

ILL Communication: Analyzing five years of Iowa State University's print Interlibrary Loan requests

Abstract

Interlibrary Loan (ILL) is a service offered by libraries to supply patrons with materials which are not immediately available for lending. This could be for many reasons; the library might not own the item, the library may own a copy but it is already checked out to another patron, or the assignment of a required but expensive textbook spurs high demand for a particular title.

Analysis of historical ILL request data is a useful exercise to undertake as each request represents a patron with an information need which was not able to be immediately filled by the library's collection. Each ILL request comes with a guaranteed circulation of at least one interested patron, and the request information is compiled in a dataset and preserved. Loans which are not able to be filled are still recorded and included in the dataset. Investigating trends and tendencies of a user base through this data can lead to more informed collection development practices, and understanding these data sets can reveal gaps in coverage or highlight areas where the user community may find the collection lacking.

This study is an analysis of five years worth of Iowa State University's ILL requests of print books, spanning calendar years 2013-2017. 18,841 borrowing requests were analyzed, and monograph title data available for conducting this analysis include loan author, title, year, publisher, edition, and lender library. Patron information includes department affiliation and status; no further identifying information is recorded in the dataset used here.

This analysis focuses mostly on requests made by patrons from engineering departments, and it analyzes trends over time by constructing visualizations to look at:

- the most active academic departments and their request activity over time
- the most heavily requested titles
- requests by patron status (undergraduate, graduate, faculty, staff, unaffiliated)
- the total number of requests made over time
- what peer libraries are used to fill the requests

This work focuses on requests for print books only; the scope does not include electronically delivered PDF journal articles, book chapters, or conference proceedings.

The analysis is done in the statistical software JMP, and the procedure to automatically create the plots which appear in this paper has been coded, saved, and uploaded for others to use or adapt to their home institution's ILL data sets at:

<https://github.com/eschares/ILL-analysis>

This study is intended to illuminate the ILL request activity at a large, public, land-grant university in the United States, demonstrate the tendencies and trends of the campus community, and discover where users' information needs are not immediately being met through the print collection. This work can inform future collection development activities not only at the local institution but also at other universities worldwide.

1 Introduction

Interlibrary Loan (ILL) is a service offered by libraries to supplement their collections and supply patrons with materials that may not be readily available for lending. There may be many reasons for this: the library simply may not own the requested item, or it may be too new, too rare, or in high demand. When this situation occurs, a patron can fill out an ILL request, and the item will be borrowed from another library on their behalf. Offering ILL service allows libraries to work together and specialize in collection development activities, as each library does not have to purchase a copy of everything ever printed but can instead focus purchasing to support the strengths of their campus and develop collections which better serve their particular patron bases.

Analyzing historical ILL request activity is a useful exercise to undergo, as it shows what materials are needed but not available. What materials are requested most often? Who is requesting them? It is important to remember that each ILL request represents an actual patron who had an information need that was unable to be immediately filled at the point of need by the library's collection. Looking through historical data allows librarians to identify trends, which can lead to more informed collection development practices. Understanding the data can also reveal gaps in the collection's coverage or highlight areas where the campus community may find the collection lacking.

This study looks at the Interlibrary Loan activity at Iowa State University, specifically 18,841 ILL requests of print books made over the years 2013-2017. Founded in 1858, Iowa State University is a public land-grant university in Ames, Iowa with a student body of approximately 36,000 and 148 academic departments. It is a doctoral granting university designated with Carnegie Classification of R1 – Highest Research Activity [1]. Over the time frame of this study, total headcount increased from 33,241 to 36,321 students, setting new enrollment records with a peak of 36,660 in the academic year 2016-2017.

The library system at Iowa State is composed of a main library on central campus, Parks Library, as well as two satellite reading rooms in the colleges of Design and Veterinary Medicine, respectively. The main Parks Library comprises 325,000 square feet, houses approximately three million books, and receives over two million visitors annually. Areas of strength for Iowa State include agriculture, science, engineering, and veterinary medicine, and these priorities are reflected in the university library's collection development practices.

2 Literature Review

A review of the existing literature shows that some studies touch on Interlibrary Loan as a facet of overall library service when studying how a community group interacts the library, while other studies explore the impact on ILL rates due to various other factors. Studies looking at the ILL activity at a single institution in greater detail are relatively few; there may be reluctance for librarians to publish ILL activity due to the local nature of the exercise and the fact that the analysis may not be easily generalized, or a similar analysis may be published only internally to inform collection development practices.

This paper is intended to not only continue those valuable local conversations, but also to open up the data to provide a detailed glimpse into a large, public, land-grant university's ILL activity. This can illuminate broader trends in collection development and help inform ILL activities at other institutions worldwide. Furthermore, it is possible that a similar type of analysis is not being performed at a certain institution with any regularity, possibly because the dataset is perceived as too large or unwieldy. In that event, the following analysis can hopefully serve to demonstrate the types of insights that are possible, show value in the work to better understand user behavior, and remove some of the heavy lifting of data analysis by providing the underlying code that created the following plots.

