

The University of New Brunswick's Pilot for an Electronic Theses and Dissertation Program

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ABSTRACT

In November 2002, the University of New Brunswick and UNB's Graduate Student Association (GSA) began an Electronic Thesis and Dissertation (ETD) pilot program. An ETD is an electronically published thesis or dissertation. By publishing ETDs on the web, a student's work is easily and quickly accessible to the research community. UNB's pilot was based on information obtained from the National Digital Library of Theses and Dissertations, discussions with universities participating in ETD programs, and information obtained through published literature. Electronic services offered by the National Library of Canada were reviewed. An on-line editorial office is also being piloted. Both electronic editing of theses by review committee members, as well as electronic transfer and version control are being considered.

Categories and Subject Descriptors

H.3.4 Digital Libraries---Collection

General Terms: Documentation, Standardization

Keywords: ETD, Thesis, Dissertation, Electronic Publishing, Digital Dissertations

1. INTRODUCTION

An ETD is an electronic document explaining the research of a graduate student. Ideally these documents are submitted electronically, are searchable and freely available over the Internet. In the summer of 2001, the UNB Graduate Student Association (GSA) approached UNB's Integrated Technology Services (ITS) department and asked it to investigate the possibility of introducing an Electronic Dissertation and Thesis (ETD) program on campus. They based their request on George J. Soete's article "Issues and Innovations in Electronic Theses and Dissertations" [6] and strong support from graduate students. Another important document supporting their request was Joseph M. Moxley's article "Universities Should Require Electronic Theses and Dissertations" [1].

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The central goals of an ETD program are improved accessibility to theses and dissertations, public access, and empowering students to use hypertext and multimedia technologies as part of their work. Another benefit cited in ETD literature is the development of the practical skills required by students for electronic submission to journals. These are acquired when students go through a similar process at their own institution. For institutions that do not require paper in addition to electronic submission, costs may also be reduced.

ITS assembled an ETD Ad Hoc Committee with representatives from both UNB and the UNB Fredericton campus Graduate Student Association. Committee members from UNB included the Associate Dean of the School of Graduate Studies, Dr. Ed Biden, the Director and Assistant Director of the Electronic Text Centre, Alan Burk and Lisa Charlong, and the ITS Manager of Client Services, Janice El-Bayoumi. The GSA membership was GSA President, Jose Rodriquez. The mandate of this committee was to investigate ETD issues and the feasibility of implementing a local ETD program. The committee researched the available web literature, and obtained input from other local campus groups whose members would be affected by the implementation of an ETD program. As well, several institutions in various stages of an ETD program were contacted to learn how they handled the issues surrounding ETDs and to glean from them their lessons learned.

The result of this investigation was a pilot project that started in November of 2002. The program is piloting not only the final submission and publication of theses and dissertations on the web, but as of this writing, hopes to pilot an on-line editorial office. The on-line editorial office will electronically manage the review process that each candidate's thesis undergoes during development, much like current commercial online publishing peer review software and workflows.

2. THE ISSUES

Institutions must address a number of issues before adopting an ETD program: the most important revolve around resources, publication, and copyright. Formats for ETD submission, dissemination and archiving must be decided. Workload shifts or increases must be determined and funding obtained to support them. Finally, where local ETD initiatives fit into national and international strategies should be addressed as well as the role universities play in these strategies.

2.1 Copyright and Publication Issues

Universities must determine how to deal with copyright and publication concerns. Questions such as when should a thesis be

released and to whom? How should copyright be handled? If a thesis is distributed on the web and then the author wishes to publish a related paper in a journal, will the journal consider the material already published? Will dissemination on the web increase the incidences of plagiarism?

2.2 Submission, Distribution, and Archiving Formats

Submission, distribution, and archiving formats must be determined. Should the student be able to submit in any electronic format? How will a submission format affect the work an institution must do to get the document ready for electronic distribution and archiving? If submission formats are to be limited, what should they be limited to? How can data integrity be maintained when converting documents from a word processing format to another format such as PDF? Is providing templates in popular word processing formats an effective workflow in publishing, distributing and archiving files? Should submission, publication and archive formats be the same, or can they be different? For distribution, what formats are most accessible to a online researcher? For archive purposes, proprietary formats such as PDF files may be easy to use, but may be inaccessible in a few years. Other formats, such as XML may be good from a longevity point of view, but might be more difficult to implement as a workflow. Also, at the time of writing, an XML DTD or schema for ETDs has not yet been agreed upon in the ETD community. Finally, should both paper and electronic versions of the work be archived?

