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MPACT and citation impact: Two sides of the same scholarly coin?

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ABSTRACT

This article provides the first comparison of citation counts and mentoring impact (MPACT) indicators — indicators that serve to quantify the process of doctoral mentoring. Using a dataset of 120 library and information science (LIS) faculty members in North America, this article examines the correlation between MPACT indicators and citation counts. Results suggest that MPACT indicators measure something distinct from citation counts. The article discusses these distinctions, with emphasis on differences between faculty ranks. It considers possible explanations for weak correlations between citations and mentoring at the full professor rank as well as implications for faculty activity analysis and broader institutional evolution.

1. Introduction

Faculty members at doctoral degree-granting institutions are familiar with the three aspects on which their productivity is typically measured—research, teaching, and service—and the various metrics by which their level of productivity is assessed—e.g., publication record, citation count and ranking, number and size of grants received, number of patents issued, awards, student course evaluations, and level of participation and leadership in campus and professional organizations. While each of these metrics indicates some faculty impact within their domain (discipline, field, research area), they fail to assess the mentoring impact of a faculty member adequately. Mentoring, specifically in the form of advising and serving on doctoral committees, is "one of the most significant activities undertaken by faculty at doctoral granting institutions and one that requires substantial amounts of time and energy" (Marchionini, Solomon, Davis, & Russell, 2006, p. 482). However, this activity has been largely overlooked in the academic community. In order to quantify this vital aspect of scholarship, a set of mentoring impact (MPACT) indicators have been proposed (Marchionini et al., 2006). These indicators calculate raw and weighted counts for advising and serving as a committee member on Ph.D. dissertations, resulting in values that serve as proxies for the many ways in which a faculty member influences the field through mentoring.

1.1. Problem statement

The MPACT indicators have not yet been compared with other metrics of faculty productivity, such as publication and citation counts. Comparing MPACT indicators with other measures of productivity would allow researchers to analyze whether MPACT indicators measure something similar or distinct from existing metrics. This analysis would provide valuable information for the academic community—if MPACT indicators prove to be distinct measures of productivity, the academic community will have a means to compare a faculty member's mentoring activity with their peers', both locally and across the greater academic landscape. Additionally, being able to quantify the mentoring aspect of a faculty member's scholarly activities efficiently may lead to integration mentoring into the current academic reward system. Mentoring could be used simultaneously with other productivity metrics.

Currently, faculty scholarly productivity assessments focus primarily on publication counts and venues, peer evaluation, and citation-based indicators. However, these indicators of scholarship do not provide a comprehensive view of all faculty members' scholarly activities. Activities such as mentoring, which span the boundary of the academic triad—integrating the ideas of teaching, research, and service—should be part of a faculty member's scholarly productivity assessment. If shown to provide distinct indicators of productivity, MPACT indicators may be able to reflect the consummate and integrated activities of the scholar accurately.

2. Literature review

Mentoring is a multi-faceted and highly personalized form of teaching (for definitions, see Eby, Rhodes, & Allen, 2007). The research literature identifies three main mentoring situations: workplace mentoring (e.g., Zachary, 2005), youth and specialized K-12 mentoring programs (e.g., Dennis, 1993), and faculty-student mentoring (e.g., Daloz, 1986). This paper focuses on faculty-student mentoring. Most of the existing research focuses on undergraduate mentoring; there is little research on advising and mentoring graduate students. In one

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exception, Austin (2002) interviewed 79 doctoral students in different disciplines over a four-year period. He discussed the ad-hoc quality of faculty mentoring as an important challenge for graduate education.

There are several possible reasons that graduate mentoring is not more considered in the literature or in practice. One reason might be that just as university faculty are not expected to take instructional training before assuming teaching responsibilities, they are not expected to have any instruction in advising and mentoring. Assessing teaching and mentoring adequacy is a thorny issue mainly handled by student evaluation surveys and peer observations.

This study presents doctoral-level mentoring as the rarified epitome of university mentoring and dissertations as the best quantifiable proxy for that mentoring process. Focusing on doctoral mentoring is limiting because it only applies to faculty at doctoral degree-granting institutions. However, it is practical due to the publicly accessible record and evidence of published work that completes the dissertation committee process. The MPACT factors derived from doctoral advising and committee membership are thus one practical, but limited, indicator of mentoring activity. Clearly, MPACT is neither necessary nor sufficient as a measure of mentoring. However, it does offer one tangible kind of evidence for professorial mentoring in doctoral degree programs.