Impacts on ILL usage were studied by Musser and Coopey [2], who explored the effect of the discovery layer on ILL and found that four years after implementing Summon at Penn State, ILL rates had seen a 22% reduction due to increased findability of library-owned resources. Additionally, Gaffney [3] found that implementing WorldCat Local at the University of Delaware resulted in fewer loan requests being cancelled due to the ability of patrons to find items that were already being held locally.

A family of studies explored purchasing materials outright instead of filling demand through ILL. Kochan and Duncan [4] used ILL request data to help decide which titles were permanently added to the collection through a purchase on demand program, and Gee [5] used ILL to purchase requested titles, especially recently published titles that other libraries may be more reluctant to lend and therefore may be more difficult to acquire through ILL. Imamoto and Mackinder [6] describe a similar program to purchase titles and get them to the patron more quickly than through traditional ILL methods. Jong and Nance [7] also explored alternative methods of filling patron requests for materials such as direct purchasing, although they found these alternative methods were not greatly used.

Tolppanen and Derr [8] conducted an analysis of ILL activity at Eastern Illinois University, finding that graduate students and faculty submitted the most borrowing requests and 67% of loans were borrowed only once. Munson and Savage [9] focused on Interlibrary Loan as a means to provide students with textbooks specifically, finding that students used ILL because textbooks were too expensive but also required for their coursework. Students reported being satisfied with the ILL service, although the study found that the fill rate for textbooks was approximately 20% lower than for other types of materials (67% vs. 87%). Loan periods were also shorter than students would prefer, but the majority of lending libraries allowed for renewals. Blackburn and Tiemeyer [10] also looked at students' use of ILL to acquire textbooks for their classwork, although this was set against a policy that requests were specifically cancelled if they were found to be on a list of required textbooks each semester. Analysis done by Calcagno and Bowdoin [11] found that 90% of the top 50 most requested books were textbooks from Engineering and IT, and in response George Mason University formed an Engineering Textbook Reserve program.

Ways to improve awareness of ILL are a common theme in the literature. Hale and Coffman [12] scaffolded an instruction session for writing a paper, the first step of which was to sign up for Interlibrary Loan, and noted, "The class was amazed at what a powerful tool Interlibrary Loan was during their literature review." Other studies have touched on Interlibrary Loan as a way to gain access to technical reports and gray literature [13], or focused on increasing awareness of ILL to undergraduates after finding that many students learn about ILL from their professors

[14].

A survey of faculty at the University of Arizona showed that ILL requests ranked fourth on a list of preferred ways to gain access to an article, behind visiting the library for a print subscription, looking for an electronic subscription, and checking with colleagues for a copy [15]. A survey at the Georgia Institute of Technology [16] found that 3/4 of undergraduate students had not requested anything through ILL in the past twelve months, while more than half of graduate students and faculty had requested three or more articles in the past year. The survey also found that student use of ILL and electronic journal articles increased as they progressed toward degrees.

Finally, it should be noted that a growing area of research in this field is the possibility of Interlibrary Lending e-books using tools such as Occam's Reader [17]–[21], though these resources are not addressed in this study.

3 Interlibrary Loan Unit

Interlibrary Loan at Iowa State is administered from the Access Services department. Borrowers with a current university affiliation or a library visitor card are allowed unlimited ILL requests for free [22], though the library does pay a small fee for each request. The ILL unit follows guidelines set by the American Library Association's Interlibrary Loan Code for the United States [23] and local policies established by individual libraries.

For an ILL request to succeed, a staff member must be able to track down a copy of the work at another library to initiate the borrowing request. Not all items are able to be obtained through ILL. These include reference books, very new or old books, rare books, computer software, archival or genealogical materials, and certain serial volumes [24]. Iowa State provides ILL service through the resource sharing management software ILLiad [25].

Some items included in the loan request dataset analyzed here are in fact owned by Parks Library. This could be for numerous reasons [26]:

- The material may have been acquired after the ILL request was filled
- The item may have been at the bindery when the patron requested the material
- The material was “on order” when the patron requested it
- The item was “reported missing” at the time it was requested
- The item may have been under repair at Preservation or otherwise unavailable
- The item was checked out at the time the material was requested
- The request could have “slipped through the cracks” if ILL staff did not find the material in Quick Search at the time it was requested, and Iowa State was not listed on the OCLC record

In addition to print books, the ILL unit also does a great deal of work in sourcing, locating, and obtaining electronic copies of peer-reviewed journal articles or book chapters, often filling a

request in less than 24 hours. However, these requests are compiled in a separate dataset and are not considered in this analysis; for the purpose of this paper, only requests for print books to be physically shipped to Iowa State and borrowed are included.

