust) is added to the regression model in Stata 12.1 to apply the Huber-White-sandwich estimator which is a technique to help to address heteroskedasticity (Baum, 2006; Hamilton, 2009). Robust regression was also tested to determine if it was a better model for the data. The only difference in significance observed was in region four which was not statistically significant in the robust regression. This difference was attributed to the single statistical outlier. The effects of this outlier are minimized through use of the preferred vce(robust) option which provides unbiased estimates.

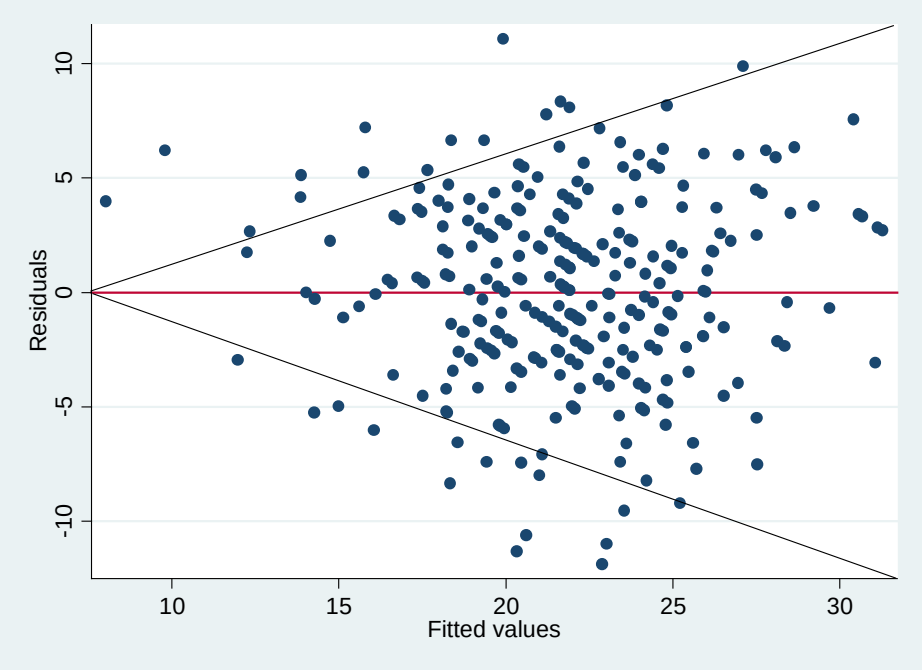

Figure 13. Residuals versus predicted values plot.

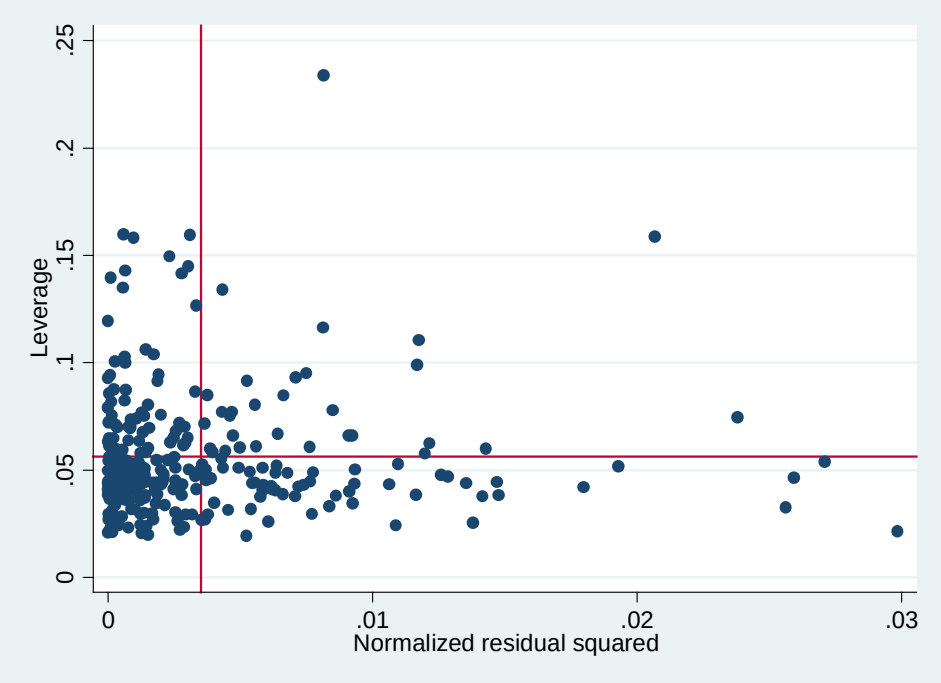

Figure 14. Leverage versus squared residuals plot.

According to the regression model using the vce(robust) option, administrator attention to open access, decision making influence - librarian, and decision making influence - faculty statistically predict faculty proclivity toward open access. Results are displayed in Table 24.

Table 24

Regression Table (robust, vce). Predictors of Faculty Proclivity toward Open Access

Variable	Coefficient	Standard Error	t	p
Administrator attention to OA	37.359	6.001	6.22	0.000
Decision influence – librarian	1.342	.41	3.27	0.001
Decision influence – faculty	1.601	.465	3.45	0.001
Constant	34.447	3.259	10.57	0.000

Note: R^2 = .449, Adj. R2 = .4179, F(15, 269) = 15.15, p < .01.

Figure 15 shows the relationship between the transformed values of administrator attention to open access and faculty proclivity toward open access using a predictive margins plot. Figure 16 displays this relationship using original units computed by using the inverse variable transformations. This allows the graph to display the true curvilinear relationship. Administrator attention to open access is an important element of faculty proclivity toward open access, especially at lower levels of administrator support. As administrator support increases the effect on faculty proclivity diminishes somewhat. Figure 17 shows the relationship between decision making influence of librarians and faculty proclivity toward open access using a predictive margins plot, while Figure 18 shows the relationship between decision making influence of faculty and faculty proclivity toward open access. Both of these independent variables contribute to a greater increase in faculty proclivity, however decision making influence of faculty has a slightly greater impact on this dependent variable.

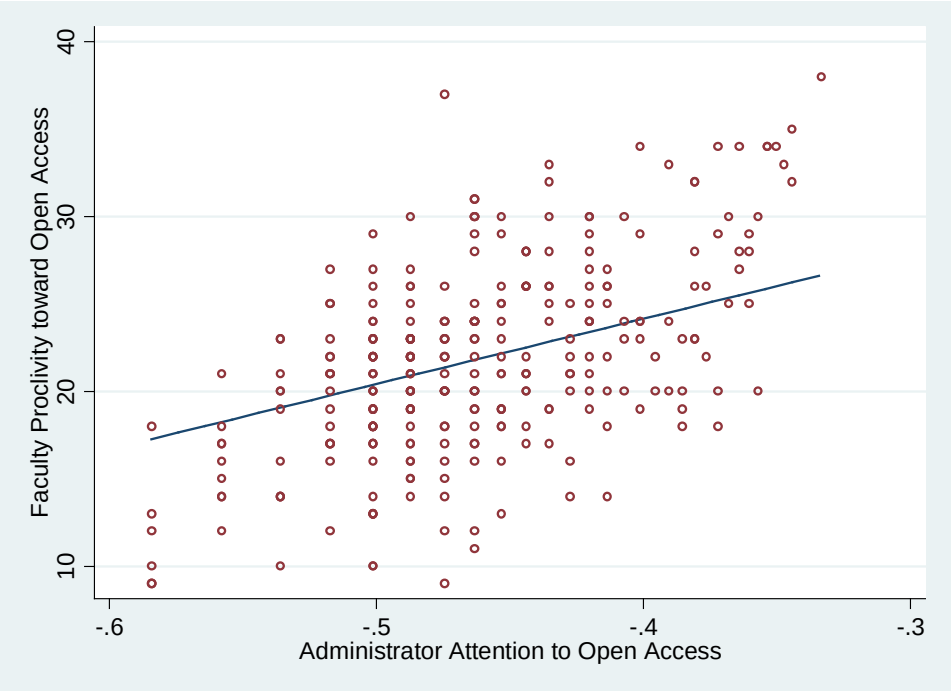

Figure 15. Predictive margins plot of administrator attention to open access and faculty proclivity toward open access (transformed values).

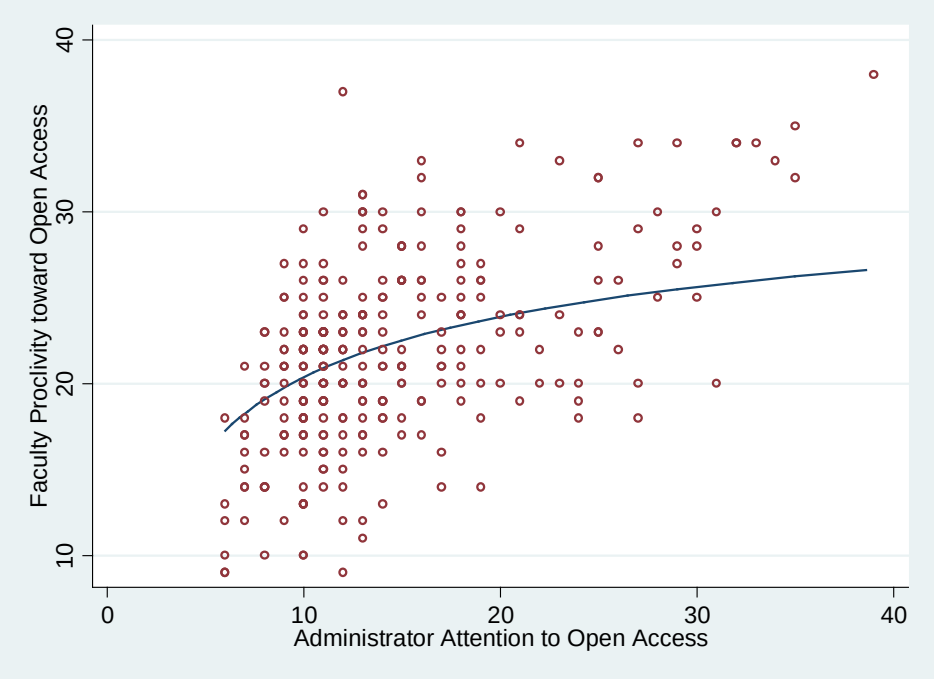

Figure 16. Predictive margins plot of administrator attention to open access and faculty proclivity toward open access (original values).

