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# Using citation analysis to develop core book collections in academic libraries

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ABSTRACT

Collection development in college and university libraries most often occurs using longstanding traditional selection methods, such as favorable book reviews or local user needs. This study uses citation analysis as a tool to select books for the social science book collection in one academic library and compares the circulation of books using traditional methods to those books using citation analysis. The journal impact factor was used to determine those journals and authors cited the most in the disciplines of business, anthropology, education, political science, psychology, and sociology. If those authors published books, the books were purchased and circulation data on the books were tabulated and compared to books chosen using traditional methods. Findings indicate that books purchased using traditional methods of selection circulated more, except when individual disciplines were measured. In the areas of business, political science, and psychology, there was no significant difference in circulation statistics, and together both the traditional and citation analysis methods accounted for circulation of nearly 95% of the social science collection. Since it is based on scholarly activity, citation analysis is a collection development method that could be used in all academic libraries.



## 1. Background

Academic journals represent communication between and among scholars. Each article that is written, reviewed, and published builds on previous work, shown in the literature review and reference list. Without the literature review and references, new research would stand alone, without the support of previous scholarly work. It is through the research that precedes individual studies and through references to them that knowledge is built and that disciplines move forward. No one study stands alone:

> The process by which the boundaries of knowledge are advanced, and the structure of organized science is built, is a complex process indeed… There are no direct orders from architect or quarrymaster. Individuals and small bands proceed about their businesses unimpeded and uncontrolled, digging where they will, working over their material, and tucking it into place in the edifice (Bush, 1945, p. 162).

Bush (1945) understood that scholars build knowledge together, even as they work in solitude. Through publication, work is presented collaboratively through the citation process, and scholarly communication moves research forward. In his treatise on the social dimension of science, Ziman (1968) expounded on the philosophical underpinnings of science, stating:

> This is something that non-scientists do not understand—that anyone who works in the same scientific field, who can use the same technical language, who has faced the same problems, is a colleague and comrade…Scientific work is only meaningful in the social context of the scientific community (p. 93).

The sociology of science purports that knowledge is derived from shared communication between and among scholars, rather than shared belief (social epistemology). The theory that supports citation analysis rests in the sociology of knowledge presented by Robert K. Merton, who argued that science is a social activity. Merton's precepts are based on four norms, which collectively are called the *ethos of science*: universalism, communalism, disinterestedness, and organized skepticism. Merton explains:

> The norms are expressed in the form of prescriptions, proscriptions, preferences, and permissions. They are legitimatized in terms of institutional values. These imperatives, transmitted by precept and example, and reinforced by sanctions are in varying degrees internalized by the scientist, thus fashioning his scientific conscience or, if one prefers, his 'superego' (Merton, 1973, pp. 268–269).

Merton was criticized for the norms on which the ethos of science was based. The argument opposed to using norms to explain scientific behavior is seeded in symbolic interactionism, which views norms as flexible, rather than functional, where many different understandings evolve. Scientific norms do not act on their own, but are the result of individual decisions by scientists that may not adhere to unified cultural norms. "The underlying assumptions regarding citers'

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motivations have become problematic" (Pierce, 1992, p. 485). Scientists act and decide on their own right, based on their own individual decisions (Kalleberg, 2007). Thus, norms are not reliable in understanding the sociology of knowledge. However, Huff (2007) discussed the difference between Merton's ethos of science and Merton's role-set theory. While Merton put forth the ethos of science, he also presented a role-set theory, where individuals play not only individual roles, "but an array of associated roles" (Merton, 1968, p. 423). Huff (2003) rephrases Merton:

> The role-set of the scientist is most typically comprised of a college or university professor, a teacher of students, a member of a disciplinary department, a researcher, a writer and author, and, quite possibly, a gatekeeper who referees knowledge claims produced by other scientists. Nor should we ignore the role of the scientist as expositor to the public of authoritative knowledge, above all, when these knowledge claims are published. In that form they purport to carry the imprimatur of the scientific community at large to which the scientist belongs (Huff, 2003, p. 18).

To Merton, role-set theory provides the foundation to sustain the fluid and responsive interaction among scholars through publication of peer-reviewed articles in academic journals and through which disciplines emerge. Merton does not discuss the relationship between the role-set of the scientist and the ethos of science—the two are not conjoined. He does present a theory of knowledge that may be acceptable to sociologists and a theoretical foundation for citation analysis. There is a close association between the sociology of science presented by Merton in role-set theory and that represented in the citation process.

