

Beyond the Paywall: Examining Open Access and Data Sharing Practices Among Faculty at
Virginia Tech Through the Lens of Social Exchange

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ABSTRACT

The open access movement has encouraged the dissemination of scholarly content by allowing free access to research materials for all users of the Internet, where readers have access to literature without traditional subscription restrictions. However, the issue of faculty making their scholarly output open access is not fully understood in contemporary academia. Funders, especially government agencies, are requesting for more openness with regards to research findings. Academic libraries are moving to more digital archiving, making data sharing and research output sharing more ubiquitous. This study surveyed Virginia Tech faculty (N = 264) about their awareness and attitudes toward open access practices through the lens of social exchange theory. Social exchange theory assesses relationships in terms of costs versus benefits, where rewards, or benefits, should outweigh the perceived costs if social exchange is to occur. The analysis considered eleven social exchange constructs, including copyright concerns, additional time and effort, accessibility, publicity, trustworthiness, professional recognition, academic reward, altruism, trust, self-archiving culture, and influence of external factors. Findings indicate that while the majority of Virginia Tech faculty are seeking to publish in open access, many are unaware of the open access services provided by the university and even less are using the services available to them. Time, effort, and costs were identified as factors inhibiting open access and data sharing practices. Differences in awareness and attitudes towards open access were observed among faculty ranks and areas of research. Virginia Tech will need to increase faculty awareness of institutional open access repositories and maximize benefits over perceived costs if there is to be more faculty participation in open access practices.

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GENERAL AUDIENCE ABSTRACT

The movement towards open access has allowed academic researchers to communicate and share their scholarly content more widely by being freely available to Internet users. However, there are still issues of concern among faculty in regards to making their scholarly output open access. This study surveyed Virginia Tech faculty (N = 264) awareness and attitudes toward open access practices. In addition, faculty were asked to identify factors that inhibited or encouraged their participation in open access repositories. Findings indicate that while the majority of Virginia Tech faculty are seeking to publish in open access, many are unaware of the open access services provided by the university and even less are using the services available to them. Time, effort, and costs were identified as factors inhibiting open access and data sharing practices. Differences in awareness and attitudes towards open access were observed among faculty ranks and areas of research. Virginia Tech will need to increase faculty awareness of institutional open access repositories and maximize benefits over perceived costs if there is to be more faculty participation in open access practices.

Table of Contents

Introduction.....	1
Literature Review.....	4
Theoretical Foundations.....	4
Theoretical Implications.....	6
Open Access Surveys.....	7
Practical Implications.....	12
Institutional Contexts.....	13
Research Questions.....	15
Method.....	15
Participants.....	16
Materials and Procedures.....	18
Measures.....	19
Years of experience.....	19
Research area.....	19
Awareness and use of Virginia Tech resources.....	20
Inhibiting factors and obstacles to open access.....	20
Important factors for journal publishing.....	21
Attitudes toward open access journals.....	21
Cost and benefit measures: Theoretical measures.....	22
<i>Copyright</i>	22
<i>Additional time and effort</i>	22
<i>Accessibility</i>	22
<i>Publicity</i>	22
<i>Trustworthiness</i>	23
<i>Professional recognition</i>	23
<i>Academic reward</i>	23
<i>Altruism</i>	23
<i>Trust</i>	24
<i>Self-archiving</i>	24
<i>External factors</i>	24
Results.....	24
Awareness and use of institutional open access resources.....	24
Inhibiting factors as obstacles to open access practices.....	26
Open access practices by faculty career length.....	29
Discussion.....	35
Theoretical Implications.....	38
Limitations.....	39
Conclusion and Future Study.....	39
References.....	41
Appendices.....	46

List of Tables

Table 1. <i>Virginia Tech Faculty Awareness and Usage of Institutional Open Access Resources</i> (N = 264)	25
Table 2. <i>Inhibiting Factors as Obstacles to Faculty Open Access (OA) Practices</i> (N = 259) ...	26
Table 3. <i>Faculty Attitudes Toward Sharing/Not Sharing Data in OA Outlets</i> (N = 263)	28
Table 4. <i>Mean Scores for Importance of Factors When Selecting a Journal for Publication</i> (N = 263)	31
Table 5. <i>Mean Scores for Factors Affecting Faculty Open Access Attitudes and Practices</i> (N = 259)	33

Introduction

The ability to communicate and disseminate scholarly content has been greatly expanded through the Internet and its capabilities for broadly accessible information. However, the issue of faculty making their scholarly output open access, or free access to research materials for all users of the Internet (Suber, 2004), is not fully understood in contemporary academia. Until we understand the motivations and cost factors for open access and data sharing, the efforts to improve openness and reproducibility of scholarly research will remain truncated. Using the theoretical lens of social exchange theory, this study identifies Virginia Tech faculty awareness and attitudes toward open access research. In doing so, this study offers both theoretical and practical implications for identifying faculty needs in understanding the open access movement.

Open access, while referring to the free access of research publications and data, spans publishing in open access journals and self-archiving, which is when researchers deposit their work in an online repository that is accessible to researchers. In this manuscript, the term open access refers generally to one of these forms. If a specific form of open access is discussed, it will be identified. For example, open access journals are the subject of much discussion and debate among scholars, publishers, authors, and students alike. On the one hand, open access is celebrated for the rich possibilities it offers researchers everywhere to have access to scholarly publications regardless of their institutional affiliation or an institution's library budget and its ability to purchase subscriptions to journals or datasets. On the other hand, the open access model has been subject to criticisms regarding quality of open access journals and the potential for opportunistic or predatory publishers who exploit academic publication requirements and focus on making money instead of publishing quality scholarship. While predatory publishers may be few, their presence can have a harmful influence on perceptions toward open access

generally if they accept payment from researchers and do not follow such standards as making research accessible in important databases such as Web of Science or fail to preserve work in ways that ensure it is available throughout a researcher's career. While the open access model sometimes requires publishers to charge authors for publishing in open access journals, this allows publishers to cover their costs that would normally be passed down through subscriptions to libraries or individual researchers. One area of debate that is easily identified is the idea of gatekeeping. Nosek, Spies and Motyl (2012) hold that reviewers and editors are the gatekeepers for scientific publishing because the influence they have on acceptance of research manuscripts for publication. Many, if not most, journals maintain a role that supports scholarly reputations by ensuring such aspects as a quality peer review process and close coordination with researchers in the editing or indexing of articles. However, these same gatekeepers can deny some much needed and developed scholarship due to considerations like confirmatory bias or theoretical preferences.

In a 2014 lecture at Virginia Tech, Brian Nosek, professor in the Department of Psychology at the University of Virginia and co-founder and director for the Center for Open Science, shared problems with scientific research that have resulted from the lack of open access data (Nosek, 2014). Some of the problems mentioned include an overabundance of positive results, questionable research practices (e.g., failing to report all dependent measures, collecting more data after seeing whether results were significant, and ignoring null results), the lack of replicability, and limitations imposed by grant funders, such as the National Science Foundation and the National Institutes of Health. For example, granting agencies impose open access requirements on funded researchers to ensure compliance with their open access mandates, which is discussed further in the literature review.

The problems, Nosek (2014) argued, could be addressed through a better use of open access repositories. Open access could provide opportunities for more transparency in the research process, opportunities for better replication, and a better understanding of confirmatory versus exploratory research. Despite the opportunities, Nosek and Bar-Anan (2012) consider researchers themselves as one of the barriers to open access. Faculty at institutions rich with resources may not be aware of the costs associated with the traditional publishing system. Most researchers at U.S. universities access articles they need through their institution's library or library consortia without necessarily noticing the cost because their university takes care of the bill. Others that are aware of the costs want their universities not only to pay for subscriptions, especially for journals with strong reputation or impact, but also to pay for open access costs publishers transfer to the researcher. Sharing their research with new journals that do not have the same strong brand identity as traditional journals may pose a risk to researchers. Nosek and Bar-Anan (2012) agree that awareness may increase researchers' preference for open access (OA) outlets. Thus, this research serves to advance the understanding of faculty's awareness and attitudes toward open access.

Given the increased dedication, time, and research many higher education institutions have put forth to understand open access, it seems important to better understand OA from a Virginia Tech faculty perspective. This study benefits from previous studies on faculty awareness and perceptions of OA and adapts prior institutional surveys for an assessment of OA awareness, attitudes, and practices among Virginia Tech faculty. First, a synthesis of previous literature on social exchange theory will determine various cost factors that may influence faculty perceptions. Second, a conceptualization of methodology will be presented, providing a description of the participants surveyed, followed by a discussion of data-collection methods.

Third, results from the survey will be shared, specifically indicating where statistical significance was found. This study concludes with a discussion of both theoretical and practical implications, potential limitations, and suggestions for future research possibilities.

Literature Review

Theoretical Foundations

Social exchange theory looks at relationships in terms of costs versus benefits where rewards outweigh the perceived cost. In other words, the theory assumes people will seek to maximize their benefits and minimize their costs (Thibaut & Kelley, 1959). This economic approach to relationships creates an interesting framework for studying motivations and behaviors. Social exchange theory is reliant on reciprocity where individuals practice an exchange with others for mutual benefit. Mitchell, Cropanzano, and Quisenberry (2012) expand on a number of social exchange approaches that can involve symbolic resources and consider the value of equality in exchanges can depend on cultural norms, expectations and relationships.

Homans (1958) defined social behavior as the “exchange of goods, material goods but also non-material ones, such as the symbols of approval or prestige” (p. 606). Blau (1964) expanded Homans’ theory of social exchange to “reflect any behavior oriented to socially mediated goals” (p. 5). Social exchange theory has been further refined by Emerson, Cook, and colleagues (Cook & Emerson, 1978; Cook, Emerson, Gillmore, & Yamagishi, 1983; Emerson, 1976), mainly through laboratory practice. Overall, social exchange theory was developed and continues to be studied in order to analyze the outcome of social interactions. As it relates to faculty motivations, rewards may include publicity and professional recognition. To avoid potential costs, faculty may be averse to spending additional time and effort or wish to avoid trustworthiness concerns. Since social exchange is routed in assessments of costs and benefits of

behaviors, Kim's (2011) approach to open access is a helpful lens to understanding social exchange in regards to open access. Kim identified physical costs, such as *additional time and effort* required to upload research to open access repositories. Additionally, *copyright concerns*, or fear of violating a publisher's copyright, are more of a psychological cost of contributing to open access, but such violations could have physical costs as well. Kim (2011, p. 247-248) identified intrinsic and extrinsic rewards researchers may experience through open access.

