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RESEARCH

ETD Management & Publishing in the ProQuest System and the University Repository: A Comparative Analysis

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Abstract

INTRODUCTION This study compares the two most popular electronic theses and dissertation (ETD) management systems used in the American higher education community today: the commercial ProQuest dissertation publishing system and the university repository. **METHODS** Characteristics of these systems are identified and categorized to determine the features, functions, and policies common to both, and those that uniquely characterize one or the other system. Performing such a head-to-head comparison provides valuable information and insights to decision makers responsible for managing or overhauling their university's ETD program. **RESULTS** Comparison of characteristics shows the ProQuest system and the University Repository both provide functional solutions for submitting, storing, disseminating, and archiving ETD's using digital technology. Yet each system also has unique characteristics that distinguish it from the other. **DISCUSSION & CONCLUSION** The authors conclude that there is no single 'best' system for ETD management overall. Rather, it is up to decision makers at each institution to choose an approach that best fits their university's values, goals, and needs. Additionally, the authors point out the need for a single portal for ETDs that allows for search and discovery of these unique works of scholarship wherever the full text resides. Future investigation into possible solutions for such an ETD portal would be a boon not only to universities and ETD authors, but to the diverse researchers, students, professionals, and interested citizenry who could benefit from easier access to this growing corpus of knowledge.

Implications for Practice:

- The ETD movement has fundamentally changed the landscape of academic and scholarly publishing, impelling stakeholders in graduate programs to reexamine historic assumptions about thesis and dissertation management and distribution that were developed in the age of print and microfilm.
- ETD management decisions based on operational convenience for graduate school personnel, or on the presumption that student authors care most about earning royalties from their works, may not effectively support the goals of graduate education, digital scholarship, and academic publishing in the 21st century.

(continued on following page)

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Implications for Practice (cont'd):

- The Open Access, Open Education, and Open Science movements are impacting students' attitudes and expectations about their publishing choices that may be in conflict with status quo practices requiring ETD submission to a commercial reseller of graduate works.
- A small but growing set of top research institutions in the United States have changed their ETD policies to no longer require submission to the commercial ProQuest system. These schools offer a successful model for other institutions wishing to shift to a ProQuest-optional policy.

INTRODUCTION & LITERATURE REVIEW

This study considers the effectiveness of managing electronic theses and dissertations (ETDs) in two of the most popular systems used in the American higher education community today: the commercial ProQuest dissertation publishing system (hereafter, the ProQuest system) and the university's institutional repository system (hereafter, university repository).[1] The authors undertook a comparative analysis of these two platforms to provide ETD program stakeholders with a thorough and balanced assessment of their respective support for submission, publishing, access control, discovery, and archiving.[2] Results of this head-to-head comparison confirm that there are numerous equivalencies between the ProQuest and university repository systems when it comes to ETD management and publishing, but there are also distinctions characterizing each platform. It is hoped that the information contributed by this investigation will support decision making by those charged with designing a new ETD program, as well as those tasked with assessing and enhancing an existing one.

History of American ETD Dissemination

In the United States, the practice of publicly distributing doctoral dissertations (and to a far lesser extent, master's theses[3]) dates back to the earliest 20th century, but the manner of dissemination has changed with the technology of the day. The use of microfilm to store and distribute dissertations began in the late 1930's when microphotography had evolved to the stage of commercial exploitation and was being used to redistribute a wide range of research materials, government documents, and business records. Microfilm's particular value as an affordable and effective publication medium for new scholarly manuscripts—those highly specialized works of interest to a limited but serious readership—was also gaining recognition (Satlow, 1943). Microfilm publication (or "micro publication") was more economical than traditional print publishing because the original film negative could be made at a minimum cost, with subsequent copies made on demand (Power, 1942; University Microfilms Inc., 1939).

Among the handful of companies offering microfilming services on a commercial basis before WWII was a new venture named University Microfilms Inc., or UMI. This company was the earliest predecessor to the corporation now known as ProQuest (ProQuest, 2013d). UMI's president, Mr. Eugene Power, proposed to "micro publish" scholarly manuscripts with the following

[1] The authors of this paper consider a "system" to represent a combination of technology, policies and practices applied to manage the lifecycle of the ETD, from submission to archiving.

[2] The authors use the terms "system" and "platform" interchangeably throughout this paper.

[3] The far less common practice of submitting master's level works to ProQuest has been an entirely different matter within the US graduate school community. This circumstance owes to the decision by the Association of Research Libraries not to recommend submission of these works to UMI:

> "The plan does not include Masters' theses for two reasons. First, most of them are probably not worth intercampus use. The few that are worthy will either be developed in doctoral dissertations or be made available as articles. Second, the tremendously large number that are written each year…renders impracticable any arrangement for automatic publication." Source: Dr. Ralph Ellsworth, writing in the *Journal of Higher Education* (1952, p. 244).

In the absence of ARL support, UMI pursued the business of micro-publishing theses on its own (Association of Research Libraries, 1961). The percent of coverage for American master's theses in ProQuest's services, therefore, is considerably lower than that for doctoral dissertations.

plan: "Notification" would be achieved by periodically circulating to libraries a free printed catalog of abstracts along with ordering information. "Delivery" would take the form of positive microfilm copies of the manuscript sold to interested individuals or organizations. (Power, 1939). Power launched this plan in cooperation with a few universities willing to experiment with dissertation publishing: Princeton, Stanford, Nebraska, Toronto, and Michigan (American Library Association, 1939). The inaugural edition of UMI's *Microform Abstracts* in 1939 advertised some 17 dissertations for sale (Bornet, 1952). Over the next two decades, Power expanded the experiment with additional university participants, particularly members of the recently formed Association of Research Libraries (ARL) (Association of Research Libraries, 1938; Association of Research Libraries, 1939).

Since its founding in 1931, the Association of Research Libraries had made the availability of American (including Canadian) dissertation literature a priority concern. The Association charged a small group, known as the Committee on Dissertation Publication, to consider how American dissertations could be made more widely available (Ellsworth, 1980). At the conclusion of its investigation, the Committee issued a final report emphasizing that universities must agree to accept responsibility for publishing the results of dissertation research, but the manner of doing so should be left to the institution. The Committee further advised that acceptable publishing options might include a traditionally published book; one or more articles published in a scholarly journal; or a micro publication of some kind (Association of Research Libraries, 1951).

It was the latter suggestion that opened the door for UMI to achieve broader uptake of its dissertation microfilming service among American universities. Working with the ARL Committee, Eugene Power developed an arrangement that would encourage the broadest possible participation. To that end, a flexible set of service tiers were devised to accommodate the individual needs and preferences of each institution. Full participation was available to institutions that supplied UMI the complete dissertation manuscript plus an abstract approved by the Institution. For a fee of $20.00, UMI would microfilm the dissertation, store the negative, sell copies of the film on request, and print the abstract in (the newly renamed) *Dissertation Abstracts*. At the lowest level of participation, dissertation titles would be listed in *Dissertation Abstracts* for $2.00. The publication of the dissertation itself would be left to the institution. In between these tiers were several options for limited participation that allowed institutions to choose from a menu of services. For example, some institutions chose to make their own microfilms but still have abstracts listed in *Dissertation Abstracts*. Pricing for these intermediate tiers depended on the services provided. Additionally, UMI's *Microform Abstracts* was renamed *Dissertation Abstracts* and upgraded to a more regular and subscription-based publication (Association of Research Libraries, 1952).

In the years since 1952, the UMI microfilm dissertation publishing program gained in popularity among both ARL and non-ARL institutions alike. Present-day ProQuest marketing claims that "All of the top-ranked research universities in the United States, as defined by the Carnegie Foundation, publish graduate works with ProQuest" (ProQuest, 2013c). Though not wholly accurate,[4] this marketing claim does reflect the historical role that ProQuest/UMI has played in supporting American graduate scholarship since the mid-20th century.

Yet today, some sixty years after ARL endorsed microfilming as an acceptable dissertation publishing option, American universities find themselves at a crossroads. Has digital publishing eclipsed the need for microfilming services? Given the ubiquity and affordability of digital technologies in higher education, does a single private enterprise still offer unique advantages that a research university cannot match? Do Internet-based search systems such as the Networked Digital Library of Theses and Dissertations (NDLTD) Catalog, the Open Access Theses and Dissertations (OATD.org) portal, the WorldCat union catalog of libraries, Google, and other

[4] In fact, some top research universities have never adopted a ProQuest submission requirement or have allowed submission of only abstracts (e.g., MIT); a number of others have maintained a policy of publishing choice, allowing graduate students to publish their doctoral dissertations either as a full length book; as one or more articles in recognized research journals; or as microfilm with an abstract published in Dissertation Abstracts (Horace H. Rackham Graduate School, 1971). Throughout the 20th century, other major research institutions with limited participation in the UMI program have included Harvard, the University of Hawaii, and the University of Southern California. (Shulman, 1985). And, finally, the list of universities no longer requiring ProQuest submission (Table 1) includes several top research-intensive universities with significant output of graduate scholarship, including Stanford University and Georgia Tech.

Web discovery services provide sufficient coverage of the ETD literature to justify abandoning ProQuest's fee-based database? These are some of the questions guiding the investigation reported here.

Current Considerations in ETD Management and Dissemination

The matter of which online platform(s) optimize the possibilities for ETD management in the digital age is a growing topic of discussion among the American community of practice. On the ETD-L discussion list, for example, interest in ETD management using the university repository dates back to the early 2000's, as evidenced in the call for participation in the 2001 conference of the NDLTD, inviting "submissions on all topics related to the creation and maintenance of ETD repositories" (Hagen, 2000). The more recent question of dual submission to both the university repository and to the ProQuest system has engendered considerable discussion, as reflected in the ETD-L discussion threads "ETDs in DSpace and ProQuest/UMI" (Labelle, 2011) and "Workflow for getting files from Proquest to bepress" (Gonzalez, 2010). Additionally, the topic of requiring submission to the university repository but leaving submission to ProQuest an optional choice for students has continually recurred over the last several years (Bolton, 2011; Hamilton, 2009; Salo, 2009).

Evidence that graduate students are also questioning university policies mandating submission to the ProQuest system is found in graduate student discussion boards, Twitter, and blogs (Clement, 2013, April 6). For example, a doctoral candidate posting to the "Physician Scientist Forum" noted (Member 255357, 2011):

> I am happy to report that I requested a waiver for the requirement of submitting my dissertation to ProQuest. After reading my letter, the dean not only granted my request, but met with the university level graduate committee and they have now removed the ProQuest requirement for all students. My main objection was that they were forcing the students into a commercial relationship with a third party (ProQuest) in order to graduate. Basically ProQuest offered the university a business deal with seemingly nice terms at the expense of the students, though I'm of the impression that the university never understood this.

