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Analysis of Usage of The Ohio State University's Electronic Theses and Dissertations

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Keywords: ETDs, usage, downloads, The Ohio State University, theses, dissertations, OhioLINK, repository, citations

Abstract:

This study involves an examination of the download rates for The Ohio State University's freely available electronic theses and dissertations. The Graduate School has required submission of doctoral (2002) and masters (2008) for over a decade, with limited exceptions, including embargos. Older digitized theses and dissertations have been made available over the past several years, resulting in over 51,000 titles in the online holdings. Download data from the OhioLINK Electronic Theses and Dissertations Center were analyzed to determine how well the theses and dissertations were used and what departments saw noted success for their students' works.

Introduction

Theses and dissertations are a staple product of research at colleges and universities across the U.S. and around the world. However, until recently, theses and dissertations saw limited availability outside their home institution. The movements towards electronic theses and dissertations (ETDs) sought to change this via institutions making their theses and dissertations openly available across the world. This paper focuses on The Ohio State University's graduate ETDs, their levels of download, and the disciplines that see the most ETD usage. A special focus on the most downloaded titles examines their citation rate and authors' future publication record.

Literature Review

While it may seem obvious to most, it might be good to examine what advantages ETDs have over their non-electronic versions. Copeland and Penman (2004) listed benefits for students, faculty/academic staff, and libraries. In short, these benefits include:

- Students: More flexibility/creativity, wider availability, more cost-effective, improves students' IT skills.
- Faculty/academic staff: Immediate and remote access, use by multiple researchers, saves time, supervisors can encourage more diverse student research, compare/contrast other schools' styles/standards.
- Libraries: Saves storage space, saves staff time, less interlibrary loan requests, better user service/satisfaction

Using ETDs instead of their print counterparts allows for increased options for providing materials. Pavlásková (2018) examined 2,528 ETDs (PDF formats) at Charles University (Czech Republic) to determine what file types are associated with the main file for each ETD. These files, called annexes, totaled 481,396 files. File types include plain text files, image files, executable files, Java, HTML, ZIP, and more. Plain text (38.70%) and PNG (12.28%) accounted for over half of the files associated with the ETDs. This indicates ETDs are making use of content other than the standard PDF, although it should be noted that most ETDs with an annex had only one annex.

The distribution of ETDs has been examined in the literature. Kim, Yang, and Fox (2006) examined 242,688 indexed in NDLTD and placed into subject categories (specifically, 7 categories and 77 subcategories). These authors did a supply and demand analysis to determine what subcategories were not seeing their demand for ETDs being met by the current supply. The business and economics categories showed the starkest difference in these levels, but several other subcategories (such as computer science, electronics, nursing, and library science) saw gaps as well. The authors also used looked at the larger categories and found that only two (engineering and applied science and business and commerce) of the seven were not seeing their supply meet the demand.

But do ETDs show any better usage rates than their non-electronic counterparts? Moxley (2001) examined usage of theses and dissertations at Virginia Tech and found that ETDs are 100 times more likely to be used than their print counterparts. Theses and dissertations approved 1990-1994 saw an average of 0.26 circulations per item whereas ETDs produced 2000-2001 saw about 461.29 downloads per PDF.

One of the biggest advantages of ETDs is the fact that they improve usage beyond their home institution. Coates (2014) examined the use of Auburn University's ETDs and found that 54.3% of page views on their ETD site came from outside the institution's home state (Alabama), with 28.2% outside the U.S. The study also found non-Alabama users were far more likely to get to the ETD pages via web search tools rather than navigating via the university's website.

Schopf et al. (2018) focused on 587 masters theses and their use January 2015 to June 2018 at University of Lille (France). These had 296,074 downloads during this period, with all being downloaded and downloads ranging from 10 to more than 60,000. The median was 43. The authors examined popular downloads and found the year of upload was a factor, but also believed "hot topics" were probably a factor.

Zhang, Lee & You (2001) examined use of ETDs from the Korean Institute of Science and Technology Information (KISTI), a South Korean digital library. They found that 20.0% of visitors examined individual ETD pages, 13.4% viewed bibliographic records, 7.5% ETD table of contents, and 5.4% ETD documents. They also found about 20% of the use came from international users (and primarily from countries with visiting South Korean scholars). The majority of visits were from academic institutions.