Whether through publishing in an open access journal or through self-archiving in an institutional repository, *accessibility* is a considerable reward identified by researchers. The potential for *publicity*, and the importance that it offers for citation, is another considerable benefit for open access. While open access journals are more likely to bring about rewards associated with *trustworthiness*, due to the likelihood the open access journals can establish quality measures through peer review, sharing work in institutional repositories can be established as an institutional norm and likely increase participation in OA publishing. Since academic reward at most research universities is based predominantly on research quality indicators, included OA publishing and self-archiving as institutional norms tied with *academic reward* may be important to help shift faculty perceptions of the importance of OA.

Furthermore, since participation in OA publishing or self-archiving in institutional repositories can lead to increased citation, and thus measurable impact of research, *professional recognition* can be a benefit of OA. In addition to these extrinsic benefits, researchers (Bates, Loddington, Oppenheim, 2007; Kim, 2011) identified altruism as an intrinsic motivation that may motivate faculty to share their work in OA venues. Altruism was the motivation to share research openly so as to benefit others. While some academic disciplines or research topics may be more conducive to public use or public benefit of research, altruism could extend beyond

public uses for research and include altruistic motivation to share with researchers across the globe who may have access to the Internet but do not have a well-funded institution or institutional library that can purchase access to journals.

In addition to extrinsic and intrinsic motivations, Kim (2011) identified contextual considerations that may affect faculty OA practices. For example, *trust* in an open repository, institutional or beyond, differences in *archiving culture* at institutions or within research disciplines, researcher *identification* with institution- or discipline-specific goals toward OA, and *external factors*, such as granting agencies' or co-authors' OA expectations are important to understanding incentives or motivations to OA.

Theoretical Implications

The results of the survey should help identify the motivations of Virginia Tech faculty participation in open access publishing, self-archiving, and data sharing. By discovering which factors encourage or hinder participation among VT faculty, this study can assess whether social exchange costs and benefits related to OA are reflected in faculty attitudes and practices.

Salager-Meyer (2012) asserts that OA increases the social value of science, meaning research can be accessed, used, applied, and built upon in further research. If researchers agree that OA increases the social value of science, then they may be more inclined to participate to maximize their personal and institutional research gains.

Scholarly communication is a social process where researchers share information and have relationships through academic communities (Borgman & Furner, 2012). Open access is a useful mechanism for social exchange. Most of the research regarding open access perceptions has focused on faculty stakeholders (Creaser et al., 2010; Kim, 2011; Lwoga & Questier, 2015; Schroter, Tite & Smith, 2005). The literature does branch out to include the role of the academic

administrator, such as Reinsfelder and Anderson (2013), for example. While some research was conducted regarding data sharing practices at Virginia Tech (Shen, 2016), particularly focused on the types of data shared and storage protocols used by faculty, there has not been an institutional-wide study focused on faculty awareness and attitudes toward open access at Virginia Tech. As the university library system looks to more digital archiving, faculty at Virginia Tech are poised to play a large role in the next phase of the open access initiative.

Thus, social exchange theory, which focuses on the assessment of costs and benefits related to individual behaviors, is an applicable theoretical approach when examining faculty motivations to participate in open access publishing, archiving, and data sharing. While other applications of social exchange theory have centered on interpersonal relationships (Shtatfeld & Barak, 2009) and workplace dynamics (Saks, 2006), it is Kim's (2011) identification of open access costs and benefits for faculty that informs the conceptualization of social exchange in this study.

Open Access Surveys

As established, Kim's (2011) study on faculty self-archiving motivations, developed through the lens of costs and benefits factors, is a foundational study for this thesis. Kim (2011) invited 1,500 faculty from 17 doctorate-granting institutions in the United States and received 684 survey responses. The sample group included faculty from four broad research disciplines: science, engineering, social science, and humanities. The study considered four categories of factors related to institutional repository usage: costs, benefits, contextual factors, and individual traits. Cost factors included copyright concerns and additional time and effort. Extrinsic and intrinsic benefit factors included accessibility, publicity, trustworthiness, professional

recognition, academic reward and altruism. Contextual factors included trust, self-archiving culture, influence of external actors, and identification.

Kim (2011) found that out of 684 survey respondents, only 40.1% (n = 274) were aware of their institutional repositories and only 15.9% (n = 109) had deposited their work in their institutional repository. The major motivational factors Kim (2011) found included preservation, in regards to accessibility of archived works, trust, altruism and copyright considerations. Concerns about copyright positively correlated with institutional repository contribution. Kim found that faculty with greater copyright concerns were more likely to publish in institutional archives. While this finding contradicts other research that found the opposite, that copyright concerns obstruct faculty from sharing their research (McGovern & McCay, 2008), Kim (2011) felt this relationship implied that professors now expect institutional repositories to manage copyright issues.

This current study also adopts a portion of Lwoga and Questier's (2015) health sciences faculty survey, which gauged faculty's general awareness of open access issues. In particular, this survey utilized questions Lwoga and Questier used regarding factors that inhibit researchers from disseminating publications in OA venues (Lwoga & Questier, 2015). Lwoga and Questier (2015) surveyed a random sample of faculty from eight Tanzanian health science universities, resulting in 295 completed responses from 415 sampled. Most of the participants were aware of open access issues (93.5%; n = 276), but only one university had established an institutional repository. Major barriers toward open access publishing included slow Internet connectivity, lack of awareness, and inadequate skills (Lwoga & Questier, 2015). It is not expected that slow Internet connectivity will be an obstacle at Virginia Tech or at the large majority of U.S.-based research institutions.

Antelman (2004) found that freely accessible articles across a variety of disciplines hold a greater research impact, which indicates that rewards can be found from adopting open access practices. Additional surveys were incorporated to provide a comprehensive perspective of open access practices among faculty across the globe.

Dallmeier-Tiessen et al. (2011) conducted a Study of Open Access Publishing (SOAP) on behalf of the European Commission, publishers, libraries and research communities. The large-scale survey measured researcher attitudes and experiences with open access publishing. Questions regarding importance factors in open access publishing were incorporated into the Virginia Tech survey. The SOAP collected nearly forty thousand answers across disciplines (Dallmeier-Tiessen et al., 2011). SOAP was distributed to about 1.5 million individuals via publisher mailing lists including SAGE, Springer, BioMed Central, and Thomson Reuters and the survey was open for almost seven months (Dallmeier-Tiessen et al., 2011). Researchers found that 89% of survey respondents were convinced that open access is an advantageous endeavor and when reviewing based on areas of research, this percentage was higher than 90% for humanities and social science disciplines and around 80% for STEM disciplines.

In yet another survey, this one based in Canada, Dawson (2014) sought to understand publishing behaviors of faculty at the University of Saskatchewan as they relate to open access. The survey results suggested faculty members were already aware and supportive of the open access movement, but some gaps in knowledge of practices were identified. The University of Saskatchewan was looking to expand their university repository to include researcher publications in addition to electronic theses and dissertations; Virginia Tech already has an established university repository for all works, known as VTechWorks. University of Saskatchewan faculty (N = 1327) were sent personal email invitations requesting their

participation in a short university survey regarding their open access understanding and needs. The survey resulted in 291 completed surveys, for a 21.9% response rate. Although Dawson (2014) acknowledge a low response rate (21.9%), when compared to similar online surveys targeted at university researchers, the response rate was considered high. Dawson found that 91% of faculty at University of Saskatchewan indicated awareness or understanding for open access issues, but far fewer (33%) were able to identify discipline-specific repositories. Findings from Dawson's institutional-based survey echo results of similar institutional surveys in that copyright considerations for authors, lack of understanding and awareness of tools to assist with the upload of research manuscripts and data, and resistance to publishing fees were identified as significant obstacles to open access.

Research by Fecher et al. (2015) takes the spirit of the open access movement one step further by gauging faculty's data sharing practices. Many of the questions regarding data sharing practices used by Fecher et al. were adopted for the Virginia Tech survey, including characteristics to describe types of data as well as motivations on whether or not to share data. Fecher et al. (2015) invited 2,661 academic researchers to participate in a survey about their data sharing practices. Results from 1,564 completed responses, resulting in a 59% response rate and with 88% of those respondents from German institutions, support research findings from other locations in that faculty are aware of and support data sharing for the benefits it offers. However, despite the acknowledgment of the data sharing benefits, results indicate that data sharing occurred only moderately. Factors that inhibited researchers from sharing their data included whether other researchers could publish off the data before them (80%), if it was a major effort to share their data (59%), or if there were fears or concerns that data could be misinterpreted (46%).

Surveys by Harjuniemi and Lehto (2012) and the Repository Support Project (RSP) and United Kingdom Council of Research Repositories (UKCoRR) (2011) focused on attitudes towards open access practices among faculty researchers in European institutions of higher education. Questions that were incorporated from this survey asked about prevailing attitudes including institutional repository usage, publication charges, and archiving practices.

The RSP and UKCoRR (2011) national survey went to academics across the United Kingdom and garnered 1,676 responses. Participants did include a subset outside of faculty, with 23% (n = 370) reported doctoral students in the study. A large percentage of respondents in the RSP and UKCoRR survey were from a STEM discipline (n = 682; 42%). When asked if they knew about their university repository, UK researchers answered 73% (n = 1108) in the affirmative. When asked if they make any of their publications available in their repository, 59% (n = 617) of UK researchers answered yes. The top reasons for not using the repositories included: haven't published yet, copyright concerns, lack of time, lack of knowledge, or use other method of archiving (Harjuniemi & Lehto, 2012; RSP & UKCoRR, 2011). Institutional repositories may be considered too much additional effort since many researchers share their work through an individual page as offered by sites like ResearchGate or Academia.edu. But, institutional repositories, typically with the support of librarians or archivists, may be better positioned to ensure broad dissemination of self-archived works or data.