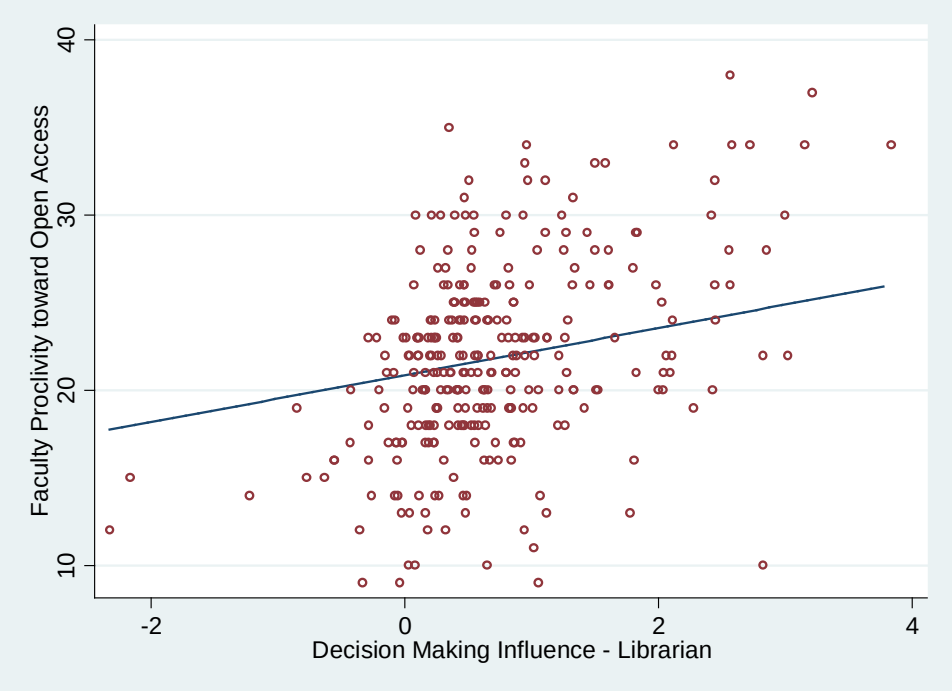

Figure 17. Predictive margins plot of decision making influence - librarian and faculty proclivity toward open access.

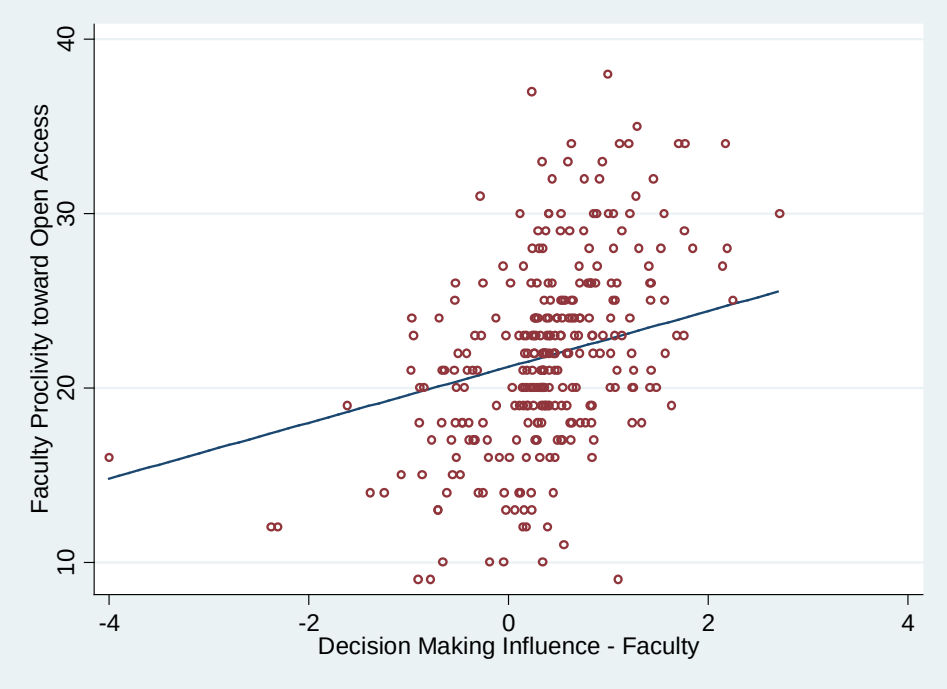

Figure 18. Predictive margins plot of decision making influence - faculty and faculty proclivity toward open access.

Initial regression results suggested that geographic region could possibly be a predictor of faculty proclivity toward open access. However, further analysis of the joint effect for contrasts of predictive margins using Fisher's protected Least Significant Difference (LSD) made it clear that no statistically significant relationship exists between these two variables (df=4, χ^2=8.81; p> χ^2=.0660).

Faculty adherence to open access.

When using faculty adherence to open access as a dependent variable, Poisson regression analysis was used due to the positive skew. An alternative, perhaps more conservative, approach would have been to use negative binomial regression, however in this case results produced are very similar to the Poisson analysis. Therefore, Poisson regression was chosen as the preferred method for data analysis in this section because the vce(robust) option in Stata 12.1 allows the use of robust standard errors to obtain consistent estimates of the coefficients, even in cases with mild violation of the distribution assumption that the variance equals the mean. (Cameron & Trivedi, 2005; Woolridge, 2002).

Results show a positive significant relationship between administrator attention to open access and faculty adherence toward open access when controlling for the calculated decision making influence of stakeholder groups (administrators, librarians, faculty and publishers), respondent years of library experience, respondent gender, institution size, region, and sector, sector (public vs. private). According to this model, administrator attention to open access and decision making influence – faculty statistically predict faculty adherence to open access. Results are displayed in Table 25.

Table 25

Poisson Regression Table. Predictors of Faculty Adherence to Open Access

Variable	Coefficient	Standard Error	t	p
Administrator attention to OA	6.052	1.149	5.27	0.00
Decision influence – faculty	0.365	0.085	4.31	0.00
Constant	3.263	0.653	5.00	0.00

Note: Pseudo R^2, Wald $chi^2(15) = 238.74$, $p < .01$.

Figure 19 shows the relationship between faculty adherence to open access and administrator attention to open access using transformed values on a predictive margins plot. Figure 20 displays this relationship using original units computed by taking the inverse transformation of the independent variable, administrator attention to open access. Here faculty adherence to open access increases steadily as administrator attention increases before leveling off a bit. Also, as decision influence of the faculty increases above zero a greater adherence toward open access among the faculty is observed (Figure 21).Readers should note that the y-axis for Figures 19-21 result from a Poisson regression and represent levels of faculty adherence to open access in probabilities.

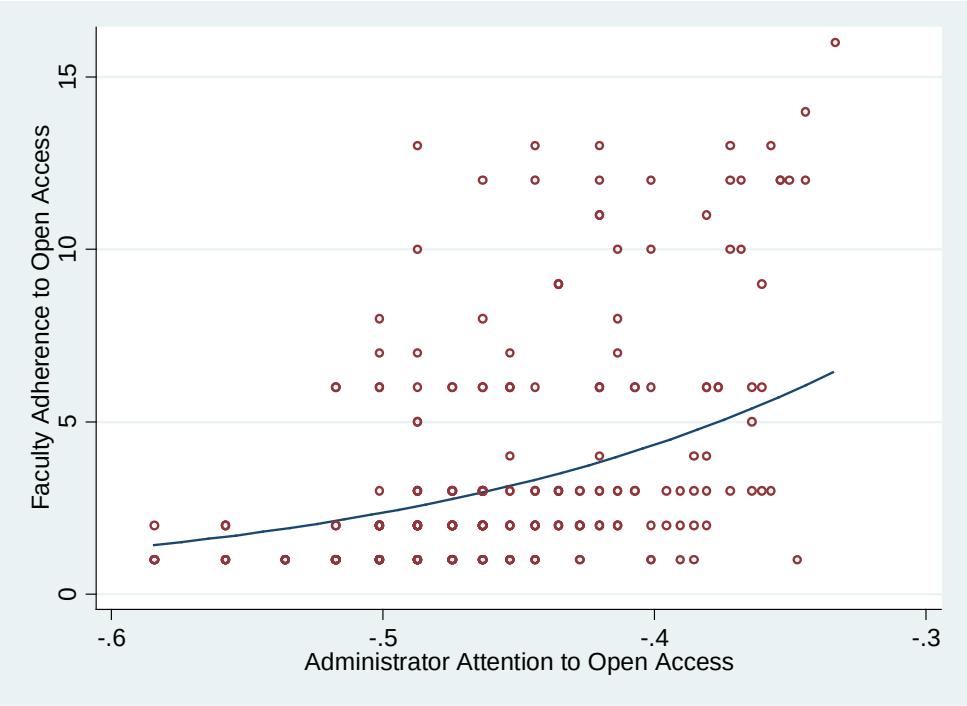

Figure 19. Predictive margins plot of administrator attention to open access and faculty adherence to open access (transformed values).

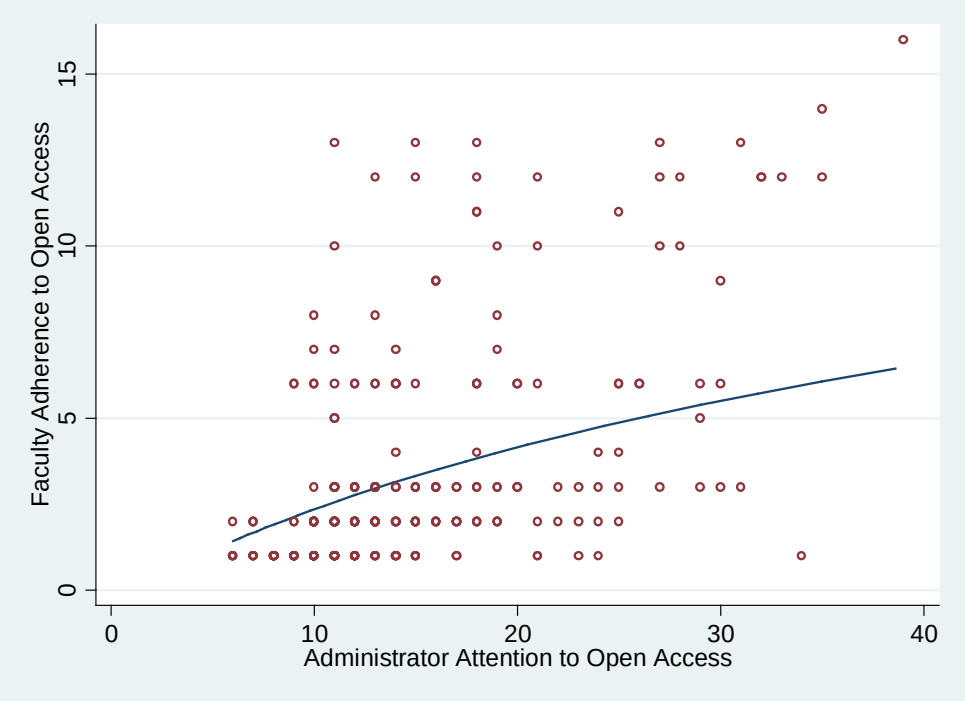

Figure 20. Predictive margins plot of administrator attention to open access and faculty adherence to open access (original values).