Bennett and Flanagan (2016) examined the use of London School of Economics theses, which had recently seen a large number of digitized older theses added to their ETD holdings. They found that the addition of new ETDs to the mix resulted in a significant increase in traffic. They also examined the source of traffic and discovered Google referrals dominating, accounting for over 2/3 of the traffic. Direct linking was in second place, with everything else (other tools and search engines) accounting for less than 20% of the traffic. The authors specifically examined the ten most downloaded theses to see if they were highly cited and found no correlation. For example, the most downloaded thesis saw only about 1/3 of the number of citations of the second most downloaded thesis (which was downloaded about 1/2 as much). One interesting finding was that two heavily-cited theses also were adapted as books at some point (although these two titles were not as heavily downloaded as some less-cited titles).

Alemneh and Phillips (2011) examined use of University of North Texas's ETDs in 2010 and found 282,240 accesses with PhD dissertations seeing a higher percentage of use compared to their percentage of ETD holdings. About 31% of the usage came from outside the U.S. Interestingly, only about 16.8% of the U.S. use came from Texas.

Cheng, Cheung & Kot (2014) examined use of ETDs from Lingnan University, Hong Kong. There were 17,620 unique views of the 204 ETDs. They found that 78% of unique pageviews came from within Asia (i.e. 22% from outside Asia). However, when they dug into subject areas, they found that arts topics saw more use within the region compared to non-arts topics. Business, in particular, was seen as having significant use outside the region.

The CalTech THESIS (2019) site tracks downloads of ETDs. For 9,696 items in this collection (as of 02/01/19), there have been 4,190,117 downloads. This is an average of 432.15 times per item.

The discoverability and use of theses and dissertations and the change to ETDs is a significant enough of a change that Schopfel and Rasuli (2017) debated in their article whether or not theses and dissertations should still be considered grey literature.

Significant ETD Sites

Given the number of colleges and universities across the globe and that fact that theses and dissertations are requirements for many graduate programs, it should be no surprise that the number of theses available is a large number. Table 1 is a list of major theses and dissertations portals and the number of ETDs discoverable via these tools. Note a few things:

- Many of these portals are metasearch tools, which search repositories elsewhere rather than hosting the ETDs themselves.
- Some of these may overlap, especially with the metasearch tools.
- Some of these index theses and dissertations in all formats, not just electronic.
- Some of these sites may index, but may point to restricted content and/or may require subscription or purchase.

Table 1: Major ETD Sites

Site	Description	Link	Geographic Region	# of Schools	ETD Count
NDLTD	Metasearch engine focusing on ETDs	http://search.ndltd.org	Worldwide	Not specified	5.4+ million

OATD	Metasearch engine focusing on ETDs	https://oatd.org	Worldwide	Over 1100	4.6+ million
ProQuest Dissertations & Theses Global	A database that has long been the go-to tool for theses and dissertations from around the world. This is a proprietary tool, but there is a service to also purchase individual titles.	https://www.proquest.com/products-services/pqdtglobal.html Individual purchase: https://www.proquest.com/products-services/dissertations/Dissertation-Copies-for-Researchers.html	Worldwide	Schools from 88 countries	4+ million
China Doctoral Dissertations / Masters' Theses Full Text Database (CDMD)	Chinese theses and dissertations from a wide range of institutions.	Doctoral: http://oversea.cnki.net/kns55/brief/result.aspx?dbPrefix=CDFD Masters: http://oversea.cnki.net/kns55/brief/result.aspx?dbPrefix=CMFD	China	384 Doctoral 547 Masters	144,000+ dissertation 1.1+ million theses
DART-Europe E-theses Portal	ETDs for Europe.	http://www.dart-europe.eu	Europe	617	805,000+
EBSCO Open Dissertations	ETDs worldwide, including older content.	https://biblioboard.com/opendissertations/	Worldwide	Not specified	800,000+
EthOS	British Library project focused on theses and dissertations	https://ethos.bl.uk	United Kingdom	144	500,000+ ~260,000 full text
Trove	Search engine for National Library of Australia, which allows limiting to theses	https://trove.nla.gov.au/book/result?l-australian=y&l-format=Thesis&q=&sortBy=dateDesc	Australia, New Zealand	Not specified	360,000+ ~150,000 full text
Theses Canada Portal	Theses from institutions across Canada	https://www.bac-lac.gc.ca/eng/services/theses/Pages/theses-canada.aspx	Canada	70	500,000+
Shodhganga	A response to a mandate for making theses and dissertations in Indian institutions available electronically.	http://shodhganga.inflibnet.ac.in	India	381	~209,000
OhioLINK ETD Center	OhioLINK consortium project to host and search theses/dissertations.	https://etd.ohiolink.edu	Ohio, United States	32	96,000+
Database of African Theses and Dissertations including Research (DATAD-R)	ETDs from across Africa	http://datad.aau.org	Africa	15	29,000+
eScholarship	ETDs from the University of California System.	https://escholarship.org/search?type_of_work=dissertation	California, United States	7	29,000+