The growing trend in questioning a publishing and archiving policy devised in the age of microfilm should come as no surprise. As many universities succeed in establishing their own campus-based Internet publishing systems, and as an increasing number of reputable scholarly sharing sites proliferate across the World Wide Web, the practice of outsourcing academic publishing and archiving to a commercial, third-party distributor may no longer be as compelling as it was before the Internet. Increasing awareness of, and support for, Open Access, Open Education, and Open Science across American campuses is heightening demand for open access to scholarship in all its forms, from textbooks to the literature of peer-reviewed articles. In this context, ETD management and publishing systems that impede open access to graduate works may appear counter to stakeholder values. As a consequence, graduate school policies requiring ETD submission to a single, fee-based commercial publisher may lose support. Additionally, the operational challenges in managing two ETD systems—locally and through ProQuest—may prove unnecessarily duplicative and cost-ineffective in an era of budget tightening and pressures for greater accountability on campus.

For these reasons, a small but growing number of American ETD programs have shifted to a ProQuest-optional policy, providing students a choice whether or not to send their works on to that company. Table 1 (following page) lists fourteen American universities with ETD repositories that have self-reported their change in ProQuest submission requirement in a public venue, with published written policies confirming this policy publicly online.[5] At some of these institutions, the removal of a ProQuest submission mandate is accompanied by operational changes in institutional practice: graduate schools or libraries no longer mediate submissions to ProQuest, leaving students to pursue the option directly with the company. An analyses of resulting ProQuest

[5] Public venues include the ETD-L listserv (Listserv address is ETD-L@LISTSERV.VT.EDU with archives available at http://listserv.vt.edu/cgi-bin/wa?A0=ETD-L); the shared Google work-sheet maintained by ETD-L volunteers at https://docs.google.com/spreadsheet/ccc?key=0AtSglIhGWCkpdHJvOUNSZUZyRC04UXRUa0w3UmgtYWc&usp=sharing; and the Free US ETDs blog (http://sites.tdl.org/fuse) maintained by the first author of this paper. The list of ProQuest-optional institutions along with links to official documentation verifying the policy is maintained at "ETDs freed here (PQ optional or NoQuest Institutions for US dissertations)," http://sites.tdl.org/fuse/?page_id=372.

Table 1. List of US universities not requiring submission of the doctoral dissertation to the ProQuest system

Institution	Carnegie Class of Graduate Instructional Program	Source of policy
Boise State University	Doc/Prof: Doctoral, professional dominant	http://gradcoll.boisestate.edu/wp-content/uploads/2011/10/SGTD.pdf
Brown University*	CompDoc/MedVet: Comprehensive doctoral with medical/veterinary	http://library.brown.edu/etd/faq.php
Florida International University	CompDoc/NMedVet: Comprehensive doctoral (no medical/veterinary)	http://libguides.fiu.edu/content.php?pid=233174&sid=2464966
Georgia Institute of Technology*	CompDoc/NMedVet: Comprehensive doctoral (no medical/veterinary)	http://www.gradadmiss.gatech.edu/thesis/electronic_submission.php
Louisiana State University	CompDoc/MedVet: Comprehensive doctoral with medical/veterinary	http://gradschool.lsu.edu/files/item10745.pdf
Stanford University*	CompDoc/MedVet: Comprehensive doctoral with medical/veterinary	http://studentaffairs.stanford.edu/registrar/students/edissertation-faq
University of Central Florida	CompDoc/NMedVet: Comprehensive doctoral (no medical/veterinary)	http://guides.ucf.edu/content.php?pid=109442&sid=849469
University of Georgia	CompDoc/MedVet: Comprehensive doctoral with medical/veterinary	http://www.grad.uga.edu/academics/thesis/
University of Hawaii at Manoa	CompDoc/MedVet: Comprehensive doctoral with medical/veterinary	http://manoa.hawaii.edu/graduate/content/submission-publication
University of Michigan*	CompDoc/MedVet: Comprehensive doctoral with medical/veterinary	http://www.rackham.umich.edu/dissertation_information/the_dissertation/submitting_the_dissertation/
University of North Florida	Doc/Prof: Doctoral, professional dominant	https://www.unf.edu/graduateschool/student_resources/thesis_step_six.aspx
University of Tennessee at Knoxville	CompDoc/MedVet: Comprehensive doctoral with medical/veterinary	http://gradschool.utk.edu/GraduateCouncil/AcadPoli/apcreport01222009.pdf
University of Texas at Austin*	CompDoc/NMedVet: Comprehensive doctoral (no medical/veterinary)	http://www.utexas.edu/ogs/etd/submit.html
Worcester Polytechnic Institute	Doc/STEM: Doctoral, STEM dominant	http://www.wpi.edu/Pubs/ETD/fees.html

* Member of Association of American Universities (AAU)

submission rates at one of these schools (University of Texas) shows a significantly lower uptake among students given the choice in dissertation publishing platforms (Potvin, 2012).

Yet it is important to note that the trend towards ProQuest-optional policies among American universities is still nascent, currently reflecting only a minority of graduate programs within the United States. At the time of this writing, a majority of American universities operating local ETD repositories on the Internet still also require that at least doctoral dissertations go to ProQuest (ETD-L volunteers, 2013). Moreover, ProQuest's own data indicates that the majority of North American research-intensive institutions depositing graduate works with the company also maintain university repositories. According to their marketing guide, "ProQuest in the Age of Institutional Repositories" (ProQuest, 2012):

> An increasing number of institutions which can be characterized as "less" research intensive have also developed repositories….We have observed that as institutions have rolled out their IRs, the most readily available content for populating them has been dissertations and theses.

The predominant practice of dual submission for graduate works to both the university repository and

to the ProQuest system raises important questions for ETD stakeholders to consider. Does the value of a two-pronged approach to dissertation publishing outweigh the additional costs of sustaining two parallel systems? What would the consequences be of dropping one system in favor of the other? Universities across the United States today wrestle with these questions in order to find an approach most effective and suitable for the institution (for example, Kleister, 2012, Oct. 8; McIntyre, 2012; Banach, 2011).

It is important that decision makers contemplating any policy change weigh the pros and cons carefully and completely. But to date there have been no independent analyses of ETD management systems, comparing the features of the university repository against those of the ProQuest system. Nancy Herther, writing in "Dissertations and Research in an Era of Change" (2010), discusses the proliferation of ETD distribution platforms on the Internet and highlights the difficulties in searching for and retrieving these works of scholarship dispersed across multiple sites online. Yet she offers no insight into *why* universities and their students choose to submit their graduate scholarship to one ETD system over another. She also does not consider the growing trend towards dual submission of ETDs to both the university repository and to the ProQuest system, or compare the costs vs. benefits of such a dual prong approach.

The study presented in this article therefore addresses a notable gap in the ETD literature—one that considers the question of where on the Internet ETDs are best made available and who has ultimate responsibility for publishing, providing access to, and archiving these unique works of scholarship. It is hoped that the findings from this study will aid decision makers at American universities to evaluate ETD management options in a reasoned fashion, in order to arrive at a policy that best meets the needs of the institution and its ETD stakeholders.

METHOD OF INVESTIGATION

Selecting the systems for study

The university repository

The heart of this study is a comparative analysis of the ETD management and publishing systems offered by the university repository and by the ProQuest system. Representing the former category are the university repositories of two unrelated research institutions: Georgia Institute of Technology (hereafter, Georgia Tech) and Texas A&M University. Both systems share a common technology platform—the open source DSpace repository system—for which documentation and source code is publicly available at http://www.dspace.org/. Yet each institution maintains its own policies and practices crafted to meet its respective institutional needs and values. These two case studies were chosen as the basis of this study because they illustrate that similar research institutions with essentially the same university repository system may arrive at different conclusions regarding ETD management policy and practice.

It should be noted that there are other repository systems, both commercial and open source, in use among North American universities: examples include CONTENTdm, E-Prints, Digital Commons, and Greenstone, among others (University of Nottingham, 2013). However, the authors' focus on DSpace repositories is not seen as a significant limitation to the study because most institutional repository systems share a similar set of functions and features for ETD management and publishing. Additionally, DSpace is the more prevalently used platform for institutional repositories in North America (ibid).

Texas A&M began accepting electronic theses and dissertations on a voluntary bases in 2002 and moved to mandatory submission in 2004. To house and disseminate this growing corpus of digital scholarship, the university established the Texas A&M Digital Repository (http://repository.tamu.edu) using the DSpace platform. The implementation of the Manakin interface to the Repository system in 2007 enabled easier customization of the interface "according to the specific needs of the particular repository, community or collection" (Phillips et al., 2007). At present, the ETD collection in the Texas A&M Digital Repository comprises 10,001 ETDs from 2002 to the present. Additionally, almost 17,000 digitized masters' theses representing the years 1922 to 2004 have been added to the Repository. A project is also underway to digitize historic dissertations no longer under copyright protection and distribute them openly via the Repository.

Students submit their ETDs to the Texas A&M graduate

school using Vireo, an open source ETD submission management system that readily integrates with DSpace and other repository platforms (Texas Digital Library, 2013). Vireo was developed by Texas A&M and the Texas Digital Library and is maintained by these groups with guidance from the Vireo Users Group (http://blogs.tdl.org/vireo/). For the purposes of this comparative study, Vireo features and functions are considered as part of the Texas A&M university repository system because all students are required to submit their ETDs using this tool. Moreoever, Vireo is used to capture and retain administrative metadata about the ETD submission (e.g., copyright permissions) that are not included with the ETD published in the repository (Larrison, 2013).

The university repository for Georgia Tech, known as SMARTech, or Scholarly Materials And Research @ Georgia Tech, captures the intellectual output of the Institute in support of its teaching and research missions. SMARTech was started in 2003 (and went live in 2004), and as of this writing has nearly 40,000 items, including a complete digital collection of Georgia Tech's theses and dissertations (approx. 17,000 total). Submission of ETD's into SMARTech became mandatory in 2004.

Until Summer 2013, students at Georgia Tech submitted their ETD's via the ETD-db submission management system (developed by Virginia Tech). In the summer of 2013, Georgia Tech switched to the Vireo software. All submission management systems used at Georgia Tech result in the ETD being deposited into the SMARTech institutional repository.

The ProQuest publishing system

For the purposes of this study, the ProQuest system is defined as "the ProQuest Dissertation Publishing" service, comprising: ProQuest Dissertations & Theses Database (PQDT); its open access subset, PQDT Open; the compulsory microfilming process applied by ProQuest to all submitted theses and dissertations, and the optional services for copyright registration and purchase of printed copies. The company's related submission tool, ETD Administrator, is not considered as a core part of the ProQuest system since only some customers use this method to get their ETDs to the company. However, selected features of ETD Administrator are mentioned in comparison to the open source Vireo tool used in conjunction with Dspace for ETD management at both Texas A&M and Georgia Tech.