RSP and UKCoRR (2011) allowed respondents to fill in their area of research and results were collapsed and coded into four different disciplines: arts and humanities; health and social care, social science; STEM; and business, law. As described in the forthcoming Method section, a similar classification system was used to group Virginia Tech faculty into areas of research for analysis purposes.

Respondents (N = 211) from Finland answered the Harjuniemi and Lehto (2012) survey, which was adopted from the RSP and UKCoRR (2011) survey. While nearly 75% of respondents were aware of their institutional repository, only about 20% of them said they put their own publications there. Researchers selected a number of reasons why they did not participate in OA archiving, including: they did not know how, they were uncertain about copyright permissions, they thought OA archiving came at a cost, and they thought the institutional archiving process was difficult.

With the utilization of questions pulled from multiple surveys from the U.S., Europe, Africa, and Canada, the resulting survey in this study aimed at Virginia Tech faculty attempts to provide a comprehensive view when capturing attitudes and awareness about open access and data sharing practices among researchers at academic institutions in the United States.

Practical Implications

Discipline areas have differing perceptions of open access and that should be taken into account if an overall policy is to be adopted. As of 2010, there were about 5000 open access peer reviewed journals in existence, of which many were from a scientific discipline (Björk et al., 2010). Literature suggests open access articles hold a greater research impact across a variety of disciplines (Antelman, 2004). Creaser et al. (2010) indicate some disciplines, like those from physics and economics, traditionally self-archive papers prior to peer review to support rapid dissemination. Suber (2005) indicates the slow progress of OA in the humanities. Few of the top journals in humanities are OA and a Public Library of Science (PLoS) equivalent does not exist for the Arts. OA advocates will need to give more attention to the arts and humanities if they want to increase participation in those areas.

U.S. funding agencies have implemented their own policies regarding open access in response to a 2013 Office of Science and Technology Policy (OSTP) 2013 memorandum. The OSTP memorandum, entitled “Increasing Access to the Results of Federally Funded Scientific Research” (Holdren, 2013), serves as a directive for any Federal agency with more than \$100 million in annual research expenditures to develop a plan to support public access to the results of research funded by the federal government, which includes any results published in peer-reviewed scholarly publications based on research directly supported by federal funds (Holdren, 2013).

Many agencies already have taken action and have a policy in place regarding access to government funded research and data. For instance, the National Institutes of Health (NIH) have mandated a self-archiving model where NIH-funded researchers must submit final peer reviewed journal manuscripts into PubMed Central within twelve months of being accepted for publication (NIH, 2008). Researchers may struggle to receive new funding if found in non-compliance with research and data policies. Other funding agencies have followed suit. For example, the National Science Foundation (NSF) released their public access policy in 2015 (NSF, 2015) and the Department of Energy (DOE) released their policy in 2014 (DOE, 2014).

Institutional Contexts

The prevailing attitudes from funding agencies suggest that open access is increasingly important to the research mission of these agencies. As a result, institutions have put mechanisms into place to increase an observance of open access practices. Virginia Tech is working to raise open access awareness by hosting OA week events, offering an OA subvention fund, fee discounts, and a variety of OA informational resources, which can be found on an open access website hosted by the University Libraries (2013). In their most recent efforts, the

University Libraries have instituted a new repository for data archiving and sharing (Bassler, 2016).

As with similar studies of open access, it appears that institutions are creating repositories for their faculty to share research and data. While many of the questions about open access will focus on the institutional specific repositories, VTechWorks and VTechData, some questions address open access publishing in journals as well. Typically, self-archiving is used to refer to sharing work in institutional repositories. VTechWorks, which was created in 2012, is the open access scholarly work preservation resource and VTechData, which was launched in 2016, is the open access data sharing resource. Both are institutional repositories administered by Virginia Tech's University Libraries.

Despite the momentum in the direction of open access, the movement is not without criticisms. Beall (2013) argues the open access (OA) movement is poisoning scholarly communication and flooding publications with poor quality. Perhaps one of the hurdles in OA education is that faculty have become used to the traditional models of research dissemination. Bivens-Tatum (2014) fires back at Beall by analyzing his reactive rhetoric. Whether an advocate or a critic, open access provides publics with an opportunity to present, distribute and approach scholarly information in a new way.

Virginia Tech researchers have the privilege of attending an institution where there is ample access to a great deal of scholarly resources, including research librarians who can assist with lowering obstacles for open access publishing and self-archiving. Not all university libraries have the same expansive access to research literature or personnel resources. Open access allows greater access to all, but it does require knowledge and favorable attitudes regarding its benefits relative to costs or obstacles.

Open access is becoming more pervasive as governments, institutions and research funders are adopting policies in support of public access. While some faculty may not be applying to grant funding as much as others, understanding the importance of OA in communicating research is certainly worth their attention. Methods of communication need to be varied and appeal to a variety of diverse faculty populations. The same approach for STEM may not work as well for arts and humanities researchers. Regardless of discipline or title, more guidance in Open Access may need to be integrated in the overall research experience.

Research Questions

The goal of this thesis is to assess institutional awareness about open access publishing and self-archiving among faculty at Virginia Tech and to evaluate the factors that encourage, or inhibit, open access practices. The costs and benefits of open access participation, which may be viewed through a social exchange theoretical lens, are also explored.

RQ1: What are the awareness and usage levels of the open access institutional repositories, VTechWorks and VTechData, at Virginia Tech?

RQ2: What factors inhibit or encourage dissemination in open access venues?

RQ2a: Do these factors differ between data sharing and open access publishing?

RQ3: Are there open access practice differences among faculty ranks or areas of research?

Method

A survey of Virginia Tech faculty served as the method to answer the research questions posed in this thesis. The method section details the sample and participants, procedures, and measures.

Participants

As the literature review shows, faculty members at research institutions have completed similar survey assessments of their open access attitudes and practices (e.g., Dallmeier-Tiessen et al., 2011; Dawson, 2014; Harjuniemi & Lehto, 2012; Kim, 2011; Lwoga & Questier, 2015). In most cases, questions were adapted from previous surveys so that comparisons could be made to other results in the field. Since many such surveys of open access are institutionally based, a specific survey targeting Virginia Tech faculty was commensurate with published research on the topic of open access.

A survey analyzing open access and data sharing practices among researchers was administered to faculty at Virginia Tech. In a series of emails sent out from February 9 - March 15, 2017, participants were provided with a URL that linked them to a Qualtrics survey (see Appendix A). A list of email addresses for the entire population of Virginia Tech tenure and nontenure track faculty, which includes instructional, research, administrative, and professional faculty classifications, were used for survey recruitment. The Office of Institutional Research and Effectiveness provided the list of 4,178 email addresses with permission from the Office of the Executive Vice President and Provost at Virginia Tech.

Although the initial faculty population included 4,178 email addresses across all faculty classifications, 265 email addresses returned automated non-working email or “out-of-office” replies in each of the three participation recruitment attempts. Thus, it is assumed the recruitment email reached 3,913 active email addresses. While the decision was made to recruit from the entire faculty population, 1,641 (41.93%) faculty at Virginia Tech are classified as “administrative” or “professional” faculty, sometimes referred to as A/P faculty. According to the Virginia Tech Faculty Handbook, administrative faculty, “also referred to as senior

administrators, typically serve in executive level leadership roles such as vice president, dean, assistant or associate vice president or dean, or director of a major unit” (Faculty Handbook, 2016, p. 23), while professional faculty “may direct or provide support for academic, administrative, extension, outreach, athletic, or other programs. They may also provide vital university functions such as information technology, budget or finance, human resources, public relations, development, or architectural or engineering functions” (Faculty Handbook, 2016, p. 23). While some of these faculty members were formerly researchers, either at Virginia Tech or elsewhere, prior to their current position, or hold concurrent appointments as research faculty within a college, only 34 responses were received from these faculty members. Of the entire population of 3,913 active email addresses, administrative and professional faculty (n = 1,641) represent 41.93% of the population. The administrative and professional faculty members were included in this survey, but their large percentage of the total faculty population may help explain the low response rate since only 2.07% (n = 34) of the 1,641 Administrative or Professional faculty participated in the survey.

The survey was initiated by 477 (12.19%) faculty members and resulted in 264 completed responses, for a response rate of 6.74%. Although the response rate would increase to 10.12% if responses (n = 230) only from research and teaching faculty (n = 2,272) were included, the goal of this thesis was to understand prevailing attitudes toward open access at Virginia Tech. While subsequent analyses may limit the sample to research faculty exclusively, this thesis reports all completed surveys (N = 264). A fully completed survey was identified as a survey in which participants made their way through the entire survey, even if they failed to answer a question or two along the way. Incomplete surveys were identified as those where the participant abandoned the survey before reaching the final submit button. While an additional

213 partial surveys were completed, only fully completed surveys were included in this analysis. Some participants, despite reaching the end of the survey, did not answer all of the survey questions. In cases where the survey was completed but some questions were skipped, the total response rate for individual questions may be less than 264. A complete account of the survey results is openly available at Lawrence-Kuether (2017).

The average age of participants was 48.12 (N = 261), with 66.9% (n = 176) identifying as male and 32.7% (n = 86) as female. Participants had an average of 16.03 years of research experience.

Materials and Procedures

The goal of this study is to expand current knowledge on perceptions of open access practices. The purpose of utilizing a survey was to investigate faculty awareness, attitudes, and use of open access journals and data. This study was conducted through a Qualtrics survey consisting of questions involving demographic factors such as gender, age, faculty status, academic discipline. Additionally, survey questions asked about research experience and experience with open access publishing, archiving and data sharing. Survey questions asked about knowledge, attitudes and practices regarding open access generally and about Virginia Tech open access resources specifically. Virginia Tech's Institutional Review Board approved of the survey protocol on November 22, 2016 and recruitment began in earnest in the spring of 2017. A copy of the IRB approval letter is attached (see Appendix B).