The Resource Sharing department at Parks Library also offers a *Document Delivery* service, which can often be confused with Interlibrary Loan. Contrary to ILL, “Doc Del” operates as a type of “digitize on demand” service; a user requests something the library owns in print to be pulled off the shelf, scanned, and emailed to them as a PDF file. Document Delivery requests are also compiled in a separate database and are not included in this study.

4 Data Analysis and Discussion

This study is an analysis of five years worth of Iowa State University’s ILL requests of print books, 18,841 individual requests spanning calendar years 2013-2017. Monograph data available for analysis include loan author, title, year, publisher, edition, and lender library. Patron information includes department affiliation and status; no further personally identifying information about the patron is recorded in the dataset.

The analysis was conducted using the statistical program JMP [27], a powerful data analysis software package to analyze statistics and create visualizations. This software was chosen due to the author’s prior work with the program and the need for more advanced analysis possibilities than Excel could easily provide. Instructions to automatically re-create analysis and plots can be coded in JMP and saved for application to future data sets.

4.1 Preparing the Data

Twice per year, the ILL unit distributes a large Excel file of requests for print books from the preceding six months. Individual reports from years 2013-2017 were combined into one consolidated file for this analysis by merging on column titles. Instances where the same entity was being referred to in two slightly different ways were manually consolidated and combined into one standardized heading.

Fundamentals of Structural Analysis	1	0.00045
Fundamentals of structural analysis /	5	0.00225
Fundamentals of structural engineering /	4	0.00180
fundamentals of supply chain theory	1	0.00045
Fundamentals of supply chain theory	1	0.00045
Fundamentals of Supply Chain Theory	3	0.00135
FUNDAMENTALS OF SUPPLY CHAIN THEORY	1	0.00045
Fundamentals of supply chain theory /	14	0.00631
Fundamentals of traffic engineering / 15th edition	1	0.00045
Gadsby : a story of over 50,000 words without using the letter "E" /	1	0.00045
Game theory : an introduction /	1	0.00045

Figure 1: Multiple instances of the same title with varying names

This data cleanup was required for department names and loan titles; for example, Industrial Engineering was listed in some years’ reports as “Industrial Engineering” and other years as “Ind

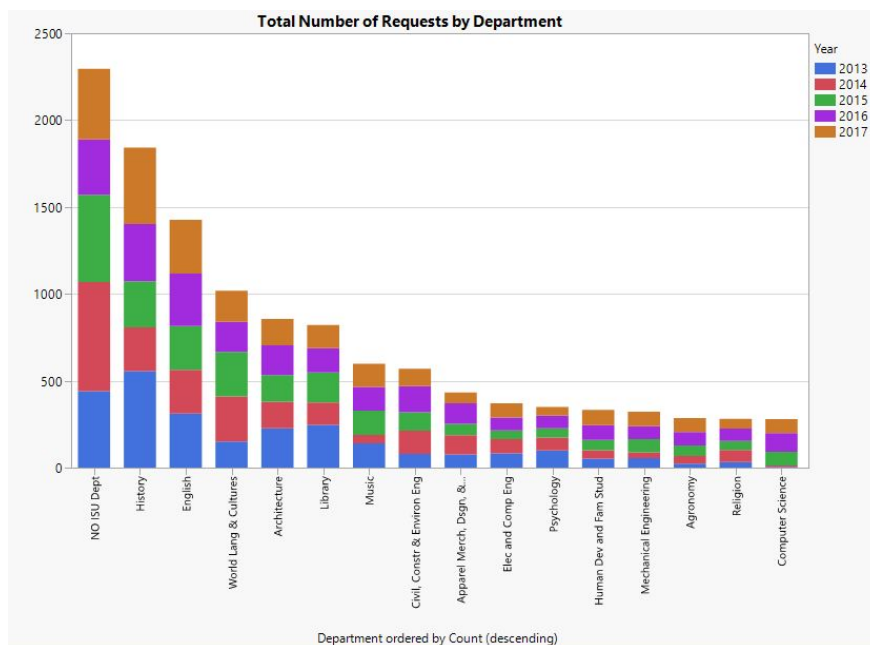


Figure 2: Total number of requests from all departments, stacked by year

and Manuf Syst Eng.” A similar process was done with the titles of the requested book; Figure 1 shows an example of consolidating and de-duping loan title information with slightly different capitalization approaches. Manually overwriting the names with one consistent title combined the records to give an accurate count, or in the case of Figure 1, 20 total requests.