Documentation analyzed for comparison

In preparation for the comparative analysis, the authors compiled a set of source documentation publicly available from ProQuest and each of the universities included in the study. Additional information also came from: the published literature; presentations made at conferences; websites of ETD-related and organizations such as the Networked Digital Library of Theses and Dissertations, the Texas Digital Library, and the DSpace/DuraSpace Open Source communities; and other public venues as well. All materials analyzed in this study are openly available and are fully attributed in the references list at the end of this article.

Each document from this set was culled to identify all of the features, functions, practices, and policies characterizing the ETD service providers, in combination. All of these culled attributes were aggregated under a category entitled 'System Characteristics' and then further broken down into sub-categories representing the various events in the ETD lifecycle: Submission; Publication; Discovery and access; Archiving). One additional category was added to represent the technical and user support features of the ETD systems analyzed.

All of the system characteristics claimed in the documentation for each ETD system provider were taken at face value and presented in the comparison, based on the claims made in the document. However, where data contradicting a given claim was provided in a publicly-accessible, professional forum, the authors did include this additional information in the Discussion section to assist the reader's evaluation of system provider claims.

RESULTS

The results of the comparative analysis are shown in Table 2 (following pages). The first column itemizes the system characteristics included in the comparison, organized under sub-categories discussed previously. The third and fourth columns represent the characteristics of ProQuest and the university repository, respectively.

Unless otherwise indicated, the descriptions provided for the university repository represent the systems of both Texas A&M and Georgia Tech. Where differences

between repository systems exist, they are noted with the initials signifying the specific institution: TAM for Texas A&M, GT for Georgia Tech. Differences noted in this column may represent technology, workflows, policies, or practices exercised by one or the other institution.

With the characteristics of both ETD management systems compiled in Table 2, it is then possible to identify those characteristics shared by ProQuest and the university repository (Table 3, p. 12). Table 3 indicates that the university repository and ProQuest systems share

Table 2. Combined Characteristics of the ProQuest System and the University Repository

Category	Characteristic	ProQuest System	University Repository (unless otherwise noted, refers to both TAM and GT)
SUBMISSION	*Web-based submission for student*	Some submitters use the proprietary ETD Administrator tool (ProQuest, 2013a).	All submitters use the open source Vireo ETD management system [TAM; GT effective Summer 2013](Texas A&M University, 2013a; Georgia Institute of Technology, 2013b.)
	Submission fee	For traditional publishing, the fee ranges from $0/submission for users of ETD Administrator to $25 for FTP/CD submission. Printed theses or dissertations cost $65/submission. For the Open Access publishing option, an additional $95 fee is charged in addition to the base submission fee. (ProQuest, 2011b)	Not applicable
	Alternate submission methods accepted	Paper submissions accepted and are scanned as page images and saved in PDF format for fee of $65. Abstract-only submissions are accepted for fee of $65.00 (ProQuest, 2013e; Massachusetts Institute of Technology, 2013b).	Not applicable
	Formatting guidelines must be followed	All submissions must adhere to specified formatting requirements (ProQuest, 2013f).	All submissions must adhere to specified formatting requirements (Texas A&M University, 2013a; Georgia Institute of Technology, 2013c).
	Genres of student works eligible for submission	Doctoral dissertations; Masters theses (ProQuest, 2013e).	Repository holds collections of Doctoral dissertations; Masters theses; Graduate level non-thesis reports (Records of Study, Internship reports and Capstone projects); Undergraduate theses (Texas A&M University, 2013b; Georgia Institute of Technology, 2013f).
	File formats accepted	Basis of submission must be in PDF format. Supplementary files may include .gif, .jpeg, .tif, .mov, .avi, mgp, .aif, cd-da, cd-rom/xa, .midi, mpeg-2, .smd, .wav (ProQuest, 2013f).	Basis of submission must be in PDF format. Supplementary files may include both supported and known digital file formats, including .pdf, xml, .html, .rtf, txt, .ps, .csv, .odt, .ods, .odp, .txt, .xml, .sgml, .jpg, .jp2, .jpf, .png .svg, .tif, .aif, .wav, .avi, .ram, au, .xls, .doc, .ppt, tex, dvi, .mj2, .jp2, and more (Massachusetts Institute of Technology, 2013a).
	File size allowed	"Upper limit of 100 MB may be sent via Web interface. Files exceeding this limit must be sent to us on CD or DVD (ProQuest, 2013e)."	Upper limit of 2 GB may be sent via Vireo Web interface. Larger files may be provided on CD or DVD for manual loading into the repository (Hammons, Park and Phillips, 2013).
	Workflow efficiencies	Student accesses Web-based submission system using proprietary ETD Administrator tool; OR Graduate School submits metadata and electronic files via FTP or on CD, along with ProQuest-specific XML files. Student must fill out ProQuest paper forms (ProQuest, 2013e).	Students submit ETDs through Web-based, open source, Vireo submission system and, upon final approval, Graduate School publishes submission to the repository. Student's source files not sent to repository but retained for digital preservation purposes (Larrison, 2013).
	Accommodations for dual submission (PQDT and University Repository)	ProQuest will provide copies of ETD files and metadata to university servers. Universities may then elect to ingest ProQuest content into their repositories (ProQuest, 2012).	Using the Vireo ETD management system, graduate school personnel publish ETDs to the Repository using the SWORD protocol. Vireo 2.0 also provides an export of ETD files and metadata in the ProQuest format, which can be transmitted to a ProQuest server and ingested into the ProQuest database [TAM]. Dual submission to ProQuest is not supported; students wishing to submit their works to ProQuest do so on their own with no assistance by the Graduate School or Library [GT] (Hammons, Park, and Phillips, 2013; Georgia Institute of Technology, 2013c).
	Word limit on abstract	No limit on abstract for online version of ETD; 350 word limit on entry for ETD in printed indexes (ProQuest, 2013e).	Not applicable

Table 2 (cont'd). Combined Characteristics of the ProQuest System and the University Repository

Category	Characteristic	ProQuest System	University Repository (unless otherwise noted, refers to both TAM and GT)
SUBMISSION (cont'd)	*Copyright ownership of the student's work*	Submitted ETD remains copyrighted by the student author. Proquest asserts copyright in the item record and in the microfilmed version (ProQuest, 2009; McLean, 2013).	Submitted ETD remains copyrighted to the student author. The student author is advised [TAM] or required [GT] to place a copyright notice on the title page of the ETD (Texas A&M University, 2013c; Georgia Institute of Technology, 2013c).
	Student publishing agreement	Student grants a non-exclusive license to ProQuest to distribute the work. Agreement contains options for reselling the work through additional commercial distributors; Open Access publishing; access restrictions (embargoes) and indexing by Internet search engines. ProQuest also asks for the right to microfilm the ETD and asserts copyright over the microfilm edition (ProQuest, 2009).	Student grants a non-exclusive license to respective institutions (and to the Texas Digital Library in the case of Texas A&M) to distribute and archive the work. Agreement includes options for access restrictions (embargoes) (Texas A&M University, 2013d; Georgia Institute of Technology, 2013d, 2013e).
	Management of embargoes and other restrictions	Embargo periods are fixed by the company with available terms of 6 months, 1 year and two years. Optional write in available for other periods. No options to allow some parts of ETD to be open access, others restricted to campus or restricted completely. Full sales restriction available at student request. Restriction from harvesting by major search engines are also available (ProQuest, 2009).	Vireo supports customizable embargo types. Embargo periods of 2 years available with option to renew (TAM). Author can choose one year embargo, with option for one year extension [GT]. Special arrangements may be made for campus-only access or for restricting one or more parts of the submission [TAM] (Hammons, Henry, and Larrison, 2013; Georgia Institute of Technology, 2013e).
	Inclusion of third-party copyrighted material	Requires student authors to receive permission from the copyright owner(s) and include it with the submission before it can be published in the database (ProQuest, 2013e).	Students are responsible for making the determination whether other people's copyrighted work may be included in the ETD under Fair Use, under the terms of a license, or with the express permission of the copyright owner. Copies of licenses or permission letters, where applicable, must be submitted to the Graduate Office along with the ETD and are retained in the Vireo ETD management system (Texas A&M University, 2013c; Georgia Institute of Technology, 2013c, 2013d).
	Ability for student to revise or replace submitted ETD after publication online	Special revision process must be followed to ensure revised PDF and metadata supersedes original submission. Requires new microfilming. Published submissions cannot be recalled. $45. vault fee may apply (Kleister, 2012, July 23).	Institutional policies do not address this possibility in writing, but in practice replacement of a final ETD after acceptance is allowed in very special cases, with permission of the Graduate School. Special revision process must be followed to ensure revised PDF and metadata supersedes original submission. Change made the same day.
PUBLISHING	*Editorial review*	Editorial specialists assign search descriptors to each ETD supplied by the University and purport to check each student work for completeness, accuracy and copyright permissions (ProQuest, 2013c).	All editorial review of the ETD takes place before the final version of the work is submitted and accepted for graduation and for publication in the university repository (Texas A&M University, 2013c; Georgia Institute of Technology, 2013c).
	Publisher modification of the student's submitted work	System modifies the student's final submitted PDF files to add corporate identifying information and company copyright notices to the verso of the original title page. Changes include a notice asserting copyright ownership over the microfilm edition and the item record (Clement, 2012; McLean, 2013).	Not applicable
	Publication for copyright purposes	Digital distribution via the PQDT database meets the definition for publication according to the US Copyright Office (Norris, 2010).	Digital distribution via the university repository meets the definition for publication according to the US Copyright Office (Norris, 2010).
	Copyright registration	Submit registration application to US Copyright Office if author elects, charging an additional service fee of $20.00 in addition to mandated registration fee of $35 (ProQuest, 2013e).	Student may opt to register the thesis or dissertation directly online with the US Copyright Office and pay the $35 mandatory fee. US Copyright Office (United States Copyright Office, 2013).
	Compliance with Mandatory Deposit Rule (US Code, Title 17, Section 407)	Reserves right to make a copy of the work available to the Library of Congress in digital, microform or other format (Norris, 2010; ProQuest, 2011a).	"Mandatory deposit rule does not apply to dissertations that remain in digital-only format. If author or institution wishes to deposit a copy of the ETD with the Library of Congress, they can achieve this goal via copyright registration with the Copyright Office (Clement, 2013, February 1)."