The survey was open from February 9 to March 15, 2017 and each email address received three recruitment emails. The first email, which was batch sent due to email limits set by the university's email client, spanned a three-day period from February 9 to February 13,

while observing a weekend break. A second email was distributed in a three-day window from February 27 to March 2, while the final recruitment was made between March 8 and March 13.

Measures

The following research measures were used to answer the research questions for this thesis. Reliability coefficients reported for measures were assessed through Cronbach's alpha coefficient, which is assessed through the "scale" feature in SPSS.

Years of experience. The years of experience question asked participants to report the number of years that they have served in a research position. The question was created to serve as a continuous measure. Based on considerations such as the number of years in tenure-track and the average number of years in rank of associate professor, the years of experience data were collapsed to allow comparison by groups for some of the analysis. When years of experience were collapsed, 5 or fewer years experience equates to "early career" (n = 59); 6 to 15 years experience equates to "middle career" (n = 84); and more than 16 years experience equals "advanced career" standing (n = 116).

Research area. Participants were asked to identify the area that best describes their research. More than 20 research disciplines were offered, including: agriculture and biological sciences; arts and humanities; biochemistry, genetics and molecular biology; business, management and accounting; chemical engineering; chemistry; computer science; economics; engineering; environmental science; immunology and microbiology; materials science; mathematics; medicine; physics; psychology; public health; social sciences; veterinary; and "other" (please specify). Since the number of researchers by specific area prohibits assessment of general patterns by discipline, areas of research were collapsed into four groups that made the most sense institutionally based on areas reported. These four groups were created in an effort to

represent clustered areas of research that are similar. Thus, research areas were collapsed into four broad areas of research: arts and humanities (n = 23), public health and social care (n = 22), STEM disciplines (n = 148), and social sciences (n = 67). These four classifications are similar to the classifications used by others (Kim, 2011; RSP and UKCoRR, 2011). In this case, the STEM disciplines of science and engineering were merged, while “public health and social care” was added based on the uniqueness of Virginia Tech’s faculty, which was closely aligned with the classification from the RSP and UKCoRR (2011) survey.

Awareness and use of Virginia Tech resources. Research question 1 asks about awareness and practices related open access at Virginia Tech. For example, survey questions asked participants to indicate whether they were aware of open access subvention fund and library discounted fees. Additionally, participants were asked to indicate their awareness of and use of VTechWorks, the open access archiving repository for Virginia Tech faculty and student research papers and publications, and VTechData, which allows faculty and students to openly share standalone datasets.

Inhibiting factors and obstacles to open access. Participants were asked to indicate whether which, if any, factors were an obstacle to their open access use or participation either for open access publishing or open access archiving. The range of inhibiting factors and obstacles included the following: lack of familiarity with OA repositories/journals, lack of mandatory policy for depositing work in OA venues, OA publications likely misused or plagiarized, lack of time to publish in OA outlets, inadequate skill to publish in OA outlets, fear of violating publisher’s copyright, uncertainty of long-term OA publication availability, OA journals not peer-reviewed/low quality, OA not compatible with existing scholarly practice, inadequate funds to publish in OA outlets, and some OA journals require authors to pay publication costs.

Similarly, participants were asked about their attitudes toward data sharing practices. Using a five-point Likert scale (strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree, and strongly disagree), participants were asked to indicate their level of agreement or disagreement to the question stem, “I would only share my data,” and a range of circumstances: *if I knew what the data would be used for, if it enabled me to get in contact with others, if I had enough time to publish beforehand, if I knew who would be able to access the data, if my employer supported me, if I were cited, if I received co-authorship, or if I received financial compensation*. Additionally, using the same five-point Likert scale as reported above, participants were asked the stem, “I would NOT share my data” with a range of circumstances: *if others could use my data to publish before me, if others could criticize or falsify my work, if the data could be misinterpreted, if the data collected required considerable effort, if a major effort were required to share the data, and if time, or other resources, were not available*.

Important factors for journal publishing. Participants were asked to report the importance of nine factors when they consider publishing their research. Using a five-point Likert scale from strongly agree to strongly disagree, participants were asked to indicate their agreement with the importance of each of the nine factors about the journal: open access, quality, impact factor, acceptance, publication speed, relevance, colleague recommendation, absence of fees, and copyright policy. Mean scores for each of the nine “importance” factors were calculated and used in the analysis.

Attitudes toward open access journals. Participants were asked to report their attitudes toward 11 open access considerations as specified below. In each case, the question asked participants to record their level of agreement or disagreement on the five-point Likert scale spanning strongly agree to strongly disagree. The measures, detailed below, are as follows:

copyright concerns, additional time and effort, accessibility, publicity, trustworthiness, professional recognition, academic reward, altruism, trust, self-archiving culture, and influence of external factors.

Costs and benefit measures: Theoretical measures

Copyright. Three survey items addressed copyright considerations: “I need to ask permission from publishers to post my work on publicly accessible Web sites:” “if I post my work on publicly accessible Web sites without permission, I may infringe copyright;” “I cannot publish my work if I post it on publicly accessible Web sites before publication.” Cronbach’s alpha coefficient was .739 for *copyright*.

Additional time and effort. Additional time and effort combined two survey questions, which addressed “posting my materials on publicly accessible Web sites takes time away from my research and writing” and “it is difficult to learn how to enter the required data (e.g., title, author, date, etc.) with my deposit,” resulting in a Cronbach’s alpha coefficient of .757.

Accessibility. Accessibility combined two survey questions, which addressed “posting my research work on publicly accessible Web sites will increase the chance to communicate my research findings to peers” and “materials on publicly accessible Web sites are more easily accessible through Internet search engines,” resulting in a Cronbach’s alpha coefficient of .742.

Publicity. The measure for publicity combined three survey questions, which addressed “posting my materials on publicly accessible Web sites will enlarge the readership of the materials;” “posting my research work on publicly accessible Web sites will increase the potential impact of my work;” and “posting my research work on publicly accessible Web sites allows for earlier dissemination of my research findings,” resulting in a Cronbach’s alpha coefficient of .893.

Trustworthiness. *Trustworthiness* combined three survey questions, which addressed “I trust the quality of materials on publicly accessible Web sites from authors employed by prestigious institutions;” “I trust the quality of materials on publicly accessible Web sites from well-known researchers in my field;” and “I trust the quality of peer-reviewed articles on publicly accessible Web sites;” resulting in a Cronbach’s alpha coefficient of .770.

Professional recognition. The measure for professional recognition combined two survey questions, which addressed “posting my research work on publicly accessible Web sites will increase my visibility within the discipline(s) to which I belong” and “materials on publicly accessible Web sites will be cited more frequently,” resulting in a Cronbach’s alpha coefficient of .858.

Academic reward. Academic reward combined two survey questions, which addressed, “posting my work on publicly accessible Web sites will adversely affect my chances of tenure/promotion” and “posting my research work on publicly accessible Web sites will adversely affect my chances of attaining research grants,” resulting in an alpha coefficient of .767.

Altruism. Altruism combined four survey questions, which addressed “I will continue posting my work on publicly accessible Web sites even if others in my field do not;” “I support the principle of open access (free and unrestricted access to research materials) for all users;” “posting my materials on publicly accessible Web sites will help other researchers build on my research findings;” and “posting my materials on publicly accessible Web sites allows other scholars to access those that they could not otherwise use,” resulting in a Cronbach’s alpha coefficient of .873.

Trust. The measure for trust combined three survey questions, which addressed, “if I post my materials on publicly accessible Web sites, readers may plagiarize or fail to cite my work;” “if I post my materials on publicly accessible Web sites, the integrity of my work will be compromised;” and “materials on publicly accessible Web sites are not maintained securely,” resulting in a Cronbach’s alpha coefficient of .764.

Self-archiving. Self-archiving combined two survey questions, which addressed “in my field, it is common for researchers to post their pre- or post-refereed articles on publicly accessible Web sites” and “in my department, it is common for faculty and students to create and share working papers or technical reports,” resulting in a Cronbach’s alpha coefficient of .679. While this alpha coefficient is below the recommended level of .70 generally identified as acceptable to the research community, it was retained in the analysis instead of using a single item for *self-archiving*.

External factors. The measure for external factors combined three survey questions, which addressed “my decision to make, (or not to make) my materials publicly accessible on the Internet was influenced by my co-authors or collaborators;” “my decision to make, (or not to make) my materials publicly accessible on the Internet was influenced by my grant-awarding body;” and “My decision to make (or not to make) my materials publicly accessible on the Internet was influenced by my university or department,” resulting in a Cronbach’s alpha coefficient of .767.

Results

Awareness and Use of Institutional Open Access Resources

Research question one asked about awareness and usage of Virginia Tech’s open access resources provided through the University Libraries. VTechWorks, which was created in 2012,

is the open access publishing resource and VTechData, which was launched in 2016, is the open access data sharing resource. Table 1 shows the frequency numbers and percentage of faculty who were aware of VTechWorks and VTechData. Additionally, Table 1 shows results regarding faculty member knowledge of the institution’s Subvention Fund, which helps support costs associated with open access publishing.

Table 1

Virginia Tech Faculty Awareness and Usage of Institutional Open Access Resources (N = 264)

	<u>Yes</u>	<u>No</u>
OA Publishing		
Were you aware of VTechWorks?	130 (49.2%)	133 (50.4%)
Do you use VTechWorks?	45 (17.0%)	214 (81.1%)
OA Data		
Were you aware of VTechData?	62 (23.5%)	193 (73.1%)
Do you use VTechData?	11 (4.2%)	243 (92.0%)
OA Subvention Fund		
Were you aware of the OA Subvention Fund and library discounted fees?	127 (48.1%)	135 (51.1%)
Have you received funding from the OA Subvention Fund?	34 (12.9%)	229 (87.1%)

To serve as a baseline, researchers at Virginia Tech were asked whether they were looking to publish in open access venues. 58.7% (n = 155) responded yes, they were seeking to publish in OA. Results indicate that less than half the survey participants are aware of VTechWorks (49.2%) and even fewer are aware of VTechData (23.5%). Results suggest that even fewer use these institutional resources and repositories. With regards to VTechWorks, only 17% (n = 45) of researchers reported that they deposit their scholarly works into the institutional repository, while only 4.2% (n = 11) of researchers have deposited data into VTechData. Results regarding the awareness and use of the Subvention Fund are similar to the results for awareness

and usage of VTechWorks. While slightly less than half of the faculty were aware of the OA Subvention Fund to help defray costs associated with open access publishing, only 12.9% (n = 34) of survey participants indicated that they have received funding from the OA Subvention Fund.

