

Information Use in History Research: A Citation Analysis of Master's Level Theses

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Abstract

This article addresses the need for quantitative investigation into students' use of information resources in historical research. It reports the results of a citation analysis of more than 3,000 citations from master's level history theses submitted between 1998 and 2008 at a mid-sized public university. The study's results support the hypotheses that the predominant format in history research is the monograph and that history research entails use of older resources, and in greater proportions, than other disciplines. Results also support the conclusions that journal usage is comparatively low and that there is a high degree of citation dispersal across journal titles.

Introduction

This study applies the techniques of bibliometric analysis to the citations in master's level theses at Southern Connecticut State University (SCSU) in order to identify patterns of information use in the discipline of history. This analysis examines citations, aggregates statistical data describing their characteristics, and draws conclusions about information resources and the ways in which they are accessed.

Citation analysis of this kind can provide insights about research interests, resource needs, research behavior, interdisciplinarity, scholarly communication, and

collection management in academic libraries. Used cautiously and in conjunction with other evaluation sources, it can contribute to a profile of the resources that researchers most commonly use.

Citation analysis is also a valuable method for collecting objective quantitative data on which to base collection development decisions. College and university libraries are constantly under pressure to manage funds prudently and in a manner consistent with teaching and research needs. This is increasingly difficult as journal subscriptions, in particular, continue to rise at a rate that outstrips any growth in acquisitions budgets. Libraries that want to provide the greatest possible access to the greatest possible breadth of resources need to know and understand the resource needs of their users. Citation analysis is one way to study these needs.

Citation analysis of articles in professional journals dates back to 1927,¹ but citation analysis of student dissertations and theses began in earnest only in the 1990s, and there remain gaps in scholarly knowledge that published research has not yet addressed. One area in need of research is information use by graduate students in the humanities and social sciences. Most citation analyses of graduate student research have focused on the natural sciences and technology.

This case study contributes to the understanding of information use in the discipline of history. In particular, it examines the hypotheses that research in the humanities and social sciences involves greater use of monographs than journal articles, unlike research in the natural sciences, and that it involves greater use of older resources, reflected by a longer and flatter age distribution. This case study also assesses the degree of dispersal of journal articles across different titles, the role of foreign language

materials in history research, and the availability of cited resources at SCSU.²

Setting

SCSU is a mid-sized public university located in New Haven, Connecticut. It was founded as a training school for teachers in 1893 and was re-established as a college in 1954 and as a university in 1983. In that year, it became the fourth university in the Connecticut State University system. The Carnegie classification system categorizes it as "Master's Colleges and Universities (larger programs)." In 2008–2009, its total enrollment was 11,930, of whom 3,415 were graduate students. The History Department's share of graduate enrollment in 2008–2009 was 10 students.³

The History Department offers four programs of study—the BA, MA, and MS in history and the BS in history with secondary teaching certification. Both graduate programs require 30 credits of study; each student must submit a thesis, which represents six of the required 30 credits. Faculty interests include the history of New England, indigenous peoples in the Americas, medieval Europe, and east and southeast Asia.⁴

Library resources and services are provided by the on-campus Hilton C. Buley Library. The library's responsibilities include developing and maintaining collections, providing access to library services, providing bibliographic instruction to students, and advising faculty, scholars, staff, and Connecticut residents.⁵

According to 2004 data, SCSU's Buley Library has holdings of 591,429 print items and 110,468 serials.⁶ The library's collection policy specifies possible criteria for acquisitions that include relevance to students' research. The policy also describes the

formula used to allocate funding to academic departments. Significantly for this study, one element in this formula is the typical characteristics of materials used within a discipline: "the nature of material needed to support a department (ex. subscriptions, monographs, rare materials, on-line services, etc.)"⁷

Literature Review

Citation analysis of scholarly journals dates back to P. L. K. Gross and E. M. Gross' 1927 analysis of citations in chemistry journals but was not widely applied to student papers until the 1990s. These analyses take advantage of the properties of research-based theses and dissertations, which are abundant, data-rich, relatively easy to access, and do not require the participation of human research subjects. Furthermore, one study has found a correlation between the journal citations of graduate students and faculty members, so citation analysis of graduate work can be extrapolated for both graduate and faculty research.⁸