4.2 Requests by all departments over time

Once the data was compiled and standardized, the analysis looked at all 148 departments across campus to arrive at a complete picture of ILL borrowing activity over time. Figure 2 shows this overall look, with the graph ordered by total number of requests over the five year period and stacked by yearly data. It was found that the category without an academic department declared actually had the highest number of total requests over the five year period with 2,296 requests.

The “NO ISU Dept” grouping contains users who are unaffiliated with Iowa State, but is also skewed by actively enrolled users who simply don’t choose a department. Users are asked to fill out a form with basic contact information when setting up an ILLiad profile the first time they make an ILL request, and selecting a department is part of that one-time form. NO DEPT happens to be the first entry in a long dropdown box, so users who are in a hurry to get their request filled out may just select the first categorization and move on. There is no validation code set up to certify that the departmental choice was indeed correct, such as checking against the patron’s username or email they used to log in to ILLiad. Compounding the issue, unless the patron takes it upon themselves to go back into their user profile and correct the departmental selection, subsequent requests during their collegiate career will continue to be categorized in the NO DEPT classification, further skewing the data. It should be clear that user-declared

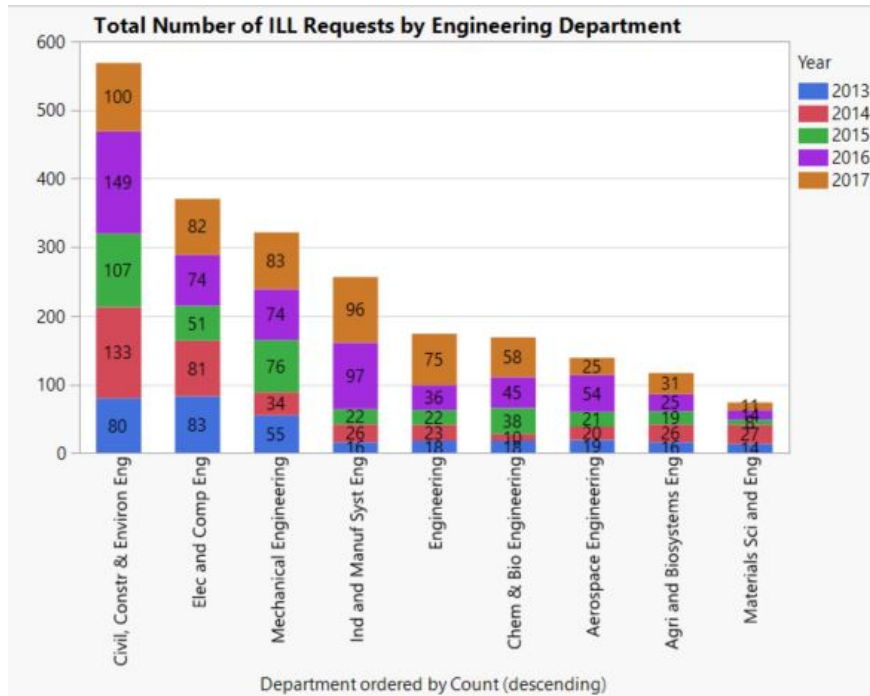


Figure 3: Total number of requests by engineering departments, stacked by Year

departmental affiliation is not a perfect method of data collection, but instead a verification check against a user’s already provided credentials would be a better and more reliable method.

Moving further down Figure 2, the ranked list of request totals was then dominated by monograph-heavy fields in the social sciences and humanities such as History (1,843), English (1,426), and World Languages & Cultures (1,018). While these academic disciplines are undoubtedly important, they do not fit well within the scope of an engineering education focused conference. Therefore, to better align with the emphasis of ASEE, the analysis re-focused to look at the ILL activity from nine engineering departments. The names of these departments and their total number of ILL requests over five years are shown in Figure 3.

4.3 What engineering departments request most often?

Iowa State has eight engineering departments on campus. The generically named “Engineering” seen in Figure 3 is not an official department, but an artifact of the data provided in the bi-annual ILL reports. The category could likely have been eliminated by examining the requested titles and reassigning to the individual departments which most often requested that title, but this was not done due to the danger of inventing data for analysis.

With the scope narrowed to focus only on engineering departments, the analysis of the nine departments’ 2,219 total requests over five years was repeated. Figure 3 shows the results of this narrowed scope, as well as the yearly breakdown of requests. It was found that the department of Civil, Construction, & Environmental Engineering (CCEE) had the greatest number of total requests with 569. CCEE was the largest engineering requester of ILL materials in four of the five