2.3 Workload and Cost Implications

What are the workload and cost implications of running an ETD program? How will the electronic thesis be processed? How will it be sent to the National Library? Should the library try to digitize old theses? Who should verify ETDs: the student, graduate school, the library? Will the initiative require more staff or less staff? Will the program require additional software or training for the student?

2.4 Institutional, National, International Responsibilities

Who should be setting the standards? Should each institution be making its own decisions, or should a national or international body be determining standards and identifying best practices in all or some workflow elements?

3. THE UNIVERSITY OF NEW BRUNSWICK'S ETD PILOT [7]

At UNB the original ETD Ad Hoc Committee, responsible for investigating ETD issues, is now designing and carrying out an ETD pilot program. UNB processes about 250 Master theses and 50 PhD dissertations each year. Over the course of the two-year ETD pilot twelve or thirteen Masters and PhD candidates will test the process. The students are charged with providing feedback as they work their way through the thesis creation, review and submission processes.

In addition to personal interviews the ETD committee relied on the UNESCO *Guide to Electronic Theses and Dissertations* [9] and the resources and information provided by National Digital Library of Theses and Dissertations (NDLTD) [4] for guidance in setting up its ETD pilot.

3.1 ETD Funding and Consultation Process

In order to receive broad university community support for the ETD pilot, and ensure that student and faculty concerns regarding ETDs would be addressed, the ETD committee consulted with a number of university committees and requested financial support from the Vice President Academic. University committees consulted included:

- Graduate Student Association (this group initiated the request to investigate an ETD program at UNB)
- Senate Library Committee
- Senate Technology Committee
- Graduate School Executive Committee (representatives from each faculty)
- Graduate School representative on the University of New Brunswick Saint John campus

It is the intent of the ETD committee to keep these groups informed as the pilot progresses.

A \$36,000 budget supports the ETD pilot. Both UNB and the Graduate Student Association (GSA) from the Fredericton campus provided equal funds for the project. The Graduate Student Association obtained their funding from an annual technology fee paid to UNB.

Table 1. Funding sources and projected expenditures

Funding Source	Funding Amount	Payment to whom	Projected Expenses
GSA	\$18,000	Stipends to participating graduate students. \$1,500 each	\$18,000
VP Academic	\$5,000	Electronic Text Centre staff time – development of XML stream	\$14,090
VP Research	\$8,000	Graduate School staff time for procedures development	\$2,910
UNB Saint John campus	\$4,000	Integrated Technology Services, development of version tracking module	\$1,000

3.2 Process

UNB has biannual graduation points, one in May and the other in October. The two tracks of the ETD pilot build their timelines around these graduation points. The ETD pilot consists of 2 tracks.

The first track (Track A) focuses on setting up a workflow to support the submission of ETDs in PDF and XML formats. Microsoft Word templates are to be used by each student with their work. The purpose of the template is to facilitate translation of the document into XML format. In addition the first track will supply critical input on the usability of the ETD submission process using the NDLTD software installed locally.

The second track (Track B) focuses on further enhancement of the templates and submission process tested by Track A participants. Track B participants may submit in formats other than Microsoft Word, and may have mathematical formulae and multimedia components to their works. In addition Track B participants will be piloting the on-line editorial office, in which electronic versions of their thesis will be submitted to the thesis review team.