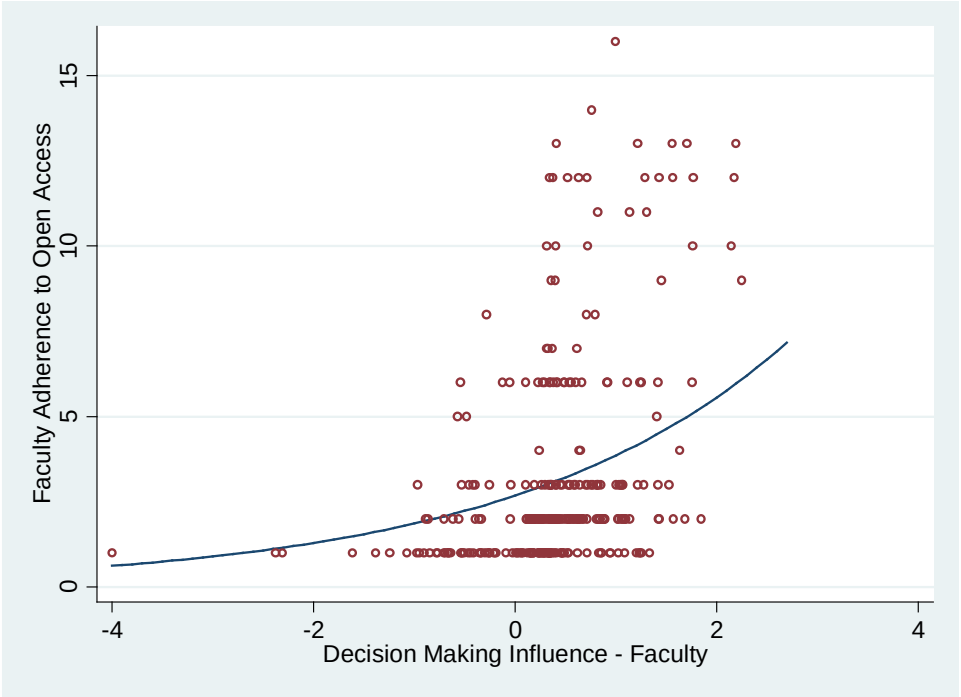

Figure 21. Predictive margins plot of decision making influence – faculty and faculty adherence to open access.

The Poisson regression suggests there may be a statistically significant relationship between institution size and faculty adherence to open access. But it is not possible to compare faculty adherence to individual categories of institution size based solely on this result. Further analysis of the joint effect for contrasts of predictive margins using Fisher's protected Least Significant Difference (LSD) made it clear that a statistically significant relationship exists between these two variables (df=3, χ^2=12.04; $p> \chi^2$=.0072). Because the joint effect is significant faculty adherence can be compared to institutional size categories. Upon this closer inspection the largest institutions are significantly different from other size institutions when it comes to predicting faculty adherence such that larger institutions have a higher likelihood of faculty adherence to open access than medium sized or smaller sized institutions (Table 26, 27, and Figure 22).

Table 26

Pairwise Comparisons of Predictive Margins

	Delta Method		Unadjusted	
Institution Size	Contrast	Std. Err.	z	P>z
1,000 – 4,999 vs 5,000 – 9,999	0.6053	.4687	1.29	0.197
1,000 – 4,999 vs 10,000 – 19,999	0.4842	.4548	1.06	0.287
1,000 – 4,999 vs 20,000 and above	1.891	.5464	3.46	**0.001**
5,000 – 9,999 vs 10,000 – 19,999	-0.1212	.5249	-0.23	0.817
5,000 – 9,999 vs 20,000 and above	1.285	.5467	2.35	**0.019**
10,000 – 19,999 vs 20,000 and above	1.407	.5698	2.47	**0.014**

Note. Model VCE : Robust.

Table 27

Predictive Margins, Institution Size

	Delta Method		Unadjusted	
Institution Size	Margin	Std. Err.	z	P>z
1,000 – 4,999	2.734	.2144	12.75	0.000
5,000 – 9,999	3.339	.3893	8.58	0.000
10,000 – 19,999	3.218	.3761	8.56	0.000
20,000 and above	4.625	.4324	10.70	0.000

Note. Model VCE : Robust.

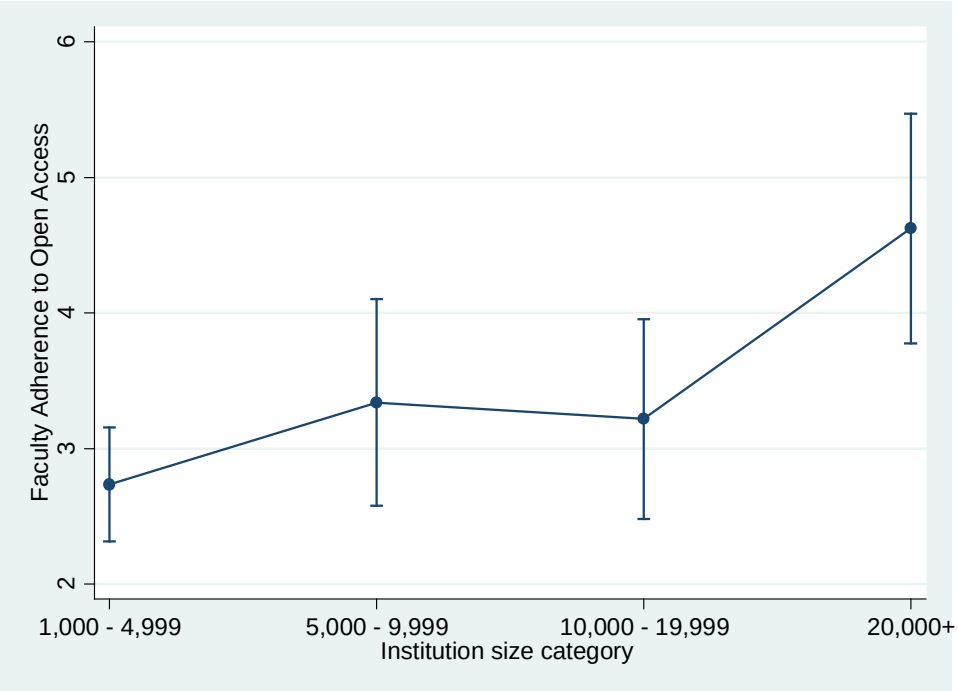

Figure 22. Predictive margins of institution size and faculty adherence to open access with 95% confidence intervals.

Faculty commitment to open access, overall.

Here, faculty commitment to open access is considered as one construct, rather than separating it into elements such as faculty proclivity toward open access and faculty adherence to open access. This conservative approach was used to further explore and understand the data due to observed alpha values for faculty proclivity and faculty adherence that were lower than those observed for the constructs relating to administrator attention and librarian commitment to open access. There is some suspicion that measurement error may account for the lower observed alpha levels because responding library directors may be less familiar with faculty actions and because faculty represent a much more diverse group. Results of the analysis using this construct, combining faculty proclivity and faculty adherence to open access, are very similar to results obtained when considering each element of faculty commitment to open access separately. However, some differences were observed among the three separate investigations

(faculty adherence, faculty proclivity, and faculty commitment, overall). Institution size was significant except when predicting faculty proclivity. Decision making influence of librarians was significant except when predicting faculty adherence. Additionally, when using the combined variable, faculty commitment to open access, overall, sector (public vs. private) became significant. It should also be noted that sector was significant at the .10 level (p=.053) in the analysis using faculty proclivity toward open access, suggesting that sector could have an impact on faculty commitment if measurement error can be reduced. Unfortunately, the results here are inconclusive and further research is needed to clarify the effect of these variables on faculty commitment to open access.

A multiple ordinary least squares regression indicates that a positive significant relationship exists between administrator attention to open access and faculty commitment to open access, overall, when controlling for the calculated decision making influence of stakeholder groups (administrators, librarians, faculty, and publishers), respondent years of library experience, respondent gender, institution size, geographic region, and sector (public vs. private). The adjusted R^2 (R_a^2) indicates that 48.49% of the variability in the dependent variable faculty commitment to open access, overall, can be explained by the included variables. Several tests were run to check for potential problems related to multicollinearity (variance inflation *mean vif* =1.38) and heteroskedasticity (Breusch-Pagan/Cook-Weisberg test χ^2=3.21, p> χ^2=.0731). Additionally, a leverage versus squared residuals plot and a residuals versus predicted values plot was used to check the data visually. These data do not appear to be impacted by multicollinearity or heteroskedasticity.

According to this model administrator attention to open access, decision making influence of librarians, and decision making influence of faculty statistically predict faculty commitment to open access, overall. Results are displayed in Table 28.

Table 28

Regression Table. Predictors of Faculty Commitment to Open Access, Overall

Variable	Coefficient	Standard Error	t	p
Administrator attention to OA	2.293	.3211	7.14	0.000
Decision influence – librarian	0.0408	.0188	2.17	0.031
Decision influence – faculty	0.1082	.0229	4.73	0.000
Constant	3.987	.1726	23.10	0.000

Note: Adj. R^2 = .512, $F(15, 269) = 18.82$, $p < .01$.

Figure 23 shows the relationship between the transformed variables of administrator attention to open access and faculty commitment to open access, overall, using a predictive margins plot. Figure 24 displays this relationship using original units computed by using the inverse variable transformations. This allows the graph to display the true curvilinear relationship. Faculty commitment to open access, overall, continues to increase as academic administrator attention rises. However, faculty commitment to open access, overall, rises most sharply at lower levels of administrator attention, then moderates but still rises as administrator attention continues to increase.