Table 2 (cont'd). Combined Characteristics of the ProQuest System and the University Repository

Category	Characteristic	ProQuest System	University Repository (unless otherwise noted, refers to both TAM and GT)
PUBLISHING (cont'd)	*Recognition/Legitimate citation for work*	Popular style manuals such as the Chicago Manual of Style provide a citation format for ETDs whether distributed via ProQuest or a University Repository. The ProQuest OpenURL assigned to each item provides a link to include in resumes or publications (University of Chicago, 2013; ProQuest, 2008).	Popular style manuals such as the Chicago Manual of Style provide a citation format for ETDs whether distributed via ProQuest or a University Repository. The Internet Handle assigned to each item in the repository provides a link to include in resumes or publications (University of Chicago, 2013; Scholarly Publishing and Academic Resources Coalition, 2013).
	Assignment of a standard unique identifier	An International standard book number (ISBN) is assigned to each ETD, enabling sale of the ETD through standard trade channels (Amazon, bookstores, etc.) Each work is also assigned a unique internal number by the ProQuest system (ProQuest, 2013c, 2008)	A permanent, stable Internet handle is assigned to each ETD in the repository. Each work is also assigned a unique internal number by the DSpace system. (DuraSpace, 2013b).
COLLECTION MANAGEMENT	*Scope of collection*	ProQuest collections millions of digital theses and dissertations from universities around the world (ProQuest, 2013h).	University repository collects all scholarly and creative output of the institution, including theses and dissertations; other graduate works; undergraduate theses; institutionally sponsored journals; and faculty scholarship.
	Completeness of institutional collection	PQDT Database holds 62% (TAM) and 35% (GT) of the Universities' full-text theses and dissertations (based on searches conducted by authors on 3-7-2013)	University repository holds 91% [TAM] and 100% [GT] of the Universities' full text theses and dissertations (based on searches conducted by authors on 3-7-2013).
	Usage Statistics for Individual ETDs	Not applicable	Current and past usage statistics automatically available to users and institution from ETD landing page in the database (Dspace Developer Team, 2011a).
	Metadata for ETDs conforms to ETD-MS standard	Proprietary metadata schema does not match ETD-MS standard (Averkamp and Lee, 2009).	With addition of four elements to Dspace Dublin Core metadata scheme, repositories support ETD-MS metadata standard (Hickey et al., 2010).
DISCOVERY/ ACCESS	*Full-text search of ETD document*	Subscribers to the database are able to search the full-text of select theses and dissertations (Center for Research Libraries, 2013).	Available for all ETDs not under access restriction/ embargo.
	Access limitations (besides embargoes)	Unless student author has elected and paid for Open Access, ETDs are available only through a paid subscription costing many thousands of dollars annually. Individual student works available for purchase for $37-$70. depending on format desired (Black and Keller, 2009; ProQuest, 2013l).	Immediate online, full text access for works produced before 2004 is available on a title-by-title basis with permission of the ETD author. Digital copies of all pre-2004 works may be requested electronically to any user via interlibrary loan. (Texas A&M University, 2013e; Georgia Institute of Technology, 2013f).
	Support for Open Access publishing	Works submitted through the Open Access Publishing PLUS are available without subscription or payment, but student author must pay $95. fee to opt into this mode. System provides no support for Creative Commons or other open licenses selected by ETD author (ProQuest, 2011b; Clement, 2012).	Open Access student works made available to users worldwide require no payment. DSpace system supports Creative Commons licensing of submitted works. If the option is enabled, users may select a Creative Commons license during the submission process, or elect to skip Creative Commons licensing (Dspace Developer Team, 2011b).
	Indexing in other discovery services	Citations sent to indexing services including ABI Inform, PsychINFO, Sociological Abstracts, MathSciNet, Chemical Abstracts, ERIC, and Institute of Physics (IOP). Indexing by Google and Google scholar is limited by year and search engine , Graduate Schools & Libraries (ProQuest, 2013c; Center for Research Libraries, 2013).	ETD records entered into the Library and OCLC catalogs, with web links to allow users to click through to full text copy in the Repository. Repository configured to allow metadata harvesting by numerous Web-based catalogs, repositories, preprint servers and other discovery platforms, including the arXiv.org pre-print service; OAISter; OAETD.org portal and the NDLTD catalog.
	Purchasing printed, bound copies of dissertation	Available upon request for additional charge. Fees start at $40. (ProQuest, 2013i)	Graduate School maintains selected list of binderies and self publishing services that offer students printed and bound copies starting at $10-25 [TAM] (Texas A&M University, 2012a).
	Sale of ETD with royalties to author	10% royalty paid to author once royalty payment reaches $250.00 (when approximately fifty copies have been sold). Royalty agreement ceases after 25 years if no sales made (ProQuest, 2011a).	Not applicable

Table 2 (cont'd). Combined Characteristics of the ProQuest System and the University Repository

Category	Characteristic	ProQuest System	University Repository (unless otherwise noted, refers to both TAM and GT)
DISCOVERY/ ACCESS (cont'd)	*Commercial resale*	Content is made available through third party retailers including Amazon, independent booksellers and book suppliers. Dissertations from 2008 forward are licensed through a premium service offered by TurnItIn.com (ProQuest, 2013b; TurnItIn, 2012).	Not applicable
	Ready production of MARC records for Library catalog	Provides machine-generated level 7 ("K" level) records MARC records with limited re-use rights (ProQuest, 2013j).	Vireo ETD management system exports MARC 21 XML records which can be converted for ingest into the OPAC (Texas Digital Library, 2013).
ARCHIVING	*Primary responsibility and version of record*	ProQuest represents an "external archive" of the universities' work. ProQuest produces no ETD content of its own but rather relies on Universities, as 'Publishing Partners,' to submit content to them. ProQuest modifies the version of record supplied by the University by stamping its company branding and sales ordering information on the verso of the title page of each thesis or dissertation (McLean, 2006; ProQuest, 2013g).	As the primary publisher of the theses and dissertations produced at the institution, the University produces the version of record which is official evidence that the student has satisfied a graduate requirement. All theses and dissertations are required to be submitted to each university's repository (and, prior to 2004, to the University Libraries) for access and preservation (Texas A&M University, 2012b; Georgia Institute of Technology, 2013c).
	Microform archiving	All student works are archived on 2 copies of black and white microform stored in climate-controlled vaults (ProQuest 2013k).	Not applicable
	Digital archiving	Perpetual online hosting. Digital files backed up and stored as TIFFs and PDFs in two separate locations (ProQuest 2013k).	Perpetual online hosting provided. Digital files backed up and stored as PDFs and as original source files in separate locations, with cloud storage
	Long term digital preservation	Working towards designation as a Trusted Digital Repository (ProQuest 2013k).	As a charter member of the Digital Preservation Network (DPN), University is working towards designation as a Trusted Digital Repository [TAM] (Morales, 2013).
	Filing dissertations with Library of Congress	Reserves the right to make copy available to Library of Congress. Database is designated as an offsite repository for American digital dissertations (ProQuest, 2013k).	Library of Congress policy is to collect all American dissertations, whether or not they are in ProQuest. Library of Congress advises students at present to submit dissertations directly to LoC through copyright registration process (Clement, 2013, February 1)
TECHNOLOGY SUPPORT	*User support and Troubleshooting*	Dedicated technology specialists are available 24/7 to troubleshoot problems.	Dedicated technology specialists are available 24/7 to troubleshoot problems.
	Long-term costs	If using the turn-key ETD Administrator tool, ProQuest provides most of the technical support for the ETD program. If transmission of files and metadata is managed using CD's or FTP's, Institution occurs additional costs in fees, labor, and computer support.	If using the turn-key Vireo ETD management system local support is needed to install and administer the the software. (2)Continuing maintenance and enhancement is sustained by the Open Source community IT staff and resources required to move ETDs into IR, and trouble shoot technical problems.
	Opportunity to suggest enhancements	Opportunities to customize the system and its interfaces are limited due to the proprietary nature of the system.	Opportunities to enhance the system are available through voluntary participation in the Open Source communities for DSpace and Vireo.

a number of equivalent characteristics in each of the categories analyzed. Both systems offer functional ETD management and Internet publishing systems with some degree of support for submission, public distribution, collection management, discovery, access control, archiving, and technical/user support. This finding is not surprising considering that both systems are in heavy use within the US ETD community at this time.

From the comparison shown in Table 2, it is also possible to identify those characteristics uniquely held by one or the other system (Tables 4a and 4b, pp. 13 and 14). Tables 4a and 4b specify the distinctive characteristics differentiating ProQuest and the university repository. Identifying these distinctions is a first step in understanding what value proposition(s) each system offers. It is these unique values that likely determine the choice of one system over the other, or that could justify a continued investment in using both systems, in spite of many shared common features.

Table 3. Common Characteristics of the ProQuest System and the University Repository

Category	Common Characteristics
SUBMISSION	Web-based submission of metadata and full-text is free
	PDF file constitutes basis of submission with range of multimedia accepted as optional supplementary files
	No word count limit on abstract included in online database
	Formatting guidelines set by the service provider must be followed or the submission may be rejected
	Eligible graduate works for submission include both doctoral dissertations and masters theses
	Submission workflow facilitates, but does not completely automate, dual submission of the ETD to the other system
	Copyright in ETD remains with student
	Submission license grants service provider non-exclusive rights to copy, modify, and distribute the submitted ETD and metadata
	Student has options to place temporary restrictions on access to full text of ETD for specific time durations set by the service provider
	Published ETD's can not be recalled but may be revised and/or superseded under special conditions and with permission of the University
	Purchasing printed, bound copies of dissertation
PUBLISHING	Distribution of the ETD through the service is considered publication for copyright purposes, according to the US Copyright Office.
	Electronic dissertations published through the service and not produced in any other format (e.g., film, print) are exempt from mandatory deposit with the Library of Congress under current law.
	A unique and persistent Internet identifier is assigned to each ETD
	ETD's published through the service are citable according to popular citation styles (APA, MLA, etc.)
COLLECTION MANAGEMENT	Database scope is broader than just the ETD's from a given university
DISCOVERY/ ACCESS	ETDs are searchable by the fields specified in the ETD-MS metadata standard.
	ETDs are full-text searchable for at least some years.
	ETDs in the database are discoverable through outside search and retrieval services including Internet search engines
	System is able to generate MARC records of the thesis or dissertation for inclusion in the University Library's catalog
ARCHIVING/ PRESERVATION	Service provider assures perpetual online hosting of the ETD; regularly backs up the ETD and associated metadata; and stores the backed up digital content in multiple offsite locations
	Service provider strives to gain designation as a Trusted Digital Repository through the TRAC certification process
TECHNOLOGY/ USER SUPPORT	User and troubleshooting support is available via email request and, to a more limited extent, via phone or instant message.
	Opportunities to suggest enhancements and improvements to the system are available to institutions using the system