Library and information science (LIS) faculty members were the first group to be examined utilizing this new metric. MPACT indicators were applied individually and in aggregate for faculty members at six LIS schools in the U.S. (Marchionini et al., 2006). The findings from the study on the aggregate level found that for all six schools, a small portion of faculty members accounted for more than half of all the doctoral dissertation mentoring that occurred, with some schools appearing slightly more distributed than others (Marchionini et al., 2006). In an evaluation of the indicators, the study found that the fractional MPACT value—similar to Price & Beaver's (1966) idea of fractional productivity—may be the most accurate method for estimating mentoring productivity. It takes into account the different roles of advising and serving as a committee member in a logically weighted fashion. However, the study also found the more easily calculated summation score (equally weighting advisorships and committeeships) to be highly correlated with the fractional score and thereby nearly equally useful in evaluation (Marchionini et al., 2006).

Marchionini et al. (2006) presented and evaluated the new MPACT metric, but they did not examine the relationship of the MPACT metric and other metrics traditionally used for assessing faculty productivity (e.g. citation counts, grant money, patents, publications, etc.). For example, the new metric begs the question, do the MPACT indicators identify something that is not already captured by an existing metric for faculty productivity? Specifically, how do the MPACT indicators correlate with other existing metrics, such as citation counts, which are increasingly important indicators of faculty research productivity? In an attempt to address this question, this study gathered and compared MPACT indicators and citation counts for a sample of 120 LIS faculty members.

3. Methodology

In order to compare faculty citation counts and MPACT indicators for the field of LIS, a stratified-random sample of faculty members were selected (a ten percent sample of the field, sampled proportionately by rank) along with the entire faculty from three LIS schools. Researchers compiled their citation counts and a list of all the dissertations on which they have served (see Fig. 1 for a diagram of the data collection and analysis process). The final dataset included 120 faculty members currently serving at 29 doctoral degree-granting ALA-accredited schools.

3.1. Selection and description of faculty and schools analyzed in the study

In order to compare individual faculty members and schools, this study used two methods of sample selection (Phase A). The first was to choose three schools which would be studied in their entirety — that is, all faculty members from those schools were included in the sample. Researchers chose the University of North Carolina at Chapel Hill (UNC), the University of Illinois at Urbana-Champaign (UIUC), and Indiana University Bloomington (IUB) because complete dissertation data for these schools existed in the MPACT database. These schools were also chosen because of they are ranked highly among LIS schools (America's best colleges, 2007), their faculty is diverse (ALISE, 2004), and their faculty is among the most published and cited in LIS (Adkins & Budd, 2006; Budd, 2000; Persson & Åström, 2005). Thus, they are comparable on a number of productivity factors. In May 2007, these schools employed a total of 61 full-time faculty members.

In order to generalize the findings, researchers used a stratified-random sampling method to select a group of 80 LIS faculty from ALA-accredited programs. The sample included a proportionate number of

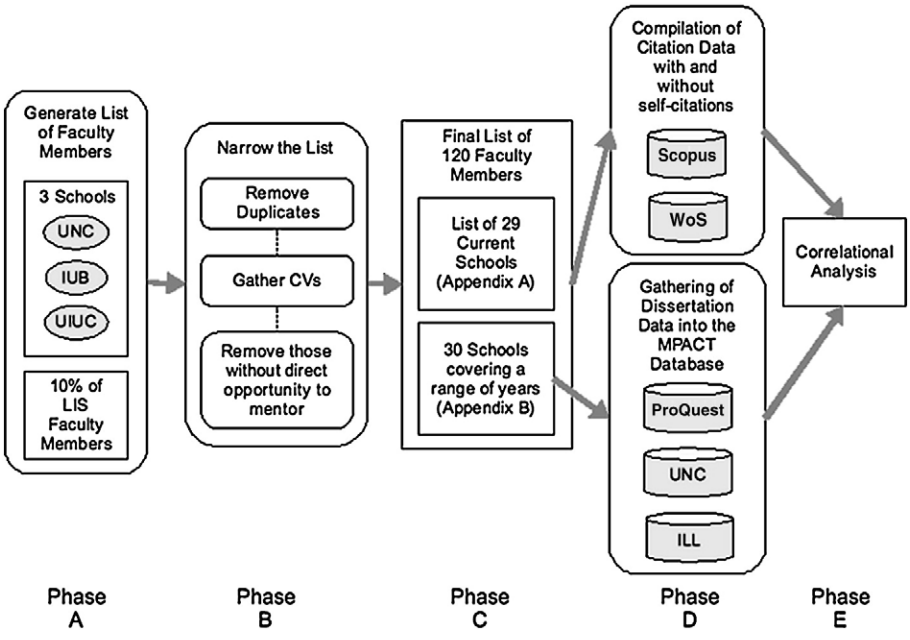

Fig. 1. The data collection and analysis process.