Inhibiting Factors as Obstacles to Open Access Practices

Research question 2a inquired about the factors that inhibit or encourage dissemination in open access venues and whether the factors that inhibit or encourage are similar for open access publishing and open access data. In order to identify the inhibiting factors that present obstacles for faculty to participate in open access practices, eleven considerations were addressed through the survey. As Table 2 shows, researchers reported that “inadequate funds to publish in OA outlets” was the most significant inhibiting factor (47.9%) to practicing open access. Additional inhibiting factors consisted of “lack of familiarity with OA repositories/journals” (32.0%) followed by “fear of violating publisher’s copyright” (24.7%) and “OA journals not peer-reviewed or of low quality” (24.3%). Overall, researchers did not feel they had “inadequate skill to publish in OA outlets” (5.8%) or that “OA publications are likely misused or plagiarized” (6.2%).

Table 2

Inhibiting Factors as Obstacles to Faculty Open Access (OA) Practices (N = 259)

Inhibiting Factor:	<u>Frequency (%)</u>
Inadequate funds to publish in OA outlets	124 (47.9%)
Lack of familiarity with OA	83 (32.0%)
Fear of violating publisher’s copyright	64 (24.7%)
OA journals not peer reviewed/low quality	63 (24.3%)
Lack of mandatory policy for depositing work in OA venues	41 (15.8%)
Some OA journals require authors to pay publication costs	38 (14.7%)
OA not compatible with existing scholarly practice	30 (11.6%)

Uncertainty of long-term OA publication availability	30 (11.6%)
Lack of time to publish in OA outlets	26 (10.0%)
OA publications likely misused or plagiarized	16 (6.2%)
Inadequate skill to publish in OA outlets	15 (5.8%)

Thus, researchers have the skill and are not concerned about misuse of publications they share in an OA outlet. However, almost half the faculty identified inadequate funds as an inhibiting factor, followed by about one-third of faculty who acknowledged lack of familiarity, and about one-quarter of faculty identified either fear of copyright violation or journal quality as inhibiting factors.

Research question 2b asked about the factors that inhibit or encourage open access data sharing. In order to answer this question, the survey asked respondents to indicate whether they strongly agreed, somewhat agreed, neither agreed nor disagreed, somewhat disagreed, or strongly disagreed with eight data sharing conditions. Similarly, respondents were asked to indicate their level of agreement or disagreement with six conditions under which they would not share their data. Results of research question 2b are presented in Table 3.

While Table 3 shows the percentages across each of the agreement or disagreement options as presented on the survey, attitudes may be easier to understand if the two agreement (strongly agree and somewhat agree) and two disagreement (strongly disagree and somewhat disagree) categories are combined to show general levels of agreement or disagreement. For example, in regards to data sharing practices, the majority of researchers were willing to share their data if they had enough time to publish beforehand 66.1% (n = 174); if their employer supported their efforts 55.4% (n = 146); and if they were cited 73.3% (n = 193). For these three categories, less than 10% registered a form of disagreement in acknowledging that employer support (9.8%), enough time to publish beforehand (8.3%), and acknowledgment through

citation (3.1%) were important considerations for sharing data. The factors that were least influential as a determinant of sharing data were knowledge of who would be able to access the data (38.6%) and receipt of financial compensation for the data (30.1%).

In regards to data sharing practices, researchers were less willing to share their data if others could use the data to publish before them 77.6% (n = 205); if the data could be misinterpreted 62.1% (n = 164); if major effort was required to share the data 73.4% (n = 193); and if time or other resources were not available 77.2% (n = 203).

Table 3

Faculty Attitudes Toward Sharing/Not Sharing Data in OA Outlets (N = 263)

	Agree		Neither	Disagree	
	Strongly -	Somewhat		Somewhat -	Strongly
<i>I would only share my data...</i>					
if I knew what the data would be used for.	14.5%	32.3%	23.6%	17.5%	9.5%
if it enabled me to get into contact with others.	9.9%	32.3%	33.5%	15.2%	6.5%
if I had enough time to publish beforehand.	30.0%	36.1%	22.0%	5.3%	3.0%
if I knew who would be able to access the data.	14.5%	23.9%	33.1%	14.5%	11.0%
if my employer supported me.	16.3%	39.1%	31.6%	6.8%	3.0%
If I were cited.	33.8%	39.5%	20.9%	0.8%	3.0%
If I received co-authorship.	19.8%	25.5%	32.7%	11.0%	7.9%
If I received financial compensation.	11.8%	18.3%	35.0%	14.8%	17.5%
<i>I would NOT share my data...</i>					
if others could use my data to publish before me.	54.9%	22.7%	11.0%	3.8%	2.7%
if other could criticize or falsify my work.	28.4%	15.9%	23.9%	16.3%	11.0%
if the data could be misinterpreted.	34.1%	28.0%	15.9%	12.9%	4.5%
if the data collected required considerable effort.	18.6%	30.3%	27.3%	13.6%	5.7%
if a major effort were required to share the data.	31.2%	42.2%	17.1%	4.9%	0.4%
if time, or other resources, were not available.	32.7%	44.5%	15.2%	2.7%	0.4%

In fact, the overwhelming majority of faculty agreed that these were important considerations for sharing data. Less than 10% of faculty *disagreed* that if others publishing off of data before the researcher (6.5%), if major effort is required to share data (5.3%), and if time and other resources were not available (3.1%), they would be less likely to share data through an open data resource.

Open Access Practices by Faculty Career Length

Research question 3 asked whether the open access practices differed by faculty career length or area of research. As discussed in the method section, faculty career length was asked as a continuous variable, with faculty indicating the number of years they have served in a research position. In an effort to classify the faculty by early, middle, or advanced career standing, years in a research position were collapsed into three groups: 5 years or less for early career, between 6 and 15 years for middle career, and more than 15 years of service for advanced career classification. In order to test for difference between faculty career standing, a crosstabulation was performed using the frequency of mentions for each inhibiting factor and early, middle, or advanced standing of participants. Chi-square results indicated significant difference based on career standing for “uncertainty of long-term OA publication availability” [$\chi^2 (2, 254) = 7.84, p < .05$] and “inadequate funds to publish in OA outlets” [$\chi^2 (2, 254) = 15.84, p < .001$]. Advanced career researchers were the most likely (17.2%) to identify long term availability of OA publications as a concern, followed by middle career (9.5%) and early career (3.4%) participants. Middle (57.1%) and advanced (52.6%) career researchers were much more likely than early (25.4%) career researchers to identify inadequate funds as an inhibiting factor for OA participation.

In an effort to determine whether inhibiting factors differed by area of research, a crosstabulation was performed using the frequency of mentions for each inhibiting factor and

area of research of participants. The four areas of research (Arts & Humanities, Public Health and Social Care, STEM, and Social Science) were crosstabulated against the inhibiting factors. Chi-square results indicated significant difference based on area of research for “OA publications likely misused or plagiarized” [$\chi^2(3, 254) = 7.77, p < .05$]. Arts & humanities researchers were the most likely (17.4%) to identify the possibility of OA publications becoming misused or plagiarized as a concern, followed by public health and social care (13.6%). Faculty in the social sciences (6.0%) and STEM (4.1%) disciplines rarely indicated concern for misuse or plagiarism as a concern for open access publications. Thus, there were few factors that differed significantly based on faculty career standing or area of research through this analysis.

In an effort to explore additional considerations that might be impacted by faculty career standing or area of research, analysis is made of the important factors faculty consider when selected a journal in which to publish their work. Table 4 shows mean scores for nine factors faculty might consider when selecting a journal. As the table notes, the mean score is based on a 5-point scale, with *extremely important* representing a 5 and *not at all important* represented by a 1. For each faculty career classification, the quality of the journal and the relevance of the journal to the research community were the most important considerations. The journal’s impact factor, which is typically another indicator of its quality, was the third most important factor among faculty regardless of classification. Interestingly, whether the journal is open access has the least importance among faculty at any career level as it recorded the lowest mean score for any of the nine factors for each group.

To tease out statistical differences, a one-way between subjects ANOVA was conducted to compare the effect of years of research on factors relating to selecting a journal for publication in early career, mid-career and advanced career conditions. Table 4 shows that the mean scores

for the factors are very similar in that the scores are relatively class across career standing and the factors rank similarly in importance within the faculty standing groups. Nevertheless, there was a significant effect of years of research on the *quality of the journal* at the $p < .05$ level for the three conditions [$F(2, 256) = 3.24, p = 0.041$]. Post hoc comparisons using the Tukey HSD test indicated that the mean score for the early career condition ($M = 4.31, SD = 1.26$) was significantly different than the mid-career ($M = 4.56, SD = 0.86$) and the advanced career conditions ($M = 4.67, SD = 0.70$). These results suggest that as faculty members gain more years of research experience, they find the quality of the journal to be an important factor when choosing where to publish.

Table 4

Mean Scores for Importance of Factors When Selecting a Journal for Publication (N = 263).

Factor	Faculty Career Standing		
	Early	Middle	Advanced
The journal is open access	2.22	2.38	2.21
Quality of journal*	4.31	4.56	4.67
Journal impact factor	3.68	3.88	3.81
Likelihood of acceptance**	3.07	3.52	3.66
Publication speed**	2.69	3.39	3.23
Relevance of journal to research community*	4.15	4.55	4.49
Journal recommended by colleague	3.29	3.29	3.17
Absence of journal fees*	2.68	2.98	3.17
Copyright policy of journal	2.69	2.62	2.65

** Indicates significant difference between groups at the level of $p < .01$

* Indicates significant difference between groups at the level of $p < .05$

Note: The survey question asked, “What factors are important when selecting a journal to publish in?” Responses options were *extremely important* (coded as a 5), *very important* (4), *moderately important* (3), *slightly important* (2), and *not at all important* (1). The score reported in the table is the mean score for each career standing classification.