The most common aspect of citation analysis is composition by format—which formats are represented within an aggregated set of citations and in what proportions? The responses to these questions can become useful inputs for decisions about collection development. For example, format ratios may be valuable when determining formulas for budget allocations.⁹

Most studies have focused on disciplines in the natural sciences and technology, consistently showing that the majority of citations are to journal articles, with a significant minority to monographs. A typical example is Angela Gooden's study of

chemistry dissertations, which reported that 85.8 percent of citations were to journal articles.¹⁰ Angela Gooden; Bradley Brazzeal and Robert Fowler (forestry theses); and Arjun Lal and K. C. Panda (plant pathology dissertations) reported citations to books were 8.4 percent, 13.0 percent, and 7.9 percent, respectively.¹¹

Anne Buchanan and Jean-Pierre Herubel and Sherri Edwards assert that the ratio of journal articles to monographs is lower in the humanities and social sciences. Buchanan and Herubel's study of citations in political science dissertations supports this view of the social sciences (46.7 percent of citations to monographs), but neither study cites research to support this contention with regard to other social sciences or the humanities.¹²

Multi-disciplinary studies by Jeffrey Kushkowski, Kathy Parsons, and William Wiese, as well as Erin Smith's study of graduate students, and Mark Slutz's survey of English literature master's theses indicate that selected humanities and social sciences (not including history) are dependent on monographs. For example, Slutz calculated that 50.2 percent of citations in English master's theses were to books and 27.4 percent to journal articles.¹³ However, all three studies examined comparatively small data sets for humanities and social sciences. For example, their data sets for humanities were N = approximately 449; N = 377; and N = 938 citations, respectively.¹⁴

The literature shows that the age distribution of cited resources in graduate students' dissertations and theses tends to peak at two to three years, with significant drop-off at around 15 years, and then a gradual decrease.¹⁵ Steven Black speculates that this peak occurs despite a probable bias in citation analysis against the most recently published resources, given that it may take several years for faculty and students to

become aware of their existence and relevance.

Several studies have suggested that, within this general pattern, the age distributions for humanities and social sciences sources are flatter because of the greater use of older materials. One method of comparison is to calculate the mean and median ages, which—according to this hypothesis—would be higher in humanities and social sciences. Kushkowsky, Parsons, and Wiese report an overall mean of 12.3 years for their multidisciplinary survey and a mean of 18.1 years for humanities, as well as medians of eight years overall and 10 years for humanities.¹⁶ These statistics support the hypothesis, but the study also reported the same median of 10 years for some science disciplines.¹⁷ Consequently, the study's authors do not endorse in full the hypothesis of a distinction between an emphasis in the natural sciences on recently published research and an emphasis in the humanities and social sciences on older "foundational" publications. The data set for this study is comparatively small and does not include history research.

Citation analysis also permits the creation of ranking tables showing the most cited journal titles and an analysis of title dispersal, or the degree to which the literature on a subject area is scattered across a number of resources. Scatter across a large number of resources means a high level of dispersal. Journal title dispersal is low in several disciplines. Steven Black found that citations in communication disorders research conform to the "80/20" principle devised by Richard W. Trueswell, meaning that 20 percent of cited journals contain 80 percent of citations.¹⁸ Similar patterns have been found in social work research, forestry, and chemistry.¹⁹

Journal dispersal analysis is also an indicator of subject dispersal, also known as "interdisciplinarity" and "information scatter."²⁰ Subject dispersal has implications for

matters including collection budgets, reference work, bibliographic instruction, and the location of collections and departmental libraries. Bradley Brazzeal and Robert Fowler were surprised to find that 60 percent of cited journals in forestry theses were coded to other departments, whereas Joy Thomas showed that only 23.7 percent of journal citations in social work theses were to social work journals.²¹ Another alternative measurement of subject dispersal is analysis by Library of Congress (LC) classification and was used by Rosalind Walcott to show that 41 percent of citations in geoscience dissertations were to non-geological materials.²² No major study of subject dispersal in history at the student level has yet been published.