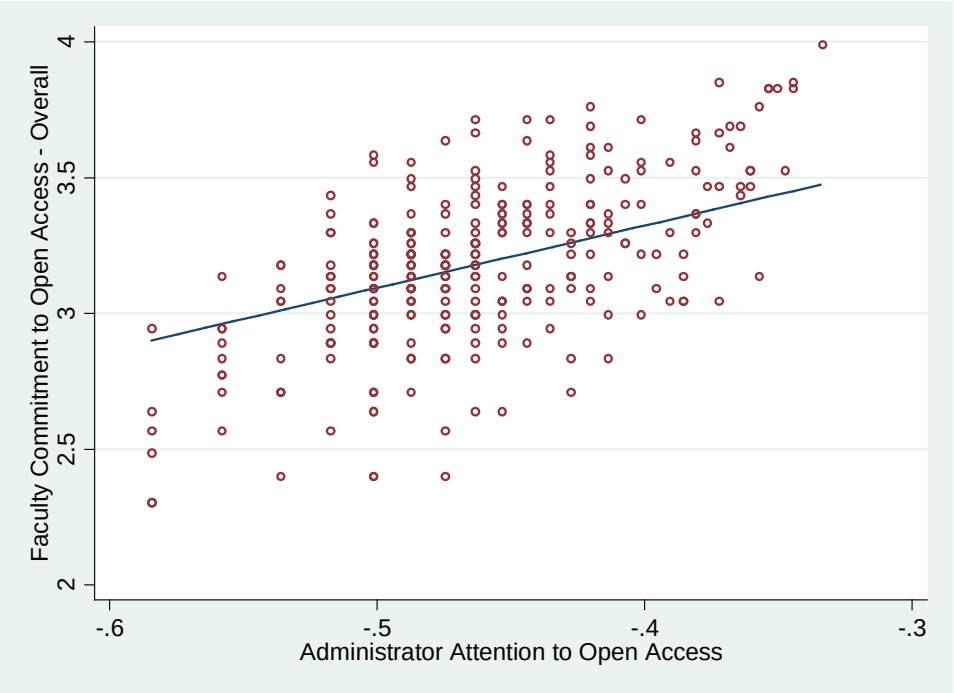

Figure 23. Predictive margins plot of administrator attention to open access and faculty commitment to open access (transformed values).

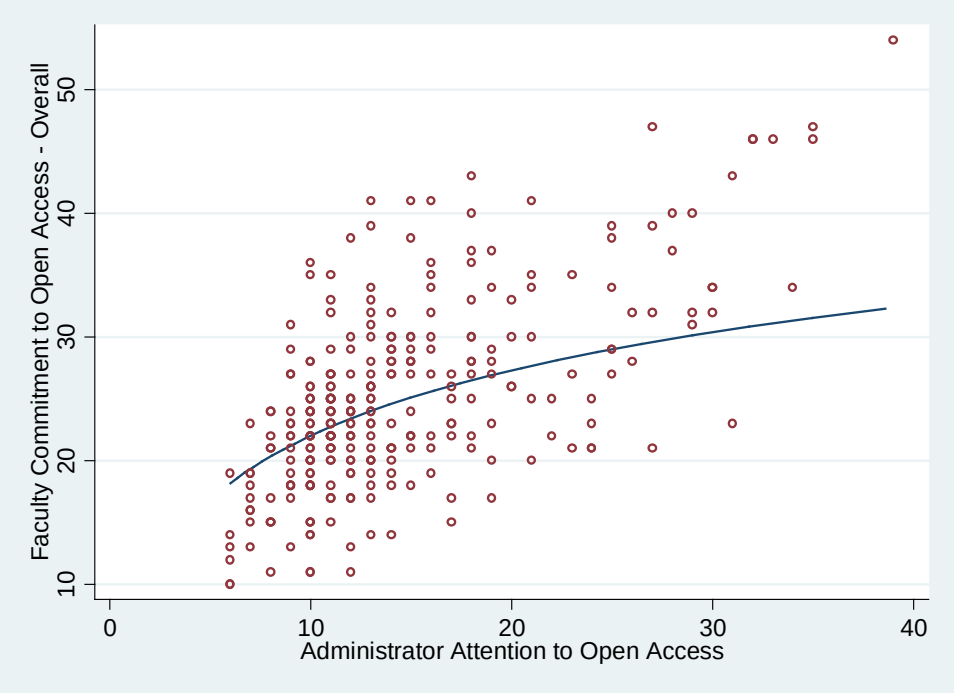

Figure 24. Predictive margins plot of administrator attention to open access and faculty commitment to open access (original values).

Figure 25 shows the relationship between the transformed variable of faculty commitment to open access, overall, and decision making influence of librarians using a predictive margins plot. Figure 26 displays this relationship using original units computed by using the inverse variable transformations. Figure 27 shows the relationship between the transformed variable of faculty commitment to open access, overall, and decision making influence of faculty using a predictive margins plot. Figure 28 displays this relationship using original units computed by using the inverse variable transformations. Figures 26 and 28 show that both librarian decision making influence and faculty decision making influence positively affect faculty commitment to open access, overall. However, faculty decision making influence is noticeably stronger as a predictor of faculty commitment to open access, overall.

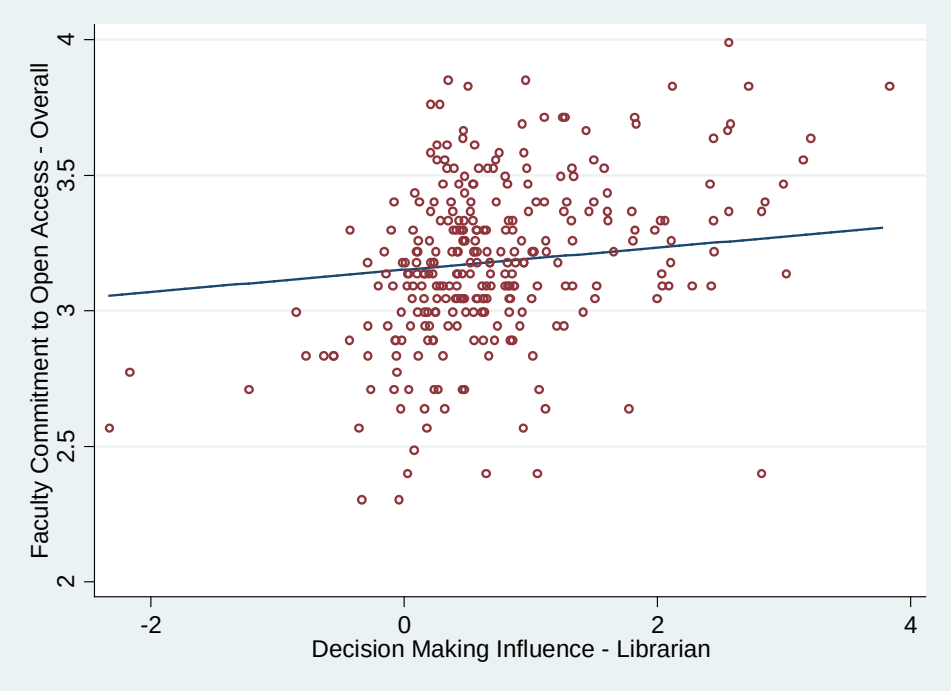

Figure 25. Predictive margins plot of decision making influence – librarian and faculty commitment to open access, overall (transformed values).

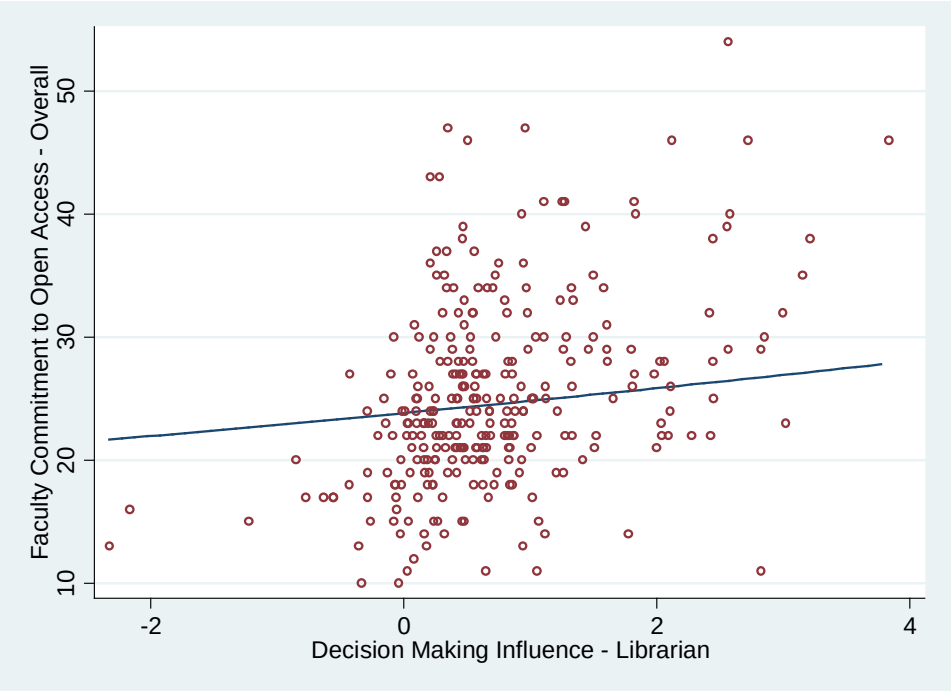

Figure 26. Predictive margins plot of decision making influence – librarian and faculty commitment to open access, overall (original values).

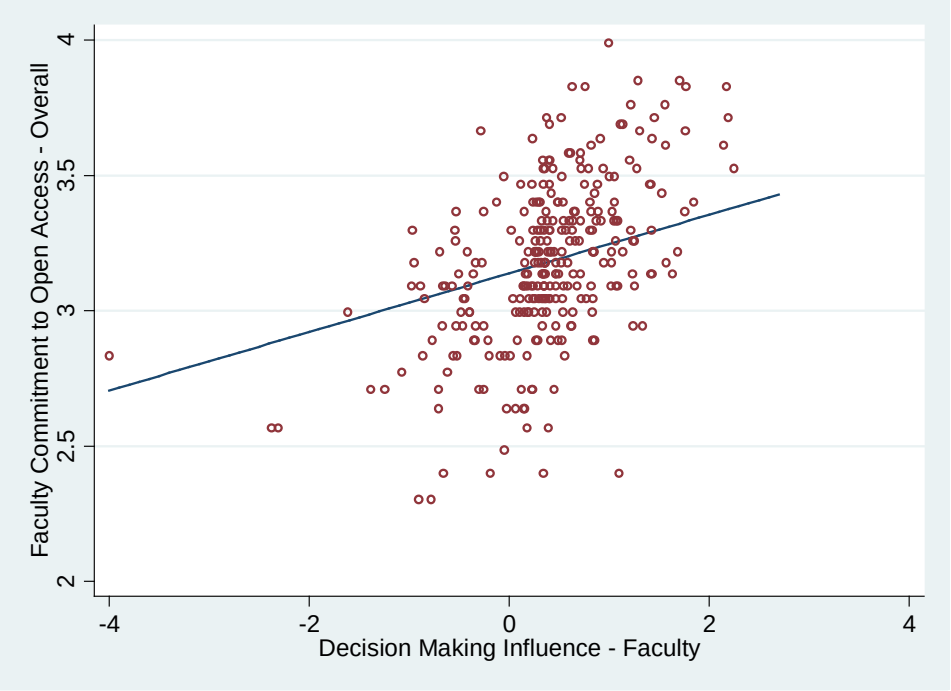

Figure 27. Predictive margins plot of decision making influence – faculty and faculty commitment to open access, overall (transformed values).