Additionally, there was a significant effect of years of research on the *likelihood of article acceptance* at the $p < .05$ level for the three conditions [$F(2, 256) = 5.97, p = 0.003$]. Post

hoc comparisons using the Tukey HSD test indicated that the mean score for the early career condition ($M = 3.07$, $SD = 1.27$) was significantly different than the mid-career ($M = 3.52$, $SD = 1.07$) and advanced career conditions ($M = 3.66$, $SD = 0.96$). These results suggest that as faculty members gain more years of research experience, they find the likelihood of getting an article accepted to be an important factor when choosing where to publish. Results also indicate a significant difference based on years of research and the *speed of publication* at the $p < .05$ level for the three conditions [$F(2, 256) = 6.12$, $p = 0.003$]. Post hoc comparisons using the Tukey HSD test indicated that the mean score for the early career condition ($M = 2.69$, $SD = 1.37$) was significantly different from the mid-career condition ($M = 3.39$, $SD = 1.02$) and advanced career condition ($M = 3.23$, $SD = 1.25$). These results suggest that early career researchers are less concerned with the speed of publication when choosing where to publish.

Results also indicate a significant effect of years of research on the *journal relevance* at the $p < .05$ level for the three conditions [$F(2, 256) = 3.49$, $p = 0.032$]. Post hoc comparisons using the Tukey HSD test indicated that the mean score for mid-career ($M = 4.55$, $SD = 0.75$) and advanced career conditions ($M = 4.49$, $SD = 0.78$) were significantly different from the early career condition ($M = 4.15$, $SD = 1.38$). These results suggest that middle and advanced career researchers are more concerned with the journal's relevance to their community when choosing where to publish.

Furthermore, there was a significant effect of years of research on the *absence of publication fees* at the $p < .05$ level for the three conditions [$F(2, 256) = 4.37$, $p = 0.014$]. Post hoc comparisons using the Tukey HSD test indicated that the mean score for early career ($M = 2.68$, $SD = 1.28$), middle career ($M = 2.98$, $SD = 1.29$), and advanced career conditions ($M = 3.27$, $SD = 1.28$) were significantly different from one another. These results suggest that as

faculty members gain more years of research experience, they find the absence of publication fees to be an important factor when choosing where to publish.

Thus, while the factors that faculty express as important to their journal choices when publishing are similar in terms of ranked importance, there are significant differences in terms of the level of importance faculty assign to these factors at different career stages.

Additional consideration of the final research question regarding faculty differences by career standing is assessed through the questions asking faculty to indicate their awareness or attitudes toward open access journals. Table 5 shows the mean score for cost and benefit factors related to open access practices.

Table 5

Mean Scores for Factors Affecting Faculty Open Access Attitudes and Practices (N = 259)

	Career Standing		
	Early (n = 59)	Middle (n = 84)	Advanced (n = 116)
Cost Factors			
Copyright Concerns**	2.71	2.71	2.34
Additional Time & Effort	3.34	3.26	3.07
Benefit Factors - Extrinsic			
Accessibility*	3.81	4.05	3.71
Publicity	3.98	4.05	3.88
Trustworthiness*	3.89	3.60	3.60
Professional Recognition	3.63	3.61	3.47
Academic Reward	3.25	3.55	3.46
Benefit Factor - Intrinsic			
Altruism	3.13	3.13	3.15

* Note: As described in the method, each of the cost and benefit factors were comprised of reliable constructs. The score presented in the table is a mean score from questions asking respondents to indicate their level of agreement or disagreement with statements regarding each cost or benefit factor. Strongly agree was coded as a score of 5, while strongly disagree was coded as a 1, with agree, neutral, and disagree scoring 4, 3, and 2, respectively.

Table 5 shows that, for the most part, the extrinsic benefits were stronger factors in determining faculty attitudes toward open access as these factors generally produced the highest mean scores. A one-way between subjects ANOVA was conducted to compare the effect of years of research on factors relating to the awareness and attitudes of open access practices in early career, middle career and advanced career groupings.

There was a significant effect of years of research on *copyright concerns* at the $p < .01$ level for the three conditions [$F(2, 256) = 5.43, p = 0.005$]. Post hoc comparisons using the Tukey HSD test indicated that the mean score for the advanced career condition ($M = 2.34, SD = 0.82$) was significantly different than the early career ($M = 2.71, SD = 0.99$) and mid-career conditions ($M = 2.71, SD = 0.89$). These results suggest that advanced career researchers are more concerned with copyright considerations and open access practices than early and mid-career researchers.

There was a significant effect of years of research on *accessibility* at the $p < .05$ level for the three conditions [$F(2, 256) = 3.75, p = 0.038$]. Post hoc comparisons using the Tukey HSD test indicated that the mean score for the mid-career condition ($M = 4.05, SD = 0.84$) was significantly different from the early career ($M = 3.81, SD = 0.85$) and the advanced career conditions ($M = 3.71, SD = 0.95$). These results seem to indicate that mid-career researchers felt open access allowed their work to be more accessible to others, more so than early and advanced career researchers.

There was a significant effect of years of research on *trustworthiness* at the $p < .05$ level for the three conditions [$F(2, 256) = 3.33, p = 0.020$]. Post hoc comparisons using the Tukey HSD test indicated that the mean score for the early career condition ($M = 3.89, SD = 0.71$) was significantly different than the mid-career ($M = 3.60, SD = 0.70$) and the advanced career

conditions ($M = 3.61$, $SD = 0.78$). Results indicate that early career researchers are more likely to trust the quality of open access materials over middle and advanced career researchers.

Discussion

Results indicate that close to 50% of Virginia Tech faculty are aware of the institutional repository for research and close to 60% of Virginia Tech faculty are interested in publishing in open access venues. This places Virginia Tech within a range of awareness similar to other faculty at research institutions across North America, Europe and Africa. The 49.2% awareness of VTechWorks among the faculty respondents exceeds the 40% awareness reported by Kim (2011) in her evaluation of faculty at 17 Carnegie doctorate-granting universities, but lower than the 73% (Harjuniemi & Lehto, 2012) and 59% (RSP UKCoRR, 2011) awareness among surveys of faculty at European universities. However, the 17.0% of faculty usage of VTechWorks at Virginia Tech is slightly higher than the 15.9% usage reported by Kim (2011), and close to the 20% reported by Harjuniemi and Lehto (2012), but far below the 59% use reported by participants in the RSP UKCoRR (2011) survey.

Comparison of usage for institutional repositories for data is more limited since most of the other surveys do not assess differences between repositories for research and repositories for data. However, similar to Fecher et al. (2015), researchers at Virginia Tech did indicate some obstacles to sharing their data. 77.6% of Virginia Tech researchers were concerned with sharing their data if other researchers could publish off the data before them; similarly, Fecher et al. (2015) reported 80% of researchers held the same concern. 73.4% of Virginia Tech researchers were concerned with sharing their data if major effort was required, whereas 59% of researchers in the Fecher et al. (2015) study held the same concern. 62.1% of Virginia Tech researchers were concerned with sharing their data if it could be misinterpreted, though 46% of researchers

in the Fecher et al. (2015) study indicated the same concern. Since the research repository has been available for a few years longer than the data repository, it is not surprising that there are differences among Virginia Tech faculty awareness and usage of VTechWorks and VTechData.

Another data point that is difficult to compare across universities is institutional support for open access publishing in journals since prior studies have not measured presence of subvention funds or faculty awareness of institutional subvention funds, which support faculty costs for publishing in open access journals. Nevertheless, almost half of the Virginia Tech faculty are aware of the subvention fund. What seems to be the biggest obstacle for data sharing is fear that the researcher will not be able to get the data published before those whom access the data through an open data repository. Among Virginia Tech faculty, ensuring that researchers are cited when their data is used was the most important consideration. Researchers seemed more willing to share data they could ensure publishing from the data before it was shared, while significant time or effort were required to upload the data are considerable obstacles. Given the concerns over publication, perhaps an embargo period would be acceptable in some disciplines. However, it is also possible that an embargo period would be unacceptable, in such fields as public health for example. An embargo on sharing data in epidemiology, especially international crises such as the H1N1 crises, for example, would be irresponsible to impose if it meant that a delay would jeopardize lives. Since data repositories appear newer at most institutions, more institutional educational efforts may be required to increase open access practices among faculty and graduate students. Standard procedures will also need to be in place to ensure that operational definitions of variables are shared as are specific survey questions or data collection methods are uploaded along with data.

Results indicate that factors that inhibit open access practices at Virginia Tech are similar to the factors that inhibit researchers at other institutions. The leading factors that inhibit Virginia Tech faculty open access practices are inadequate funds to publish in OA outlets (47.9%), lack of familiarity with OA repositories (32.0%), fear of violating publisher's copyright (24.7%), and concerns about the quality of OA journals or lack of peer review (24.3%). Lack of knowledge and copyright concerns were cited in many of the prior surveys (Dawson, 2014; Harjuniemi & Lehto, 2012; Kim, 2011; Lwoga & Questier, 2015; RSP UKCoRR, 2011) as considerable obstacles to open access practices. But, the most significant reason identified by Virginia Tech faculty was cost associated with open access journals, which supports findings from other surveys (Dawson, 2014; Harjuniemi & Lehto, 2012). Thus, it seems that there are a sizable portion of faculty in North America and Europe who share concerns about open access publishing. It will be important for academic associations, such as the National Academy of Engineering, American Psychological Association, American Sociological Association, research universities and institutions, and perhaps even unions like the American Association of University Professionals to create codes of practices to help guide faculty engagement in open access. The American Library Association is certainly well positioned to continue leading the charge to support open access policies for universities. While there would likely be some institutional-specific objections, or at least individual researcher objections, tying yearly productivity or activity reports to open access offers great promise to increase participation. For example, if VTechWorks was populated each year through upload of research works as part of the Faculty Activity Report, compliance would certainly increase significantly. Virginia Tech may already be headed in this direction; when logged into the University's Electronic Faculty Activity Reporting System, faculty can also deposit their scholarly items to VTechWorks. This

would still require a significant educational effort on part of the institution, and likely an opt-out feature for research funded by proprietary organizations and sensitive government- or defense-sponsored research reports. It is likely that this would be a faculty governance issue at research universities and likely need to pass through the governance process or union, but it seems to be the direction the research environment is moving if the precedent established by government agencies is the compass.