The literature review, which is required in most published empirical studies, integrates previous studies into the most recent studies through citation. More specifically, the citation process is a mechanism that brings the social interactions among scholars together. Analysis of citations and what they represent is rooted in the sociology of science (Small, 2004), and critical human processes and communication are represented in the exercise of citation (Garfield, 1965). Citations are an exegesis of sorts, expounding on and leading the way from findings in one study to those in another. In his formative research on co-citation, Small (1978) recognized that citations represented the structure of science. "When scientists agree on what constitutes prior relevant literature, including what is significant in that literature, they are in fact defining the structures of their communities" (p. 72). Citations are also concept symbols. "Where documents are frequently cited, their use as concept symbols may be shared by a group of scientists" (L.C. Smith, 1981, p. 91). Citation analysis is

> based on the assumption that frequently cited journals or articles have most impact, or influence, on the scientific community. Citation analysis is a general term encompassing measurement variables such as Journal Impact Factor (JIF), the immediacy index, and cited and citing half-lives (Sims & McGhee, 2003, p. 14).

In a recent (March, 2008) search of the database Web of Science, 879 articles were retrieved from the term *citation analysis*. In the Web of Science, citation analysis was searched across numerous disciplines, including physics, psychology, medicine, economics, management, advertising, nursing, education, urban affairs, geography, etc. In another search of *Dissertation Abstracts Online* (also in March, 2008), 113 dissertations were retrieved using the term "citation analysis". These covered a range of topics, as illustrated by titles such as *Citation Analysis and Journal Impact in School Psychology: 1995–2004* (Jennings-Knotts, 2007) or *Pondering Paradigms: Tracing the Development of Accounting Thought with Taxonomic and Citation Analysis* (Badua, 2005). Citation analysis applies to the widest variety of situations, transcending the borders of disciplines. Citation analysis also encompasses a wide range of laws, including Lotka's law, Pareto's law, Zipf's law, Bradford's law, and the Matthew effect. Citation analysis is also related to bibliometrics, which is "the application of mathematics and statistical methods to books and other forms of written communication" (Pritchard, 1969, p. 349).

Baker (1990) suggests:

> Citation analysis is a sub-area of bibliometrics: Bibliometrics is the application of quantitative methods to the study of communication media such as books and published articles. As a field, bibliometrics has a long history of use among librarians and bibliographers, particularly in the determination of core literatures in specific academic areas (p. 4).

Bibliometrics relies heavily on citation analysis a method of inquiry.

## 2. Nature of the problem

Various methods have been used to develop book collections in academic libraries for some time. Most academic libraries bring faculty members into the selection process, drawing on their subject expertise in designing a collection and relying on them to represent their research interests through journal selection and book purchases (Ameen & Haider, 2007). The curriculum is often also examined and reflected upon before purchasing materials. Collection development librarians examine syllabi and course catalogs, or meet regularly with academic departments to determine the material needed by faculty and students in carrying out the curriculum and meeting course requirements (D.A. Smith, 2008). Librarians may conduct use studies using focus groups or surveys to determine local faculty and student needs or to compare purchases with circulation or interlibrary loan activities (Wallace & Van Fleet, 2001). Through reference and instruction activities, librarians may learn directly what is needed in the collection from interaction with students. The collection, therefore, is developed largely on the local needs of individual campuses (Schmidt, 2004).

In large research universities, blanket orders and approval plans may be established to directly order all of the books in one particular area, or from one publisher. Another common method for collection development is the use of book selection aids such as the American Library Association's *Choice*, *Publishers Weekly*, the *New York Times Book Review*, or *Library Journal* (Evans, 2000).

While all of these methods contribute to designing strong academic library collections, any particular academic collection may represent local user needs at certain points in time throughout the development of the collection, without truly reflecting the disciplines that are represented in the collection. Periodically, the collection may be analyzed to discover existing gaps. When academic collections are evaluated retrospectively, they may show that essential materials representing a discipline are missing. "Materials are selected by different people over a long period of time. Librarians may vary in their conceptions of the general principles of selection" (Curley & Broderick, 1985, p. 297).