Table 2. Goals for each track

Track A	Track B
Develop and test MS Word template	Test MS Word template for use during initial writing of thesis
Develop and test submission process	Improve submission process
Develop and test template handbook	Improve template handbook
Produce ETDs in XML and PDF formats	Process ETDs produced in other formats (LaTeX, Corel Word Perfect)
	Process ETDs incorporating complex equations and multimedia content
	Develop and test on-line editorial office

Pilot participation is dependant on both the expected graduation date of the student as well as the how far along the student is in their thesis development. Track A students apply the template to a substantially complete thesis. Most students in this category are expected to graduate soon. Track B participants require a longer time frame to achieve pilot goals. They test the templates earlier in the writing process, as well as pilot the on-line editorial office. As a result it is expected that they will graduate at later dates. Graduation dates are flexible as necessary to adjust to research and review schedules.

Table 3. Participation requirements

Track A	Track B
Expected graduation date May 2003 or Oct. 2003	Expected graduation date May 2004 or Oct 2004
Thesis substantially complete	Just beginning to write thesis
No complex graphics or multimedia content	Complex equations or multimedia content accepted
Thesis produced in MS Word	Alternate formats accepted
Supervisor approval for participation	Supervisor approval for participation

Students participating in the pilot are required to provide feedback on the processes, workflows, and use of the various tools provided. Feedback is provided formally through written reports as well as informally when working with Electronic Text Centre staff.

Table 4. Student Activities

Track A	Track B
Maintenance of questions/comments log	Maintenance of questions/comments log
Work with ETC on implementation/usability of templates	Evaluate ease of use of templates
Comparison of standard word processor methods of thesis preparation vs template method	Comparison of standard word processor methods of thesis preparation vs template method
Create PDF	Create PDF
Submit thesis electronic	Submit thesis electronic
Provide feedback on all parts of process	Provide feedback on all parts of process
	Evaluate electronic interaction with supervisor as well as use of on-line editorial office

The active participation of graduate student's supervisors is considered essential to the pilot's success. Students are required to have their supervisors sign a form indicating the supervisor's approval of the graduate student's participation in the project. The Assistant Dean of the School of Graduate Studies also contacted each supervisor individually.

Table 5. Supervisor Activities

Track A	Track B
None	Track how student shares electronic files
None	Evaluate ease of reviewing electronic thesis
None	Evaluate ease of providing feedback to student
None	Comment on practicality of adopting electronic thesis for review process

The ETD Committee felt it was reasonable to compensate graduate students for the extra work required when participating in the pilot. A pay schedule was developed to compensate the student upon presentation of a set of deliverables.

Table 6. Student Pay Schedule

Track A	Track B
\$500 – After submission of substantially completed work for application of templates	\$100 – Sign up payment
\$500 – After template application	\$400 – After substantial portion of thesis has had template applied, feedback provided to ETC
\$500 – After electronic submission of thesis and feedback to ETC.	\$500 – After electronic and paper versions of thesis have been reviewed by Academic unit prior to thesis defense
	\$500 – After final submission of ETD and feedback provided to ETC

3.3 Copyright and Publication Issues

Paper copies of thesis and dissertations will continue to be submitted to the UNB library as well as to National Library of Canada applying the copyright procedures currently in place. Access to electronic theses stored at UNB will be controlled by the library based on information provided by the student at the time of submission. Four access levels are to be available. These are: unrestricted availability to the world, available only to the university community, no access (limited time) and mixed access. Access levels may be applied to individual thesis chapters.

3.4 Submission, Distribution and Archiving Formats

If an ETD program is adopted the ETD committee hopes to accept multiple submissions formats. PDF and/or XML are undoubtedly the de facto archiving formats for ETDs both in Canada and abroad. XML is of course noted as a non-proprietary data format, robust and interoperable. The Electronic Text Centre at UNB Libraries has been implementing SGML and, more recently, XML applications in the humanities for several years. The Centre's experience in and support of open data standards such as XML directed the UNB ETD Committees exploration of XML as an ETD application.

During the course of its research, the UNB Committee learned that the National Library had been exploring a national XML ETD

initiative based on the Université de Montréal's model of ETD production and workflow. This document and the recommendations it outlined, including a national adoption of XML as an archiving format, has not moved to publication as far as the authors are aware. With the recent signing of its contract with UMI, the National Library simply states that it supports the electronic submission of theses and dissertations. It is therefore left to individual institutions to decide on the format(s) it chooses to use.