Table 1
Original sample before duplicate faculty and non-doctoral degree-granting schools were removed

	Assistant prof.	Associate prof.	Full prof.	Total
Illinois faculty	3	11	6	20
Indiana faculty	5	8	5	18
UNC faculty	6	7	10	23
Random faculty	30	26	24	80

faculty from each academic rank (assistant, associate, or full professor) (Table 1). This sample represents approximately 10% of the entire population of full-time LIS faculty in North America (Meho, 2007).

From this initial list, duplicates were removed, curriculum vitae (CVs) were gathered, and faculty members without direct opportunities to mentor were identified (Phase B). Because the entire set of full-time, tenure-track faculty of North American programs listed in ALISE were sampled, there were 11 duplicate faculty members between the three schools and the random sample. After removing those 11, the selection included 130 individual faculty members.

The CV for each of these 130 individuals was gathered by means of locating a current Web page or by individual solicitation via email. These CVs were then mined for a list of all the schools at which the faculty member had taught. Since the purpose of this study was to evaluate the relationship between citation counts and MPACT indicators, the 10 faculty members who had never taught at an LIS doctoral degree-granting institution were removed from the study. They did not have a direct opportunity to generate an MPACT score greater than zero.

The resulting list of 120 faculty members (Phase C) included 35 assistant professors, 47 associate professors, and 38 full professors currently serving at 29 different ALA-accredited schools in North America (Table 2). Appendix A lists the schools at which these 120 faculty members currently serve.

Using the CVs, researchers compiled a list of all the LIS doctoral degree-granting institutions at which the faculty members had taught, along with the corresponding years that they served at those institutions. This list of 30 schools (Appendix B) represented all the schools at which the faculty member could have served on a dissertation (excluding service as an external member at a different school). This list provided the focus of the study — it dictated for which schools researchers needed to gather dissertation data.

3.2. Compilation of citation data

As recommended by Meho and Yang (2007) for LIS, both Scopus® and Web of Science® were used to compile citation data for the 120 sample members. The exact match search approach in Scopus was used to identify citations to all items published or produced by the 120 faculty members constituting the study sample. This exact search method used the title of an item as a search statement (e.g., *Information Seeking in Electronic Environments*) to locate an exact match in the cited "References" field of the indexed records. In cases where the title was too short or ambiguous to refer to the item in question, additional information such as the first author's last name was used to ensure that researchers retrieved only relevant citations. In cases where the title was too long, the first few words of the title were used because utilizing all the words in a long title may increase the possibility of missing some relevant citations due to typing or indexing errors. In Web of Science, the "Cited Author" search option was used to identify citations to all items published or produced by the sample.

To ensure that citations were not overlooked because of searching or indexing errors, all of the citations missed by each database were cross-examined. For example, if a citation was found in Scopus but not in Web of Science, bibliographic searches were conducted in Web of Science to see if the item was in fact indexed in the database. When the bibliographic record of any of these missed citations was found in Scopus or Web of Science, an examination was conducted to determine why it was not retrieved and whether it should be counted as a citation. Items that were overlooked due to searching errors were counted as found by their respective databases. Citations that were missed due to errors beyond the control of the investigators were tallied but were not counted as found. Examples of these system errors include records with an incomplete list of cited references, a lack of cited references information, and errors in cited reference information. Most of the system errors, which constituted less than 2% of the sample's 20,486 citations, were found in Scopus. It should be emphasized that errors in cited reference information may be caused by the citing authors rather than errors caused by the databases themselves (e.g., if an author cited a specific item and had a typo in the title or author fields, this error may not be detected or corrected during data entry into the citation database).

All citations were entered into a spreadsheet and database and were coded by first author, source (e.g., journal and conference name), document type (e.g., journal article, review article, conference paper), publication year, language, institutional affiliation of the correspondence author, and country of the correspondence author, as well as the source used to identify the citation. Virtually all citations were from refereed sources. Approximately 10% of the citations did not have country and institutional affiliation information. Researchers used the Web to identify missing information.

Because some journal and conference names are not entered consistently in Scopus and Web of Science (e.g., *Information Research* is indexed as *Information Research* in Scopus and *Information Research—An International Electronic Journal* in Web of Science), all such instances were manually standardized. In cases where a citing source had changed its name in the citation, the citations were merged under their most recent respective names (e.g., citations found in the *Journal of the American Society for Information Science* were listed under its more recent name, the *Journal of the American Society for Information Science and Technology*).