Few citation analyses have considered the aspect of language. Walcott's examination of geoscience dissertations found that non-English language resources represented fewer than 3 percent of cited materials, prompting the conclusion that foreign language resources in this discipline are likely to receive minimal use.²³

Several studies have calculated the availability of cited resources in the library holdings of the host institution. The percentages representing available resources have clustered in a narrow range between 85 percent of multidisciplinary materials at Iowa State University and 93 percent of chemistry materials at Ohio State.²⁴ In other words, reported levels of local holdings have tended to be high.

Methodology

The data for this project were retrieved from master's-level theses submitted to the Department of History at SCSU during the 10-year period between academic years 1998–

1999 and 2007–2008 (inclusive). Searching Consuls, the online public access catalog (OPAC) for the Connecticut State University system (<http://www.consuls.org>) identified 47 theses. Forty-five were retrieved from ProQuest's Digital Dissertations database; the remaining two were retrieved from the printed volumes of theses shelved at Buley Library.

The theses encompassed a broad range of research interests. This breadth was chronological, addressing time periods from the 3rd century CE to the late 20th century, and geographical—15 of the 47 theses studied historical issues and developments beyond North America. There was also disciplinary breadth, with theses applying the perspectives and techniques of military, artistic, legal, racial, women's, religious, and political histories.

Each thesis' abstract page and references section were either printed or photocopied. These data were collated in an Excel spreadsheet. In-text citations, footnotes, and endnotes were excluded to avoid duplications. The data collection generated a source of 3,498 citations, a significantly larger data set than those used in other citation analyses of humanities or the social sciences.

One table contained thesis elements, including thesis title, author, degree program (MA or MS), year of acceptance, number of pages, number of citations, and an assigned identifier code. Page counts included appendices and endnotes and ignored variations in font size, line spacing, and paragraph spacing. A second table contained citation elements, including thesis code, format category, publication date, citation age (computed as the number of years between the year of acceptance and the date of publication), language (if not English), Buley Library holdings (yes/no), and Library of Congress (LC)

classification.

Incorrect citations appeared in several theses; examples included incomplete or missing dates, duplicates, and the citation of a text's original publication rather than that of the specific edition consulted. Correct bibliographical information was located and recorded for cited materials when possible.

Duplicates were ignored and edition dates, not original publication dates, were logged. This was a pragmatic decision that was made despite the possibility that a resource's edition date might be significantly different from its date of original publication. For example, a medieval or early modern text might have been consulted in a modern edition.²⁵ This study assumed that the majority of edition dates are the same as, or approximate to, the dates of original publication and that the large size of the data set compensates for any misleadingly dated resources. When it was not possible to identify correct bibliographical information, spreadsheets' cells were left blank, and the citation was omitted from the relevant statistical analysis. All calculated figures were rounded to the first decimal place.

Results

Citations per Dissertation

As noted, this study examined 47 theses. Thirty-nine were submitted for the MA program and eight for the MS program. The mean number of pages was 100.1 and the median was 91, with a total page range from 44 to 330.

The theses' references sections contained a combined total of 3,498 citations. The mean number of citations was 74.4 and the median was 62, with a range from 28 to 183 citations. Both the mean and median of citations per page were 0.7, with a range from 0.3 to 1.9 citations.

Format

Twenty-six format types were identified. In table 1, "contributed chapter" refers to chapters or papers contributed to a compilation. "Journal article" refers to an article in a scholarly journal, whereas articles in non-scholarly journals are referred to as "periodical." OCLC and proprietary Web sites were used to verify unknown or abbreviated periodical titles and to establish whether journals were peer reviewed or non-scholarly. "Web document" refers to unrestricted Web sites and Web pages. These included online texts and academic, commercial, and institutional Web sites.

Of the 3,498 citations, 53.2 percent were monographs. Other formats that represented more than 5 percent of the citations were periodicals (15.7 percent), journal articles (7.8 percent), government documents (6.7 percent), and contributed chapters (5.3 percent). Combining monographs and contributed chapters, the proportion represented by books was 58.5 percent.

"Other" formats included brochures, catalogs, class notes, conference addresses and proceedings, exhibitions, genealogical charts, institutional reports, manuals, maps, personal communications, press releases, and photographs. Together, they represented 1.4 percent of citations.

