Perspectives on Electronic Theses and Dissertations

by

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INTRODUCTION

This paper provides three perspectives on electronic theses and dissertations (ETDs): the student's, the faculty member's, and the librarian's. These might also be described as immediate, near term, and long term perspectives. While this paper describes largely recent events, it also draws on the ten year history leading to the Networked Digital Library of Theses and Dissertations (NDLTD), especially the effects of the ETD requirement at Virginia Tech since January 1, 1997. A surprise to some, a revelation to others, but it is a fact of life now for the students, faculty, and library at Virginia Polytechnic Institute and State University (Virginia Tech). As a result, we have gathered a body of information, factual and anecdotal, that describes the impact of ETDs on many cultures both within and outside the academy. This paper presents the ETD initiative from these perspectives.

STUDENTS' PERSPECTIVES

When graduate students at Virginia Tech submit their ETDs, they are asked to respond to a nine-question online survey. The following summarizes the surveys received from 455 graduate student authors submitting their ETDs between February and mid-August, 1999.

When they needed help with their questions about ETDs, 60% of our students sought personal assistance, turning to their friends, committee members, or staff at the library's New Media Center (NMC). The most frequently consulted source of personal assistance to authors' questions about ETDs was their friends (42.6%). Graduate students' consulted their committees nearly 8% of the time, and the NMC staff worked with nearly 10% of

our ETD authors. It is the only computer lab that has staff trained and assigned to help its users. Other open computer labs on campus have computers and software, but staff monitor the facility and are not assigned to assist users.

When they wanted answers to their questions about ETDs, three-fourths of our students also turned to the Web. 74.9% said they consulted the VT Web and a few (1.1%) went elsewhere on the Internet. We asked authors who used the VT Web (http://etd.vt.edu) how helpful they found it, and 72.2% found it helpful or extremely helpful. Only 1.6% said it was extremely unhelpful and 6% said “unhelpful.” 13.9% found the Web neither helpful nor unhelpful. Staff working with the Digital Library and Archives are reorganizing and updating the VT Web so it will continue to be useful.

Another source of helpful information was attendance at the ETD workshops organized by the Graduate School. Presented twice a semester and once during each summer session, the workshops are held at a variety of locations and at times meant to appeal to students. These workshops have two goals: to introduce students (and faculty who may attend) to the ETD process, and to provide help and advice for preparing ETDs. The workshops are presented in two segments: the first portion is one for the "novice" and the second is for those with more advanced skill levels. The former emphasizes some typical word processing steps, such as using page breaks and how to automatically insert page numbers, as well as preparing tables of contents and integrating portrait and landscape page layouts in the same document. The instructor also covers the steps from the word-processed document to PDF (portable

document format) and submitting an ETD through the Web to the Graduate School.

The ETD workshops, however, were not as successful as the Web site in providing graduate students with assistance, because only 21% said the workshop was a source of answers to their questions about ETDs. Of those who said they attended the workshops, over half, 56.9%, found them helpful or extremely helpful. A large percentage, 34.1%, was neutral on this issue, while less than ten percent did not find the workshops helpful.

Whether they got help through personal contact, the workshops, the Web, or elsewhere, over half (256) of our graduate student survey respondents were pleasantly surprised that turning their theses and dissertations into portable document format (PDF) files and submitting them electronically was easier than they expected. Over one fourth, 28.7% reported that creating PDFs were somewhat less difficult, and 27.6% found PDF conversion much less difficult than they had expected. Unfortunately, we still had nearly one-fourth of our students, 106 out of 453, who found PDF more difficult than they had anticipated. “Somewhat more difficult” was the response from 15.7%, and 7.7% said it was “much more difficult.” Based on discussions with New Media Center staff, the ETD workshop instructor, and the Dean of the Graduate School, it appears that older graduate students have less experience with computer technology and, therefore, encounter more problems converting their theses and dissertations to ETDs. Others that have difficulty are, not surprisingly, those who wait until the last minute and find they lack the time to learn to use the technology. One-fifth were not surprised one way or another by the conversion to PDF process.

The results from our graduate student authors were similar when surveyed about the ETD submission process. Over half, 56.5%, found it less difficult than they expected, and nearly one-fourth found it more difficult. As with converting files to PDF, one-fifth found it neither more nor less difficult to submit their ETDs than they had expected.