PDF is perhaps the most common document delivery format. While some would argue that PDF is not an archiving format, that it is dependent on the availability of a proprietary reader, others have faith in the ability to construct a reader should the current one discontinue.

The pilot will concentrate on submission of works in XML through conversion from MS Word using Word templates. A suitable product to perform this conversion is a challenge. Commercial products tend to have much more capabilities than required for the scope of the conversion and UNB does not have the required funding to purchase one. Some shareware products, although limited, may be able to be modified to accommodate thesis requirements. The Electronic Text Centre at UNB is currently partnering with the Université de Montréal's érudit team [10] and will no doubt adopt their processes in the near future. Part of the érudit team's work is to develop software to directly convert MS Word documents, using templates, to XML. It should be noted that the same team, led by Guylaine Beaudry, was one of the first groups in Canada to implement an ETD program. UNB may also partner with érudit to develop a suitable XML schema for ETDs.

ETDs will be distributed via the WWW in XML and PDF formats. Some exceptions may apply. The National Library of Canada will continue to archive and distribute UNB theses through UMI and its own catalogs.

3.5 Workload and Cost Implications

Workload and on-going cost implications for an ETD program will become clearer as the pilot progresses. It is worth noting that every group consulted with at UNB had reservations on removing the requirement for paper copies of theses. If UNB requires students to produce both electronic and paper copies, it will require increases in the workload of students producing the thesis, as well as staff processing the finished product.

3.6 Institutional, National, International Responsibilities

UNB continues to be a participant in the National Library's Canadian (NLC) Theses Service including the latter's services with UMI. While the NLC supports Canadian universities in their setup of electronic submission processes, it has not yet set a national standard of best practices.

At present the ETD pilot is using the NDLTD developed open source ETD database.

3.7 On-line Editorial Office

During our ETD research we were unable to identify any university that has adopted an on-line editorial office as part of their ETD program. Two main components need to be considered. One component is the electronic transfer of the document to be reviewed,

along with version tracking. The second component is the actual electronic input of editing suggestions to the document under review. Some on-line editorial office options UNB is exploring implement both components, while others implement only a single component.

Under consideration are:

- Transmitting files to reviewers as simple e-mail attachments
- Cutting CD's for various versions of a thesis and mailing these to the reviewers,
- Purchase of commercial software used in journals (very expensive with many features not required)
- Homegrown software
- Adding on the base functionality already provided by NDLTD
- Use of existing editing tools such as the Change feature already provided in MS Word
- The possibility of working with UMI to customize to the ETD environment a bePress product for journal online submission and review software.

As of this writing UNB is in the preliminary stages of exploring on-line editorial office options. Buy in from supervisors and reviewers is important for the successful implementation of an on-line editorial office. Their feedback will heavily influence the direction UNB takes. Much more work remains to be done in this area.

4. CASE STUDIES

When designing its' ETD project the Committee undertook several case studies to obtain real life experience on implementing an ETD program. A number of universities generously shared their time, expertise, and their work. UNB learned what worked and what did not work from them, and incorporated this information into their pilot design. Research into the National Library of Canada also revealed information on electronic services that UNB was not familiar with. Information from Virginia Tech, an American pioneer in ETDs, the Université de Montréal, a Canadian ETD pioneer, and electronic theses services offered by the National Library of Canada are presented here.

5. VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY [11]

Virginia Polytechnic Institute and State University, popularly known as Virginia Tech, is a pioneer of the electronic thesis and dissertation initiative, having instituted an ETD program in 1995. Their ETD website offers extensive information for not only Virginia Tech students producing ETDs, but also for any institution that is or has set up an ETD program.

5.1 Copyright and Publication issues

At Virginia Tech, copyright rests with the author of the thesis. Help information is readily available from the Virginia Tech ETD website. The Virginia Tech Graduate School does not require registration of copyright for ETDs. The library controls thesis access based on information provided by the student at the time of submission. Four access levels are available: unrestricted availability to the world, available only to the university community, no access (limited time) and mixed access. Access controls may be applied to individual thesis chapters.