<Insert Table 1>

Age Distribution

Two hundred two citations (5.8 percent) were undated and were excluded from the following calculations. Most were Web documents, but some were archival collections and citations whose date had been omitted. Dated citations referred to items aged between zero and 479 years. Twenty-five cited items were published in the same year as the submission of the thesis. The oldest item was Erasmus' *A Devout Treatise Upon the Pater Noster* (1526); another four items were more than 400 years old. In these and similar cases, the thesis author may have used a modern edition and cited the original publication; but it was not possible to second-guess the citation, so this study presumed that the item used was the item cited.

Figure 1 shows the distribution of citation ages, revealing that the most common ages were one to five years; the mode was three years. Citation numbers are lower but still relatively high for the ages six to 16 years, before declining gradually over the sequence of remaining ages. The median age was 25 years.

There is a spike in the number of citations for the age 39 years. This is an anomaly resulting from the citation of a large number of primary documents in a particular thesis. Figure 1 also shows the significant number of citations for items aged 48+ years. For example, 346 cited items (10.5 percent) were dated to the 19th century.

[Placeholder: Figure 1]

Figure 1. Citation age distribution, emphasizing ages zero to 51 years.

Journal Frequency

There were 274 citations (7.8 percent) to articles in scholarly journals, contained in 153 discrete journal titles. This results in a mean of 1.8 citations per journal, with a range from one citation to 11.

Table 2 indicates the most frequently cited journal titles; journals with a single citation (n=105) are omitted. The five most cited titles were *American Historical Review*, *English Historical Review*, *Journal of American History*, *Diplomatic History*, and *History of Education Quarterly*. Combined, these titles accounted for 15.4 percent of journal citations.

<Insert Table 2>

Journal Title Dispersal

The results of this study show a high degree of scatter. The five most productive titles in this study represented a combined total of only 15.4 percent of journal citations. No journal received more than 11 citations (*American Historical Review*), or 4 percent of the total. In addition, the "long tail" was very long; 126 titles (82.4 percent) had either one or two citations.

This adds up to a high level of dispersal. There is no discernible "80/20" pattern. Instead, the most frequently cited 20 percent of journal titles contained only 53.7 percent of cited articles. To cover 80 percent of journal citations, 65.4 percent of titles are needed.

Subject Dispersal

Interdisciplinarity, or the degree to which the literature on a given subject area is scattered across a number of disciplines, was measured by analyzing the LC classifications of cited materials. Almost two-thirds of cited resources that included an LC classification had a record in Consuls or the LC OPAC (<http://catalog.loc.gov>). The examined theses contained citations to items in all 21 LC classes, but table 3 shows that there was significant variation in numbers. The range was from a single citation (M and S) to 498, or 23.9 percent of classified citations (E). Combined, the four history classes (C, D, E, F) comprised 48.5 percent of classified citations. The only other classes with more than 6 percent of classified citations were B (philosophy, psychology, and religion, 9.5 percent) and H (social sciences, 13.7 percent). Another means of evaluating subject dispersal is to study the journal titles in table 2. The five most commonly cited journals were history focused; but, overall, only 52 of the 153 cited titles were history journals, or 34.0 percent.

<Insert Table 3>

<Insert Table 4>

Language

Items in a language other than English were cited 54 times, representing 1.5 percent of citations. The languages of cited materials were French, Italian, Korean, Latin, and Spanish. The most-cited languages were Korean (27 citations) and Italian (10), but only French-language materials were cited in more than one thesis. The most common formats of non-English materials were monographs (53.7 percent) and contributed chapters (33.3 percent). Only two cited foreign language items could be found in Buley Library holdings, whereas 50 items could not.

<Insert Table 5>

Local Holdings

A total of 3,022 citations (86.4 percent) were annotated to indicate whether Buley Library has ownership of or licensed access to the item in question. When the item was available online without restriction or charge, or it was not possible to identify an item in either Consuls or the LC OPAC, or the item was a government document, then no indicator was

marked. Searching in Consuls for government documents to the point of certainty that it was or was not available is complex and prohibitively time-consuming for this study.

Buley Library holds 1,239 cited resources, or 41.0 percent of annotated cited resources. This percentage varied according to the format type, as shown in table 6. The library provides access to a higher percentage of journal articles (72.6 percent) but a lower percentage of monographs (46.8 percent) and periodicals (49.5 percent). Some types of resources, such as archival papers, were accessed entirely elsewhere.