Where were the VT graduate students when they submitted their ETDs and completed these survey questions? Nearly two-thirds were working on campus: 28.1% were working unassisted in a computer lab while 6.6% were in the New Media Center. Almost one-third, 29.8%, submitted from their campus offices. Nearly 20% submitted their ETDs from their residences; 18.4% were in their off-campus residences and a few, six or 1.3%, submitted from their campus dormitory rooms. 15.8% submitted their ETDs from elsewhere.

What kind of computers did these ETD authors use? The vast majority used PCs: 83.7%. Mac users comprised 13.7% of the survey respondents. Nearly a dozen others, 2.4%, used Unix-based operating systems.

The final questions of the nine asked of our graduate students submitting their ETDs, are very telling ones. In the last two questions the graduate students report their plans to publish from their theses and dissertations, and if they restricted access to their works, who advised them to do so.

Virginia Tech's ETD authors reported ambitious publication plans. Over 85% reported that they planned to publish articles, proceedings, chapters, books, and other works based on their theses and dissertations. Only 13.7% reported that they did not plann to publish anything from their ETDs. Over two-thirds of our graduate students reported that they would publish articles, and

40.7% anticipated publishing in conference proceedings. Only a small number, 26 out of 445 respondents or 5.8%, plan to publish a chapter, while a few students, 31 or 7%, plan to publish a book.

While many authors and their faculty advisors are afraid that ETDs that are available on the Web will be considered “published,” only 11.4% of the authors reported that publishers had advised them to restrict access to their ETDs. On the other hand, the graduate student authors reported that their faculty are overwhelmingly advising them to restrict access to their ETDs—235 out of 271 or 86.7%. Someone other than faculty and publishers advised 82 authors (30.3%) to restrict access to their ETDs.

ALUMNI'S PERSPECTIVES

In addition to having information from graduate students who submitted ETDs in 1999, the Graduate School gathered data from about 50 alumni who allowed their ETDs to be Web-accessible during the previous year. While 86.3% of the 1999 ETD authors said they would publish something from their ETDs, 42.6% of the 1998 survey respondents said they had published. Remarkably, the published authors reported that they did not encounter any resistance from publishers to accepting their manuscripts because they were derived from online theses or dissertations. Hopefully the same will hold true for the 1999 ETD authors though 11.4% said they restricted access based on advice from publishers.

The 1998 authors responding to the Graduate School’s survey reported overwhelmingly that they were

satisfied (66.7%) or somewhat satisfied (29.2%) that their work was more widely known and appreciated because their ETDs were accessible. Over 40% had been contacted as a result of having their works on the Web, and 88.3% were satisfied or somewhat satisfied with contacts resulting from their Web-accessible ETDs. The vast majority were satisfied (27.8%) or somewhat satisfied (55.6%) that it also helped to expand their network of research colleagues. Of those who received comments about their ETDs, 83.3% reported receiving somewhat positive comments though 16.7% said they received somewhat negative comments. Small, but equal numbers were somewhat satisfied (5) an somewhat unsatisfied (5) that having their ETDs online helped them locate employment.

Among the comments they noted that they were pleased with the ability to "share one's knowledge and research." Another popular comment was about how "incredibly convenient" it was to provide copies of their theses and dissertations by forwarding the URLs of their VT ETDs. One survey respondent expressed concern about the ease of plagiarism and copyright violation. The Graduate School is conducting another alumni survey in September 1999.

USERS' PERSPECTIVES

In addition to survey responses from ETD authors, we collected responses from about 50 individuals between April and October 1998. Voluntarily completing a “user survey” that was a link from the library’s ETD homepage (http://scholar.lib.vt.edu/theses), they responded to 16 multiple-choice questions. Where did these respondents work or study? 65.4% were associated with universities, 13.5% with industry, 7.7%

with schools, and 13.5% worked or studied elsewhere. Who were these respondents? 44.2% were researchers, 3.8% were faculty, 11.5% were teachers, and one (1.9%) was a librarian. 13.5% categorized themselves as "other."