3.3. Compilation of dissertation data

The compilation of dissertation data was dictated by the list of 30 doctoral-degree granting schools at which any of the 120 faculty members had served (Appendix B). This list was augmented by identifying all years at which any of the 120 faculty members served at the given schools. After identifying the data, researchers generated a list of all the dissertation authors for the schools during those given years (Phase D). Authors already in the existing MPACT database were verified, and new authors were added using ProQuest's *Dissertations and Theses* database. This was done by searching each school individually with the keywords *information systems* or *library science*. The results were then manually examined to determine whether the dissertation was conferred by the appropriate school/department (for example, the above search returned dissertations from education, computer science, business, etc.). In some cases, this meant examining more than 500 results to add fewer than a dozen dissertations to the dataset. Also, the information regarding the school/department appears on the dissertation itself and not the bibliographic surrogate, so the exact information given varied by dissertation and school. In some cases, the conferring department/school had to be uncovered by examining information on the document, such as the advisor names and acknowledgements. Unfortunately, ProQuest's *Dissertation and*

Table 2
Final faculty sample by rank

	Assistant prof.	Associate prof.	Full prof.	Total
29 schools	35	47	38	120

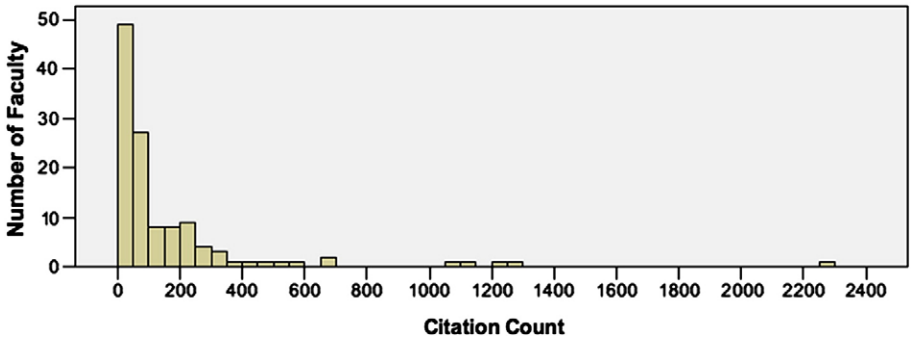

Fig. 2. Citation counts across all 120 faculty members.

Theses database does not allow searching by exact departments/disciplines, and the department names vary across the LIS discipline,. The researchers' method provided the most thorough way of gleaning names of all authors for the given time periods. In cases where there were significant problems finding complete data, researchers augmented the list of authors by contacting the individual schools and requesting lists of recent doctoral graduates.

Once the list of dissertation authors had been compiled (along with year conferred and school), advisor and committee member names were investigated. The primary source for this step was also ProQuest's *Dissertation and Theses* database, which allows one to view the first 24 pages for most dissertations conferred in the past 13 years and those included in previous ProQuest digitization projects. Advisor and committee member names could be found in a variety of places on the dissertation; the most common places included the signature pages (some of which print the names beneath the signatures and others which do not) and the acknowledgments. For most dissertations, researchers had to cross-reference multiple places within the dissertation manually in order to disambiguate names (some authors merely referred to the professor by last name only), deal with lacking signature pages or indecipherable signatures, and disambiguate unclear acknowledgements. In some cases, the dissertation itself could not provide the information needed so the researchers contacted the schools and/or the authors to identify further information. In a few cases, these ambiguities and/or missing pieces of information were not resolved at the time of this writing.

For those dissertations where an electronic preview was not available, the holdings available at the University of North Carolina at Chapel Hill were searched. The print and microfiche collections were examined (more than 50% were in the microfiche collection). Researchers used the same process with the same limitations as the electronic copies, trying to identify advisor and committee member names. When the dissertation was neither online nor in the UNC-Chapel Hill collection, the items were searched using WorldCat and available dissertations were manually requested using interlibrary loan. In total, nearly 250 interlibrary loan requests were made for this project. However, some dissertations remained unavailable—those that were not available online, at UNC-Chapel Hill, or via interlibrary loan. In these cases, as in those in which the dissertations were unable to provide information, the schools and/or the authors were contacted directly. There were a few cases in which no resolution was obtained.

At the time of the Marchionini et al. study (2006), the MPACT database contained 2400 LIS dissertations from 32 North American schools. At the time of this writing, the MPACT database (found at http://www.ils.unc.edu/mpact/) provided dissertation information for more than 2700 LIS dissertations across 37 North American schools for the years 1964–2007.

4. Results

The final dataset consisted of 120 faculty members, their rank, schools, MPACT indicators, and citation counts (with and without self-citations), current through May 2007.

4.1. Description

Findings show that the citation counts (Fig. 2) displayed a classic power law distribution with the median citation count at 68.5. The counts ranged from zero to 2287 with an average of 166.51 (Table 3). Very few faculty members (9%) had citation counts above 400, and approximately 41% had fewer than 50.

MPACT (A+C) scores (Fig. 3) displayed similar characteristics to the citation data, ranging from zero (0) to 70, with 70 being an extreme outlier. The average score across all 120 faculty members was 4.18, with 50% of faculty having a score of zero (0) or one (1) (Table 4).