5.2 Submission, Publication and Archiving Formats

Although Virginia Tech experimented with XML in its original pilot program, all current files are stored as PDFs. The format of choice for most students is PDF, with a very small percentage submitting in either LaTeX or XML format. The PDF files are text based, not image files. At Virginia Tech, although the longevity of the proprietary PDF format is a concern, they believe that tools will be developed to convert PDF files to other formats as required. (McMillan, personal communication 2002).

5.3 Workload and Cost Implications

Virginia Tech has fully adopted an ETD program. Students no longer submit paper copies of their theses or dissertations. Resources used to process paper copies have been reallocated to the ETD process. Theses produced prior to the introduction of the ETD program are available only in paper copy. The removal of the requirement for paper submission has contributed to lowering the cost of their ETD program.

Although Virginia Tech offers seminars and tutorials for students on Word/WordPerfect, Adobe Acrobat, Adobe Distiller, and LaTeX, they have found that most students already have the technical skills needed to create an ETD. An extensive FAQ answers most student questions in both the technical and process areas of the ETD program. Students are expected to verify the electronic copy of their thesis prior to submission. The graduate school reviews the submissions for formatting errors. In addition, upon submission of their thesis, graduate students are required to evaluate the submission process, providing valuable feedback and enabling process improvement. An additional optional evaluation form is available for those doing research using ETDs.

5.4 Institutional, National, International responsibilities

In the late 1980's Virginia Tech was one of the original members of a group interested in a national initiative for ETDs. This group participated in the development of the National Digital Library of Theses and Dissertations (NDLTD). Organizations participating in NDLTD may have their ETDs freely available and searchable through the NDLTD OAI based Union Catalog web site, through a federated search site and through a locally installed open source ETD database.

5.5 Final Comments

At Virginia Tech, the ETD program has been very well received by both students and the graduate school [McMillan, personal communication 2002]. A study of circulation statistics demonstrates the ETDs are accessed much more frequently than paper theses, filling the promise of improved accessibility. Graduate students have gained additional skills, both in electronic submission and in using electronic resources.

If they had to do it over again, Virginia Tech would have more actively involved their budget office. Graduate School involvement at an early stage in a project is also important, not only in adapting regulations, but in getting information out to departments, faculty and graduate students. It should also be noted that many departments still require paper copies of theses for review purposes.

6. UNIVERSITÉ DE MONTRÉAL[11]

The Université de Montréal was one of the first Canadian universities to explore electronic theses and dissertations. It ran an ETD pilot program for two years, 1998 – 2000, and now has solid ETD processes and support in place. The Université de Montréal partnered with the Université de Lyon to create a portal ETD site, Cybertheses.

6.1 Copyright and Publication Issues

Similar to other institutions, all authors of ETDs own copyright on their work. An interesting feature at Montreal was their desire to circumvent a commercial service provider such as UMI. Montreal reported that it has spent approximately one half million dollars per year on its' UMI process. [Beaudry, personal communication 2002]. ETDs at the university would be an open access alternative to this commercial route. In terms of publication concerns, it was noted that electronic versions made plagiarism easier to identify.

6.2 Submission, Distribution and Archiving Formats

Students in the pilot project at Université de Montréal, submitted their files in Word or WordPerfect using provided templates. Files were converted from Word to RTF and were then converted to SGML in compliance with the TEI Lite DTD. Omnimark was used for the mapping of RTF to SGML structures. SGML was delivered to the web as was XML, HTML and PDF. If students wished an archived version of their ETD they were required to use the templates to facilitate conversion to an XML version. Otherwise a PDF version and associated metadata were created and archived.

6.3 Workload and Cost Implications

For the pilot project period, one full time analyst position was created as well as five technical staff positions. Students were (and are) offered a series of training workshops throughout the school year in the use of word processor templates, and in Endnote for creating bibliographies. Indeed training was seen as a crucial component of the process.

6.4 Institutional, National, International Responsibilities

The group at the Université de Montréal who launched the pilot ETD program has since developed into an organization called érudit. Part of érudit's mandate is to offer a gateway and free access to the ETDs from the Université de Montréal, the Université Laval, NDLTD and Cybertheses. The Université de Montréal and érudit continue to offer guidance and leadership to Canadian institutions in the area of ETDs and general scholarly communication.