Of our 52 respondents, nearly one-third (32%) had relatively fast Internet connections (i.e., Ethernet, T1, ISDN, or cable modem). The majority, 54%, was connecting at slower speeds, 56 KBPS (kilobytes per second) down to less than 14.4 KBPS. The connect speed was unknown to seven of our respondents.

These survey respondents used PCs, Macs, and Unix-based operating systems in similar proportions to ETD authors. 2.4% of the user survey respondents used Unix-based systems. 13.7% of the authors used Macs, but slightly fewer of the surveyed users did, 10.2%. ETD authors were 83.7% PC users and 91.8% of the surveyed users. Only about one-fourth of the ETD users responded that they were unfamiliar with PDF.

Twenty-five percent of our ETD users were from universities that do not accept ETDs, though 27.5% responded that they did not know if their universities accepted ETDs. 40% were from universities that accepted ETDs. 18% of the respondents said they submitted ETDs, while 82% (32) said they did not. 55.2% of the user survey respondents said their universities *should* accept ETDs. Only one person answered that their university should not accept ETDs, and 20.7% had no opinion on this topic.

When asked why they came to the ETD digital library homepage (http://scholar.lib.vt.edu/theses), the largest percentage, 62%, said they were doing research. 21% wanted to learn about ETDs, 2% were there because of their jobs. Personal interest was the

motivating factor for 15%. There was an even distribution for responses to “Were ETDs easy to find?” Seven responded “very easy” while six responded “very difficult.” Ten each responded easy, fair, and difficult. Four responded to our survey before they tried to find any ETDs. In the future we may survey most of these readers again. Over 82% said that we could contact them for further information and they gave us their email addresses.

FACULTY MEMBERS' PERSPECTIVES

ETDs have been a topic of conversation among Virginia Tech faculty for many years and in the winter of 1996 the Degree Requirements, Standards, Criteria, and Academic Policies Committee (DRSCAP) recommended to the Commission on Graduate Studies and Policies (CGS&P) that graduate students submit theses and dissertations electronically. Unlike the information we have gathered from student and user surveys, faculty opinions have been gleaned largely from electronic mail archive (email), minutes of the university's ETD Advisory Committee meetings, and anecdotal evidence from workshops and individual encounters.

One source is the archive of minutes of the Commission on Graduate Studies and Policies and its Degree Requirements, Standards, Criteria, and Academic Policies Committee. The minutes of October 18, 1995 show a proposal from DRSCAP that recommends that the Graduate School begin requiring students to submit their theses and dissertations electronically by the fall 1996 semester. The minutes of a January 1996 Commission meeting report six concerns: (1) phase in the requirement, (2) make resources available to support the requirement, (3) include

copyright statement, (4) put in place procedures for exemptions, and (5) make allowances for hard copies and (6) adaptation to new software.

On Feb. 21, 1996 CGS&P received a document on implementing ETDs prepared by DRSCAP. After modification, it was approved unanimously. One of the modifications was to begin the requirement Jan. 1, 1997. DRSCAP recommended: (1) encourage voluntary submission prior to January 1997; (2) establish university oversight committee; (3) publicize the requirement widely; (4) provide training and workshops for students, faculty, and staff; (5) avoid significant burden on departments.

At the April 17, 1996 meeting of the Commission, an amendment was made to the Feb. 21 policy stating that ETDs would not be available on the WWW until a release form granting permission to do so was signed by both the student and major professor. The oversight committee was also charged to work with societies and publishers to encourage them to adapt their policies concerning ETDs.

As a member of the Virginia Tech ETD Team, my email archives are quite robust. They show areas of faculty concerns focussed on three main topics in 1996: (1) quality of the works representing the university; (2) easy and timely access to graduate students' research; (3) impact of ETDs on future publications.

Of these concerns, only the last was reflected in the minutes of DRACAP and CGS&P. Widely available ETDs caused faculty to be more concerned about the potential impact of their students' works. They wanted their university to be represented by quality research, and, if they are going to be available, they should be timely and easy to find.

Many email messages also focused on training for students and faculty. This concern was addressed in two ways. The Graduate School has provided "ETD Workshops," informing attendees about the process of conversion from word processed documents to PDF and the online submission process. At the workshops, students frequently ask about scanning images--an indication of their planning to convert analog formats to digital formats instead of creating digital works initially.