<Insert Table 6>

Discussion

Format

The identification of 26 formats among the citations indicates that history research requires access to information resources in a variety of formats. However, the results support the hypothesis that the predominant format for master's level history research is the monograph, which in this study comprised approximately half of all citations (53.2 percent). This high percentage of citations to monographs contrasts starkly with citation analyses of dissertations and theses in the natural sciences and technology, which point to low levels of monograph usage. Instead, monograph use in historical research appears to be closer to that in political science, as reported by Anne Buchanan and Jean-Pierre Herubel.²⁶

However, Buchanan and Herubel concluded that scholarly journal articles have almost equal importance to monographs in political science, with journal articles comprising 36.8 percent of citations. The present study suggests that scholarly journals have markedly less importance for historical research; journals represented only 7.8 percent of citations, less than non-scholarly periodicals (15.7 percent) and approximate to government documents (6.7 percent).

This finding appears to confirm the continued importance of the monograph in scholarly communication in the field of history, in which faculty appointments and tenured status continue to emphasize monographic publications. It also appears to validate the approach of libraries like SCSU that incorporate considerations of format into budget allocation formulas. Many academic libraries have reallocated funds from monographs to serials in order to cope with the escalating costs of journal subscriptions. However, the data in this study support the view that, all other things being equal, spending on history resources should prioritize monographs and not journals. The data even suggest that non-scholarly periodicals warrant greater funding than journals, though many of these, such as newspaper archives, will be considered general works and would not be funded by a departmental budget allocation.

Age Distribution

The age distribution of cited resources supports the hypothesis that history research requires access to and use of older materials than those used in the natural sciences and in proportionately greater quantities. This is shown in the longer and flatter curve of age

distribution. The curve peaks quickly at three years and remains relatively high for years one to 16, mirroring the peaks of age distribution curves in citation analyses of natural sciences research. However, the subsequent decreases are less pronounced, indicating that recently published materials do not dominate history research in the same way. As further support for this conclusion, the median resource age of 26 years is more than double the highest median in citation analyses of the natural sciences and more than three times the median in some of the studies discussed in the literature review; and the proportion of materials aged 30+ years is more significant than in other studies.

In other words, this longer, flatter age distribution appears to provide quantitative support for the hypothesis that there is a distinction between a focus in the natural sciences on recently published research and a focus in the humanities and social sciences on older literature, as discussed but not endorsed by Kushkowsky, Parsons, and Wiese.²⁷ This distinction is partly the effect of researchers' use of primary documents, such as archival papers, government documents, and periodicals. The use of older monographs may indicate that scholarly knowledge in history takes a longer period of time to become outdated than in the sciences.

Alternatively, or perhaps additionally, the longer age distribution may support the view that master's theses in history emphasize familiarization with the literature that has accumulated on a topic, as opposed to the more recent scholarship that is generally more relevant to doctoral research. If so, libraries need to examine their holdings relative to the programs offered by their institutions and plan their collections accordingly.

The longer age distribution of resources for historical research has other key implications. Access to older materials requires investment in long-term collection

development, retrospective acquisitions, conservation, and efficient archival storage. The longer age distribution may also mean that a more conservative approach to weeding and de-accessioning should be applied to history collections. Local access to older materials is especially valuable because these are often more rare and more fragile and, therefore, less likely to circulate among lending consortia. The longer age distribution also means that librarians providing research assistance and bibliographic instruction need to teach students the value of reviewing literature historically and showing them how to do so effectively.

Journal Frequency

Citation analysis can be a useful tool for identifying the most important journals in a disciplinary field. The tabulation of most frequently cited journals can inform reference work, such as index searches. It can also highlight gaps in a collection and help to identify specific titles that would be desirable acquisitions.

As table 6 reveals, Buley Library does not provide access to journal titles that contained 27.4 percent of cited articles. The most frequently cited journals not in Buley's holdings were:

- *Connecticut Bar Journal* (4 citations)
- *American Quarterly* (3)
- *Journal of Medieval History* (3)
- *New Haven Teachers Journal* (4)

However, these low numbers for citations to specific journal titles would complicate collection development decisions. Are they both statistically and practically significant? If not, they could be susceptible to shifts in student and faculty research interests.