In addition, researchers found that the data displayed characteristics of the Pareto distribution. In evaluating the A score (number of times a faculty member served as an advisor) for each of the 120 faculty members, researchers found that 80% of the advisorships were served by 18% of the faculty members.

4.1.1. Rank

The relationship between citation counts and MPACT (A+C) by rank is shown in Fig. 4. Of the 120 faculty member sample, 42 (35%)

Table 3
Descriptive statistics for citation counts

	Min	Max	Std Dev	Variance	Mean	Median	Mode	Quartiles		
								25	50	75
TOTAL (n=120)	0	2287	305.2	93122.7	166.5	68.5	1, 16, 59	22	68.5	188.8
Assistant (n=35)	0	336	73.8	5446.4	52.2	20	0, 1, 16	3	20	69
Associate (n=47)	1	663	140.4	19715.6	110.7	68	14, 22, 35, 122	34	68	122
Full (n=38)	5	2287	472.0	222769.6	340.3	174	*	56.8	174	338.3
UNC (n=23)	1	1298	264.8	70122.5	178.2	92	*	38	92	250
IUB (n=18)	1	1100	332.2	110337.5	248.1	148.5	*	53.5	148.5	242.8
UIUC (n=20)	16	663	223.8	50072.1	219.3	107.5	*	42.5	107.5	413.3
Random (n=69)	0	2287	342.4	117207.6	139.4	48	0, 1, 16, 59	16	48	108

* All numbers are unique.

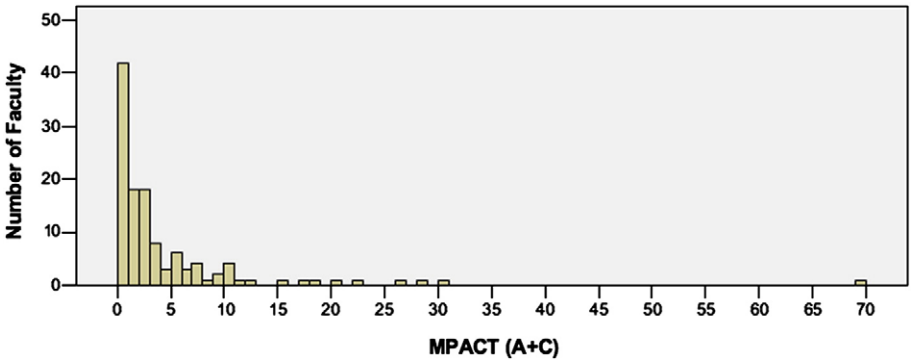

Fig. 3. MPACT (A+C) scores across all 120 faculty members.

had an MPACT score of zero (0). This means they have neither advised a dissertation nor sat on a dissertation committee. Of these 42 faculty members, 23 are assistant professors, 12 are associate professors, and 7 are full professors. Some of these professors are currently at schools without doctoral programs or with programs that have been initiated recently. There are 47 faculty members (39%) with an MPACT between 1 and 4, inclusive: 12 assistant professors, 22 associate professors, and 13 full professors. There are 31 faculty members (26%) with MPACT scores of 5 or above. All of these are tenured faculty, and 18 are full professors. No assistant professors have advised a doctoral student, and there are no assistant professors in the sample with 5 or more committeeships.

In terms of citation counts, 49 faculty members within our sample (41%) had citation counts ranging between zero and 49. Of these, 35 were assistant professors (all of the assistant professors within our study), 12 were associate professors, and 2 were full professors. There were 27 faculty members (22.5%) with citation counts from 50 to 99: 22 associate professors and 5 full professors. Thirty-three faculty members (28%) had citation counts from 100 to 399: 12 associate professors and 21 full professors. Lastly, 11 faculty members (9%) had citation counts of 400 or more. There was one associate professor in this group, and the remaining 10 were full professors.

4.1.2. Analysis by school

Analyzing the dataset by school indicated that faculty members in the three individual schools (UNC, UIUC, and IUB) had higher MPACT (A+C) scores (Fig. 5) than those in the random sample. This is mostly due to a higher proportion of tenured faculty within the three-school sample—the three individual schools did not have a proportionate number of assistant professors to the entire population. Because stratified sampling was used to select the random sample, the proportions of faculty at each rank are representative of the entire population (805 faculty members in all of LIS). However, the rank distribution in the three-school sample is skewed toward the associate and full professor ranks.

The distributions of MPACT scores by school reflected this disparity: 42% of faculty members in the random sample had an MPACT (A+C) score of zero (0), whereas only 25% of faculty members at the three schools had an MPACT (A+C) score of zero (0). Additionally, 15% of the faculty members at the three schools had MPACT (A+C) scores above 12, whereas only 15% of the faculty members in the random sample had MPACT (A+C) scores above 3.