ETDs at OSU

The Ohio State University (OSU) requires (with limited exceptions, including embargo options) its graduate theses and dissertations to be made available free online since 2002 (PhD) and 2008 (masters) via the OhioLINK Electronic Theses

and Dissertations Center (ETD Center). OSU over time has also added older theses and dissertations to the ETD Center via scanning or purchase of scanned dissertations from ProQuest.

The ETD Center (<https://etd.ohiolink.edu>) began in 2001 (OhioLINK 2019) and currently has 32 Ohio colleges and universities participating. The ETD Center contains theses and dissertations from these other Ohio colleges and universities as well with over 96,000 ETDs, over 51,000 of those being from OSU. Note that some schools include undergraduate theses in their ETD Center holdings, while OSU hosts theirs in its institutional repository.

Previously, these theses and dissertations were available only three ways:

- Direct use, including interlibrary loan, via the OSU Libraries:
 - In print
 - On microform
- PhD dissertations only for purchase via ProQuest (or its predecessor, UMI)
 - Note: over time, ProQuest made content available to library subscribers as full-text PDF, eventually including older content.
- Contact the author and hope they still had a copy.

The decision of the OSU Graduate School was that it was to the advantage that these be made available freely online. This enables for increased availability and use. It also allows for more options for making associated files (audiovisual, data, etc.) to be made available.

The ETD Center allows for both search and browse access to titles. One of the interesting features of the ETD Center is the download count for its content. This enables people to see how often the PDF of an ETD has been downloaded for use and thus gives an idea of popular topic areas for use across the world.

Analysis of OSU's ETDs

Data was requested from OhioLINK about OSU's ETDs. The data was analyzed in order to answer the following questions:

- For all ETDs:
 - How well are ETDs used?
 - What departments have the most downloads per ETD?
 - What sees more downloads – masters or PhD?
 - What broad disciplines see the best use?
- For the top 25 ETDs:
 - What are the departments for the most downloaded OSU ETDs?
 - How heavily are they cited?
 - What are the author's publication and citation rates like post-graduation?

A few clarifications

Before moving into analysis, some clarification on language used in the description of the use of OSU's ETDs. Table 2 contains clarifications on some of the terminology used.