Few collection management strategies are applicable across academic libraries; most academic library selection procedures are primarily based on local user needs. Universal and standardized methods of selection that successfully anticipate patron needs would be of great value to those charged with collection development. Osburn (1983) suggested:

> A very strong argument could be made that the theory of librarianship does reside in an undiscovered theory of collection development and that the tardiness of the profession to address collection development matters per se is directly responsible for its inability thus far to arrive at a satisfactory theory of librarianship (p. 176).

While citation analysis has been used extensively to manage journal collections, it has not been used to develop book collections. It

is, however, one measurable way to effectively manage them.Using citation analysis to develop core book collections in academic libraries is discipline centered and goes beyond the walls of individual libraries to include material discussed by scholars in the academic literature. Using citation analysis, then, is most relevant to academic library collections that represent a wide spectrum of disciplines and whose collections are centered on scholarship, as opposed to public or special library collections. Citation analysis gives selectors a tool to recognize important works in a field.

Academic libraries build on existing knowledge and bring collections forward. "The academic library exists to make manifest and tangible the products of social processes aimed at putting us on the path to knowledge" (Budd, 2004, p. 364). Using citation analysis to quantitatively select books builds core collections that represent disciplines, develops collections for future scholars, and supports present scholars all at the same time. Alabaster (2002) defines a core book collection as "certain basic titles…that are the foundation of any library" (p. 9). The *Concise Dictionary of Library and Information Science* (Keenan & Johnston, 2000) defines core literature as "material considered essential for the study of a particular subject" (p. 61). A quantitative measure, such as citation analysis, provides a baseline for collection management, ensuring that the ideas represented in the scholarly literature are reflected in the college or university library collection.

## 3. Citation analysis and collection development

Citation patterns and journal rankings have been examined for a long time. Gross and Gross (1927) ranked chemistry journals based on the number of times they were cited in the *Journal of the American Chemical Society*. Citation analysis has been used extensively to determine and define core journal collections in academic libraries (Altman & Gorman, 1998; Broadus, 1977; Drombrowski, 1988; Edwards, 1999; Garfield, 1965; Garfield, 1972; Lal & Panda, 1996). As Pancheshnikov (2007) notes, "A substantial amount of experience, accumulated over a period of more than forty years, has proven the viability of citation analysis as a major collection management methodology" (p.674). In some cases, the number of times a journal was referenced in any particular discipline indicated whether a journal subscription continued or ceased; in others, the impact factor influenced subscription decisions (Nisonger, 2004). The impact factor measures the number of citations given a journal in the previous year to the citable items published in the two years prior, divided by citable items published in the two prior years (Garfield, 1976–), "impact factor has achieved international stature as a journal evaluation tool" (Nisonger, 2004, p. 71).

While using citation as a measure of journal quality has been shown to be effective, there are problems associated with relying entirely on citation analysis as a selection or de-selection tool (Edwards, 1999). Citation analysis may not represent local usage and is not the sole reason that a journal is valued (Gisvold, 1990; Kriz, 1978). Other factors determine a journal's quality, such as high standards of acceptance, a diverse editorial board, or use of a critical refereeing system (Rousseau, 2002; Zwemer, 1970). Another problem associated with citation analysis is the delay in publication and citation. Four years might be the minimum time between research and a significant number of citations, so this method advantages more established authors. In addition, the journal impact factor should not be relied on solely to determine research quality (Ha, Tan, & Soo, 2006). For example, a high impact factor may be the result of a few articles that are highly cited (Harter & Nisonger, 1997; Seglen, 1997). On the other hand, studies representing nearly every discipline have shown that the increased numbers of citations to a particular work characterize quality. Pan (1978) found a significant correlation between the citation counts of journals and their use counts. Hoeffel (1998) stated, "Experience has shown that in each specialty the best journals are those in which it is most difficult to have an article accepted, and these are the journals that have a high impact factor" (p. 1225).

Using citation analysis as selection criteria is based on standards implicit in citation ranks. Before the citation process begins and an article becomes public, it undergoes peer review. Once an article is published, additional peer review occurs, and citation by other scholars represents an evaluation of the article referenced. Citing is essentially another form of peer review. "The highest priority in the matter of journal selection should be given to those journals which are highly cited, abstracted, and used" (Dhawan, Phull, & Jain, 1980, p. 24).