The citation counts displayed similar characteristics: 51% of the faculty members in the random sample had citation counts between zero and 49, inclusive, while only 26% of the faculty members at the three schools fell in that category. At the other end of the scale, only 6% of the faculty members in the random sample had citation counts of 400 or greater, while 15% of the faculty members at the three schools had counts in this range.

4.2. Correlation

The data were imported into SPSS to perform a correlational analysis between the MPACT indicators and full citations counts. The analysis had two separate goals: 1) to analyze the impact of faculty rank on the entire data set and 2) to analyze the patterns across the three individual schools.

4.2.1. Rank

The first correlational analysis involved faculty rank and all MPACT indicators from the MPACT database. The MPACT indicators consist of two raw components and five derived values. The two raw components are A (the number of times a particular faculty member served as a dissertation advisor) and C (the number of times a particular faculty member served on a dissertation committee, not as an advisor). A+C is simply the sum of these two components, weighting each component equally. The FM indicators represent fractional mentorship calculated as $A+\Sigma(1/\text{number of committee members})$. The number of committee members can be inclusive (FMI) or exclusive (FME) of the number of advisors on that dissertation committee because some dissertations include co-advisors. FMI/(A+C) and FME/(A+C) are normalized versions of the FM indicators.

The correlational analysis revealed primarily insignificant positive correlations between MPACT indicators and full citation counts

Table 4
Descriptive statistics for MPACT (A+C)

	Min	Max	Std Dev	Variance	Mean	Median	Mode	Quartiles		
								25	50	75
TOTAL (n=120)	0	70	8.42	70.97	4.18	1.5	0	0	1.5	5
Assistant (n=35)	0	3	0.95	0.89	0.60	0	0	0	0	1
Associate (n=47)	0	30	4.89	23.82	3.30	2	0	0	2	5
Full (n=38)	0	70	12.85	165.07	8.55	3.5	0	1	3.5	10.3
UNC (n=23)	0	30	9.75	94.98	9.39	6	0	1	6	15
IUB (n=18)	0	18	5.38	28.89	3.78	2	2	1	2	4
UIUC (n=20)	0	70	15.26	232.87	6.35	3.5	0	0	3.5	5.8
Random (n=69)	0	28	4.01	16.04	2.07	1	0	0	1	2

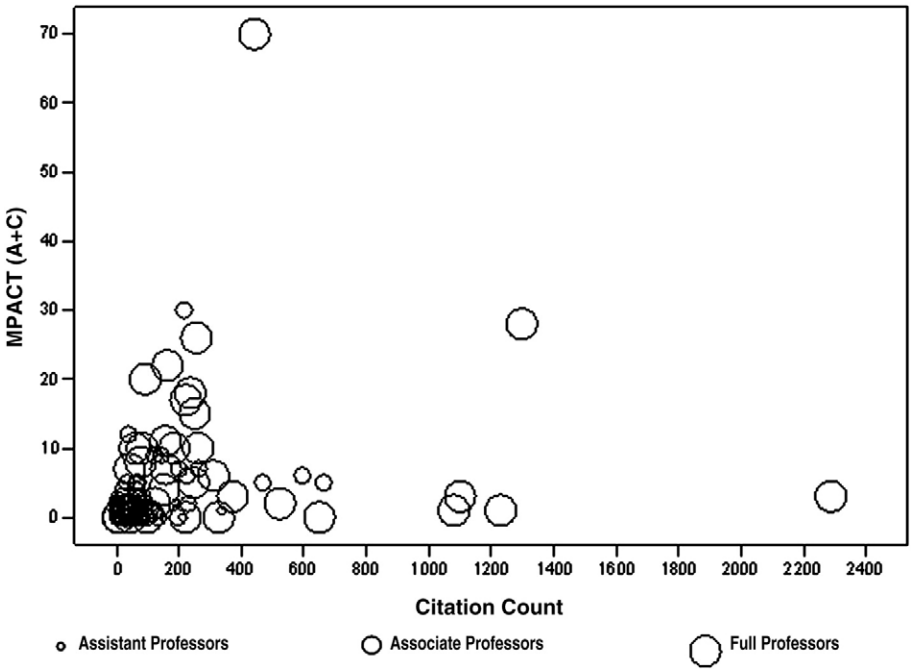

Fig. 4. Relationship between citation counts and MPACT (A+C) by rank.

(Table 5). Significant correlations were found at the associate level for the A indicator (.526) and also for those non-normalized FM indicators that give the A indicator greater weight. The negative correlation between the A indicator and assistant professor citation counts (−.022) reflects the fact that no assistants in the sample had served as advisor on a dissertation. Thus, the correlation is necessarily less than or equal to zero. The relatively small negative correlation suggests that citation counts for assistant professors vary considerably. If most assistant professors had very small citation counts, there would be a stronger negative linear relationship. Significant correlations were also identified for the whole population. This was largely due to the strength of the correlation of the associate A indictor, as well as the lack of assistant professors serving as advisors. However, even these were weak (.268). The most surprising result was the almost random relationship between citation count and MPACT at the full professor rank; these results are discussed in Section 4.