Table 2: Clarifications

Topic	Clarification
Time Ranges	Ohio State began requiring Doctoral dissertations to be uploaded to the OhioLINK ETD Center in 2002. This extended to Masters degrees in 2008. OSU Libraries has retroactively added older content over time. The ETDs ranged from 1903 to 2018 for their degree year. The most common year was 2012 and the median was 1993.
Downloads	The number of times the PDF for the ETD was downloaded since the OhioLINK ETD Center began tracking downloads or from the time the ETD became downloadable, whichever was more recent. The download data was provided through the end of 2018.
Departments	<p>Department names had slight variations in some cases. The data had 202 unique department names. In order to make sure these variations did not affect calculations, these department names were all converted to a single name. In some cases, a program is listed instead as the program is interdisciplinary and not assigned to a specific department. The new total was 106 departments.</p> <p>OSU recently purchased a large number of doctoral dissertations from ProQuest. In order to simplify the uploading of these to the OhioLINK ETD Center, the department of Graduate School was used for all of these titles. Therefore, a large number of items had this department listed. Given the number of titles, an attempt to convert to an existing department name was not attempted.</p>
Embargoes	OSU students are allowed to request an embargo of varying periods. Due to the complexity of embargoes, these titles are included in analysis, but items currently embargoed will have a 0 download count. Titles with no downloads, which includes (but is not limited to) embargoes are only 2.07% of the total number of titles.
Degrees	<p>OSU places only graduate theses and dissertations in the ETD Center. All undergraduate theses are placed in the institutional repository, Knowledge Bank.</p> <p>While there are many degrees, the degrees were all converted to two broad categories for simplification – Doctoral and Masters.</p>

Degrees

There were 19 degree types given for the ETDs, but in order to simplify the data, the list was reduced to two degree types: Doctoral and Masters. The distribution was as thus:

Table 3: ETDs by Degree

Degree	Total titles	% of titles	# Downloads	% Downloads	Average Downloads <small>(includes embargoes)</small>
Doctoral	41503	80.78%	21583888	73.56%	520.06
Masters	9872	19.22%	7757908	26.44%	785.85

Interestingly, while Doctoral titles saw a much higher percentage of titles, Masters titles had a higher average download per title (embargoes included). Note, however, that the large influx of digitized dissertations likely affected the Doctoral category.

Top Departments

The departments listed for the ETDs were examined to determine which departments had the highest downloads per ETD. Department with fewer than 10 ETDs were excluded. The departments with the 10 highest download rates are shared in Table 4.

Table 4: Top 10 Departments

Department	Downloads	ETDs	Downloads / ETD
Music	1,722,536	699	2464.29
Near Eastern Languages and Cultures	146,865	60	2447.75
African-American and African Studies	942,86	44	2142.86
East Asian Languages and Literatures	564,242	297	1899.80
Materials Science and Engineering	772881	467	1654.99
French and Italian	150,595	93	1619.30
Food Science and Technology	484,558	306	1583.52
Arts Administration, Education and Policy	450,123	285	1579.38
Industrial and Systems Engineering	411,089	275	1494.87
Electrical and Computer Engineering	1,299,400	900	1443.78

Examining departments with over 1,000 downloads per ETD, there were 39 out of 106 (36.79%) that fit this threshold. There were 15 out of 106 (14.15%) departments with under 500 downloads per ETD. This included the Graduate School, which had the largest number of titles at 26,313 out of 51,375 ETDs (51.22%). This large number and the recent big influx mentioned previously accounted for its seemingly low performance. Note that again, embargoed titles were included in the count.

The departments were assigned to one of three broad subject disciplines (Arts & Humanities, Sciences, and Social Sciences). Departments which had significant overlap between more than one of these areas was assigned to Multi. The Graduate School was assigned to Multi given it encompasses all subjects. Table 5 has the breakdown by these broad disciplines.

Table 5: Broad Disciplines Breakdown

Broad Subject Area	ETDs	Downloads	Downloads/ETDs
Arts & Humanities	4,986	6,061,603	1215.72
Sciences	12,454	12,360,569	992.50
Social Sciences	7,069	6,850,865	969.14
Multi	26,866	4,068,759	151.45

Of the three (non-Multi) disciplines, the Sciences had by far the most ETDs, but Arts & Humanities, with the lowest number, had the highest download rate. Multi, given the presence of the Graduate School and the mass influx of digitized ETDs, had the lowest download rate.

During the time period examined, the Top 50 theses and dissertations saw a total of 2,453,518 downloads. The downloads for all theses and dissertations was 29,341,796, so the Top 50 comprised 8.36% of the total downloads while being less than 0.1% of the total number of titles (51,375). Adding in the 100 most downloaded titles brought the percentage of downloads up to 11.22% (3,291,374 downloads).