Loan Title		
Frequencies		
Level	Count	Prob
Value added decision making for managers	34	0.01551
Basic engineering data collection and analysis	20	0.00912
Fundamentals of supply chain theory	20	0.00912
Introduction to Stochastic Processes with R	16	0.00730
Project Management in Practice	13	0.00593
FE civil review manual : rapid preparation for the Civil Fundamentals of Engineering Exam /	13	0.00593
Developing managerial skills in engineers and scientists - succeeding as a technical manager	12	0.00547
Principles of foundation engineering	12	0.00547
The failure of risk management : why it's broken and how to fix it /	11	0.00502
Design of concrete structures /	11	0.00502
Physics for scientists & engineers /	11	0.00502
An introduction to statistical methods and data analysis.	11	0.00502
Fundamentals of engineering thermodynamics	10	0.00456
Probability and Statistics for Engineering and the Sciences	10	0.00456
Optoelectronics and photonics : principles and practices /	9	0.00411
Seismic design and retrofit of bridges	9	0.00411
Structural motion engineering /	8	0.00365
Nonlinear programming	7	0.00319
Dynamics of structures - theory and applications to earthquake engineering	6	0.00274
Steel construction manual.	6	0.00274
Introduction to environmental engineering	6	0.00274
Learn to listen, listen to learn : academic listening and note-taking /	6	0.00274
Hydrology and Hydraulic Systems	6	0.00274
Fundamentals of Structural Analysis	6	0.00274
Contemporary Engineering Economics	6	0.00274
Principles of highway engineering and traffic analysis	6	0.00274

Figure 4: Total number of requests by title in all engineering departments

years analyzed in this study, and the year it was not the largest, it took second by three requests. Furthermore, CCEE's 569 total requests were 1.5x larger than the next highest engineering department.

Electrical & Computer Engineering (ECpE), Mechanical Engineering (ME), and Industrial & Manufacturing Systems Engineering (IMSE) followed in ranks 2, 3, and 4, respectively. ECpE and ME had fairly consistent numbers of requests through each of the five years considered in the analysis, but IMSE made the vast majority (75%) of its requests in years 2016 and 2017.

4.4 What titles are most requested?

One of the most basic questions that an ILL dataset can answer is, "Which titles are requested, and how often?" This gives insight into which particular monographs are being sought after by patrons but which are not able to be provided immediately by the library's collection.

The books most often requested when combining all engineering departments are largely textbooks, as seen in Figure 4. The overall most requested title was "Value Added Decision Making for Managers" (2012) by Kenneth Chelst, requested a total of 34 times over five years. This title was requested 3 to 7 times in each of the years 2013-2016, then requested 17 times in 2017 alone. This suggests the book was used as a course textbook, though this theory does not fully explain why the demand for the book suddenly increased that year. Presumably, if the book

was being used as a required text, demand should have remained fairly consistent through the years. Industrial & Manufacturing Systems Engineering graduate students were responsible for the majority of the requests, with a few Aerospace Engineering graduate students requesting the book as well. This book is used in a 500-level Industrial Engineering course, and as a result of an early iteration of this analysis, the library purchased a copy of the book in November of 2017 and placed it on a 2-hour restricted checkout through Course Reserves to help alleviate the demand.

One of the books tied for second place had similar borrowing patterns. “Fundamentals of Supply Chain Theory” (2011) was requested three times in 2014, then 17 times in 2016. IMSE graduate students were wholly responsible for the requests of this title in 2017, but which course was driving this demand could not be determined. As of this writing, the library has not purchased a copy.

The other second place title, “Basic Engineering Data Collection and Analysis,” (2001) had a much broader reach. While it saw most of its ILL requests in 2017 (11 of 20), it was requested at least once by patrons from six engineering departments. These patrons were almost evenly split between undergraduate and graduate status. This particular book was very interesting because it was written by an Iowa State University author. A short conversation with him revealed that this book had been used in a 100- and 300-level engineering statistics course in the past, but was most recently used in a 500-level course, Statistical Methods for Research Workers. Parks Library owns a copy in the General Collection that is almost constantly checked out, and since it is written by an Iowa State author, a second copy is permanently housed in Special Collections and University Archives. The archives copy is open for students to use, though not available for checkout or use outside the Special Collections Reading Room. Additionally, the book has fallen out of print, likely around the time of the observed spike in 2017. Future students needing the book will need to either locate a used copy, use the e-book version, or request it through Interlibrary Loan as the author has no plans to update the book and release a new edition.

Looking at the opposite side of the title frequency list showed that most books were borrowed only once. A total of 83% of titles (1326) were requested once, 164 titles were borrowed twice (10%), 49 titles were borrowed three times (3%), and the remaining 51 titles were borrowed four or more times (3%). This is higher than the 67% rate of titles borrowed once found by Tolppanen and Derr [8].

4.5 Titles by individual engineering department

After looking into the top overall requested titles, the data was broken out and reanalyzed for frequently requested titles by individual engineering department. Figures 5 and 6 show the top five most requested titles in the four most active engineering departments; in instances where the fifth ranked title was the result of a tie, all titles with that number of requests are included.