Correlational analysis for citation counts without self-citations (Table 6) reflected the same patterns as the full citation count analysis (Table 5). The difference between these correlations is minimal; it reinforces the interchangeable use of citation counts with or without self-citations (Cronin & Meho, 2006).

Recognizing the individual with an MPACT score of 70 and the individual with a citation count of 2287 as outliers (both full professors), the correlational analysis was rerun without outliers to identify if there were any considerable changes. Table 7 shows that the correlations became more positive with the removal of the two

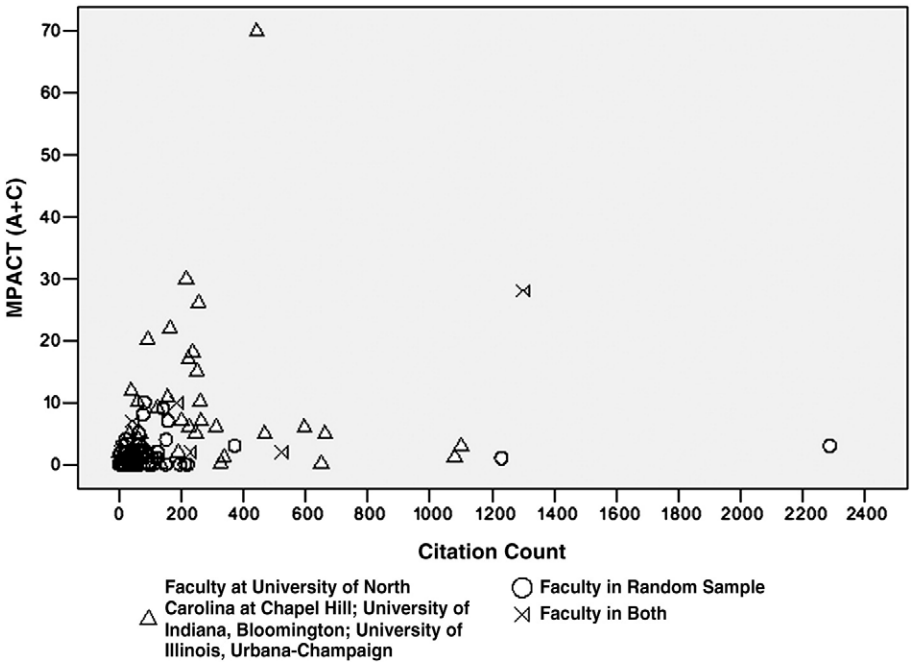

Fig. 5. Relationship between citation counts and MPACT (A+C) by school and random sample.

Table 5
Correlations between MPACT indicators and full citation count by rank level

	A	C	A+C	FMI	FME	FMI/(A+C)	FME/(A+ C)
Assistant	−.022	.088	.081	.039	.044	.079	.083
Associate	.526*	.207	.298	.445*	.431*	.331	.324
Full	.101	.012	.049	.074	.069	.080	.090
Tenured	.219	.120	.154	.192	.186	.146	.155
ALL	.268*	.175	.209	.244*	.239*	.227	.234

* Correlation is significant at the .01 level (2-tailed).

outliers, but only the category of tenured professors showed a change in levels of significance. This may be due to the higher proportion of associate professors in that category with the removal of two full professors.

4.2.2. School

Correlational analysis was then performed on each school, to analyze patterns across sets of faculty members. Table 8 displays the correlations between MPACT indicators and full citations counts for each school and for the entire data set.

Correlational analysis at the school level displays high levels of variance due to the small sample size and outliers in the data set. For example, the UNC data seems to reflect the presence of an individual who is both extremely well-cited and has an unusually high MPACT value. IUB also contains an outlier—an individual who is extremely well-cited, but has never served as an advisor on a doctoral committee. The outlier for UIUC is also well-cited and has an extremely high MPACT value (A+C of 70). With the removal of these outliers, the data changes substantially (Table 9).

The results are insignificant with the removal of the outlier from each school, which may be partly due to the high concentration of tenured faculty members at these schools (see Table 1 and Section 3.1). Furthermore, data from Tables 8 and 9 may indicate that the schools' samples are too small and volatile from which to draw generalizable conclusions and that the combined data set provides more stable generalizations.

5. Discussion

> *"The greatest good you can do for another is not just to share your riches but to reveal to him his own."*
>
> *Benjamin Disraeli*

The data from this study shows that for the most part, there is little to no correlation between MPACT values and citation counts — implying that MPACT is measuring something distinct from citation counts. The strongest positive correlations were at the associate level, suggesting that there might be some relationship between the academic life cycle and MPACT values. The academic ranking system (assistant, associate, full professors) seems to be related to mentoring activity.