Table 4a. Unique Characteristics of the ProQuest System

Category	Common Characteristics
SUBMISSION	Submission of abstracts only (without the full-text document) is available for a fee of $65.00
	Submission of printed theses or dissertations is available for a fee of $55.00
	Submission of ETD's via CD or FTP is available for a fee of $25.00
	Word count limit of 300 on abstract included in printed products
	Access to most ETDs is restricted to paying subscribers or on-demand purchasers (For a minority of ETDs, student assures free, unrestricted access to the ETD by electing the Open Publishing option and paying a one-time $95. fee)
	All included copyrighted material must be accompanied by written permission from the copyright owner
	Revision of submitted ETD, when permitted by the University, incurs a vault fee of $45. to cover costs such as microfilming
PUBLISHING	Editorial specialists review submitted ETD's for completeness, copyright infringement, and to assign additional search descriptors.
	System modifies the submitted PDF files to add propriety identifying information and company copyright notices to the verso of the original title page, including a notice asserting copyright ownership over the microfilm edition.
	Service to register the author's copyright in the thesis or dissertation with the US Copyright Office is available for a fee of $55 (comprising a $20 service fee plus the USCO fee of $35.00)
	ISBN is assigned to each ETD to accommodate its sale through commercial distribution channels.
	Printed and bound copies of the work may be ordered and customized at an additional cost
COLLECTION MANAGEMENT	ETDs are part of a large-scale digital collection comprising dissertations and theses from institutions around the world
DISCOVERY/ ACCESS	OpenURL is assigned to each ETD to allow only subscribers of the database to click through to the full text from any citation to the work that exists outside the database (e.g., student web page or vita, published work, etc.)
	Free unrestricted access to the ETD is available for a one-time "open access' fee of $95.
	Student author may elect to restrict commercial redistribution of the work
	Student author may elect to restrict harvesting of the ETD by Internet search engines
	Citation and some indexing of the ETD is sent to various discipline-based indexes (e.g., ABI Inform, Psychological Abstracts, and others), providing additional access points
	Royalties of 10% may be paid to ETD author once a threshold of $250 in royalties is reached (when approximately 50 copies of the thesis or dissertation have been sold). Royalty agreement ceases if no sales are made in first 25 years of ETD publication.
ARCHIVING	The system does not maintain the exact ETD version of record: the submitted version is modified before being distributed online, archived and stored offsite, and preserved over the long-time.
	All submitted ETD's are microfilmed in high-contrast, black and white mode, with 2 filmed copies stored separately in climate controlled vaults.
TECHNOLOGY/ USER SUPPORT	ETD author and the institution incur no recurring costs to maintain the ETD in the database over the long term.
	Opportunities to suggest and observe enhancements to the system are entirely controlled by the company.

Table 4a. Unique Characteristics of the University Repository

Category	Common Characteristics
SUBMISSION	Included copyrighted material may be permitted if it fits within the criteria for Fair Use
	Included copyright material may be permitted under existing licenses secured by the University Library
	Multiple genres of graduate work are acceptable including capstone reports, internship reports, and other projects in lieu of the thesis or dissertation.
	Revision of submitted ETD, when permitted by the University, incurs no fee
	File sizes up to 2 GB accepted via the Web submission interface.
COLLECTION MANAGEMENT	ETDs are part of a large-scale digital collection representing the scholarly and creative output of the Institution.
	The collection of theses and dissertations is more complete than that represented in ProQuest.
	Current usage statistics for the ETD are automatically available to the institution and the author
DISCOVERY/ ACCESS	An Internet handle is assigned to each ETD to allow any users in the world to click through to the full text from any citation to the work that exists outside the database (e.g., student web page or vita, published work, etc.)
	Full support for Open Access ETDs. Free unrestricted access to the ETD is available automatically: no author payment is required. Additionally, system provides support for open licensing of the ETD using the Creative Commons suite of licenses
	ETD citation and metadata is included in the worldwide ETD discovery service -- the catalog of the Networked Library of Theses and Dissertations.
ARCHIVING	The ETD version submitted is the version of record, meaning it is the same exact version distributed online, archived and stored offsite, and preserved over the long-time, providing a permanent record of the student's fulfillment of graduate requirements.
TECHNOLOGY/ USER SUPPORT	The institution incurs recurring costs to maintain the ETD in the database over the long term.
	Opportunities to suggest and observe enhancements to the system are controlled by the user community.

DISCUSSION

Distinctive characteristics of the ProQuest system

As shown in Table 4a, the ProQuest system offers a long list of distinct characteristics over and above those found in the university repository.

Submission with ProQuest

Under the Submission category of ETD services, ProQuest has the distinction of accepting paper submissions, albeit for a fee. For institutions still producing at least some graduate works in printed form, the opportunity to systematically digitize the works at the time of submission may represent an indispensable feature. By ProQuest assessing each student the one-time fee for this service at the time of submission, any financial demand on the Institution for exercising this option is conveniently eliminated. However, university personnel may still be needed to assist in collecting fees and paperwork and conveying them to ProQuest.

ProQuest also offers the option to submit only the ETD abstract to its database, a characteristic that may be valuable to institutions preferring to retain the full text of the ETD in the university repository as the version of record. At the time of this writing, the only US institution known to have adopted abstract-only submission to ProQuest is the Massachusetts Institution of Technology (MIT) (Clement, 2013, January 16; Massachusetts Institute of Technology, 2013b).

On the other hand, the relatively high submission fee for this option might deter universities from pursuing this option.[6] Such was case of Georgia Tech, where the

[6] At $65.00, the Abstract-only fee is the second highest of all ProQuest's submission fees. The Open Access distribution fee is the highest, at $95.00 per title.

$65.00 abstract-only fee was deemed excessive, leading the institution to drop its requirement for ProQuest submission altogether. As explained by the University's Vice Provost of Graduate Education, in a posting to the Council of Graduate Schools list (Cozzens, 2012):

> We decided not to require our students to give distribution rights to their dissertations to a third party, as we had been. We wanted to continue to have them deposit just abstracts with ProQuest, but ProQuest was going to charge each student $65 for the abstract instead of the $25 they were paying for the full dissertation. In the end, we have decided to let the students opt to send their dissertations directly to ProQuest if they want, rather than through the university. (They are all depositing dissertations in our own digital archive.)

Another distinct characteristic of ProQuest's submission system is the requirement that all third-party copyrighted material included in the ETD be accompanied by a letter of permission from the copyright owner. This policy has the advantage of eliminating risk of infringement for ProQuest and the author. Yet in requiring permissions *a priori*, without any allowance for included material under the fair use exemption of US copyright law, this policy carries another kind of risk—that of having to remove essential material for which copyright permission may not be obtainable. In cases of orphan works (no permission is possible due to an unknown or unreachable owner) or censorship (permission is denied without any option to pay a licensing fee), the student's use is likely to fall within the limitations of fair use (Columbia University, 2013). Yet with important material redacted in order to minimize the risk of an infringement claim by a commercial publisher, ProQuest's edited version of the ETD would be a poorer facsimile of the original.

A related concern with the ProQuest submission policy regarding third-party material is the difficulties it presents for included material used under a license that prohibits commercial re-use. Such material could be an art image, a technical standard, or a Google Earth map that the student lawfully obtained from a database licensed for educational use by the Library. Alternatively, the work could be the student author's own article, published prior to graduation with copyright transferred to the publisher. Rights to reuse the article or parts thereof in the ETD might apply for copies distributed in a not-for-profit university repository, but those rights may not extend to an ETD going to the commercial ProQuest system. Such a scenario occurred recently at Texas A&M, when a student presented his dissertation with a reformatted copy of the student's own article previously published in an Optical Society of America journal. The publishing contract precludes reposting the article to any server that depends on "payment for access, subscription or membership fees" (Optical Society, 2013). Texas A&M has interpreted that prohibition to include the ProQuest system.

The last distinguishing characteristic in the ProQuest submission category is the option to distribute the work via ProQuest's no-fee PQDT Open service by paying a one-time fee of $95.00. This author-pays option emulates the gold Open Access model in use by many scholarly journal publishers today. In both cases, the author pays the publisher a one-time fee upfront to compensate for the lack of future revenue that would have otherwise come from readers and subscribers. However, the author-pays aspect of the ProQuest service is the only element of Open Access publishing the company has adopted to date. Unlike the model used by journal publishers, Proquest's OA system continues to assert that all rights of the copyright owner are reserved, an attempt to control redistribution and reuse of the "free" ETD. Additionally, ProQuest offers no options to attach a Creative Commons license to the ETD, allowing legitimate scholarly and educational reuses (Clement, 2012). By contrast, OA journal publishers offer support for Creative Commons licensing and avoid placing "all rights reserved" copyright notices on articles that have been set free.

Publishing with ProQuest

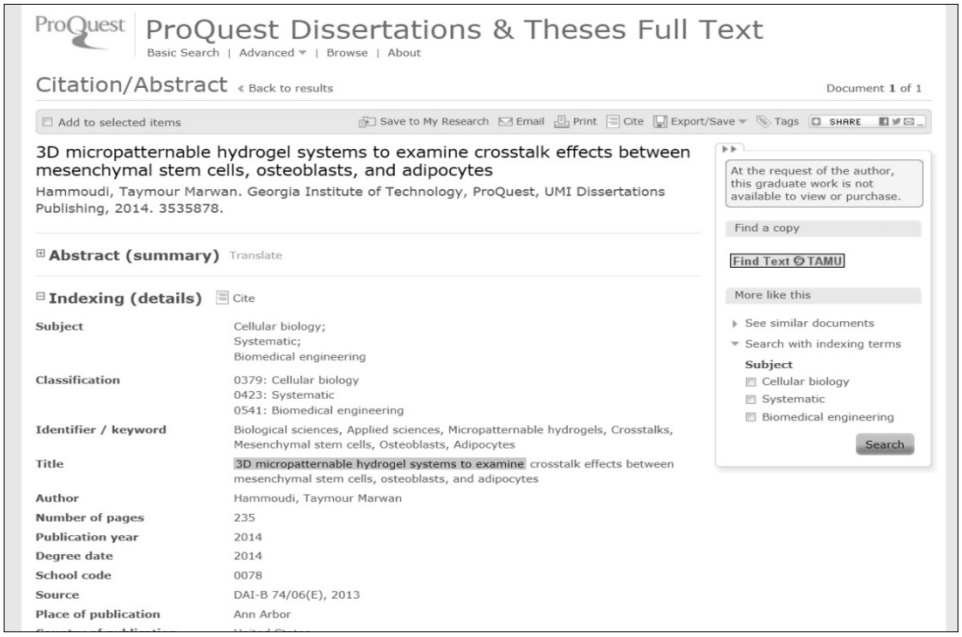
Under the category of Publishing services, ProQuest's database system offers editorial review "to deal with the approximately 15% of dissertation/theses that can't be published as submitted." Issues that ProQuest claims to resolve include "discrepancies between information in the metadata and information in the manuscript" and "copyrighted material used without permission" (McLean, 2006). This editorial service may be attractive to institutions concerned that their own internal review is inadequate.