The tabulation of most frequently cited journals may also contribute to the identification of which journals are unused or not cost effective and thus candidates for cancellation. It would be informative to identify and tally the history-focused journal titles held by Buley that were not cited in any of the examined theses and calculate these as a percentage of the library's entire holdings for history journals. However, the theses in an analysis such as this might not cite all of the journals of importance to master's level research. First, the examined theses cover only a limited time period. Secondly, a student might consult a journal but not cite it—for example, if an article were useful only as background reading.²⁸

Journal Title Dispersal

The examined theses have a high level of journal title dispersal; much of the journal literature is scattered across a large number of titles. Consequently, the results of this study fail to conform to the "80/20 Rule" or "Bradford's Law," which postulates that there is an inverse relationship between a number of journals and the number of articles that they publish. "In a given subject field over a given period of time: (1) a few journals publish a relatively high percent of the articles in the field; (2) there are many journals that publish only a few articles each."²⁹

The results may reflect history's composite nature. It covers a diverse range of subject fields and, therefore, does not have the characteristics of a single subject field. As noted in the method section, the theses assessed in this study ranged across history of art, politics, religion, women's studies, law, social studies, and other disciplines.

The immediate impact of this high degree of journal dispersal is that there is no "core" collection of journals for history, making it difficult to satisfy a large proportion of master's students' research needs with a small number of journal titles. Again, this may increase demand for document delivery services. However, considering that the number of citations for any given journal title is generally low (82.4 percent of cited titles had only one or two citations), this may be a more cost-effective option than maintaining subscriptions to full archives for a wide range of journals.

Subject Dispersal

The analysis of citations by LC classification shows a concentration of information resources in the four history classes: C (auxiliary sciences of history), D (world history, and so on), E (history of the Americas), and F (history of the Americas). Dispersal across other classes is low, with minor concentrations in only two other classes: B (philosophy, psychology, and religion) and H (social sciences). This implies that historical research does not have a high degree of interdisciplinarity, at least at the master's level. However, the profile of cited journal titles, 66.0 percent of which were not history journals, contradicts this. One explanation that reconciles these findings is that a high proportion of journals cited in history theses belong to other disciplinary areas or are published in

interdisciplinary journals, whereas the proportion of monographs and other formats that belong to other disciplines is low.

What is certain is that librarians working with history students and history collections need to be aware of the relevant resources in other disciplines. This can improve reference work, research assistance, and bibliographic instruction; it may also help the coordination of acquisitions across departmental lines. Moreover, as Juris Dilevko and Keren Dali point out, recognizing and understanding relationships between history and other disciplinary areas will increase the librarian's ability to communicate with faculty.³⁰

Language

The overall need for foreign language materials for master's level history theses seems extremely low. There were very few citations to foreign language materials (1.5 percent), a similar level to that found by Rosalind Walcott for geoscience dissertations (less than 3 percent).³¹ Only two cited foreign language items were local holdings. This may mean that students are able to find the information they need in English language items; alternatively, it may mean that students are unaware of relevant resources in other languages or are aware of them but lack the language skills necessary to use them.

In contrast with the low overall need, foreign language materials can be significant or possibly essential to an individual thesis. Italian language items represented 10 citations in one thesis (9.8 percent of its citations); Korean represented 27 in another (27.3 percent). Taken together, these two patterns imply that, depending on other

advanced degree offerings, library expenditure on foreign language acquisitions for history could be minimal but that libraries should anticipate multiple requests for access to materials in a particular language by particular students. This, again, underlines the importance of an efficient system for document delivery, including the ability to request materials from libraries with foreign language specializations or, if need be, libraries overseas.

Local Holdings

The proportion of cited resources not held by Buley Library was 59 percent, significantly lower than the 86 percent to 93 percent range reported in other case studies. This figure does not reliably indicate any pattern of resource retrieval, given that students may have obtained non-Buley resources via Buley's document delivery service. In addition, students may have accessed alternative copies of Buley-held items via other libraries. This is a significant possibility given that SCSU provides for distance education and that students may have been conducting research in situ, away from New Haven.