Theoretical Implications

The results of this survey help identify the motivations of faculty participation in open access (OA). Kim's (2011) identification of costs and benefits, both extrinsic and intrinsic, were helpful in observing open access through the lens of social exchange. This study confirms Kim's (2011) findings about the factors identified as motivations to share research. While there were some differences based on where the researcher is in their career (early, middle or advanced), having research accessible to broad and global audiences, the opportunity to increase citations and publicity for research, and the trustworthiness of open access venues were important considerations for open exchange regardless of career standing. Consistent with Kim (2011), altruism was an important factor in terms of attitudes toward open access. While altruism is a consideration for most of the researchers in this study, others were motivated by extrinsic career goals. For some researchers, it appears as though only mandates to share research will motivate them to share research or data in an open repository or through an open journal. Self-archiving and copyright concerns were less an inhibiting factor to open access journal publishing than the other factors measured. By discovering which factors encourage or hinder participation, we can then see how social exchange is reflected in researcher actions. Salager-Meyer (2012) asserts that OA increases the social value of science, meaning research can be accessed, used, applied,

and built upon in further research. By placing a value on OA, researchers may be more inclined to participate to maximize personal gains.

Overall, this study shows that faculty at Virginia Tech are in support of open access, but they may still have concerns about participating in open access practices. If institutions are interested in achieving more faculty involvement with OA, they should make sure the benefits of OA outweigh the perceived costs for researchers.

Limitations

The sample size of the study comprised of 264 faculty members at Virginia Tech. This number is relatively low in comparison to the population size of 4,178 faculty. As noted earlier, many of the faculty on the distribution list are administrative or professional faculty, which suggests that they may not have an active role as a researcher. However, to avoid excluding faculty that may have an interest or opinion to share regarding open access and scholarly communication, everyone on the distribution list was contacted and invited to participate in the survey. Additionally, the dropout rate of respondents equated to 44.7% (n = 231). This relatively high rate may be due to the length of the survey. Also, it is possible that those that chose to respond to the survey already had an interest in open access issues. The survey was meant to be comprehensive to capture social exchange constructs along with open access and data sharing practices and has resulted in a rich data set.

Conclusion and Future Study

The survey conducted at Virginia Tech has collected a large amount of responses regarding open access and data sharing awareness, attitudes, and practices among faculty across disciplines and years of research experience. While the data sample cannot represent the

opinions of all faculty at Virginia Tech, it does present a cross-sectional sample of attitudes on open access and data sharing practices that were not previously analyzed.

Open access is becoming more pervasive as governments, institutions and research funders are adopting policies in support of public access. Understanding the importance of OA in communicating research is worthy of attention. Methods of communication need to be varied and appeal to all career levels and research disciplines. Regardless of discipline or career level, more guidance in open access needs to be integrated in the overall research experience.

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Appendix A:
Faculty open access practices questionnaire

Q1 VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY Informed Consent
for Participants in Research Projects Involving Human Subjects

Title of Project: Faculty Open Access Practices

- I. Purpose of this Research Project: This study will seek to investigate faculty awareness, attitudes, and use of open access journals and data. Results will be used for a Master's thesis and may be used for publication at some point in the future.
 - II. Procedures: Should you agree to participate you will be directed to an online survey from Qualtrics software and presented with a survey. You will be presented with demographic questions, then a questionnaire to measure your awareness, attitudes and use of open access journals, data sharing and archiving practices. In total, this task will require approximately 20 minutes of your time. There will be no additional requirements after completing the questionnaire.
 - III. Risks: This study poses no physical risks to participants and a minimal possibility of emotional distress from answering the questionnaire.
 - IV. Benefits: This research project aims to expand current knowledge on perceptions of open access practices. No promise or guarantee of benefits has been made to encourage you to participate.
 - V. Confidentiality: Your privacy will be protected throughout this process and all the information you submit will be kept confidential. It is possible that the Institutional Review Board (IRB) may view this study's collected data for auditing purposes. The IRB is responsible for the oversight of the protection of human participants involved in research.
 - VI. Compensation: No participants will receive compensation for participating in the survey.
 - VII. Q2 Freedom to Withdraw: It is important for you to know that you are free to withdraw from this study at any time without penalty. You are free not to answer any questions that you choose or respond to what is being asked of you without penalty.
 - VIII. Questions or Concerns: Should you have any questions about this study, you may contact one of the research investigators whose contact information is included at the beginning of this document. Should you have any questions or concerns about the study's conduct or your rights as a research subject, or need to report a research-related injury or event, you may contact the VT IRB Chair, Dr. David M. Moore at moored@vt.edu or (540) 231-4991.
- Q2 By checking here I affirm that I have read the Consent Form and conditions of this project, have had all my questions answered, and hereby acknowledge the above and give my voluntary consent.

Q3 What is your gender?

- Male
- Female
- Other

Q4 What is your age?

Q5 Which of the following best represents your ethnic group?

- White
- Black or African American
- American Indian or Alaska Native
- Asian
- Native Hawaiian or Pacific Islander
- Other

Q6 What is your current academic title?

- Professor
- Associate Professor
- Assistant Professor
- Instructor
- Research Scientist
- Research/Project Associate
- A/P Faculty
- Other (please specify) _____

Q7 Which of the following best describes your area of research?

- Agricultural and Biological Sciences
- Arts and Humanities
- Biochemistry, Genetics and Molecular Biology
- Business, Management and Accounting
- Chemical Engineering
- Chemistry
- Computer Science
- Economics
- Engineering
- Environmental Science
- Immunology and Microbiology
- Materials Science
- Mathematics
- Medicine
- Physics
- Psychology
- Public Health
- Social Sciences
- Veterinary
- Other (please specify) _____

Q8 How many years have you been employed in a position that has a research component?

Years:

Q9 How many peer-reviewed articles do you publish in a typical year?

Peer-reviewed articles:

Q10 On average, how many scholarly publications (conference proceedings, book chapters, etc.) do you publish a year?

Scholarly publications:

Q11 Open Access (OA) is a term used to describe barrier-free access to research materials (e.g., peer-reviewed publications, research protocols, etc.) for all to access.

Q12 Please explain how you feel about the concept of open access:

Q13 Are you seeking to publish in open access journals?

- Yes
- No

Q14 Has there been a specific reason why you have not published an open access article? If so, please give your reason(s) in the textbox provided.

Q15 For funded research, if applicable, do you usually know whether the funding body requires or recommends open access archiving of results?

- Yes
- No
- Not Applicable

Display This Question:

If For funded research, if applicable, do you usually know whether the funding body requires or recommends open access archiving of their funded research? Not Applicable Is Not Selected

Q16 If you are applying for a grant from a funding agency (e.g., NSF, NIH, DoD) are you aware that they allow you to budget for publication charges within the funding?

- Yes
- No

Q17 If a funding agency allowed you to include publication charges, would you consider doing this to cover Open Access journal publication charges?

- Yes
- No

Q18 In your regard to the question above, please indicate why or why not.

Q19 Are you aware of Virginia Tech's OA Subvention Fund and library discounted fees to support OA publishing?

- Yes
- No

Q20 In cases where you received funding to support OA publishing, please select where that funding was received (check all that apply):

- Grants
- VT Department
- Library OA fund
- Other (please specify) _____

Q21 Please explain how you feel about using open access repositories:

Q22 Virginia Tech offers VTechWorks, a digital archive that provides access to and preservation of the scholarly work of Virginia Tech faculty, students, and staff (<http://vtechworks.lib.vt.edu/>).

Q23 Were you aware of VTechWorks, the digital archive at Virginia Tech?

- Yes
- No

Q24 Do you currently make any of your publications available in VTechWorks?

- Yes
- No

Display This Question:

If Do you currently make any of your publications available in VTechWorks? No Is Selected

Q25 If you are aware of VTechWorks and are NOT currently making material available in it, why not?

- I don't know how to do it
- I'm not sure it is permitted according to the publisher's copyright agreement
- I don't have permission from the other authors
- It is too much trouble
- I don't want to put my publications into VTechWorks
- Other reason (please specify) _____

Q26 Do you make your publications available in a different way, for example in a subject-based repository or networking site? (e.g., ArXiv or ResearchGate)

- Yes
- No

Display This Question:

If Do you make your publications available in a different way, for example in a subject-based repository or networking site? (e.g., ArXiv or ResearchGate) Yes Is Selected

Q27 What other repositories or sites do you use to share your publications? (please check all that apply)

- ArXiv
- Social Science Research Network
- PubMedCentral
- ResearchGate
- Academia.edu
- Other (please specify) _____

Q28 Do any of the journals in your research field publish open access journals?

- Yes
- No

Q29 Do you think your research field benefits, or would benefit, from journals that publish open access articles?

- Yes
- No

Q30 How easily can you gain online access to peer-reviewed journal articles of interest to your research?

- Extremely easy
- Somewhat easy
- Neither easy nor difficult
- Somewhat difficult
- Extremely difficult

Q31 When you are reading a journal article, are you generally aware of whether it is open access or not?

- Yes
- No

Q32 How do you know whether the article is open access?

- I had prior knowledge that the article or journal was open access
- It is clearly indicated on the web page linking to the article
- It is clearly indicated in the article itself
- Other (please specify) _____

Q33 What factors are important to you when selecting a journal to publish in?

	Extremely important	Very important	Moderately important	Slightly important	Not at all important
The journal is Open Access	<input type="radio"/>				
Quality of the journal	<input type="radio"/>				
Journal impact factor	<input type="radio"/>				
Likelihood of article acceptance	<input type="radio"/>				
Speed of publication	<input type="radio"/>				
Relevance of the journal for my community	<input type="radio"/>				
Recommendation of the journal by my colleagues	<input type="radio"/>				
Absence of journal publication fees	<input type="radio"/>				
Copyright policy of the journal	<input type="radio"/>				

Q34 What factors inhibit you to disseminate your publications in OA venues? (Select all that apply.)