Top activity in CCEE focused on textbooks and an FE exam review manual, all of which the library currently owns. The most requested books in ECpE were also largely textbooks the library owns, with the exception of “Fixed Point Theory...”. ME had a much wider range of books, with no one title dominating the request activity, and IMSE contributed heavily to the aforementioned

Distributions Department=Civil, Constr & Environ Eng		
Loan Title		
Frequencies		
Level	Count	Prob
Principles of foundation engineering	12	0.02109
FE civil review manual : rapid preparation for the Civil Fundamentals of Engineering Exam /	11	0.01933
An introduction to statistical methods and data analysis.	9	0.01582
Seismic design and retrofit of bridges	9	0.01582
Design of concrete structures /	8	0.01406
Probability and Statistics for Engineering and the Sciences	8	0.01406
Structural motion engineering /	8	0.01406

Distributions Department=Elec and Comp Eng		
Loan Title		
Frequencies		
Level	Count	Prob
Optoelectronics and photonics : principles and practices /	9	0.02426
Antenna theory : analysis and design /	5	0.01348
Fixed point theory and graph theory : foundations and integrative approaches /	4	0.01078
Advanced engineering electromagnetics	4	0.01078
The Hippocampus Book	4	0.01078

Figure 5: CCEE and ECpE Requests

Distributions Department=Mechanical Engineering			
Loan Title			
Frequencies			
Level	Count	Prob	
Basic engineering data collection and analysis	5	0.01553	
Perspectives in flow control and optimization /ALL VOLUMES	4	0.01242	
Zhongguo ji guang Chinese journal of lasers.	3	0.00932	
Fundamentals of engineering thermodynamics	3	0.00932	
High-speed 3D imaging with digital fringe projection techniques /	3	0.00932	
Advances in dynamic games and applications /	3	0.00932	
Manufacturing processes for engineering materials	3	0.00932	

Distributions Department=Ind and Manuf Syst Eng			
Loan Title			
Frequencies			
Level	Count	Prob	
Value added decision making for managers	29	0.11284	
Introduction to Stochastic Processes with R	16	0.06226	
Fundamentals of supply chain theory	16	0.06226	
Project Management in Practice	11	0.04280	
Developing managerial skills in engineers and scientists - succeeding as a tech	11	0.04280	

Figure 6: ME and IMSE Requests

“Value Added...” and “Fundamentals...” titles, as well as to the overall fourth most requested book, “Introduction to Stochastic Processes with R” (2016).

4.6 Who is requesting materials?

Next the analysis focused on the status of the patron making the Interlibrary Loan request. As seen in Figure 7, most requests come from Graduate students and Faculty members, with Graduate students making up almost all of the request activity in CCEE and IMSE. This makes sense as these groups are often pushing the limits of the library’s collection in their respective disciplines. However, undergraduate interest in books to be delivered through ILL is unusually strong in Chemical & Biological Engineering and Aerospace Engineering. By contrast, Electrical & Computer Engineering shows a much more balanced request profile.

The dataset used in this analysis does not include further identifying information about the patron making the request; therefore, it is not possible to determine how many of these requests come from the same patron or a small set of frequent users. It is also not possible to compute interesting measures such as what percentage of people in a given department are submitting ILL requests, as each request is considered individually and unable to be traced back to the requesting patron.

4.7 What peer libraries fill the requests?

Lending libraries are identified in the data by a three-character alpha-numeric code; for example, Colorado State University is coded as “COF”. Abbreviations were decoded using RapidILL’s Current Members tool available on their website [28].

Overall, 274 ILL requests in this five year period, or 14%, were not filled, as denoted in Figure 8 by the “Patron Notification B” category. This result could be for a variety of reasons; the item could be very new or old, rare, otherwise unavailable, or Parks Library may already have the item available and be able to fulfill the user’s request through Course Reserve or general checkout.