There is evidence, however, that ProQuest's editorial service is not foolproof. For example, Georgia Tech recently

discovered that one of its dissertations submitted both to the university repository and to ProQuest appeared with different metadata in the respective systems. As shown in Figure 1, the record in the University's own SMARTech repository is accurate, representing the publication year of 2012. In the ProQuest system, however, the ETD metadata displays a publication year of 2014. This erroneous metadata has resulted in failed searches for the dissertation when conducted in the ProQuest system.

Additionally, ProQuest's copyright review process may at times present concerns for the university, according to reporting on the ETD-L discussion list. An institution recently posted about its copyright permission problems with an ETD containing entire copyrighted articles in the appendix that came to the university by way of ProQuest.

Figure 1. Record for a Georgia Tech Dissertation in ProQuest (A) and the University Repository (B)
The ProQuest record introduced erroneous Graduation and Publication Dates for the ETD, whereas the Georgia Tech record is correct.



(A)

(B)

ProQuest did not redact these materials from their copy of the ETD because the company had secured permission from the publisher to redistribute such content via their own system. But in supplying the ETD to the University for its institutional repository, ProQuest did not have the right to pass along that permission to the institution. The university therefore faced concerns about the need to redact the articles in the local copy, or secure permission themselves (Corbett, 2012).

Another distinct ProQuest offering under the Publishing category is the company's copyright registration service, providing convenience for an extra fee to students interested in that additional legal protection. It should be noted, however, that the US Copyright Office's own Web-based registration system is easy and convenient to use, saving the student the $20.00 service fee assessed by ProQuest. The registration record and certificate are identical regardless of who submits the registration application on behalf of the student.

Another value-added publishing service of ProQuest is the ability to order printed and bound editions of the ETD for purchase. A recent tweet from a doctoral student reflects the value that quality printing and binding holds for some graduate students: "Graduation was last week but getting this lovely hard copy of the dissertation from ProQuest made it feel real" (Lendof, 2013).

Mention should be made that comparable ETD printing and binding services are available through a plethora of binderies, publishers, and printers at highly competitive rates. Many graduate schools and libraries maintain a listing of similar companies offering ETD printing and binding for students (Texas A&M University, 2012a).

The last of the distinctive services offered by ProQuest in the Publishing Category is assignment of a unique International Standard Book Number (ISBN) to each ETD submitted through its system. An ISBN is a numeric commercial book identifier used for monographs sold through commercial distribution outlets such as booksellers and book-ordering companies. For institutions and students interested in seeing the ETD available for sale through various commercial outlets such as Amazon, the automatic assignment of an ISBN offers distinct value.

Finally, one additional characteristic unique to ProQuest publishing represents a distinctive practice rather than a service or value. This practice relates to ProQuest's placement and content of copyright notices for the ETD. As part of the publishing process, ProQuest modifies the student's submitted PDF by inserting, after the title page, a new page with copyright notices and other publisher markings, as shown in Figure 2 (following page). Additionally, the company also adds to the item citation a statement of copyright ownership by ProQuest (see the "Copyright" field in Figure 3, p. 19). ProQuest's claim of copyright ownership is misleading and inaccurate because at no point in the submission or publishing process does the student author of the ETD transfer copyright of the ETD to the company. Moreover, ProQuest's claim of copyright ownership in the microfilm edition is also controversial because mechanical reproduction in microfilm has not been proven to add new copyrightable elements to the work (Quilter, 2012; McLean, 2013). This ProQuest characteristic may be problematic for institutions concerned with the accurate representation of copyright ownership for their graduate works.

Collection management in ProQuest

ETD stakeholders may find value in making student works available in a central database focused purely on theses and dissertations. For several decades, ProQuest and its predecessor companies have offered one of the largest databases of graduate works in the world. However, it must be pointed out that ProQuest Dissertations and Theses (PQDT) includes records for many, *but not all*, U.S. dissertations and a far smaller percentage of U.S. masters theses. For example, searches for Georgia Tech works in the database indicate that ProQuest holds just 35% of the Institute's graduate output from 1925 to the present. Searches for Texas A&M theses and dissertations reflect a larger collection in ProQuest, amounting to 62%, but that is because the University paid a considerable sum to the company to add digital back files to its dissertation records by digitally reproducing older works from microfilm and print. However, few Texas A&M masters theses can be found in the ProQuest database. A number of legacy doctoral dissertations are also missing from the ProQuest collection, representing those never sent to the company for microfilming or digitization.

Another ProQuest characteristic relating to collection management is the matter of fees required either to submit works for inclusion in the ProQuest system or

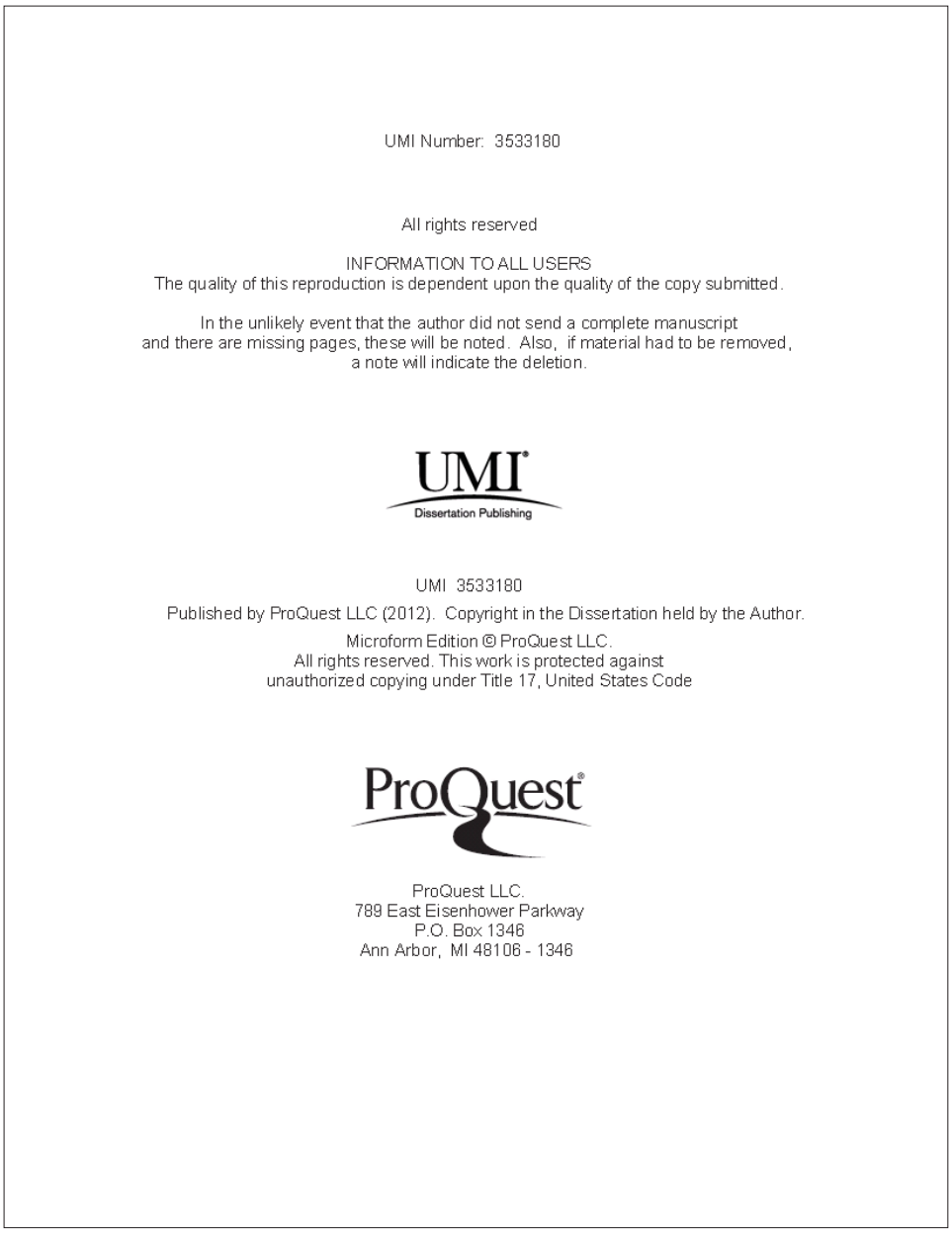
to access the ProQuest system in order to search for and retrieve ETDs. On the submission side, institutions that wish to include their dissertations and theses in the PQDT database are able to do so at no cost, providing they use the proprietary ProQuest ETD Administrator tool. Otherwise, submission comes at a cost starting at $25.00 for FTP or CD transmission of the ETD and its corresponding metadata. On the access side, fees must be paid to ProQuest to search and retrieve metadata and full text. At many institutions, these fees are paid via a library subscription that can cost as much as $40,000/year (Black and Keller, 2009). For users unaffiliated with a subscribing library, fees for downloading a given ETD may be paid individually online. The exception to fee-based access for the ProQuest system is for ETDs made available via the PQDT Open database, because the student author pays a one-time fee to set the work free for all users in perpetuity.

Discovery and access with ProQuest

To improve discovery of the ETDs in its system, ProQuest distributes citations and some indexing to additional database providers used in particular subject

Figure 2. ProQuest ETD Copyright Page

The ProQuest-added page behind the ETD title page includes ProQuest publisher information and a copyright claim in the microform edition.



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disciplines, such as business (ABI/Inform), social science (Psychological Abstracts), and others. This means that a researcher looking for information on a specific topic in those particular databases may serendipitously identify an ETD of interest in their search results without ever having to search the PQDT database. To get hold of the ETD, they would still need to click through from the citation to the ProQuest system and would only gain access to the full text of the ETD with a pre-paid subscription or payment.

Augmenting the increased exposure of the ETD in subject indexes is the assignment of an OpenURL to each ETD, allowing subscribers to seamlessly click through to the full version of the item regardless of their starting point on the Internet. OpenURL is the standard most applicable for works available only through subscription databases. Non-subscribing users who click the OpenURL have the option to purchase the ETD online from ProQuest thanks to a ready ordering screen that displays to those without pre-paid access.

Both of the characteristics outlined above, along with the assignment of an ISBN number to each ETD, are

Figure 3. PQDT Database Dissertation Record

This screen capture of a dissertation record in the PQDT database shows a ProQuest copyright claim in the "Copyright" field at the bottom of the record.

Statistical and geometric methods for visual tracking with occlusion handling and target reacquisition

Lee, Jehoon. Georgia Institute of Technology, ProQuest, UMI Dissertations Publishing, 2012. 3533180.