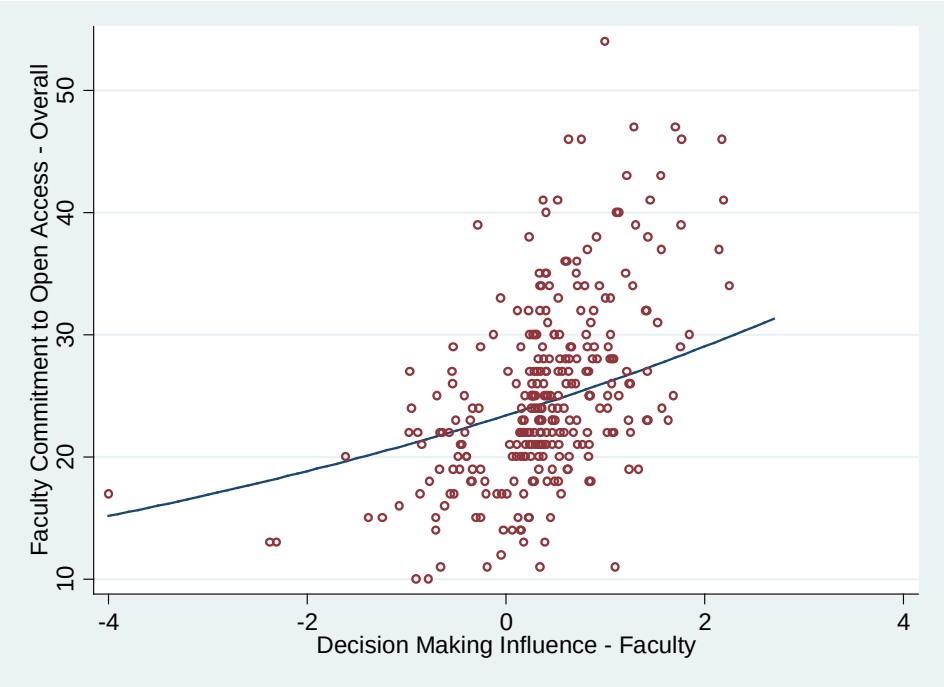

Figure 28. Predictive margins plot of decision making influence – faculty and faculty commitment to open access, overall (original values).

The regression results suggest there may be a statistically significant relationship between institution size and faculty commitment to open access, overall. But it is not possible to compare faculty commitment, overall to individual categories of institution size based solely on this result. Because the joint effect is significant when examining contrasts of predictive margins using Fisher's protected Least Significant Difference (df = 3; χ^2= 10.20; p> χ^2= 0.0169) this allows for direct comparisons between individual size categories. Upon this closer inspection the largest institutions are significantly different from other size institutions when it comes to predicting faculty commitment, overall, such that larger institutions have a higher likelihood of faculty commitment, overall, to open access than medium sized or smaller sized institutions (Table 29, Table 30, and Figure 29).

Table 29

Pairwise Comparisons of Predictive Margins

	Delta Method		Unadjusted	
Institution Size	Contrast	Std. Err.	z	P>z
1,000 - 4,999 vs 5,000 - 9,999	.0395	.0376	1.05	0.292
1,000 - 4,999 vs 10,000 - 19,999	.0252	.0417	0.60	0.547
1,000 - 4,999 vs 20,000 and above	.1340	.0439	3.05	**0.002**
5,000 - 9,999 vs 10,000 - 19,999	-.0144	.0431	-0.34	0.737
5,000 - 9,999 vs 20,000 and above	.0943	.0439	2.15	**0.032**
10,000 - 19,999 vs 20,000 and above	.1088	.0442	2.46	**0.014**

Note. Model VCE : OLS.

Table 30

Predictive Margins, Institution Size

	Delta Method		Unadjusted	
Institution Size	Margin	Std. Err.	z	P>z
1,000 - 4,999	23.685	.5303	44.66	0.000
5,000 - 9,999	24.642	.7262	33.93	0.000
10,000 – 19,999	24.289	.7881	30.82	0.000
20,000 and above	27.079	.9060	29.89	0.000

Note. Model VCE : OLS.

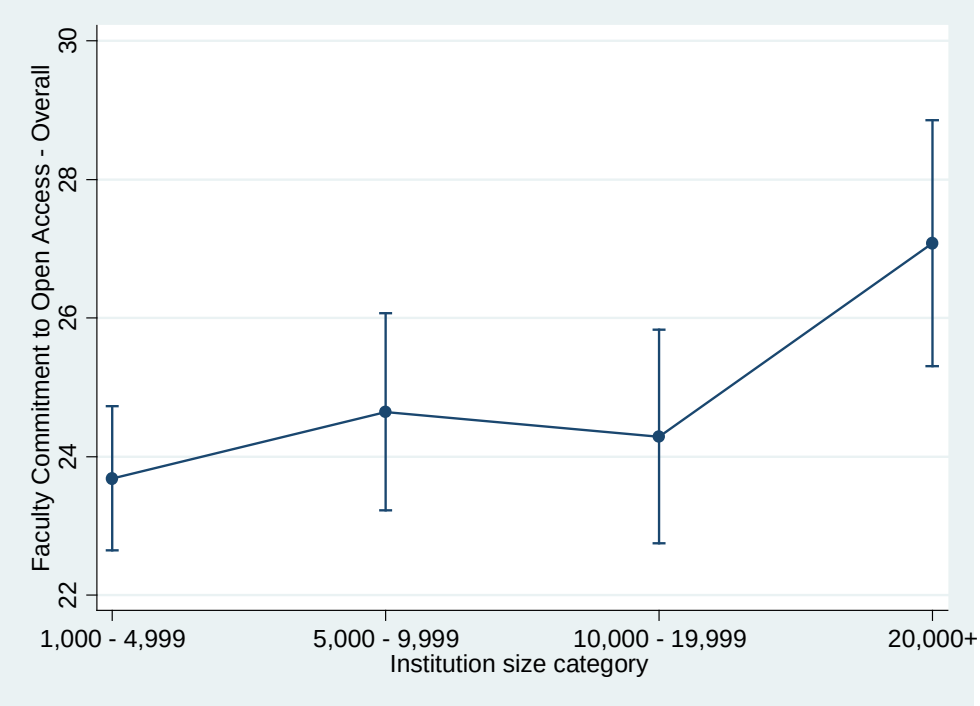

Figure 29. Predictive margins of institution size and faculty commitment to open access, overall, with 95% confidence intervals.

The regression results also suggest there may be a statistically significant relationship between the categorical variable institutional sector (public or private) and faculty commitment to open access, overall. Because the joint effect is significant when examining contrasts of predictive margins using Fisher's protected Least Significant Difference (df =1; χ^2= 4.59; p> χ^2= 0.0321) this allows for direct comparisons between individual size categories. Upon this closer inspection the private sector has more faculty commitment to open access, overall than the pub-nonprofit sector irrespective of the other covariates (Table 31 and Figure 30). When combining all elements of faculty commitment, as in this section, sector becomes a statistically significant predictor, where in the analysis of faculty proclivity and faculty adherence it was not. These differences are likely a result of measurement error. Future research may be able to better study this relationship by surveying faculty directly, rather than relying on perceptions of others such as librarians, as in the case of this study.

Table 31

Predictive Margins, Sector (Public vs. Private)

	Delta Method		Unadjusted	
Institution Size	Margin	Std. Err.	z	P>z
Public	23.808	.4811	49.48	0.000
Private	25.473	.5306	48.01	0.000

Note. Model VCE : OLS.

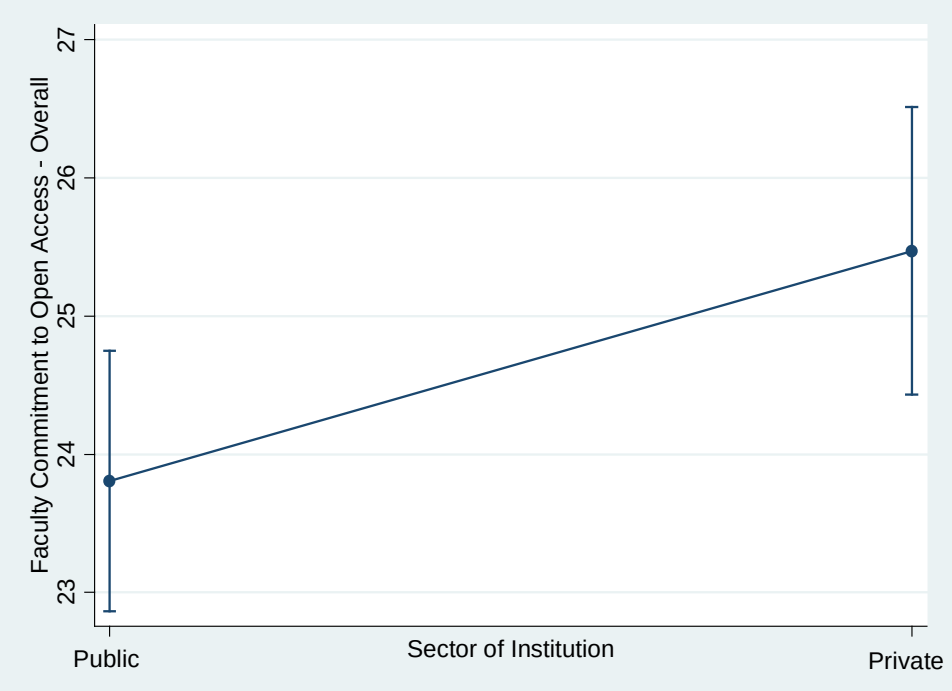

Figure 30. Predictive margins of sector of institution (public vs. private) and faculty commitment to open access, overall, with 95% confidence intervals.

CHAPTER 5

SUMMARY AND CONCLUSION

Summary

Both technological and cultural changes continue to drive the push toward the open access of scholarly research. Under the traditional system of publishing researchers often supply publishers with free labor, not only by submitting content for publication but also by reading manuscripts and providing the expertise needed during the peer-review process. Researchers and librarians must then purchase this information through subscriptions from various publishers. Due to a number of factors, including a larger number of publications and increasing subscription prices, many in the academic community see this arrangement as unsustainable. Under a system of open access publishing researchers and institutions responsible for creating new knowledge seek to retain ownership, and therefore control of how this academic work is distributed and used. At the same time, by relying on modern computers and the Internet open access enhances the impact of scholarly work by making it more accessible to researchers around the world without subscription or payment barriers. Chapters one and two explore in detail factors leading to the growth of open access publishing as well as the current conditions and challenges facing each stakeholder group operating within this complex environment.

Existing research and writing on open access focuses heavily on the roles and influences of individual groups such as researchers, publishers, and librarians. However, discussions and published works on the topic often fail to consider academic administrators as a part of the equation and pay very little attention to this group. This research was conducted in an attempt to address the existing gap in our knowledge and understanding about this key stakeholder group.