Secondly, Faculty Development Institutes (FDI: see Endnote) introduced faculty to similar processes. In 1996, 340 Virginia Tech faculty attended week-long FDIs, subsequently receiving the hardware and software that they had been instructed in using. Seven-hundred faculty had participated in the faculty development initiative by the end of the first year of the ETD requirement.

The third issue of concern to faculty in 1996 was the impact of future publications and whether an ETD would be considered published if it was available on the Worldwide Web. Unable to definitively answer this for every publisher, Virginia Tech responded to this concern by offering restricted access options. This was to give publishers time to become familiar with ETDs and reduce the perceived threat that ETDs posed journal sales. In addition to the option of unrestricted, worldwide access, students and their advisors have the option to limit access to the university community or to withhold access from everyone, both for a limited amount of time.

In 1997 the issues of concern to Virginia Tech's faculty are documented in articulate, prolific, and heated email transmissions. Many faculty felt the ETD requirement had been handed down to them by the university administration without any opportunities for

faculty input. Evidently, faculty on the CGS&P and DRSCAP had not taken information about the ETD initiative back to their constituencies. In addition, few faculty had read the articles published in the campus newspapers. The faculty, staff, graduate student newspaper, *Spectrum,* mentioned electronic theses and dissertations almost monthly in 1996. These included workshop announcements, reporting on an article about the Virginia Tech ETD initiative in the *Chronicle of Higher Education*, recounting meetings of the CGS&P and DRSCAP, announcing a FIPSE grant (Fund for the Improvement of Post-Secondary Education), and more. In 1997 ETDs were mentioned bimonthly, including articles about the feature story on National Public Radio, Microsoft and Adobe software donations to the NDLTD, workshop announcements, and more.

From the 1997email archive four themes important to the faculty stand out: potential harm to future scholars, "cultural" differences among academic disciplines, faculty feeling threatened, and the lack of clarity about intellectual property law. Only the final issue continued to be of concern to faculty in 1998 and 1999.

The emails stressing the potential harm to future scholars had three components. (1) Would new scholars be able to get their articles, for example, accepted for publication if ETDs were considered published because they were Web-accessible? (2) Would the online works have the same quality as the earlier paper versions? The subtext of this concern was: (a) Would ETD authors continue to speculate about future research if they were afraid that their ideas could easily be plagiarized? (b) Broken Web links would detract from the work, and (c) big files would be too slow for readers to download. The

last component (3) was how would UMI handle ETDs in *Dissertation Abstracts?*

Getting ETDs into *Dissertation Abstracts* was an early workflow issue resolved through programmatic email notification to UMI of each approved and available VT ETD. However, fear for students whose ETDs would be fully Web-accessible lead over 62% of our faculty to advise their students to restrict access, according to authors surveyed in 1999. 20% of our students have responded to this cautionary advice by withholding all access, and 30% restrict access to Virginia Tech. This advice has also lead to *Dissertation Abstracts* listing fewer Virginia Tech ETDs. Unlimited, worldwide access is available to 50% of the ETDs approved by the Graduate School.

Rating the quality of ETDs in comparison to other formats has not yet been address and is a topic for further study. ETDs are richer in graphics and color, very likely due to the reduced expense producing the online version, versus the considerable cost of supplying multiple color copies that would be required for the paper format. The quality of ETDs with broken Web links has not been studied. However, many feel that an out of print article is also very difficult to find and probably leaves the researcher with a greater dirth of information than do broken links and missing Web sites. The relationship of quality to download time is questionable, especially when heavy Internet traffic slows access, but it is certainly faster than traveling to campus and parking, or waiting for a dissertation to arrive through document delivery services such as interlibrary loan or UMI.

LIBRARY PERSPECTIVES

The advent of electronic theses and dissertations also raised a cadre of issues and responsibilities for libraries to address, including improving access to information, maintaining the information server, and archiving. With ETDs libraries became better-stocked digital libraries, provided more timely access to information, served more users without increased staffing, and saved shelf space. Some issues are new to libraries but most require mapping traditional services and resources to digital resources and electronic services.