Examining the 50 most downloaded theses and dissertations and their departments, only one department was the department for more than 10% of the titles – Music. History had a total of 4 titles. All other departments had 3 or fewer titles.

Only 2.07% of the total number of dissertations have had no downloads (this includes embargoed titles). Under 10 downloads was still at a low 2.20%. In other words, 97.80% of the theses and dissertations saw more than 10 downloads. If considering all titles, even embargoes, the average number of downloads per title is 571.13.

25 Most Downloaded Titles – A Closer Look

A deeper examination of the 25 most downloaded titles was done in order to take examine the success of the ETDs and their authors beyond downloads. Table 6 contains the following information about the 25 ETDs with the most downloads:

- The number of downloads.
- The departments aligned to the most downloaded titles.
- The number of cites found for the ETD, per *Google Scholar*.
- The author’s document count and cite count per *Scopus*.

Table 6: Top 25 ETDs

TITLE	Author	Department	Grad Year	Downloads	Google Scholar Cites	Scopus Doc Count	Scopus Cite Count	Download Rank	Cite Rank
The beginning and end of heavy ion collisions: using uranium beams and Bose-Einstein correlations as probes of the collision fireball	Anthony Joseph Kuhlman	Physics	2007	334,767	1	3	69	1	17
Making common cause?: western and middle eastern feminists in the international women's movement, 1911-1948	Charlotte E. Weber	History	2003	168,995	11	1	28	2	9
An Illustrated Basic Flute Repair Manual for Professionals	Hornng-Jiun Lin	Music	2008	135,545	0	NA	NA	3	20
Flutists' family tree: in search of	Demetra Baferos Fair	Music	2003	96,659	18	NA	NA	4	6

the American Flute School									
The Emotional Life of Vulnerable Narcissists	Stephanie Desiree Freis	Psychology	2014	90,008	0	3	17	5	20
A combinatorial approach to the development of composition-microstructure-property relationships in titanium alloys using directed laser deposition	Peter Chancellor Collins	Materials Science and Engineering	2004	84,382	28	65	800	6	2
Robust Bayes in Hierarchical Modeling and Empirical Bayes Analysis in Multivariate Estimation	Xiaomu Wang	Statistics	2015	82,584	0	NA	NA	7	20
"Understanding" in Revelation: the root '-Q-L in the Qur'ān	Allen L. Tuazon	Near Eastern Languages and Cultures	2011	66,310	0	NA	NA	8	20
Brecker's Blues: transcription and theoretical analysis of six selected improvised blues solos by jazz saxophonist Michael Brecker	David Rawlings Freedy	Music	2003	62,376	2	NA	NA	9	15
School facilities and student achievement: student perspectives on the connection between the urban learning environment and student motivation and performance	Nicole C. Edwards	Educational Studies	2006	61,537	19	NA	NA	10	5
The Jews and Peron: Communal Politics and National Identity in Peronist Argentina, 1946-1955	Lawrence D. Bell	History	2002	53,861	14	1	8	11	7
Reading Motivation and Reading Comprehension	Margaret E. Middleton	Human Sciences	2011	52,240	7	NA	NA	12	11
An analysis of Stravinsky's Symphony of	Jin Myung Kang	Music	2007	47,970	0	NA	NA	13	20

Psalms focusing on tonality and harmony									
African Names and Naming Practices: The Impact Slavery and European Domination had on the African Psyche, Identity and Protest	Liseli A. Fitzpatrick	African-American and African Studies	2012	47,764	10	NA	NA	14	10
Study of reversible electrode reaction and mixed ionic and electronic conduction of lithium phosphate electrolyte for an electrochemical co2 gas sensor	Chong-Hoon Lee	Materials Science and Engineering	2004	44,618	1	NA	NA	15	17
Simulation and Implementation of Two-Level and Three-Level Inverters by MATLAB and RT-LAB	Abd Almula G. M. Gebreel	Electrical and Computer Engineering	2011	43,613	26	1	4	16	3
A model of school success: instructional leadership, academic press, and student achievement	Jana Michelle Alig-Mielcarek	Educational Studies	2003	43,092	117	NA	NA	17	1
Germans Displaced From the East: Crossing Actual and Imagined Central European borders, 1944-1955	Amy Alison Alrich	History	2003	42,138	4	NA	NA	18	12
Why Branding Can Increase a Professional Athlete's Value: A Rationale for Designer Engagement	Brandan Craft	Design	2008	40,654	2	NA	NA	19	15
Attitudes Of Learners Toward English: A Case of Chinese College Students	Yang Yu	Teaching and Learning	2010	39,243	26	NA	NA	20	3
Analysis and performance aspects of GYÖRGY LIGETI'S ÉTUDES pour	Yung-jen Chen	Music	2007	37,167	13	NA	NA	21	8