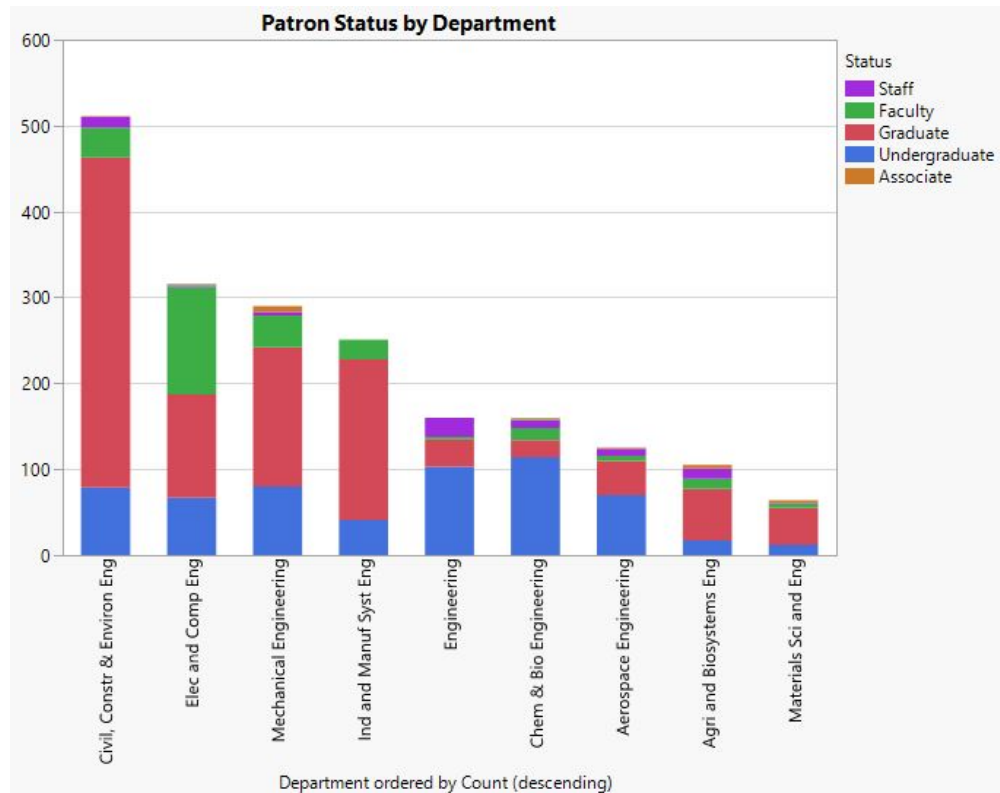


Figure 7: Status of engineering patron making the ILL request, all years combined

Additionally, patrons receive a Notification B if the item is not found in North America but is located internationally. The user must then approve a processing fee of \$5 to proceed in that case.

The 86% fill rate matches with the 86% fill rate found by Tolppanen and Derr [8] and is very close to the 87% found by Munson and Savage [9], though it should be noted that these comparison numbers are not engineering-only, monograph-only statistics, but also include electronic journal articles, copies, and other resources from a variety of requesting departments as well.

Of the 86% of monograph requests that were able to be completed successfully, the library that filled the most requests was the University of Iowa Hardin Library for the Health Sciences at 10.6% (see Figure 8). Iowa State University does not have a medical program, so Parks Library does not emphasize medical disciplines in the collection. Therefore, researchers looking for books and other materials related to medical fields would not be able to find them at their local academic library and would likely need to go through ILL.

There is a large drop-off in frequency following the University of Iowa Hardin Library, with Texas A&M University, Brigham Young University, and the University of Wyoming each filling between 2.5-3.5% of requests, and the local public library filling 2% of the requests over five years analyzed here. Overall, 430 unique libraries, both academic and public, filled at least one ILL request over the five year period in this study. (Note: the difference between the 2,219 total requests from engineering departments quoted earlier and the 1,920 requests considered in this

Library Name		
Frequencies		
Level	Count	Prob
Total	1920	1.00000
Patron Notification B	274	0.14271
University of Iowa Hardin Library for the Health Sciences	204	0.10625
Texas A&M Univ	68	0.03542
Brigham Young University	49	0.02552
University of Wyoming Libraries ILL	48	0.02500
Ames Public Library	40	0.02083
Washington State University	37	0.01927
Texas Tech University	35	0.01823
UNLV	33	0.01719
OREGON STATE UNIVERSITY LIBRARIES	32	0.01667
University of New Mexico	31	0.01615
University of Oklahoma	31	0.01615
University of Kansas Library	30	0.01563
Rice University Library	29	0.01510
University of Texas Libraries	28	0.01458
Arizona State University Libraries	25	0.01302
University of Utah	23	0.01198
University of Arkansas Libraries	20	0.01042
Washington University	20	0.01042