While attention has been given to the use of citation analysis for developing journal collections, little discussion has taken place for using citation analysis as a tool for developing book collections, even though it has been shown that scholars in the humanities and social sciences reference books more frequently than journal articles. In an article examining 9131 citations in one journal for each of the eight humanities in the disciplines of art, classics, history, linguistics, literature, music, philosophy, and religion for the year 2002, Kneival and Kelllsey (2005) found that in these eight fields combined, books represented 74.3% of all citations, a finding established by Bowman (1990). Bowman examined the literature in 34 disciplines and learned that the humanities relied mostly on monographs, followed by the social sciences. In an early article in the *American Sociological Review*, it was found that of 1016 references for 1950, 53.7% referred to books, while 46.3% referenced journal articles (Broadus, 1952). In a recent article in *College & Research Libraries,* Heinzkill (2007) found that books were cited far more often than journal articles in 42 English and American English journals devoted to the scholarship of English and American literature. In an examination of 555 journal articles (with 20,802 citations) published in 2003, books were cited 75.8% of the time, while journal articles were cited 19.8% of the time. The literature

**Table 1**
Journal by subject and ranked by impact factor

| Business | Anthropology | Criminology & penology | Education educational research | Political science | Psychology | Sociology |
|---|---|---|---|---|---|---|
| 1. Acad. Management Review (4.391) | 1. J. Human Evol. (2.429) | 1.Criminology (1.873) | 1. Rev. of Ed. Res. (3.030) | 1. A. Polit. Sci. Rev. (2.116) | 1. Psychological Review (7.790) | 1. Ann. Rev. Sociology (3.476) |
| 2. Admin. Sci. Quart. (3.592) | 2. Yearbook Physical Anthro. (1.933) | 2. J. Crim. Law & Criminology (1.779) | 2. Read. Res. Qualterly (2.500) | 2. Political Geography (1.831) | 2. Ann. Rev. Psychology (7.545) | 2. Am. Sociological Rev. (3.127) |
| 3. J. Marketing Research (2.577) | 3. Am. J. Physical Anthro. (1.724) | 3. J. Res. Crime Delinq. (1.447) | 3. Am Educational Research Journal (1.500) | 3. J. Conflict Res. (1.819) | 3. Psy. Rev. (6.803) | 3. Am. J. Sociology (2.407) |
| 4. J. Marketing (2.554) | 4. Current Anthropology (1.516) | 4. J. Interpersonal Violence (0.878) | 4. Harvard Ed. Review (1.263) | 4. A. J. Pol. Sci. (1.806) | 4. Am. Psychol. (6.022) | 4. Social Forces (1.515) |
| 5. Acad. Manage. J. (2.551) | | 5. Crim. Justice & Behav. (0.740) | | 5. New Left Review (1.792) | 5. J. Abnormal Psych. (3.174) | 5. Journal of Marriage & the Family (1.503) |
| 6. J. Consumer Res. (2.475) | | | | | | |
| 7. Strat. Manage. J. (2.146) | | | | | | |

shows that books are an essential tool in performing scholarly work, particularly in the humanities and social sciences. While deploying citation analysis in the humanities and social sciences shows that scholars cite books more than journals, citation analysis is a useful tool for developing academic book collections.

This study examines the difference in circulation between books in the social sciences selected by the traditional method of selection (based on local needs and book reviews) and books selected according to citation analysis (number of times an author who publishes books is cited in the academic literature). While circulation criteria are unique to the particular library under study, if circulation differences are significant, it may be shown that citation analysis is a viable method of book selection,. Adams and Noel (2008) maintained that the strength of a collection is represented in the value of the books residing in it and in the number of times the books in the collection circulate. Kelland and Young (1994) write, "Library use and citation are very different phenomena, but there is clearly a connection: a library is the largest repository of citable material, and citations do lead to library use, which leads to further citation" (p. 94).

This study looks at whether social science books chosen by the citation method of selection circulate more or less than those chosen by the traditional methods. The null hypothesis states that there is no significant difference in circulation between books chosen by the traditional method of selection and books chosen by citation analysis.

Using citation analysis to develop a core social science book collection in one academic library may show that it is a useful tool to help develop core book collections in all academic libraries. The basis for citation analysis is the profound relationship between publication and the development of a discipline—scholarly publication in the academic literature moves a discipline forward (Merton, 1968). Those scholars with articles cited more frequently determine the direction a discipline may take (Cronin, 2005). Frequent citation reflects the movement of a discipline into some specific areas rather than others. It is possible that books by authors frequently cited in the literature may circulate in a library collection more frequently. The goal of most selection procedures is that the materials chosen should circulate, since use of the collection represents the value of it to the patrons using it (Lancaster, 1982).