Show highlighting

Abstract (summary) Translate

Indexing (details) Cite

Subject	Computer Engineering; Electrical engineering; Artificial intelligence
Classification	0464: Computer Engineering 0544: Electrical engineering 0800: Artificial intelligence
Identifier / keyword	Applied sciences, Visual tracking, Occlusion handling, Target reacquisition, Computer vision, Shape analysis, Active contours, Image segmentation, Particle filtering
Title	Statistical and geometric methods for visual tracking with occlusion handling and target reacquisition
Author	Lee, Jehoon
Number of pages	136
Publication year	2012
Degree date	2012
School code	0078
Source	DAI-B 74/04, Oct 2013
Place of publication	Ann Arbor
Country of publication	United States
ISBN	9781267769527
Advisor	Tannenbaum, Allen, Yezzi, Anthony
University/institution	Georgia Institute of Technology
University location	United States -- Georgia
Degree	Ph.D.
Source type	Dissertations & Theses
Language	English
Document type	Dissertation/Thesis
Dissertation/thesis number	3533180
ProQuest document ID	1221989845
Document URL	http://lib-ezproxy.tamu.edu:2048/login?url=http://search.proquest.com/docview/1221989845?accountid=7082
Copyright	Copyright ProQuest, UMI Dissertations Publishing 2012
Database	ProQuest Dissertations & Theses Full Text

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characteristics intended to increase sales of the work and thereby generate royalties for the ETD author. According to its agreement with graduate students, ProQuest pays royalties of 10% of its net revenue from sales of the thesis or dissertation, as long as the author maintains a current address on record with ProQuest. It is important to note, however, that ProQuest will only make a royalty payment if sales of the work reach $250.00, representing $25.00 in royalties. According to this agreement, "If, after 25 years, earned royalties do not accrue to at least $25.00, ProQuest/UMI's royalty payment obligation will cease" (ProQuest, 2011a).

The prospect of earning royalties from ETD sales has been a ProQuest value proposition to students for some time. The recent news that the company is "winding down our optional third-party retailer service" therefore presents a puzzling development that the authors must present at face value at the time of this writing (Bolton, 2013). According to the company's Support Center website,[7] ProQuest is planning to change its ETD sales policies because of "feedback from the graduate education community that this program has been difficult to support and it is not consistent with author and institution dissemination objectives."

The final characteristic relating to discovery and access that ProQuest offers is meant to minimize exposure of the ETD. In the PQDT system, students have the option to restrict commercial redistribution of the work and/or to restrict harvesting of the ETD by Internet search engines. This may be a valuable option to students wishing to limit discovery of their works to authorized subscribers of the PQDT database.

Archiving with ProQuest

The hallmark of ProQuest and its predecessor, University Microfilms Inc., has been microfilm reproduction of the student's work and storage of the filmed copies in secure vaults in perpetuity. To this day, all theses and dissertations submitted to the company are microfilmed in high contrast, black and white format with 2 copies stored separately in climate controlled facilities. This service provides some institutions the feeling that they have safeguarded their students' work in a lockbox.

Yet there is growing evidence that microfilming does not equate with full preservation of the student work. First, the high-contrast black and white filming process fails to capture information in the document that is represented in color or shades of gray. This circumstance has been noted in dissertations which Texas A&M arranged to have digitized from microfilm held in the ProQuest vaults. An example shown in Figure 4 (following page) illustrates a page from a Wildlife Sciences dissertation containing photographic plates (an essential element of research works in agriculture, biology and earth science). The data conveyed in the original image was lost in the microfilming process. Anecdotal data from Texas A&M concerning microfilm's incomplete preservation of some types of scientific data is substantiated in formal research published by Musser and Roberts (2007).

Second, in evaluating the value of ProQuest's mandatory microfilming service, it may be helpful to know that the supremacy of microfilm as the best format for long-term preservation is no longer accepted nationally. Agencies with large-scale preservation responsibilities, such as the National Library of Medicine, have ceased their microfilming programs, and the National Endowment for the Humanities no longer funds grants for microfilming. Even the Library of Congress' Preservation Directorate (2013) affirms "doing far less microfilming than in previous years," noting that limitations of preservation microfilming include user unwillingness to work with microfilm as a format and the difficulties in maintaining operable readers. This evidence casts doubt on the wisdom of considering microfilm as a viable archiving strategy for theses and dissertations. For these reasons, it is debatable that the additional expense and effort ProQuest invests in microfilming theses and dissertations translates to proven value to universities and students.

Distinctive characteristics of the university repository system

While the characteristics distinguishing the university repository are fewer in number than those on the ProQuest list, their value may be considerable for some institutions. Each of these characteristics is assessed by category in this section.

[7] The ProQuest Support Center is online at http://support.proquest.com. Click on the tab for "FAQ;" navigate to the heading "Dissertations," and scroll down to the question "Why has ProQuest decided to wind down the third-party retailer program?"

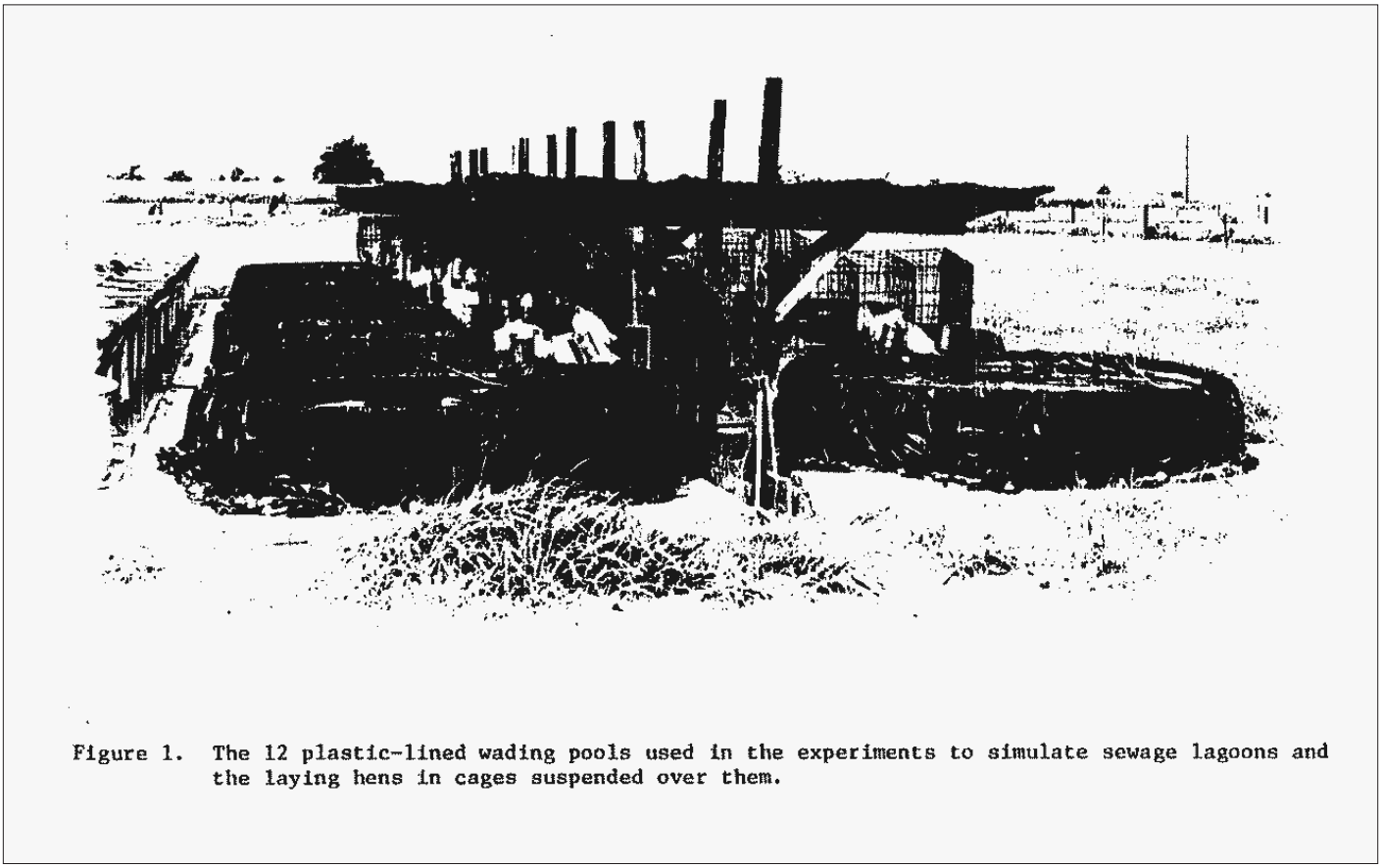
Submission with the university repository

The submission workflow efficiencies available with university repository ETD systems are comparable to those of the ProQuest system overall, as indicated in Table 2. However, when a more specific comparison is made between the repository ETD management system Vireo and the ProQuest ETD Administrator tool, the former appears to offer greater features and efficiencies. Distinctive features of Vireo not found with ProQuest include: faculty controls to approve or decline an embargo; customizable and shareable search filters; deposit of source files used to derive the final PDF; ability for institution to customize help text and field labels; and more (Larrison, 2013).

Another distinctive characteristic of institutional repository systems is the accommodation of graduate works other than dissertations and theses. ProQuest does not accept projects in lieu of theses and dissertations, whereas the university repository welcomes all manner of graduate works. Examples of additional genres of graduate work from Texas A&M include Capstone Projects from the Bush School of Government and Public Service (http://repository.tamu.edu/handle/1969.1/94971) and digitized Doctoral Internship Reports from the College of Engineering (http://repository.tamu.edu/handle/1969.1/147588). The University sees value in hosting all manner of graduate works within the repository because users find value in non-theses graduate works, and alumni appreciate having their scholarship openly available.

Figure 4. Loss of Image Quality in Microfilmed Dissertation

Example of a photographic image included in a science dissertation that was microfilmed by UMI and subsequently digitized from the film version. Due to the high-contrast, black and white nature of microfilm capture, the details of the image are practically indecipherable.



Source: McGeachin, Robert. 1980. Production of *Tilapia aurea* in simulated sewage lagoons receiving laying hen wastes. PhD Dissertation, Texas A&M University. Used under provisions of fair use.

Publishing with the university repository

The university repository system assigns unique identifiers to each ETD in the system. Instead of ISBN numbers or OpenURL's—identifiers optimized for commercial exploitation for the ETD used by ProQuest—the handles assigned to ETDs in the university repository are well suited for digital objects on the Internet. Handles represent unique and persistent identifiers for Internet resources as developed by the Corporation for National Research Initiatives (2013) in accordance with worldwide Internet standards.