Figure 8: Extended list of libraries filling ILL requests

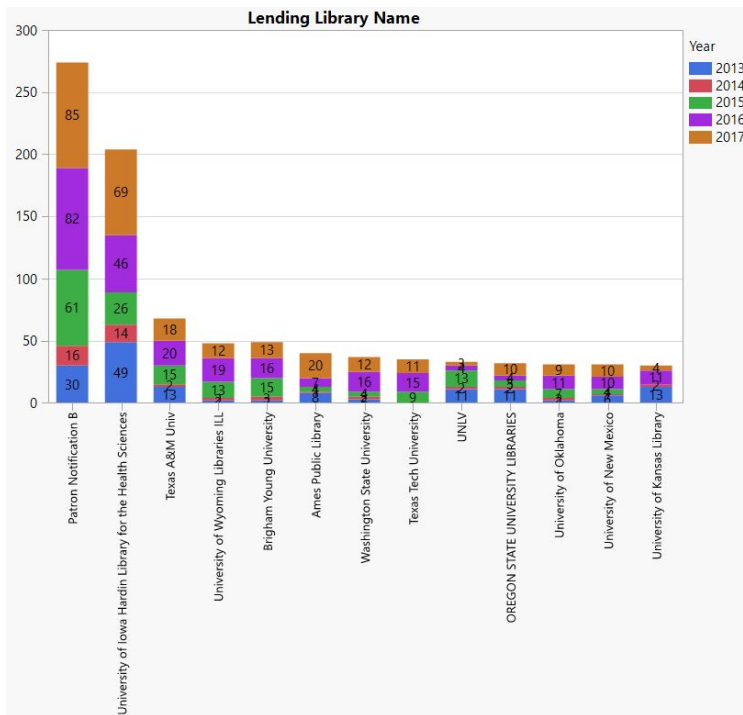


Figure 9: Libraries filling ILL requests

section is due to some records not having their lending library recorded in the dataset.)

This large set of institutions shows that filling an ILL request requires a broad system of support across a large set of libraries. Relying on external cooperation to fill the information needs of patrons allows the service to cast the broadest possible net while working to fill the request quickly and adhere to the patron's specific requests (edition number, specific year, etc). It also allows individual libraries to specialize and focus on strengthening their collections in certain areas, relying on peer libraries to supplement the gaps in their collection coverage.

5 Limitations and Future Work

The work described here has certain limitations in its scope. For example, this work did not include an analysis of Library of Congress call numbers of the requested print books, as that information is supplied only intermittently by the library filling the ILL request. Staff time does not allow Parks Library employees to go back in, look up LC call numbers, and fill missing fields with data on thousands of requests. Adding this capability through a Python script or encouraging libraries to include this information as a standard operating procedure when filling loan requests would enable many more analysis possibilities. In particular, it would be helpful for subject and liaison librarians to be able to see not only what users in their assigned departments are requesting, but what books in the librarian's assigned call number ranges were being requested across campus, regardless of department.

For example, in 2017 an English major used Interlibrary Loan to request a book on linear algebra. The math librarian would certainly be interested to know this, but she would likely never even notice the request had been made unless she happened to be looking through the list of titles requested by patrons from the English Department. Scrolling through the approximately 3,000 requests made each year and browsing the list of book titles is possible, but not entirely practical; sorting by a liaison librarian's assigned call number ranges would be a much quicker way to see what is going on with books from specific ranges.

The dataset used in this study also does not include information on the patron identity of each request. Therefore, an analysis of the number of unique patrons per department, and by extension, the percentage of patrons within a department who request print materials through ILL, cannot be determined.

Several other aspects of ILL service could be considered for future analysis. These would expand the scope to include electronic copies of peer-reviewed journal articles or individual book chapters being requested, CD, DVD's or other physical non-print items, or the Document Delivery service which digitizes print material at a patron's request. Future work could also focus on the other half of ILL, *lending*. Are the university's local subject specialties reflected in the materials requested by others? Do certain titles appear more frequently than others? What is the distribution of locations lent to, and how many international requests are there? It would be illuminating to do a systematic analysis of Iowa State's materials which go out the door to other universities, public libraries, and interested parties.

6 Conclusion

This study of ILL activity over a five year period shows that Interlibrary Loan services provide patrons with a much broader range of resources than any one library can provide alone, while also creating a valuable dataset that can give libraries a better understanding of patron behavior and the materials they request. Scholars must go through ILL to acquire a book when the book is not readily available; often in this study, it appeared the book was in fact already owned by the library, but its requirement in a course spurred high demand that could not be met with the local copy alone. With the high price of textbooks, students are savvy enough to investigate other options to get their books, and the library is one of the first stops on their search. Iowa State does not have a formal policy promoting or discouraging the acquisition of textbooks with collection development funds, but leaves the decisions up to the individual liaison librarian who generally do not purchase them for classes.

This study provided a closer look at what books are actually being requested through Interlibrary Loan at Iowa State University, but can also serve as a starting point for other libraries to conduct similar investigations. Hopefully this analysis can prove useful to other universities or institutions as they analyze their own Interlibrary Loan data to get a better feel for where their patron base is being routed to ILL.

The visualizations in this analysis were all created using the statistical software package JMP, and the procedures and code to automatically create these graphs have been saved and uploaded for others to reuse or adapt to their home institution's data sets at:

<https://github.com/eschares/ILL-analysis>

Requirements for formatting the underlying dataset and column name requirements are outlined in the accompanying readme.txt file, and any improvement suggestions or notice of discovered errors or mistakes in the analysis are welcomed.

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