6.5 Final Comments

The most important component of an ETD initiative, in addition to student training, is communication amongst all stakeholders in theses and dissertations. At present no DTD or XML schema has been identified to fit the needs of an ETD.

7. THE NATIONAL LIBRARY OF CANADA - CANADIAN THESES SERVICE [3]

The National Library of Canada embarked on a theses and dissertation program in 1965 when it began providing access to Canadian theses and dissertations at the request of deans of

Canadian graduate schools. They wanted a national program to make theses and dissertations that had been accepted by Canadian universities easily accessible to researchers. The service had two main objectives: to preserve theses and to facilitate access to them.

Today, with the participation of 55 Canadian universities, the National Library offers the following thesis services:

- Theses and dissertations are published by the National Library of Canada through its service provider, UMI Dissertations Publishing;
- Theses and dissertations are catalogued and the bibliographic record made available on AMICUS Web, Canada's national online catalogue that is freely accessible world wide on the Internet;
- Theses and dissertations are listed in *Canadiana*, Canada's national bibliography, published by the National Library of Canada and in *Dissertation Abstracts International*, published by UMI Dissertations Publishing;
- Theses and dissertations are available on interlibrary loan from the National Library of Canada;
- Theses and dissertations become part of the National Library's collection of more than 200,000 theses;
- Theses and dissertations are available for purchase from Proquest Information and Learning. Authors can purchase discounted paper copies of their theses from Proquest at the time of publication.

The National Library of Canada embarked on an ETD program of sorts in 1997 when it began providing, through its contract with UMI Electronic Publication Services a number of ETD services [5]. The UNB ETD Committee was surprised to find that many of its theses and dissertations submitted after this date were already available in electronic format [Balatti, personal communication 2002]. Information is also available from the UMI site to help students with their digital submissions [8].

The current contract between the National Library of Canada and UMI, effective since September 2002, details the ETD services. Some of these services are:

- Promotion and facilitation of electronic submission.
- Production of microfiche copy of electronically submitted theses.
- Conversion of paper manuscripts to PDF format (since 1997).
- Access to dissertation abstracts of digital library for the most current two years freely available over the Internet.
- Provision of twenty-four page review file of PDF documents.
- Free on-line access to a participating university's own theses in PDF format.
- On-line ordering and document delivery of electronic versions of theses for participating universities.

7.1 Copyright and Publication Issues

Most Canadian universities encourage their students to submit their theses and dissertations to the National Library of Canada. Part of this submission is the completion of the copyright form assuring the

NLC of all permissions on any included copyrighted materials. While authors maintain copyright of their work, the contractor, UMI, has non-exclusive permission to publish, sell and distribute theses.

7.2 Submission, Publication and Archiving formats

Universities that support the submission of ETDS can now upload ETDs at the UMI website, similar to what the NDLTD has in place. UMI's electronic publication format is PDF. Acceptable multimedia formats for ETDs are on the UMI website as well required supporting documents required for submission [8].

7.3 Workload and Cost Implications

The author of the theses is responsible for how his or her ETD appears when it is accessed or printed. UMI makes a number of technical recommendations to assist authors in this area [8].

7.4 Institutional, National, International Responsibilities

A number of organizations in Canada such as the National Organization of Graduate Schools, the National Organization of Graduate Student Associations and many university libraries would like to see the National Library of Canada take the lead in setting ETD standards in such areas as submission formats, metadata, and free distribution. In addition, the National Library could identify and promote ETD best practices.

8. CONCLUSION

The improving technology of the Internet and the desire for rapid access to information is driving universities, students and providers of access to graduate student research to meet the demand for electronic access to theses and dissertations. As more universities begin ETD programs, national standards will need to be identified. Meanwhile the gap is filled by initiatives such as the Networked Library of Digital Theses and Dissertations (NLDTD) [2] that has taken the lead by providing information, a forum for discussion, as well as software that when installed, allows a free, central, seamless access point to digital collections residing at participating universities. The ETD committee hopes that its' own pilot program, and participation in national and international initiatives, will provide the basis for adopting an ETD service that meets the needs of researchers, students, faculty and administration.

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