## 4. Procedures

The data collected for this study originated with the 1999 Journal Citation Reports (JCR), since this was the most recent report at the time of the beginning of data collection in 2002. At the time, JCR listed cited journal rankings by impact factor (described earlier) primarily by subject, then by journal title. Once the list of journals with the highest impact factor was obtained, a search of the authors cited most in those journals was possible. This work may now be more easily replicated using Web of Knowledge. Since 2005, Web of Knowledge has listed citations to journal titles directly by impact factor, without necessitating a search by subject first. The process of searching Web of Knowledge by the most frequently cited authors by discipline, then purchasing books by those authors for an academic library collection, aligns with the recommendation in this study to design an academic library collection based on those authors who may be leading the discipline (or those most frequently cited).

This study reviewed the 1999 JCR listing of journals ranked by impact factor for social science journals in the categories of business, anthropology, criminology & penology, education & educational research, political science, psychology, sociology/anthropology, and general social sciences. Each of the subject areas corresponds to the areas developed for the book collection. The journals with an impact factor of 1 or above were chosen for this study, with up to five journals (with the exception of business, which had six journals). Journals with impact factors less than 1 were not used in this study. Publications that did not clearly represent primary research were not included in the study. For instance, *Psychology Today* was not a title that would be used to determine author citation rank because it does not publish primary research material. A review of JCR for previous years showed that the same journals consistently ranked at the top of the list, with impact factors greater than 1 (see Table 1). Once the journals were chosen, a search of Web of Science took place, and the journals were searched by title, then ranked by those authors who were cited the most for 1999. Through these many steps, those authors cited the most in the journal literature were revealed.

Once the highest ranked authors were known, an online search of *Books-In-Print* determined whether the authors had published books. If the authors who were cited most in the social science journals published a book that was not owned by the library, the book or books were purchased, cataloged, and placed on the shelf by the fall of 2005 (see Table 2 for a sample of the authors chosen to for book selection in the category of business from the journal *Academy of Management Review*). Circulation data was collected on the books in the spring of 2007.

A total of 1359 books were cataloged, 92 were selected and ordered based on citation ranking, and 1267 were selected and ordered based on selection criteria traditionally used in academic libraries: local campus needs, faculty requests, and book reviews in *Choice, Booklist, Library Journal, Publishers Weekly*, and the *New York Times Book Review.* Circulation data were examined in order to determine whether there was any difference in circulation between books chosen by citation analysis and books chosen by the traditional methods of selection. Circulation was based on the number of times a book was checked-out by students or faculty in a local collection.

## 5. Analysis

A *t*-test assuming unequal variances ($n = 1359$) was tabulated to determine the difference in the circulation of books selected based on

**Table 2**
List of authors by citation ranked in academy management review

| Author 1 | Author 2 | Author 3 |
|---|---|---|
| 1. Jones TM | Wicks AC | |
| 2. Crossan MM | Lane HW | White RE |
| 3. Leana CR[a] | Van Buren HJ | |
| 4. Langley A[a] | | |
| 5. Andersson LM | Pearson CM | |
| 6. Lepah DP | Snell SA | |
| 7. Wicks AC | Berman SL | Jones TM |
| 8. McGrath RG | | |
| 9. Kostova T | Zaheen S | |
| 10. Waldman DA[a] | Yammarin FJ | |

[a] Books by the author purchased by the library.

**Table 3**
Differences in circulation between the traditional method of selection and citation analysis method of selection ($n = 1359$)

| | *n* | Mean | SD |
|---|---|---|---|
| Traditional | 1267 | 2.9487 | 2.8426 |
| Citation analysis | 92 | 2.1522 | 1.6168 |

Approximate *t*-test for equal variances = 4.27 with 136 *df*, $p < .0001$.
Equality of variances folded *f*-test $F = 3.09$ with 91 *df*, $p < .0001$.