Nonetheless, the figures in table 6 have important implications if taken as an indicator of history students' need for resources that are unavailable to them via Buley's local holdings. The shortcomings in Buley's book holdings (monographs plus collected essays) are especially pronounced. Document delivery can normally help to provide needed resources, but this means of access involves increased waiting time and delivery costs, while placing pressure on the service to function efficiently as it handles a high

level of requests. This could be explored with further research into the relationship between citation analysis and document delivery.

Perhaps more importantly, the limited nature of Buley's holdings in thesis research areas may exercise a narrowing effect on students' awareness of the existing literature on their topics. This, in turn, increases the importance of departmental faculty, reference librarians, and subject specialist librarians drawing students' attention to resources beyond the library's catalogs and collections. But even if aware of all relevant resources, on-campus students will find it easier and more convenient to focus on resources immediately available at their institution's library.

Conclusion

Citation analysis is one of several possible methods for the evaluation of information needs and resource usage. It has limitations—from the omissions and errors that frustrate the retrieval of bibliographic information to the unanswered questions "What is the relationship between citation behavior and research behavior?" and "What is the comparative intellectual value or relevance of cited resources?" Budget allocation and acquisition decisions should also consider price, circulation statistics, faculty opinions, relevance to curricula, and other factors.

To deepen our understanding of the value of citation analysis, it is necessary to explore its relationship with research behavior. Issues for further analysis could include surveys or interviews with graduate students that would probe the processes of identifying, retrieving, consulting, evaluating, using, and citing information resources.

Other aspects of research behavior worthy of assessment are use of different media and the use of electronic texts and databases and comparison with the citation analysis of undergraduate research for senior papers or honors theses.

Nonetheless, citation analysis remains useful because it enriches our understanding of academic research by providing a quantitative basis for describing and interpreting patterns of information use. This study has expanded upon existing citation analyses of graduate students' research by assessing information use in the discipline of history. It is a case study with specific chronological and academic parameters, but it has significance beyond the local institution. Its implications are relevant to collection development, conservation, storage, document delivery, reference, research assistance, instruction, and subject-based liaison work.

The findings indicate that the monograph is the predominant format for historical research. They support the conclusion drawn in previous studies that humanities and social sciences research relies on the monograph, whereas research in the natural sciences and technology relies on the journal article. Journal usage in the examined theses was surprisingly low, even when compared with recorded usage in other social sciences. This should be an important consideration when evaluating collection development policy and acquisitions budget formulas.

This study supports the hypothesis that cited resources in historical research have a longer and flatter age distribution than in the natural sciences. Another finding includes a tabulation of frequently cited journal titles, but its usefulness is tempered by the high degree of journal title dispersal that defies the "80/20" principle. At first sight, this suggests there is no "core collection" of history journals, but it is notable that a minority

of cited articles belong to history-focused journals. It is possible that careful coordination across departmental budgets would make it possible to cover most relevant journals with a limited budget.

Several findings point to pressure on document delivery, such as the high level of journal dispersal and the infrequent need for foreign-language materials that do not warrant permanent acquisition. In these cases, document delivery may be the most cost-effective approach to resource provision. It is not the most efficient system from the researcher's perspective, and it risks cramping the academic scope of research; but all libraries must strive to provide access to the greatest range of resources while operating with finite funds.

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Notes

¹ P. L. K. Gross and E. M. Gross, "College Libraries and Chemical Education," *Science* 66, 1713 (October 28, 1927): 385–9.

² This paper does not take a position on whether history is better described as a humanities discipline or a social science. History has some of the qualities of each disciplinary type, and this ambiguity is reflected in the fact that SCSU offers both MA and MS programs in history.

³ National Center for Education Statistics, "Southern Connecticut State University," U.S. Department of Education, Institute of Education Sciences, <http://nces.ed.gov/Globallocator/> (accessed December 17, 2009).

⁴ Southern Connecticut State University, "History Department," Southern Connecticut State University, <http://www.southernct.edu/history/> (accessed December 17, 2009).

⁵ Hilton C. Buley Library, "Collection Development Policy," Hilton C. Buley Library, <http://www.library.southernct.edu/subjects.htm#policy> (accessed December 17, 2009).

⁶ National Center for Education Statistics.

⁷ Hilton C. Buley Library.