piano: fanfares and arc-en-ciel									
Mughals at War: Babur, Akbar and the Indian Military Revolution, 1500 – 1605	Andrew de la Garza	History	2010	36,768	1	NA	NA	22	17
An analysis of Rachmaninoff's Concerto no. 2 in C minor, op. 18 : aids towards performance	So-Ham Kim Chung	Music	1988	36,685	3	NA	NA	23	14
Show Design and Wind Arranging for Marching Ensembles	John Michael Brennan	Music	2014	36,025	0	NA	NA	24	20
Effective teacher communication skills and teacher quality	Kevin John Loy	Educational Studies	2006	35,350	4	NA	NA	25	12

Examining these titles, the following are points of interest:

- Most of the authors (19) could not be identified in *Scopus*. Some of this may be due to one or more of these factors:
 - Some disciplines do not see as much publication in professional non-academic careers post-graduation.
 - The authors may be publishing, but in titles not indexed in *Scopus*.
 - Some authors may have been international students and may be publishing in non-English titles, which are less-indexed in *Scopus* than English-language titles.
 - A few authors may just not have begun publishing – although most of the Top 25 authors graduated 5 or more years ago.
- Authors found in *Scopus* mostly saw only a few documents published post-graduation and also fairly low citation rates.
 - The major exception is Peter Chancellor Collins, who has 65 publications and 800 citations.
- *Google Scholar* found citations for many of the titles. Topics related to education stand out as being well-cited, with one title receiving 117 citations – the only one to go over 30 cites.
- The most downloaded titles in this group did not see the most cites.

What departments were in the Top 25? There were 13 departments. Only 4 departments were represented more than once. Again, Music is a heavy hitter, with 7 (28%) of the titles. Table 7 contains the breakdown by department.

Table 7: Top 25 Department Breakdown

Department	# ETDs	%
Music	7	28%
History	4	16%
Educational Studies	3	12%
Materials Science and Engineering	2	8%

African-American and African Studies	1	4%
Design	1	4%
Electrical and Computer Engineering	1	4%
Human Sciences	1	4%
Near Eastern Languages and Cultures	1	4%
Physics	1	4%
Psychology	1	4%
Statistics	1	4%
Teaching and Learning	1	4%

Conclusions

The analysis of the ETD download data showed that OSU's ETDs are showing significant use. The average download count for all ETDs is 571.13. Three ETDs saw over 100,000 downloads. Departments from multiple disciplines saw significant download, with Music particularly standing out as a heavy hitter with the highest average download rate and also the largest presence in the 25 most-downloaded titles.

Harkening back to the literature review, the data from OSU's ETD use aligns with the idea that ETD use can see many times the use of print content. When triple digit use in print collection would be deemed significant, many of OSU's ETDs saw 5-digit download counts and 3 saw 6-digit download counts.

However, the Top 25 saw that the download rates did not always translate into citation rate or a future publication rate. Only 6 out of 25 (24%) of the authors could be identified in *Scopus* and, except for one author, a significant publication records were not seen. Citation rates per *Google Scholar* were also mixed, although 19 titles did see citations.

As the number of theses and dissertations being made available freely online continues to grow (including as digitized older content gets added), it seems likely given the data found that their download rates will continue to grow with them. It would be very interesting to see if their citation rates continue to climb as well, since their increased availability makes them a more accessible format for authors to use in their works. As more ETD authors get their work online, it would also be interesting to see how success of an ETD in terms of citations and downloads relates to their success in their own publications.

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