**Table 4**
Frequency distributions of loan counts by source

| Frequency | Loans | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4+ | Total |
| Traditional | 91 | 340 | 292 | 188 | 356 | 1267 |
| ($n = 1267$) | 7.18% | 26.84% | 23.05% | 14.84% | 28.10% | 93.23% |
| Citation analysis | 6 | 32 | 30 | 10 | 14 | 92 |
| ($n = 92$) | 6.52% | 34.78% | 32.16% | 10.87% | 15.22% | 6.77% |
| Total | 97 | 372 | 322 | 198 | 370 | 1359 |
| ($N = 1359$) | 7.14% | 27.37% | 23.69% | 14.57% | 27.23% | 100% |

**Table 5**
Circulation of books by selection method in the subject area of psychology

| | |
|---|---|
| Traditional | 2.3538 |
| Citation analysis | 2.1667 |

$t = 0.7520$ with 75 *df*, $p > .05$.
$F = 0.5926$ with 64 *df*, $p > .05$.

the traditional method ($n = 1267$) and the circulation of books based on the citation analysis method ($n = 92$). ISBN numbers served as the unique identifiers for each record. Each book purchased belonged to a subject area in the social sciences, including: business, anthropology, education, political science, psychology, and sociology. The book acquisitions budget was determined and allocated by subject.

There was a statistically significant difference at the .0001 level between the traditional method and citation method of book selection, with books using the traditional method of selection circulating more frequently than the citation method. The loan per item using the traditional method of selection was just under three circulations (2.9487) and the loan per item for the citation method was just over two circulations (2.1522). A test for the equality of variances was also performed on the data with a similar result suggesting the variances were not equal at the .0001 level (see Table 3).

The traditional method of selection was shown to account for more circulated books than the citation method in this one academic library.

The data were examined to determine the number of times books circulated for each selection method. Zero circulations were calculated at 7.18% ($n = 91$) for the traditional method of selection, while zero circulations accounted for 6.52% ($n = 6$) of the citation analysis books. Nearly 70% of the citation method books and nearly 50% of the traditional method books circulated one or two times. About 28% of the traditional method books and 15% of the citation method books circulated four or more times. Overall, most books chosen via citation analysis circulated between one to two times (see Table 4). Both methods were effective for collection development, based on the number of times each book circulated. On further examination of the data, separate *t*-tests were conducted on the four subject areas with the largest numbers of books circulating. The means changed depending on the subject, but there is no evidence that the means were different in the subsets than the total data set. The four subject areas with the largest number of books circulating were: social science general ($n = 513$), business ($n = 234$), political science ($n = 113$) and psychology ($n = 77$). In comparing the circulation of books between the traditional method and the citation method by subject in all four areas, there was no significant difference at the .05 level. In other words, at the subject level, neither the traditional books nor the citation books circulated more. Books chosen by the citation method with larger numbers at the subject level circulate as much as books chosen by the traditional method. On closer examination, the findings of this study show that authors who are cited the most in the academic literature, and who publish books, lead the discipline in specific subject areas. In other words, the books they publish circulate as much as books chosen by other methods, when the data are broken down by discipline. Table 5 shows for the breakdown of the literature in psychology.

## 6. Discussion

While citation does not necessarily represent quality, it does represent recognition and notability, and as such may be reflected in circulation. The study was concerned with whether there is a relationship between authors who are cited the most in the social science literature and the circulation rates of the books they publish. However, the data show that books chosen by the traditional methods of selection circulated more than those books chosen by the citation analysis method. When the data were examined more closely by subject, this study showed that there was no significant difference in circulation between traditional methods and the citation method of selection, which may show that in specific disciplines, books published by authors who are cited the most in the journal literature is a viable method of selection.

Using citation analysis for selection is not tied to local user needs, and this may be both a flaw and a strength. While books selected through author citation analysis may not serve the academic needs of professors and students locally, it was shown in this study, particularly when examined by subject areas, that books do circulate using this method. In collaborative selection processes, citation calculations could be performed for specific subjects and the results shared between all libraries, saving time.This method could also be used to fill subject gaps not covered by syllabuses.

## 7. Conclusion

In a time of limited resources, citation analysis is a measurable method that transcends local needs and assures that core collections representing specific disciplines reside in the book collections of academic libraries. It is a simple process that can be executed repeatedly across collections, assuring that the collection reflects the changing trends published in the literature, expanding and contracting as external forces influence academic collections. The study of circulation of social science books in this one academic library may not be generalized, but the design of the study presented here may be replicated in future studies to determine longitudinal validity of using citation analysis to develop core book collections in academic libraries. The nature of citation analysis lends itself to replication and gives meaning to the link between the progression of knowledge and the development of academic library collections. It is not suggested that citation analysis method be used as a sole method, but one that would assure a core collection, based on the long-standing practice of citation analysis.