Chapter three discusses in detail the survey instrument and the process used to collect data while chapter four offers a detailed analysis of the results.

In the first chapter, two research questions and two hypotheses were presented. They are restated below and discussed in terms of the results reported in chapter four.

Research Question 1

Among researchers, publishers, librarians, and academic administrators, how much influence do library directors perceive each stakeholder group as holding in the transition toward open access?

Because personalities, campus cultures, and political dynamics vary greatly across institutions, factors such as interest in open access and power to bring about change must be considered. Appendix A explains the procedures used to measure decision making influence of key stakeholder groups when dealing with open access. This decision making influence is based on the perceptions of responding library directors. Summary results are presented in Table 32.

Here, librarians are seen as having the greatest decision making influence when it comes to implementing open access (.70556), with faculty having the next highest amount of influence (.37924). Out of these four stakeholder groups academic administrators are perceived as having the least amount of positive influence on open access of scholarly research (.18813). Publishers are the only group perceived as having a negative influence on the adoption of open access (-.36841).

Table 32

Perceived Open Access Decision Making Influence of Stakeholder Groups as Reported by Library Directors

	Mean	Std. Dev.	Min	Max
Academic Administrators	.1881287	.6772643	-3.196	2.508
Librarians	.7055606	.8136343	-2.326	3.838
Faculty Researchers	.3792381	.7448948	-4.000	2.717
Publishers	-.3684071	.9604561	-5.000	3.600

These results are not surprising as many of the strongest advocates for open access come from the library community. Librarians are also instrumental in developing new publishing opportunities within universities and creating online repositories for sharing scholarship. Faculty are perceived as the second most influential group. One could argue that faculty researchers, as the producers of scholarly work, hold the most influence over issues related to open access. The decisions authors make about where and how to share their work determine the scholarly communication environment. Awareness of open access opportunities is rising among faculty researchers but the concept is still new to many. Academic administrators are perceived as having a positive influence on open access, although at a level that is lower than librarians and faculty researchers. While some academic administrators are highly supportive of open access, awareness may still be low among this group. In addition, these academic leaders have a broad array of responsibilities and therefore cannot devote a great deal of attention to any single issue. Finally, responding library directors perceive publishers as having about as much interest in open access as faculty, but this interest is perceived as negative, or in opposition to open access. Publishers face many challenges and are likely interested in open access developments. However, some may remain skeptical of new models that threaten well-established practices.

Research Question 2

As perceived by library directors, to what extent do the current attitudes and actions of academic administrators of colleges and universities in the United States influence institutional commitment (the actions of researchers and librarians) toward open access of scholarly research?

This second research question is addressed by testing the assumptions made in the following hypothesis.

Hypothesis 1.

As administrator attention to open access increases (controlling for differences in decision making influence across organizations), faculty and librarian actions (institutional commitment) toward open access will increase.

Data analyzed in chapter four suggests that we may reject the null hypothesis stating that no relationship exists between academic administrator attention to open access and institutional commitment to open access when controlling for perceived decision making influence of key stakeholder groups across institutions. The data analysis also controlled for differences in institution size, geographic region, public vs. private institution, as well as respondent gender and years of library experience. Academic administrator attention to open access is a statistically significant predictor of each individual element of institutional commitment to open access including:

- Librarian commitment to open access
- Two individual dimensions of faculty commitment to open access
    - Faculty proclivity toward open access
    - Faculty adherence to open access
- Faculty commitment to open access, overall

As noted in chapter four, faculty commitment to open access was considered several different ways (faculty proclivity, faculty adherence, and faculty commitment, overall). This approach was used to further explore and understand the data due to perceived measurement

error in the survey instrument. Alpha coefficients of the individual items representing this construct were not as reliable as the others, administrator attention and librarian commitment to open access. This measurement error is likely due to the fact that the survey reported library directors' perceptions of faculty attitudes and actions rather than surveying faculty directly. Library directors appear fairly capable of assessing the actions of librarians and administrators but it may be more difficult to accurately report the status of faculty researchers, a much larger and much more diverse group. Although the measurement of faculty commitment to open access in this study is not fatally flawed, future research could potentially strengthen the results reported here.

These findings provide evidence that academic administrators represent an important but often forgotten about group in the movement toward open access scholarly publishing. Their financial and leadership support appears to encourage faculty researchers and librarians to take additional steps leading to a greater level of open access scholarship. These actions of faculty and librarians often take place locally but have implications that reach much further. The link between academic administrators and institutional commitment to open access may seem logical, perhaps even obvious, to individuals working as academic administrators, researchers, librarians, and publishers. However, the role of academic administrators in the context of open access scholarly publishing has not been studied in any detail and often goes unmentioned in the many discussions and debates on the topic. Results of this study offer a preliminary quantitative analysis of how academic administrators interact with and affect the members of other stakeholder groups, especially faculty researchers and librarians. Those interested in the expansion of open access should take note of the results presented here and consider directing more resources toward the education of academic administrators. As administrators become

more aware of open access issues their interest and support is likely to impact faculty researcher and librarian actions, leading to the increased availability of scholarly work through open access. As this study is simply one investigation of the matter, future research is needed to help clarify the role of the academic administrator. Any further studies could improve upon existing knowledge by gathering data directly from members of each stakeholder group rather than relying only upon the perceptions of one group.

Hypothesis 2.

As colleges and universities increase in size, faculty and librarian actions (institutional commitment) toward open access will increase.

This second hypothesis theorized that institution size, by number of students, is a predictor of institutional commitment to open access, measured by faculty and librarian actions. Data analyzed in chapter four suggests that we may reject the null hypothesis stating that no relationship exists between institution size and institutional commitment to open access. This analysis also controlled for perceived decision making influence of key stakeholder groups across institutions, geographic region, public vs. private institution, as well as respondent gender and years of library experience. Institution size, is a statistically significant predictor of several elements of institutional commitment to open access including:

- Librarian commitment to open access
    - The smallest institutions (1,000-4,999) have a lower likelihood of librarian commitment to open access than all other size categories
    - The largest institutions (over 20,000) have a higher likelihood of librarian commitment to open access than all other size categories
- Faculty adherence to open access
    - The largest institutions (over 20,000) have a higher likelihood of faculty adherence to open access than all other size categories
- Faculty commitment to open access, overall
    - The largest institutions (over 20,000) have a higher likelihood of faculty commitment to open access, overall, than all other size categories

When examining faculty proclivity toward open access no differences were observed across categories of institution size.

Results here are consistent with what one might expect and they confirm previous research. Faculty and librarians at the largest institutions do exercise a greater degree of commitment to open access. This is logical due to the different missions of various institutions. A large university is more likely to be heavily involved in research and the largest research institutions have a responsibility to invest in all forms of scholarly research, including the systems that support it. On the other hand, a small or medium sized college or university may devote more resources to classroom teaching and less to high profile research projects. As the primary producers and consumers of scholarly publications the largest research institutions and their libraries often lead the way on matters of open access. However, this certainly does not mean smaller institutions have no interest in open access and scholarly publishing. Deltoro, Mandernack, & Zanoni (2011) explained that small and medium sized institutions are clearly aware of scholarly communication and open access issues, but they are less active in these areas than larger institutions. Some of the reasons cited for these differences include a greater emphasis on teaching, fewer graduate programs, and fewer staff.

Other Results of Interest

Several additional items are also worthy of comment. A positive statistically significant relationship was observed between decision making influence of librarians (where influence relative to librarians, administrators, faculty, and publishers, is defined in terms of the product of interest x power as described in Appendix A) and librarian commitment to open access, faculty proclivity toward open access, and faculty commitment to open access, overall. Similarly, as faculty decision making influence about matters related to open access increases, so does faculty

proclivity, faculty adherence, and faculty commitment to open access, overall. These results do not appear surprising. Although, it should be noted that librarian decision making influence does lead to increased faculty commitment to open access, overall. This can be explained because when there is high interest and awareness of open access among librarians, library staff are likely to reach out and become involved in programs aimed at educating faculty about open access issues and opportunities (Newman, Blecic, & Armstrong, 2007).

This study also considered whether an institution was publically or privately operated. An institution's sector (public vs. private) had an impact on only one of the dependent variables under consideration. When analyzing faculty commitment to open access, overall, faculty at private institutions displayed a stronger commitment to open access than faculty at public-not for profit institutions. As noted in chapter four, the construct faculty commitment to open access, overall, includes both faculty proclivity and faculty adherence in an attempt to better understand the data. This finding is not conclusive but merely suggests that sector may be a predictor of faculty commitment to open access with private institutions exhibiting a greater commitment. This result seems peculiar and in conflict with other findings related to institution size because many private institutions enroll a relatively small numbers of students when compared to the larger, often public, research universities. The inconsistency in the data is likely due to measurement error as explained earlier. Future research is necessary to clarify this relationship and future studies could provide improved data and measurement by surveying faculty members directly rather than relying on perceptions of library directors. Finally, geographic region is not a statistically significant predictor of any of the dependent variables measuring open access.

Conclusion

A survey collected data based on perceptions of library directors at four year colleges and universities in the United States regarding relationships among key stakeholder groups. The analysis provided insight into how these groups are shaping and adapting to open access scholarly publishing. The detailed results presented in the previous chapter contribute to a greater understanding of many interrelationships and might possibly allow individuals within these stakeholder groups to better position their organizations for future success in a complex environment. This study is also likely to benefit advocates of open access by clarifying the role and influence of the academic administrator, which until this point remained largely unexplored. The introductory section of the first chapter raised an important question. Is academic administrator engagement important to the success of open access scholarly publishing or are librarians and faculty researchers pursuing open access even without strong support from the administration? Results of this investigation lead to the conclusion that when controlling for other variables academic administrator support is indeed an important element that leads to greater institutional commitment to open access through both librarian and faculty actions. Therefore, those wishing to see the expansion of open access scholarly publishing should increase efforts to educate academic administrators about the many opportunities stemming from the pursuit for increased open access publishing and the resulting benefits for both the local institutional community and for the greater good of all.

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APPENDICES

Appendix A - Calculation for the Variable Decision Making Influence Across Organizations

A separate spreadsheet file associated with this research contains multiple calculations to arrive at a "decision making influence" measurement for each stakeholder group as reported by each respondent. The final values shown in Table A9 are used in an effort to control for differences in responses across institutions by acknowledging the complex interrelationships and interdependencies that exist among stakeholders. Sample data is used in the tables provided in this section. Automatic calculations will be used in Microsoft Excel to enter and compute the values when using the research data.

The spreadsheet combines perceived power to impact local decisions about open access with perceived interest in open access (either positive or negative) for each group including academic administrators, librarians, faculty, and publishers (Table A1).