Another distinctive characteristic of university repositories is the generation of usage statistics and the provision of usage data to the author and to the institution. The DSpace repository platform readily provides updated usage statistics showing total visits for month, top countries view, and top cities view. This data is available at the collection level, reflecting usage of all ETDs in aggregate, and also at the item level, indicating usage of a particular work. (DSpace Developer Team, 2011a). Usage data is valuable to the student and to the institution as an indicator of impact and reach of graduate scholarship.

Collection management with the university repository

Universities are the institutions uniquely charged with the responsibility to maintain complete collections of their graduate students work; for this reason, their own local collections of theses and dissertations are more likely to be complete than any other collection out there. Georgia Tech ETDs exist in digital format in the SMARTech repository and the collection is 100% complete. At Texas A&M, all masters' theses are in the university repository, and all dissertations from 2004 forward are also held there. A project is underway to retrospectively digitize approximately 12000 legacy dissertations to complete the repository collection.

The Texas A&M decision to digitize dissertations from print, after investing a substantial sum to have ProQuest digitize the university's dissertations from older microfilm copies, reflects user and alumni dissatisfaction with the poor quality of digital reproductions made from an intermediate, black and white microfilm copy. Additionally, ProQuest restrictions on what use could be made of the digitized PDFs they produced with Texas A&M funding proved too limiting to meet university needs. Texas A&M secured from ProQuest the right to include ProQuest-digitized dissertations in the university repository only if the full-text was restricted to campus-only access (even for works that were in the public domain). Although another university successfully negotiated with ProQuest to allow open access to their ProQuest-digitized dissertations in the university repository (Shreeves and Teper, 2012), such an allowance was not offered to Texas A&M.

The question of collection management for the university's ETDs was a key point of discussion in Georgia Tech's analysis of their ETD management practices. An informal survey of librarians showed the perception that the ProQuest Theses and Dissertation database was fully comprehensive, and librarians feared that Georgia Tech would lose prominence in ETD searches if deposits weren't made to the ProQuest database. Following up on these concerns, it was discovered that several schools (outlined in Table 2) have stopped submitting to ProQuest in recent years, meaning that a growing proportion of American ETDs produced at top research institutions are missing from that company's system. Further, private correspondence with other libraries considered as peer institutions indicated an intention to move in the direction of making ProQuest optional—suggesting a growing trend that would further diminish the relative completeness of the commercial database. Consideration was also given to the fact that Georgia Tech's entire thesis and dissertation collection has been digitized and made available to the whole campus, with citations available to the whole world and full text available on request (through ILL). Furthermore, all Georgia Tech ETDs from 2004 forward are available worldwide via open access. ProQuest does not have a complete collection of historical Georgia Tech dissertations or theses and would never 'catch up'. This combination of factors assuaged library concerns about the integrity and discoverability of the ETD collection at Georgia Tech.

Discovery and access with the university repository

University repository systems are commonly configured for harvesting via the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH), allowing ETD metadata to be retrieved automatically by Internet harvesters and added to discovery systems elsewhere on the Internet. Both Texas A&M and Georgia Tech have enabled harvesting for their repositories so that all ETD

metadata from their students is searchable in the union catalog of the Networked Digital Library of Theses and Dissertations (with two interfaces available at http://thumper.vtls.com:6090/ and http://www.ndltd.org/serviceproviders/scirus-etd-search) and the OA ETD portal (http://OATD.org). Additionally, both university repositories are configured to allow indexing by Internet search tools such as Google and Google Scholar. Students do not have the option to opt out of the harvesting of their ETD metadata. However, the harvesting is limited to metadata associated with the ETD, not the ETD itself, and therefore in no way exposes information that has been placed under embargo by the student.

Archiving with the university repository

In selecting the university repository as the primary platform for managing its collection of ETDs, institutions regard the ETD held locally as the version of record. That means that the file(s) distributed, backed up, and preserved over time is exactly the same as the student's final version submitted and approved as the official record in partial fulfillment of their graduate degree. This approach ensures that the university is responsible for stewarding the work through its entire lifecycle. It equips the university to effectively manage events that may require ongoing attention over time, such as management of embargoes; responses to audit or Freedom of Information Act (FOIA) requests; replacement or updating of files, if required; and ensuring long-term access to the work in spite of technological or other changes.

With regards to long-term preservation of the ETD to ensure its usability over time, university repositories typically archive the PDF and supplementary files in whatever formats they were submitted. Texas A&M captures and preserves the source files comprising the final ETD PDF using the Vireo system, a practice that optimizes the likelihood of reproducing the original submission with changes in technology. Vireo also captures administrative information such as permissions for included material and the distribution license signed by the student – important data for stewarding the thesis or dissertation through its lifecycle. Georgia Tech receives the original source file of the ETD from the submission system, after release from the Graduate Office. SMARTech policies, following a model established by MIT, commit to preserving the supported format types by means of format migration or emulation should the need arise (Georgia Institute of Technology, 2013a; Massachusetts Institute of Technology, 2013a). SMARTech, as a DSpace repository, also provides checksum functionality of the file at ingest, as well as regularly scheduled bitstream integrity checks using Checksum Checker (DuraSpace, 2013a).

CONCLUSION

A tale of two policies

The purpose of a comparative analysis between the ProQuest ETD system and that of the university repository is to identify commonalities shared by these systems as well as distinguishing characteristics unique to one or the other system. The aim of the comparison is not to declare one or the other system as best overall; rather, it is to assist decision makers in choosing an institutional approach that best fits their the values, goals, and needs. The analysis focused on dissertations for pragmatic reasons (many US institutions submit only doctoral-level works to ProQuest), but the findings are applicable to master's theses as well.

It is clear from this analysis that universities have two good options for ETD management in both the ProQuest system and the university repository, with both representing solid, functional platforms capable of handling the essential components in the ETD lifecycle: submission of the student's work; dissemination of that work with necessary access controls; inclusion of the work in a larger collection; discovery and retrieval of the work over the Internet; and archiving of the work over time.

The findings from this study also indicate that there are some significant differences between the two systems —distinguishing characteristics that could drive an institution's decision making in selecting one system over the other, or in justifying their dual use in parallel. These distinguishing characteristics have, in fact, resulted in different ETD management policies between the authors' institutions: the Georgia Institute of Technology and Texas A&M University.

Prior to the Fall of 2012, Georgia Tech students were submitting full text dissertations to both SMARTech and ProQuest. Georgia Tech's analysis of the service features of ProQuest arose from several complaints from graduating or recently graduated students who were concerned

about the agreement they were required to sign and about the consequences of signing such an agreement. Some students had expressed reservations at signing a licensing agreement of any kind with a third party, and others had not fully understood the agreement and were surprised to find their thesis for sale online by commercial publishers. In response to these growing concerns, Susan Parham, head of Scholarly Communications and Digital Curation at Georgia Tech, met with the Vice Provost for Graduate Studies, the Graduate Studies director, and the Georgia Tech Office of Legal Affairs to discuss the implications of these complaints and decide on the policy. The Office of Legal Affairs gave input that there was no requirement to mandate students to enter into an agreement with ProQuest (or any other third party) as a condition of graduation.

Weighing all of the options listed in Table 2, combined with research on ETD trends at peer institutions, Georgia Tech came to the conclusion that not requiring submission to ProQuest, per the discussions of all parties mentioned above, would not lead to any significant deficit in coverage, discoverability, or dissemination. Therefore, in the "submission" category, Georgia Tech's process would now end with deposit into the IR, which is free to the student. No further submission (and no further cost) is incurred to the student. The elimination of these fees was viewed as a benefit to the student, and the elimination of the paperwork for submitting to ProQuest realized greater operational efficiency.

Texas A&M considers the university repository as its primary ETD management system and, since 2004, has required submission of all theses and dissertations to that system. Historically, and continuing to the present, master's level students do not submit their theses to ProQuest. Thanks to a large-scale legacy digitization project, all master's theses are now online in the university repository.

At the time of this writing, doctoral students must double-submit their Ph.D. or Ed.D. dissertations and their D.Eng. Records of Study to both the Texas A&M Digital Repository and the ProQuest Digital Dissertations database. University administrators have been assessing the efficacy of maintaining a dual submission process for dissertations, noting the extra effort required by Thesis Office personnel and graduate students to get the works to two separate systems. Additionally, student works containing third-party copyrighted material with legal justification (fair use or license) have raised concerns about ProQuest's copyright policies. Finally, administrators have responded to students' philosophical opposition to the requirement that they provide their work to a commercial publisher. For this set of reasons, the University does allow students to opt-out of ProQuest submission with cause. Furthermore, according to the Dean of Libraries, the University is now considering shifting to an opt-in policy for ProQuest submission (Carlson, 2013). At the time of this writing, however, university policy continues to require doctoral dissertations be submitted to ProQuest.

Future directions

Regardless of policy differences between Georgia Tech and Texas A&M, the authors agree that a concern common to both institutions, and likely to other institutions as well, is having a comprehensive service for discovering ETDs regardless of the system they reside on. The increasing variety in ETD publishing choices, and the proliferation of Open Access scholarly sharing sites on the Web, are certain to create an ever-more dispersed set of ETDs across the Internet.

Moreover, as discussed earlier in this paper, ProQuest has a very large database of doctoral dissertations (and to a lesser extent masters' theses), but it is by no means complete. Both historically and to the present, not all institutions have participated in the ProQuest dissertation publishing program, and participating institutions have not sent every work. Furthermore, as more institutions decide to make submission to ProQuest optional, the degree of coverage in that database can only grow smaller.

Another concern about the role of the ProQuest database as the central discovery service for ETDs is its relatively costly subscription fee, putting the service out of the reach of many libraries and educational institutions, not to mention scholarly societies and other research organizations. In the age of free Web discovery services, users without ProQuest access may find much of what they want via a Google search that includes millions of ETDs from university repositories.

Given the predominant trend of ETD submission to university repositories, a discovery service that aggregates ETDs regardless of location offers a promising solution. One such service is the Catalog of the Networked Digital

Library of Theses and Dissertations (http://thumper.vtls.com:6090/), currently offering access to 3,049,795 ETD records from institutions worldwide. Another promising ETD discovery service is the Open Access Theses and Dissertations portal (http://oatd.org) recently launched by Wake Forest University Libraries, providing access over 1.5 million open access ETD's from around the world. Also promising are the emerging Web-scale discovery and aggregation services that cover scholarly content from repositories worldwide, such as the Primo Central Index (Vaughan, 2011) and the Digital Commons Network (Enis, 2013): such services can limit searching to ETDs within their respective networks. Federating ETD holdings across multiple repository systems (not just DSpace) would further enhance discovery and access to graduate research in unprecedented fashion. An investigation into the coverage and functionality of these promising solutions would be a boon not only to universities and the graduate students authoring thesis and dissertations, but to the diverse range of researchers, students, professionals, and interested citizenry who could benefit from these unique works of scholarship.

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