Additional studies should measure the viability of using citation analysis for developing core book collections in academic libraries. Now that Web of Knowledge is more widely available, the measurement is easier and may take place for any given year. A comparison between cited authors and the books they publish may move beyond the "within" measure employed here, and move to a "between" collection measure, where the circulation counts in a sample of academic libraries across the country could take place. Also, those books published by authors cited the most in the literature could easily be compared to holdings of libraries on WorldCat or the Research Library Information Network (RLIN), thus further expanding an understanding of using citation analysis for developing core book collections in academic libraries. Using citation analysis to develop core book collections in academic libraries is a valuable, measurable tool that may be applied universally across disciplines. Further study needs to take place, using citation analysis in areas other than the social sciences. Bringing academic library collections into the future is imperative as academic library collections represent scholarship and conserve the human record.

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## References

Adams, B., & Noel, B. (2008). Circulation statistics in the evaluation of collection development. *Collection Building*, *27*, 71—73.
Alabaster, C. (2002). *Developing an outstanding core collection: A guide for libraries*. Chicago: American Library Association.

Altman, K. G., & Gorman, G. E. (1998). The usefulness of impact factors in serial selection: A rank and mean analysis using ecology journals. *Library Acquisitions: Practices & Theory*, *22*, 147—159.
Ameen, K., & Haider, S. J. (2007). Book selection strategies in university libraries of Pakistan: An analysis. *Library Collections, Acquisitions, & Technical Services*, *31*, 208—219.
Badua, F. A. (2005). Pondering paradigms: Tracing the development of accounting thought with taxonomic and citation analysis. *Dissertation Abstracts International*, *66*, 3707.
Baker, D. R. (1990). Citation analysis: A methodological review. *Social Work Research & Abstracts*, *26*, 3—7.
Bowman, M. (1990). Format citation patterns and their implications for collection development in research libraries. *Collection Building*, *11*, 2—8.
Broadus, R. N. (1952). An analysis of literature cited in the American Sociological Review. *American Sociological Review*, *17*, 355—357.
Broadus, R. N. (1977). The application of citation analyses to library collection building. *Advances in Librarianship*, *7*, 299—328.
Budd, J. M. (2004). Academic libraries and knowledge: A social epistemology framework. *Journal of Academic Librarianship*, *30*, 361—367.
Bush, V. (1945). *The builders.* Cambridge, MA: Association of Alumni and Alumnae of the Massachusetts Institute of Technology.
Cronin, B. (2005). *The hand of science: Academic writing and its rewards.* Lanham, MD: Scarecrow Press.
Curley, A., & Broderick, D. (1985). Building library collections Metuchen, NJ: The Scarecrow Press.
Dhawan, S. M., Phull, S. K., & Jain, S. P. (1980). Selection of scientific journals: A model. *Journal of Documentation*, *36*, 24.
Drombrowski, T. (1988). Journal evaluation using Journal Citation Reports as a collection development tool. *Collection Management*, *10*, 175—180.
Edwards, S. (1999). Citation analysis as a collection development tool: A bibliometric study of polymer science theses and dissertations. *Serials Review*, *25*, 11—19.
Evans, G. (2000). *Developing library and information center collections* (4th ed.). Englewood, CO: Libraries Unlimited.
Garfield, E. (1965). Can citation indexing be automated? In M. E. Stevens, V. E. Giuliano, & L. B. Heilprin (Eds.), *Proceedings of the symposium on statistical association methods for mechanized documentation* (pp. 189—192). Washington, DC: National Bureau of Standards. (National Bureau of Standards Misc. Publication 269).
Garfield, E. (1972). Citation analysis as a tool in journal evaluation. *Science*, *178*, 471—479.
Garfield, E. (Ed.). (1976). *Science citation index, journal citation reports.* Philadelphia: Institute for Scientific Information.
Gisvold, S. (1999). Citation analysis and journal impact factors: Is the tail wagging the dog? *Acta Anaesthesiologica Scandinavica*, *43*, 971—973.
Gross, P. L. K., & Gross, E. M. (1927). College libraries and chemical education. *Science*, *66*, 385—389.