⁸ "Descriptive analysis shows that the 40 titles most heavily cited in theses and dissertations consistently contained about 70 percent of the top 40 titles cited by faculty, including most of the 12–15 top titles." Louise S. Zipp, "Thesis and Dissertation Citations as Indicators of Faculty Research Use of University Library Journal Collections," *Library Resources & Technical Services* 40, 4 (October 1996): 335.

⁹ Erin T. Smith, "Assessing Collection Usefulness: An Investigation of Library Ownership of the Resources Graduate Students Use," *College & Research Libraries* 64, 5 (September 2003): 344–55.

¹⁰ Angela M. Gooden, "Citation Analysis of Chemistry Doctoral Dissertations: An Ohio State University Case Study," *Issues in Science and Technology Librarianship* 32 (Fall 2001): 1–16, <http://www.istl.org/01-fall/refereed.html> (accessed January 20, 2010).

¹¹ *Ibid.*; Bradley Brazzeal and Robert Fowler, "Patterns of Information Use in Graduate Research in Forestry: A Citation Analysis of Master's Theses at Mississippi State University," *Science & Technology Libraries* 26, 2 (2005): 101; and Arjun Lal and K. C.

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¹² Anne L. Buchanan and Jean-Pierre V. M. Herubel, "Profiling PhD Dissertation Bibliographies: Serials and Collection Development in Political Science," *Behavioral & Social Sciences Librarian* 13, 1 (1994): 3; Sherri Edwards, "Citation Analysis as a Collection Development Tool: A Bibliometric Study of Polymer Science Theses and Dissertations," *Serials Review* 25, 1 (1999): 11–20.

¹³ Mark J. Slutz, "A Citation Analysis of Master's Level English Theses Submitted to the Department of English–Kent State University, 1985–1995" (Master's thesis, Kent State University, 1997): 18.

¹⁴ Jeffrey D. Kushkowski, Kathy A. Parsons, and William H. Wiese, "Master's and Doctoral Thesis Citations: Analysis and Trends of a Longitudinal Study," *portal: Libraries and the Academy* 3, 3 (July 2003): 467; Smith, 348; and Slutz, 18.

¹⁵ Steven Black, "Using Citation Analysis to Pursue a Core Collection of Journals for Communication Disorders," *Library Resources & Technical Service* 45, 1 (2001): 6; Kushkowski, Parsons, and Wiese, 466; and Smith, 349–50.

¹⁶ Kushkowski, Parsons, and Wiese, 465–6. The sciences with a reported median citation age of 10 years in this study are "biological sciences."

¹⁷ *Ibid.*, 467.

¹⁸ Black, 7; *Dictionary of Bibliometrics*, s.v. "Trueswell's 80/20 rule."

¹⁹ Joy Thomas, "Never Enough: Graduate Student Use of Journals: Citation Analysis of Social Work Theses," *Behavioral & Social Sciences Librarian* 19, 1 (2000): 8; Brazzeal and Fowler, 99; and Gooden.

²⁰ Juris Dilevko and Keren Dali, "Improving Collection Development and Reference Services for Interdisciplinary Fields through Analysis of Citation Patterns: An Example Using Tourism Studies," *College & Research Libraries* 65, 3 (May 2004): 235.

²¹ Brazzeal and Fowler, 100; Thomas, 9.

²² Rosalind Walcott, "Characteristics of Citations in Geoscience Doctoral Dissertations Accepted at United States Academic Institutions 1981–1985," *Science & Technology Libraries* 12, 2 (1991): 8.

²³ *Ibid.*, 10.

²⁴ Kushkowski, Parsons, and Wiese, 465; Gooden.

²⁵ However, this leads to the question of what should be the appropriate date for an older text republished with new critical additions, such as introduction, commentary, annotation and so on.

²⁶ "Monographs constituted 46.7 percent of citations." Buchanan and Herubel, 7.

²⁷ Kushkowski, Parsons, and Wiese, 472.

²⁸ There is an argument to be made that research papers should cite all resources consulted, including those not cited, for example in a broadly defined bibliography or a separate list of "sources consulted." Greater description or categorization of resources would provide more information regarding usage. Weighed against this are the issues of what level of detail is needed to describe accurately the use of a particular resource, and what level of citation description or categorization can reasonably be demanded of the author(s).

²⁹ Diodato, 24.

³⁰ Dilevko and Dali, 19.

³¹ Walcott, 10.

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