- Not familiar with OA repositories and journals
- Lack of mandatory policies for depositing in OA venues
- OA publications are likely to be misused or plagiarized
- Lack of time to publish in OA outlets (e.g. journals, repositories)
- Inadequate skills to publish in OA outlets
- Fear of violating publishers' copyright policies
- Long-term availability of OA publications is not guaranteed
- OA journals are not peer-reviewed and are of low quality
- OA is not compatible with existing scholarly communication practice
- Inadequate funds to conduct research and publish my outputs
- Some OA journals require authors to pay publishing costs
- Lack of OA journals in my field
- Other (please specify) _____
- None of the above

Q35 Below are a number of statements regarding your awareness and attitudes toward open access. Please read each one and indicate to what extent you agree or disagree with each statement.

COPYRIGHT CONCERNS

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I need to ask permission from publishers to post my work on publicly accessible Web sites.	<input type="radio"/>				
If I post my work on publicly accessible Web sites without permission, I may infringe copyright.	<input type="radio"/>				
I cannot publish my work if I post	<input type="radio"/>				

it on publicly accessible Web sites before publication.					
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Q36 ADDITIONAL TIME AND EFFORT

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Posting my materials on publicly accessible Web sites takes time away from my research and writing.	<input type="radio"/>				
It is difficult to learn how to enter the required data (e.g., title, author, date, etc.) with my deposit.	<input type="radio"/>				

Q37 ACCESSIBILITY

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Posting my research work on publicly accessible Web sites will help increase the chance to communicate my research findings to peers.	<input type="radio"/>				
Materials on publicly accessible Web sites are more easily found through Internet search engines.	<input type="radio"/>				

Q38 PUBLICITY

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Posting my materials on publicly accessible Web sites will enlarge the readership of the materials.	<input type="radio"/>				
Posting my research work on publicly accessible Web sites will increase the potential impact of my work.	<input type="radio"/>				
Posting my research work on publicly accessible Web sites allows for earlier dissemination of my research findings.	<input type="radio"/>				

Q39 TRUSTWORTHINESS

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I trust the quality of materials on publicly accessible Web sites from authors employed by prestigious institutions.	<input type="radio"/>				
I trust the quality of materials on publicly accessible Web sites from well-known researchers in my field.	<input type="radio"/>				
I trust the quality of peer-reviewed articles on publicly accessible Web sites.	<input type="radio"/>				

Q40 PROFESSIONAL RECOGNITION

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Posting my research work on publicly accessible Web sites will increase my visibility within the discipline(s) to which I belong.	<input type="radio"/>				
Materials on publicly accessible Web sites will be cited more frequently.	<input type="radio"/>				

Q41 ACADEMIC REWARD

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Posting my work on publicly accessible Web sites will adversely affect my chances of tenure/promotion.	<input type="radio"/>				
Posting my research work on publicly accessible Web sites will adversely affect my chances of attaining research grants.	<input type="radio"/>				

Q42 ALTRUISM

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I will post my work on publicly accessible Web sites even if others in my field do not.	<input type="radio"/>				
I support the principle of open access (free and unrestricted access to research materials) for all users.	<input type="radio"/>				
Posting my materials on publicly accessible Web sites will help other researchers build on my research findings.	<input type="radio"/>				
Posting my materials on publicly accessible Web sites allows other scholars to access research to which they would otherwise not have access.	<input type="radio"/>				

Q43 TRUST

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
If I post my materials on publicly accessible Web sites, readers may plagiarize or fail to cite my work.	<input type="radio"/>				
If I post my materials on publicly accessible Web sites, the integrity of my work will be compromised.	<input type="radio"/>				
Materials on publicly accessible Web sites are not preserved for prosperity.	<input type="radio"/>				

Q44 SELF-ARCHIVING CULTURE

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
In my field, it is common for researchers to post their pre- or post-refereed articles on publicly accessible Web sites.	<input type="radio"/>				
In my department, it is common for faculty and students to create and share working papers or technical reports.	<input type="radio"/>				

Q45 INFLUENCE OF EXTERNAL FACTORS

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
My decision to make, (or not to make) my materials publicly accessible on the Internet was influenced by my co-authors or collaborators.	<input type="radio"/>				
My decision to make, (or not to make) my materials publicly accessible on the Internet was influenced by my grant-awarding body.	<input type="radio"/>				
My decision to make (or not to make) my materials publicly accessible on the Internet was influenced by my university or department.	<input type="radio"/>				

Q46 The following questions refer to your research and data sharing practices.

Q47 Which of the following characteristics describes the data you work with?

- Quantitative data (e.g., datasets from surveys or experiments)
- Qualitative data (e.g., text analysis or narrative interviews)
- Sensitive data (e.g., due to data protection regulations, patents, or proprietary agreements with funding agencies or sponsors)

Q48 Do you agree with the following statements?

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
Researchers should generally publish their data.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have more disadvantages than advantages when I share my data with others.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is common in my research community/discipline to share data.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know where and how I can find relevant secondary data for my work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know where and how I can make data that I collected available to others.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It deters me from publishing when a journal requires the publication of my data.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Freely available research data is a great contribution to scientific progress.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q49 I would only share my data

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
If I knew what that data were going to be used for.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If sharing the data enabled me to get into contact with other researchers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I had enough time beforehand, to publish on the basis of my data.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I knew who would be able to access the data.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If my employer supported me actively (e.g., by providing technical support/time).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I were cited by publications using my data.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I were given a co-authorship on articles using my data.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I received financial compensation for the effort.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q50 I would NOT share my data

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
If other researchers could use my data to publish before me.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If others could criticize or falsify my work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If the data could be misinterpreted.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If the data collection required considerable effort.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If a major effort were required to share the data.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If the time, or other resources necessary (e.g., technical), were not available.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q51 Which materials would you be willing to share with other researchers?

- Raw data as they were collected
- Survey designs (e.g., questionnaires or experimental set-up)
- Preregistration of hypotheses and analysis plans
- Prepared, or cleaned, data
- Data documentation (metadata)
- Analysis scripts
- Code/software
- All of the above

Q52 Under what conditions would you share your research data?

- Unconditionally
- On demand
- If an embargo period was provided
- Based on a specific user agreement
- Based on a reciprocal agreement
- Research community or research network exclusively
- If I was cited in publications or reports
- Based on requirements or restrictions from sponsor
- Not at all

Q53 With whom would you be willing to share your data?

- With researchers I know personally
- With researchers within my research institution or organization
- With researchers who work with similar topics
- With the public

Q54 Have you ever shared your research data with others?

- Yes, with researchers I know personally
- Yes, with researchers within my institute or organization
- Yes, with researchers who work on similar topics
- Yes, with all non-commercial researchers
- Yes, with commercial researchers
- Yes, with the public
- Yes, with those whom I was contractually obligated or with whom I agreed to share based on a sponsor agreement
- Yes, with those whom I share a data partnership
- No

Q55 Have you ever used secondary data (data that you use but did not collect yourself)?

- Yes
- No

If No Is Selected, Then Skip To Virginia Tech offers VTechData, a pla...

Q56 When using secondary data, how important do you find the following?

	Extremely important	Very important	Moderately important	Slightly important	Not at all important
That the data come from a reliable person or organization	<input type="radio"/>				
That relevant articles have already been published with the data	<input type="radio"/>				
That the data collection is documented comprehensively	<input type="radio"/>				
That the data are easy to use for me (e.g., machine readable)	<input type="radio"/>				
That there is a contact person available for questions	<input type="radio"/>				

Q57 What would you like to do with secondary data?

- Use them for (my own) original research questions
- Use them to replicate and verify research findings

Q58 What would you expect data files contain when working with secondary data?

- Descriptions of the data and their origin
- Explanation on how to use the data
- References that show how the data has been used before
- Data preparation scripts and program code
- Information concerning the editor of data

Q59 Virginia Tech offers VTechData, a platform for openly publishing datasets or other research products created by Virginia Tech faculty, staff, and students. (<https://data.lib.vt.edu/>).

Q60 Were you aware of VTechData, the digital data repository at Virginia Tech?

- Yes
- No

Q61 Do you currently make any of your datasets available in VTechData?

- Yes
- No

Display This Question:

If Do you currently make any of your datasets available in VTechData? No Is Selected

Q62 If you are aware of VTechData and are NOT currently making datasets available in it, why not?

- I don't know how to do it
- I'm not sure it is permitted according to the publisher's copyright agreement
- I don't have permission from the other authors
- It is too much trouble
- I don't want to put my data into VTechData
- Other reason (please specify) _____

Q63 Do you have any suggestions for how publication and use of research data could be facilitated and fostered here at Virginia Tech?

Q64 Do you have any other open access and data sharing concerns that were not addressed in this survey?

Appendix B
IRB approval letter



Office of Research Compliance
Institutional Review Board
North End Center, Suite 4120, Virginia Tech
300 Turner Street NW
Blacksburg, Virginia 24061
540/231-4606 Fax 540/231-0959
email irb@vt.edu
website <http://www.irb.vt.edu>

MEMORANDUM

DATE: November 22, 2016
TO: John C Tedesco, Maureen Anne Lawrence-Kuether, Philip E Young, James Dee Ivory
FROM: Virginia Tech Institutional Review Board (FWA00000572, expires January 29, 2021)
PROTOCOL TITLE: Faculty Open Access Practices
IRB NUMBER: 16-950

Effective November 22, 2016, the Virginia Tech Institution Review Board (IRB) Chair, David M Moore, approved the Amendment request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at: <http://www.irb.vt.edu/pages/responsibilities.htm>

(Please review responsibilities before the commencement of your research.)

PROTOCOL INFORMATION:

Approved As: **Exempt, under 45 CFR 46.110 category(ies) 2**
Protocol Approval Date: **October 21, 2016**
Protocol Expiration Date: **N/A**
Continuing Review Due Date*: **N/A**

*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

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An equal opportunity, affirmative action institution

Date*	OSP Number	Sponsor	Grant Comparison Conducted?

* Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office (irbadmin@vt.edu) immediately.