The library is a traditional source of information, but it has not necessarily established itself as the locale for computer training. This is changing, not because of, but along with, the advent of ETDs. There are typically two types of library computer labs: those supporting learning about access to resources and those supporting training and resource development. Some libraries provide both, assisting authors to prepare ETDs and introducing users to new information resources such as ETDs. According to the author surveys, library instruction has been somewhat effective based on author use of the New Media Center. Faculty also receive training in the use of technology to prepare electronic works for publications and they are introduced to the library's new information resources.

Librarians with increased instructional responsibilities assist users throughout the full information cycle, from discovering to communication to submission, possibly for online access and publication. In addition, computer labs in libraries can familiarize graduate students with asynchronous collaboration tools, enabling them to work with local as well as remote

resources. As graduate students become more sophisticated software users, libraries may provide authoring spaces with less intervention.

With ETDs libraries enable universities to unlock intellectual property. Unlike the research described in printed and bound theses and dissertations that has been essentially hidden because it circulates so infrequently from library shelves. Similarly, very few dissertations, available through *Dissertation Abstracts,* have been requested frequently enough to garner royalty payments. Virginia Tech's ETDs are available to a wide community of users unhampered by the hours the library is open and this results in far more frequent use than the paper or microfilm formats.

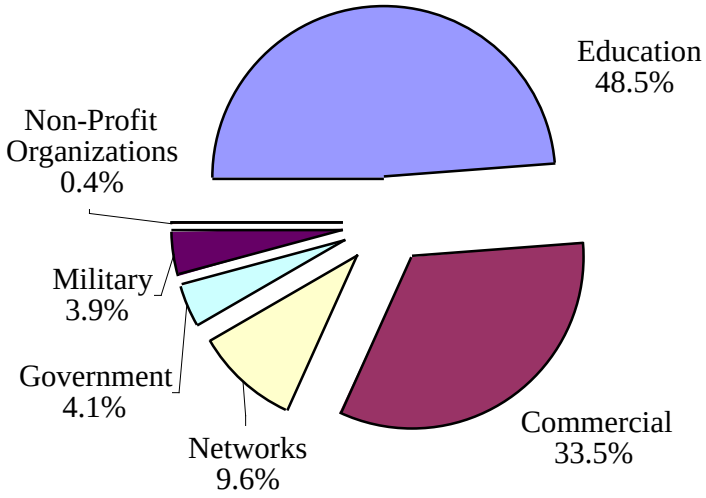
ETDs Requested

1996	*1997*	*1998*	*Jan.-Aug. 1999*
4,600	72,854	244,987	476,313

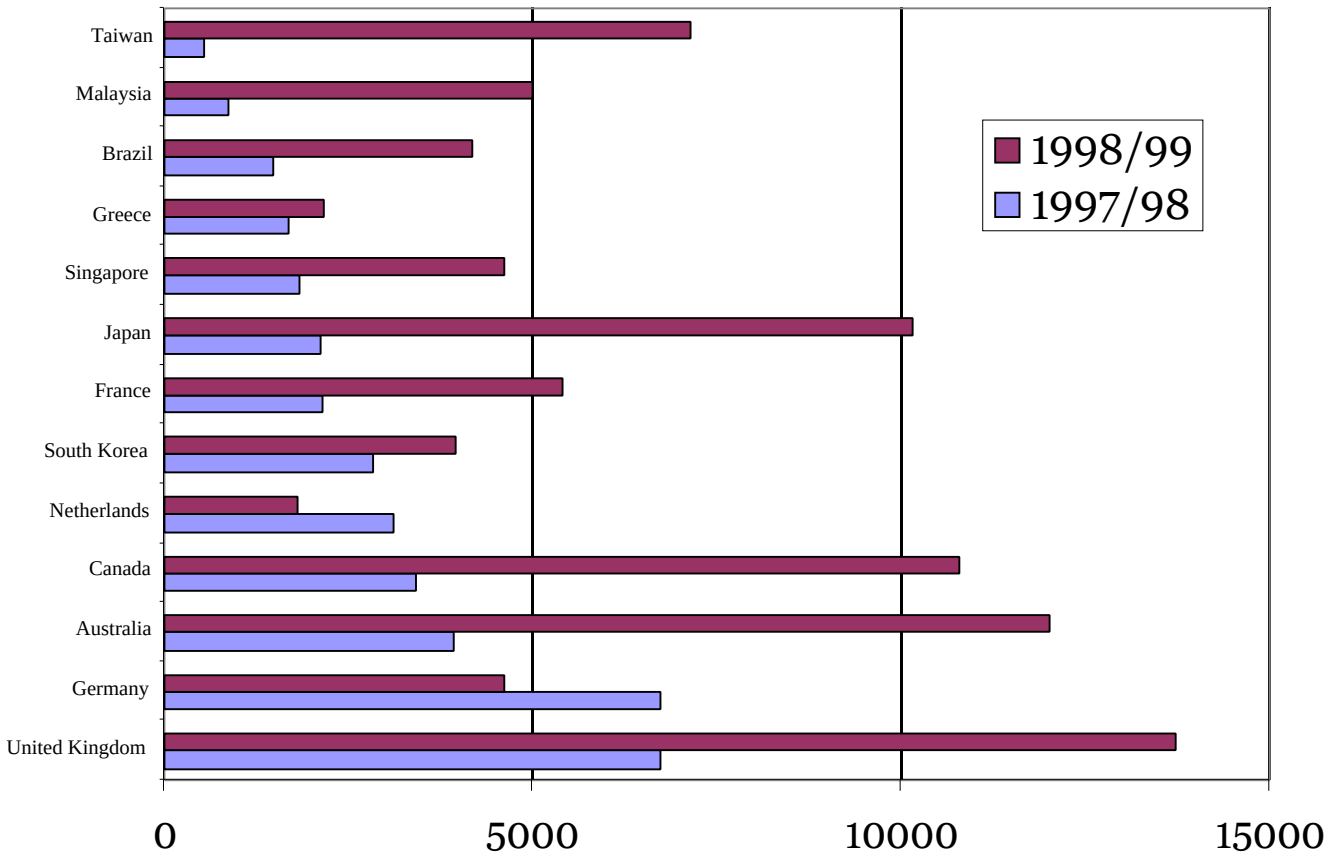
Computer log files reveal that not only does the library provide increased access to its ETDs, its clientele is broader than the local educational domain and now reaches commercial and government domains.