Table A1

Perceived power to impact local decisions about open access and perceived interest in open access (either positive or negative)

	Perceived Power	Positive/ Negative Interest	Perceived Interest	Interest in OA	
	Total to 1	+1 or -1	1 to 5	***Positive Interest***	***Negative Interest***
Administrator	0.1	-1	3	0	3
Librarian	0.2	1	3	3	0
Faculty	0.3	-1	2	0	2
Publisher	0.4	1	4	4	0
Total	1				

Because each institution is made up of unique individuals and circumstances the political power structure will vary from one location to the next. This is taken into account through a series of survey questions asking about each group's exertion of power over all the other stakeholder groups. This data will be captured in tables such as the ones below (Table A2) with 1 representing minor power over another group and 5 representing major power.

Table A2

Political Alignment Structure

Academic Administrator alignment or exertion of power over					
	Minor				**Major**
	1	**2**	**3**	**4**	**5**
Librarians	1				
Faculty			1		
Publishers				1	

Librarian alignment or exertion of power over					
	Minor				**Major**
	1	**2**	**3**	**4**	**5**
Librarians	1				
Faculty		1			
Publishers				1	

Faculty alignment or exertion of power over					
	Minor				**Major**
	1	**2**	**3**	**4**	**5**
Librarians	1				
Faculty			1		
Publishers					1

Publisher alignment or exertion of power over					
	Minor				**Major**
	1	**2**	**3**	**4**	**5**
Librarians		1			
Faculty			1		
Publishers				1	

The political alignment structure captured in this step will be combined with the perceived power of each group to impact local decisions about open access and the perceived positive or negative interest in open access initially indicated in Table A1.

The political alignment Table A3 provides values that are important for later calculations. This table takes the responses obtained in table A2 and divides each value by 15, which is the maximum value of power that any one group can exert. For example, an administrator can exert a power of 5 over each of the three other groups for a total of 15. At the sample institution

represented in table A2, the academic administrator is perceived to exert a power of 1 over librarians (1/15 = .066667), 3 over faculty (3/15 = 0.2), and 4 over publishers (4/15 = 0.266667).

Table A3

Political Alignment

	Administrator	Librarian	Faculty	Publisher
Administrator	0	0.066667	0.066667	0.133333
Librarian	0.066667	0	0.2	0.2
Faculty	0.2	0.133333	0	0.266667
Publisher	0.266667	0.266667	0.333333	0

Table A4 is then created by multiplying political alignment values in table A3 by the perceived power to impact open access decisions captured in table A1. This creates table A4 where political alignment is depicted in terms of perceived power to impact open access. For example, where the librarian group from table A1 has perceived power of 0.2, this value is multiplied by the values in the librarian column in table A3 (0.2 x 0.066667 = 0.013333; 0.2 x 0.133333 = 0.026667; 0.2 x 0.266667 = 0.053333). These new values are entered in the librarian column in table A4.

Table A4

Political Alignment x Perceived Power to impact open access (Open Access Decision Power)

	Administrator	Librarian	Faculty	Publisher
Administrator	0	0.013333	0.02	0.053333
Librarian	0.006667	0	0.06	0.08
Faculty	0.02	0.026667	0	0.106667
Publisher	0.026667	0.053333	0.01	0

Next, tables A5 (positive interest) and A6 (negative interest) are created by multiplying the political alignment factors in table A3 by the estimated interest levels from table A1. Table A5 shows positive interest (in favor of open access). Table A6 shows negative interest (opposed to open access). For example, table A5 uses the librarian values in table A1 where there is a positive interest of 3. This value is multiplied by the values in table A3 under the librarian column (3 x .066667 = 0.2; 3 x 0.13333 = 0.4; 3 x 0.26667 = 0.8). Table A6 uses the faculty values in table A1 where there is a negative interest of 2. This value is multiplied by the values in table A3 under the Faculty column (2 x .066667 = 0.133333; 2 x 0.2 = 0.4; 2 x 0.333333 = 0.666667).

Table A5

Political Alignment x Perceived Interest in Open Access (Positive Interest)

	Administrator	Librarian	Faculty	Publisher
Administrator	0	0.2	0	0.533333
Librarian	0	0	0	0.8
Faculty	0	0.4	0	1.066667
Publisher	0	0.8	0	0

Table A6

Political Alignment x Perceived Interest in Open Access (Negative Interest)

	Administrator	Librarian	Faculty	Publisher
Administrator	0	0	0.133333	0
Librarian	0.2	0	0.4	0
Faculty	0.6	0	0	0
Publisher	0.8	0	0.666667	0

Table A7 represents political alignment in terms of total perceived interest in open access, or negative interest subtracted from positive interest.

Table A7

Political Alignment in Terms of Perceived Interest in Open Access

	Administrator	Librarian	Faculty	Publisher
Administrator	0	0.2	-0.13333	0.533333
Librarian	-0.2	0	-0.4	0.8
Faculty	-0.6	0.4	0	1.066667
Publisher	-0.8	0.8	-0.66667	0

The values in tables A4 (power) and A7 (interest) are multiplied. The resulting values are then added to arrive at the decision making influence for each group based on political circumstances, where decision making influence is defined as the decision power and interest in open access associated with the political dynamics of the organization (Table A8).

Table A8

Decision Power x Political Alignment in Terms of Perceived Interest

	Administrator	Librarian	Faculty	Publisher	**Decision Making Influence Based on Political Dynamic**
Administrator	0	0.002667	-0.002667	0.028444	**0.028444**
Librarian	-0.00133	0	-0.024	0.064	**0.038667**
Faculty	-0.012	0.010667	0	0.113778	**0.112444**
Publisher	-0.02133	0.042667	-0.066667	0	**-0.04533**

This decision influence based on the political dynamic is then added to the raw decision making influence, shown in table A9, made up of *perceived power to impact local decisions about open access* multiplied by the *perceived interest in open access (either positive or negative)* for each group as originally indicated in table A1. The final decision making influence score is in the shaded column of table A9 labeled "external scale" and takes into account the many interactions and complex relationships among stakeholders by adjusting the raw values. This is the value that will be used to control for differences across organizations. External scaling represents the fact that interest in open access ratings is allowed to vary across organizations such that low interest values in one organization are comparable to high interest values in another organization. The open access decision power values in table A1, however, must add to 1.00 or 100% of an organization's power to influence open access within its own organizational boundaries. In this entire concept no stakeholder group will lose its power of decision by influencing another but can in fact lose or gain decision power by being influenced.

Table A9

Decision Making Influence: Additive Model (Raw Decision Influence + Politically Derived Influence)

	Raw Decision Influence	Decision Making Influence Based on Political Dynamic	**Decision Making Influence (External Scale)**
Administrator	-0.3	0.028444	**-0.27156**
Librarian	0.6	0.038667	**0.638667**
Faculty	-0.6	0.112444	**-0.48756**
Publisher	1.6	-0.04533	**1.554667**

Appendix B – Survey Instrument

Section 1

Informed Consent

Title of Project: **Open Access Scholarly Publishing: Perspectives & Actions**

Principal Investigator:
Tom Reinsfelder, MSLS (Asst. Librarian, Penn State Univ. Libraries, ALA Emerging Leader, 2011)
Ph.D Student - Administration & Leadership Studies
Indiana University of Pennsylvania

Advisor: Dr. John A. Anderson (jaa@iup.edu)

Purpose of the Study: To gather and analyze data on individual perceptions and institutional actions related to the open access of scholarly research.

Procedures to be followed: You will be asked to complete a brief online survey based on your perceptions and observations of circumstances and activities at your institution.

Duration/Time: Approximately 10-15 minutes will be required to complete this survey.

Potential Risk: The risk of harm anticipated in the proposed research is not more likely than those risks encountered in daily life.

Statement of Confidentiality: Your participation in this research is confidential. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared. Confidentiality will be maintained through the use of password protected computer systems. Further, after responses are gathered, identifying information will be removed and replaced with a unique identifier.

Right to Ask Questions: Please contact Tom Reinsfelder at (717) 749-6041 with questions or concerns about this study.

Voluntary Participation: Your decision to be in this research is voluntary. You can stop at any time. You do not have to answer any questions you do not want to answer.

Completion and return of the survey implies that you have read the information in this form and consent to take part in the research. Please keep this form for your records or future reference.

This project has been approved by the Indiana University of Pennsylvania Institutional Review Board for the Protection of Human Subjects (Phone: 724-357-7730).

Which of the following best describes your professional role at your institution? (D9)

- Library Director/ Head Librarian
- Dean of Library
- College/University Librarian
- Other

Which of the following best describes the academic administrator (outside of the library) who oversees your library? (D10)

- Provost / Chief Academic Officer
- Dean
- Vice President
- President
- Chancellor
- Other

Thinking generally about the relationships at your institution, please answer the following questions.

In general, how much influence do Academic Administrators at your institution have on **(A1)**

	Very Little 1	2	3	4	Very Much 5
Librarians					

	Very Little 1	2	3	4	Very Much 5
Faculty					
Journal Publishers					

In general, how much influence do Librarians at your institution have on (A1)

	Very Little 1	2	3	4	Very Much 5
Academic Administrators					
Faculty					
Journal Publishers					

In general, how much influence do Faculty at your institution have on (A1)

	Very Little 1	2	3	4	Very Much 5
Academic Administrators					
Librarians					
Journal Publishers					

In general, how much influence do Journal Publishers have on (A1)

	Very Little 1	2	3	4	Very Much 5
Academic Administrators					
Librarians					
Faculty					

For the purposes of this survey Open Access (OA) is:

- digital, online, free of charge, and free of most copyright and licensing restrictions
- entirely compatible with peer review, and all the major OA initiatives for scientific and scholarly literature insist on its importance

There are two primary vehicles for delivering OA to research articles: OA journals and OA archives or repositories.

(P. Suber – A Very Brief Introduction to Open Access)

Library Action

Please answer the questions in this section based on your experience and the conditions at your institution:

Library

To what extent does your library provide direct financial support for (C5)

	Not At All 1	2	3	4	To a Great Extent 5
open access journals maintained by your institution?					
open access journals or repositories maintained by another institution (e.g., ArXiv)?					
faculty who wish to publish in open access journals requiring publication fees?					
institutional memberships with OA publishers (e.g., PLOS, BiomedCentral)?					