Ha, T. C., Tan, S. B., & Soo, K. C. (2006). The journal impact factor: Too much of an impact? *Annals of the Academy of Medicine Singapore*, *35*, 911—916.
Harter, S. P., & Nisonger, T. E. (1997). ISI's impact factor as misnomer: A proposed new measure to assess journal impact. *Journal of the American Society for Information Science*, *48*, 1147—1148.
Heinzkill, R. (2007). References in scholarly English and American literary journals thirty years later: A citation study. *College & Research Libraries*, *68*, 141—153.
Hoeffel, C. (1998). Journal impact factors. *Allergy*, *53*, 1225.
Huff, T. E. (2003). *The rise of early modern science: Islam, China and the West*. New York: Cambridge University Press.
Huff, T. E. (2007). Some historical roots of the ethos of science. *Journal of Classical Sociology*, *7*, 193—210.
Jennings-Knotts, R. L. (2007). Citation analysis and journal impact in school psychology: 1995–2004. *Dissertation Abstracts International*, *68*, 5551.
Kalleberg, R. (2007). A reconstruction of the ethos of science. *Journal of Classical Sociology*, *7*, 137—160.
Keenan, S., & Johnston, C. (Eds.). (2000). *Concise dictionary of library and information science* (2nd ed.). New Providence, NJ: Bowker Saur.
Kelland, J. L., & Young, A. P. (1994). Citation as a form of library use. *Collection Management*, *19*, 81—100.
Kneivel, J. E., & Kelllsey, C. (2005). Citation analysis for collection development: A comparative study of eight humanities fields. *Library Quarterly*, *75*, 142—168.
Kriz, H. M. (1978). Subscriptions vs. books in a constant dollar budget. *College & Research Libraries*, *39*, 105—109.
Lal, A., & Panda, K. C. (1996). Research in plant pathology: A bibliometric analysis. *Library Science*, *33*, 135—147.
Lancaster, F. W. (1982). Evaluating collections by their use. *Collection Management*, *4*, 16.
Merton, R. K. (1968). *Social theory and social structure*. New York: Free Press.
Merton, R. K. (1973). *The sociology of science: Theoretical and empirical investigations*. Chicago: University of Chicago Press.
Nisonger, T. E. (2004). The benefits and drawbacks of impact factor for journal collection management in libraries. *The Serials Librarian*, *47*, 71.
Osburn, C. B. (1983). Toward a re-conceptualilzation of collection development. In G. McCabe, & B. Kreissman (Eds.), *Advances in library administration and organization* (pp. 175—198). Greenwich, CT: JAI Press.
Pan, E. (1978). Journal citation as a predictor of journal usage in libraries. *Collection Management*, *2*, 29—35.
Pancheshnikov, Y. (2007). A comparison of literature citations in faculty publications and student theses as indicators of collection use and a background for collection management at a university library. *The Journal of Academic Librarianship*, *33*, 674—683.
Pierce, S. J. (1992). On the origin and meaning of bibliometric indicators: Journals in the social sciences, 1886–1985. *Journal of the American Society for Information Science*, *43*, 477—487.
Pritchard, A. (1969). Statistical bibliography or bibliometrics? *Journal of Documentation*, *25*, 348—349.
Rousseau, R. (2002). Journal evaluation: Technical and practical issues. *Library Trends*, *50*, 418—439.
Schmidt, K. (2004). Past perfect, future tense: A survey of issues in collection development. *Library Collections, Acquisitions, & Technical Services*, *28*, 360—372.
Seglen, P. O. (1997). Why the impact factor of journals should not be used for evaluating research. *British Medical Journal*, *314*, 497.
Sims, J. L., & McGhee, C. (2003). Citation analysis and journal impact factors in ophthalmology and vision science journals. *Clinical and Experimental Ophthalmology*, *31*, 14—22.
Small, H. (1978). Cited documents as concept symbols. *Social Studies of Science*, *8*, 327—340.
Small, H. (2004). On the shoulders of Robert Merton: Towards a normative theory of citation. *Scientometrics*, *60*, 71—79.
Smith, D. A. (2008). Percentage based allocation of an academic library materials budget. *Collection Building*, *27*, 30—34.
Smith, L. C. (1981). Citation analysis. *Library Trends*, *30*, 83—105.
Wallace, D. P., & Van Fleet, C. (2001). *Library evaluation: A casebook and can-do guide.* Westport, CT: Libraries Unlimited.
Ziman, J. M. (1968). *Public knowledge: An essay concerning the social dimension of science.* Cambridge, England: Cambridge University Press.
Zwemer, R. L. (1970). Identification of journal characteristics useful in improving input and output of a retrieval system. *Federation Proceedings*, *29*, 1595—1604.