ETDs are labor saving devices! Increased use does not require increased library staff time because ETDs do not have to be mailed to *Dissertation Abstracts,* bound, labeled, security stripped, barcoded, checked out and checked-in, shelved and reshelved.

With ETDs, Libraries Serve More Users in the United States



With ETDs, Libraries Serve More International Users



Computer programs “move” submitted works through the approval process to availability and into the archive. Even without deriving the cataloging record from the online text, eliminating handling of multiple paper copies of each title could save 73.3% of the cost of processing paper dissertations.

Libraries continue to provide access to ETDs from within their buildings for patrons. At many research universities, libraries also often provide "better" downloading times through Ethernet connections. Therefore, libraries provide Internet workstations throughout their systems for students to access completed ETDs as well as supporting computer labs for authors to prepare these works.

In the future, libraries may be the principal locale for the variety of software necessary to view multimedia ETDs. Standards for software used by ETD authors are developing by default, rather than through mandates or requirements.

Multimedia Recommended / Used in ETDs

Formats Recommended		*Formats Used*
IMAGE:	**bmp, dxf, gif, jpg, tiff**	*.dxf, .gif, .jpeg, .pdf, .tiff*
MOVIE:	**avi, mov, mpg, qt**	*.mpeg, .qt, .eps*
SOUND:	**aiff, mcd, wav, mp2**	*.aif, .wav*
TEXT:	**pdf, html, SGML**	*.pdf, ETD-ML*
OTHER:	**Macromedia, SGML, XML**	*Authorware, Director, xls*

Some library users are uncomfortable when libraries do not have copies of ETDs in paper, preferably, but also microfilm formats. There are two important factors, however, that many library users do not consider. One is that some ETDs were not designed to convey the same message as text on paper (see the list of media above). Over time users will become accustomed to this media, especially when they enjoy, for example, the benefits of online works having multiple simultaneous users. Advantages also include the end of mutilated, destroyed, or stolen materials requiring expensive replacements or elimination of the works from library collections. The security of multiple copies of every electronic work should alleviate some of the tension created by not having these works also available on the shelves.