Has your library developed any ongoing initiatives to raise awareness of open access issues where the primary

audience is: (C5)

	No, our library has not	No, but planning is underway	Yes, we're just getting started	Yes, this is done occasionally	Yes, this is done frequently
FACULTY?	○	○	○	○	○
ACADEMIC ADMINISTRATORS?	○	○	○	○	○
LIBRARIANS?	○	○	○	○	○

Does your library maintain an online database (or repository) that makes faculty research openly accessible? (C5)

YES ○ NO ○

How often is this database/repository used by the college/university community? (C5)

Minimally Used 1	2	3	4	Used Very Heavily 5
○	○	○	○	○

How long has this online database/repository been operational? (C5)

Less than 1 year	1-2 Years	3-4 Years	5-6 Years	More than 6 years
○	○	○	○	○

What is the likelihood such a repository will be developed by your library in the next 2 years? (C5)

Not Likely 1	2	3	4	Almost Certain 5
○	○	○	○	○

At your institution, how many employees in the library spend at least 50% of their time on tasks related to increasing open access to scientific or scholarly literature? (C5)

Lib

Is there a group/committee/task force within your library that regularly addresses issues related to open access of scholarly research? (C5)

- ○ YES
- ○ NO

How active is this group? (C5)

Minimally Active 1	2	3	4	Very Active 5
○	○	○	○	○

How long has this group been exploring open access issues? (C5)

Less than 1 year	1-2 Years	3-4 Years	5-6 Years	More than 6 years
○	○	○	○	○

Has your library implemented any formal policies encouraging or requiring librarians to make their published work more accessible through open access methods? (C5)

- ○ Yes
- ○ No

Compliance with this policy is: (C5)

Suggested ○ Encouraged ○ Required ○

What is the likelihood such a policy will be enacted in the next 2 years? (C5)

Not Likely 1	2	3	4	Almost Certain 5
○	○	○	○	○

Indicate the extent to which you agree with the following statements.
When it comes to Open Access, librarians at your institution: (C6)

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
have the same priorities as researchers.	○	○	○	○	○
support open access in theory AND in practice.	○	○	○	○	○
are willing to invest in alternative systems that may not always be successful.	○	○	○	○	○

To what extent:

	Not At All 1	2	3	4	To a Great Extent 5
does your institution's (not the library's) strategic plan address issues related to open access? (B3)	○	○	○	○	○
does your library's strategic plan address issues related to open access? (C5)	○	○	○	○	○

Admin

Administrators

Within the last 5 years, to what extent:

	Not At All 1	2	3	4	To a Great Extent 5
has the academic administrator overseeing your library made any public statements related to open access? (B3)	○	○	○	○	○
has the academic administrator overseeing your library committed funds to support open access initiatives? (B3)	○	○	○	○	○

Has the administrator who oversees your library asked any group/committee/task force to explore issues related to open access of scholarly research? (B3)

- ○ YES
- ○ NO

How active is this group? (B3)

Minimally Active 1	2	3	4	Very Active 5
○	○	○	○	○

How long has this group been exploring open access issues? (B3)

Less than 1 year	1-2 Years	3-4 Years	5-6 Years	More than 6 years
○	○	○	○	○

Has an academic administrator who oversees your library implemented any policies encouraging or requiring faculty to make their published work more accessible through open access methods? (B3)

- ○ Yes
- ○ No

Compliance with this policy is: (B3)

Suggested	Encouraged	Required
○	○	○

What is the likelihood that an academic administrator will enact such a policy in the next 2 years? (B3)

Not Likely 1	2	3	4	Almost Certain 5
○	○	○	○	○

Indicate the extent to which you agree with the following statements.
When it comes to Open Access, academic administrators at your institution: (B4)

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
encourage publication in open access formats.	○	○	○	○	○
are willing to invest in alternative scholarly publishing systems that may not always be successful.	○	○	○	○	○

Fac

Faculty

Is there a faculty group/committee/task force that regularly addresses issues related to open access of scholarly research? (C7)

- ○ YES
- ○ NO

How active is this group? (C7)

Minimally Active 1	2	3	4	Very Active 5
○	○	○	○	○

How long has this group been exploring open access issues? (C7)

Less than 1 year	1-2 Years	3-4 Years	5-6 Years	More than 6 years
○	○	○	○	○

Have any faculty groups implemented policies encouraging or requiring faculty to make their published work more accessible through open access methods? (C7)

- ○ Yes
- ○ No

Compliance with this policy is: (C7)

Suggested	Encouraged	Required
○	○	○

What is the likelihood such a policy will be enacted in the next 2 years? (C7)

Not Likely 1	2	3	4	Almost Certain 5
○	○	○	○	○

From your experience and observations, to what extent would you estimate that faculty at your institution (C7)

	Seldom/Never 1	2	3	4	Very Frequently 5
Use a local institutional repository?	○	○	○	○	○

	Seldom/Never 1	2	3	4	Very Frequently 5
Use other subject based digital repositories (e.g., arXiv, SSRN)?					
Negotiate with publishers for more favorable copyright terms?					
publish articles in open access journals?					
use/read articles in open access journals?					

Indicate the extent to which you agree with the following statements.
When it comes to Open Access and scholarly publishing, faculty at your institution express: (C8)

	Strongly Disagree	Disagree	Neither Disagree nor Agree	Agree	Strongly Agree
a strong awareness of open access options.					
a perceived need for change.					
a strong understanding of copyright agreements.					
a strong comfort level with open access journals.					

Please answer the following questions based on your experience and the conditions at your institution:

How would you characterize the interest level in Open Access for each the following groups? (A2)
(If more than one administrator oversees the library, you may factor that into your response)

	Strong Negative Interest -5	-4	-3	-2	-1	0	1	2	3	4	Strong Positive Interest 5
Academic Administrator											
Librarians											
Faculty											
Journal Publishers											

When it comes to decisions or actions related to open access at your institution (either positive or negative), how much power does each group hold? (A1)
(must total 100%)

Librarians	0
Faculty	0
Journal Publishers	0
Academic administrators(s)	0
Total	0

Demographics

Do librarians at your institution have faculty status? (D10)

- Yes
- No

Is there a tenure system for librarians? (D10)

- Yes
- No

What is your gender? (D9)

- Male
- Female

How many years of experience do you have working in academic libraries? (D9)

Appendix C – Survey Distribution Messages

Pre-Notification Email and Introductory Statement

Subject: Your Assistance is Requested - Open Access Scholarly Publishing: Institutional Perspectives and Actions

Dear _____,

You are receiving this message because of your position as library dean or director at _____. Within the next week you will receive an invitation to participate in an important and unique survey to help provide a better and more complete understanding of the open access scholarly publishing environment. This study is being conducted by Tom Reinsfelder, a librarian at Penn State and a 2011 ALA Emerging Leader, as part of his dissertation research.

This survey **Open Access Scholarly Publishing: Institutional Perspectives and Actions** seeks to gather data on current practices as well as your perceptions of organizational influence on open access activities. This survey will not take more than 10-15 minutes of your time. Your participation is important and will provide valuable data to those concerned with the future of scholarly communication. Upon completion of this study Mr. Reinsfelder will share the results with all respondents and other interested individuals.

Please consider participating in this survey.
Thank you for your time and please look for the survey link in the coming days.

Barbara I. Dewey
Penn State University
Dean of University Libraries and Scholarly Communication

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Project conducted by:

Tom Reinsfelder, MSLS (Asst. Librarian, Penn State Univ. Libraries, ALA Emerging Leader, 2011)
t.l.reinsfelder@iup.edu
Ph.D. Student - Administration & Leadership Studies
Indiana University of Pennsylvania

Faculty Advisor: Dr. John A. Anderson (jaa@iup.edu)

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Survey Request # 1

Subject: Survey Link - Open Access Scholarly Publishing: Institutional Perspectives and Actions

Dear _____,

This is a follow up to a request from last week. I am in the process of collecting data to help provide a better and more complete understanding of the open access scholarly publishing environment.

This survey **Open Access Scholarly Publishing: Institutional Perspectives and Actions** asks about current practices at all types of institutions as well as your perceptions of organizational influences on open access activities.

I do realize that we as librarians are very busy and must balance many responsibilities. However, I am requesting your assistance with this research. The survey will only take 10-15 minutes of your time and will provide valuable data to those concerned with the future of scholarly communication.

Please Follow this link to the Survey:
Take the Survey

Or copy and paste the URL below into your internet browser:
https://iup.qualtrics.com/xxxxxxx

All responses will remain confidential and no identifiable information will be shared.

Respondents will be notified by email upon completion of this study. Results and conclusions will be posted online and respondents will receive a brief summary highlighting the most significant findings.

Thank you for taking the time to help with this project.

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Project conducted by:

Tom Reinsfelder, MSLS (Asst. Librarian, Penn State Univ. Libraries, ALA Emerging Leader, 2011)
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Survey Request # 2
(First follow up email to non responders)

Subject: Survey Reminder: Open Access Scholarly Publishing: Institutional Perspectives and Actions

Dear _____,

This is a reminder that the survey **Open Access Scholarly Publishing: Institutional Perspectives and Actions** is still open and you may still provide responses until **_____.**

This survey will only take 10-15 minutes of your time and will provide valuable data to those concerned with the future of scholarly communication. As a fellow librarian I understand how many demands are on your time. Therefore, I would like to thank you for considering my request to provide your perspectives on this important issue.

Please Follow this link to the Survey:
Take the Survey

Or copy and paste the URL below into your internet browser:
https://iup.qualtrics.com/xxxxxxx

All responses will remain confidential and no identifiable information will be shared.

Respondents will be notified by email upon completion of this study. Results and conclusions will be posted online and respondents will receive a brief summary highlighting the most significant findings.

Thank you for taking the time to help with this project.

Tom Reinsfelder, MSLS (Asst. Librarian, Penn State Univ. Libraries, ALA Emerging Leader, 2011)
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Survey Request # 3
(Second follow up email to non responders)

Subject: Survey Reminder: Open Access Scholarly Publishing: Institutional Perspectives and Actions

Dear _____,

This is a follow up message and final request asking you to kindly consider completing the survey **Open Access Scholarly Publishing: Institutional Perspectives and Actions.** The survey is still open and you may provide your responses until _____.

This survey will take no more than 10-15 minutes of your time and will provide valuable data to those concerned with the future of scholarly communication.

Please Follow this link to the Survey:
Take the Survey

Or copy and paste the URL below into your internet browser:
https://iup.qualtrics.com/xxxxxxx

All responses will remain confidential and no identifiable information will be shared.

Respondents will be notified by email upon completion of this study. Results and conclusions will be posted online and respondents will receive a brief summary highlighting the most significant findings.

Thank you for taking the time to help with this project.

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Follow up and "Thank You" email sent to responders
(sent immediately after survey completion)

Subject: Thank You: Open Access Scholarly Publishing: Institutional Perspectives and Actions

Dear _____,

Thank you for taking the time to provide your thoughts and perspectives on open access scholarly publishing.

Respondents will be notified by email upon completion of this study. Results and conclusions will be posted online and respondents will receive a brief summary highlighting the most significant findings.

Best Regards,

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Appendix D – Survey Map

Each survey item corresponds to one of the variables represented on the survey map. See Appendix B for the survey instrument.