ETDs can become accessible immediately, once the appropriate university unit completes the evaluation of the work. There do not have to be any processing delays as with paper. In addition, a library's database of

ETDs can be reindexed frequently so users can reliably search and retrieve newly available works.

Quality as well as timeliness of cataloging records for theses and dissertations has improved. When the bibliographic information from the title page is available online, catalogs can provide easy access to this information easily. When the abstract is also online, more information can be included in the catalog's bibliographic record. Library systems eventually will programmatically derive the cataloging records directly from the digital works, and with more computing power, some institutions will index entire ETDs and every word in these works will be a point of discovery for Internet users.

While libraries improve workflow and take advantage of the ease of providing prompt access to ETDs, they also have the continuing responsibility to maintain long term access and to archive these works in their final form. Maintaining the server for ETDs need not be a huge added responsibility for libraries that already maintain computers for storage and access to other digital works. Libraries, especially those that have a tradition of strong internal systems support, also have a responsibility to preserve ETDs at the same time that they provide continuous customer support.

One of the best security practices is for multiple agencies to reciprocate online archiving, and the most effective way of doing this is through “mirroring.” While this has as yet not been formalized, it is a concept under discussion among members of the Networked Digital Library of Theses and Dissertations (NDLTD). But well managed, copies can also effectively back-up online resources. Many academic libraries are working with their computer science departments where research and development in digital libraries holds great promise for

the future. But even so, the fact that PDF is a pervasive format used heavily by the federal government as well as many commercial publishers, means that university libraries will not be alone in trying to solve migration issues.

CONCLUSION

Graduate students who develop ETDs, will be better prepared to enter and fully participate in academia in the Digital Age and to be more effective digital library users even outside of the academy. They will be accustomed to creating online resources in addition to finding and using them. As novice academics they will be better prepared to submit articles electronically if they have already learned to develop and submit their digital graduate research. Libraries can be the locale where the full cycle of information takes place, from creation to access.

The speed with which research becomes available, combined with easy access on the Internet and Web, has resulted in many graduate works getting the exposure and use they deserve. The scholarly community, both here and internationally, as well as American government and commercial users, welcome timely and free access to the research available in ETDs.

Nearly 60 universities throughout the United States and internationally (see http://scholar.lib.vt.edu/theses/NDLTD/members.html) are participating in the evolution of electronic theses and dissertations by joining the Networked Digital Library of Theses and Dissertations. They are adapting traditional procedures and workflow to incorporate local authors' direct submissions into timely, worldwide access. The

computer programs and scripts written by the Digital Library and Archives staff to process ETDs are available without charge. While many are anxious about the unanswered questions remaining (such as the durability of digital works), many more are satisfied that ETDs receive increased use instead of adding to the thousands of theses and dissertations gathering dust from lack of use in university archives.

Through the perspectives of students, faculty, readers, and libraries, this paper has reviewed some of the immediate, near term, and long term issues related to electronic theses and dissertations. At Virginia Tech we have garnered experience from over five years of direct contact with many cultures, both within and outside the academy, and they have contributed to the evolution of theses and dissertations from paper to digital formats and their and dissemination throughout the world.

ENDNOTE

The Faculty Development Institute, founded in 1994, was created to increase the level of awareness and understanding of digital technologies by the faculty at Virginia Tech, with the expressed purpose of using these technologies to enhance instruction at the University.

http://www.fdi.vt.edu/1999fall/distance.html

BIOGRAPHICAL NOTE

Gail McMillan grew up and was educated in southern California. After a stint in Oregon, she moved to the east coast in 1981 where she earned two masters' degrees in library science and early American history from the University of Maryland, College Park. Currently, she directs the Digital Library and Archives (formerly the Scholarly Communications Project) at University Libraries, Virginia Polytechnic Institute and State University. She has held this position for 5 years, following her work as a serials librarian, also at Virginia Tech. Since 1995, the Special Collections Department has been under her leadership where Internet access to its unique resources is a priority. Her publications and speaking engagements most recently focused on digital libraries, electronic theses and dissertations, and electronic journals. (*See also http://scholar.lib.vt.edu/staff/gailmac/Gailsresume.html)*