As the data show, very few assistant professors are engaged in dissertation mentoring. There are several possible explanations. First, to protect student advising continuity, some schools have policies or practices that preclude assistant professors from serving as advisors or serving without a tenured co-advisor. Second, assistant professors are often encouraged to focus on establishing their research agendas and teaching repertoire in their first years rather than serving on any committees. Third, assistant professors typically have not established research agendas, funding support, or reputations that tend to attract doctoral students. Fourth, the doctoral process takes several years, sometimes longer than the term of an assistant professorship. Assistant professors may begin working with a doctoral student and be promoted to associate professor by the time the dissertation is completed. Finally, mentoring is generally not explicitly defined or rewarded. These conditions are somewhat mitigated by eagerness to work with young scholars who might collaborate on research. Thus, the results of this study reflect current academic practice and culture. It will be interesting to see whether doctoral committee service is more prevalent for faculty who work in rapidly changing fields like popular culture or technology. In those fields, there are strong incentives for faculty to work with knowledgeable young people or to work on highly interdisciplinary problems that require large teams. The intuition is that dissertation committee patterns may also be used as evidence for tracking research trends in schools or fields.

Associate professors displayed the highest correlation between MPACT values and citation counts. These positive correlations show that these professors are simultaneously mentoring and generating citations (many of which are citations of work published in their pre-tenure assistant professor phase). This characterizes the surge of the academic life cycle: the products created during the pre-tenure promotion now reward the individual with academic dividends in the form of citations, awards, grants, students, and overall visibility within their discipline. The associate professor rank is pivotal in the academic career. The reward of promotion (and typically tenure) provides these dividends and also brings new demands and opportunities. The demands are both internal and external. Psychologically, success and well-honed work habits may motivate some people to accelerate their self-expectations, decide to maintain extant inertia, or in some cases, decelerate self-expectations. Likewise, progress on complex research problems may stimulate "opportunity overload" for research directions, which could stimulate or confuse continued progress. In some cases, if narrow research agendas were adopted, the research veins may be mined out and new directions sought. Other internal factors include the aging process and social obligations that come with age. External demands that face associate professors come from institutional as well as professional practice sources. Committee service expectations at campus and professional society levels become greater, as do expectations about participation in critical social practices such as peer review. In general, the reputation associated

Table 6
Correlations between MPACT indicators and citation counts without self-citations

	A	C	A+C	FMI	FME	FMI/(A+C)	FME/(A+C)
Assistant	−.024	.082	.076	.034	.038	.070	.074
Associate	.525*	.206	.297	.444*	.430*	.328	.321
Full	.103	.012	.041	.076	.070	.080	.085
Tenured	.220	.118	.154	.192	.186	.145	.150
ALL	.267*	.172	.207	.243*	.237*	.224	.228

* Correlation is significant at the .01 level (2-tailed).

Table 7
Correlations between MPACT indicators and citations removing the two outliers

	A	C	A+C	FMI	FME	FMI/(A+C)	FME/(A+C)
Full	.206	.045	.106	.172	.164	.007	.029
Tenured	.327*	.159	.226	.299*	.292*	.124	.136
ALL	.377*	.225	.290*	.357*	.352*	.216	.227

* Correlation is significant at the .01 level (2-tailed).

Table 8
Correlations between MPACT indicators and full citation count at the school level

	A	C	A+C	FMI	FME	FMI/(A+C)	FME/(A+C)
UNC	.759*	.376	.536*	.703*	.692*	.342	.335
IUB	−.037	.066	.038	.003	.013	.065	.152
UIUC	.322	.238	.264	.292	.286	.375	.343
Random	.403*	.337*	.385*	.403*	.402*	.219	.213
ALL	.268*	.175	.209	.244*	.239*	.227	.234

* Correlation is significant at the .01 level (2-tailed).

Table 9
Correlations between MPACT indicators and full citation count at the school level (with outliers removed)

	A	C	A+C	FMI	FME	FMI/(A+C)	FME/(A+C)
UNC	.286	.439	.432	.388	.401	.219	.241
IUB	.067	.077	.079	.083	.089	.189	.285
UIUC	.336	.042	.183	.278	.257	.353	.318

with the research, teaching, and service done to achieve promotion brings more research opportunities, students, and service invitations. Associate professors make implicit and explicit decisions about what kind of career trajectory they wish to pursue based on their experiences during assistant professor "boot camp" and their inherent personal compositions.

Once the individual has obtained the status of full professor, these data show that the correlation between MPACT values and citation counts is lost. This may indicate that personal decisions become more of a factor in this post-promotion phase—some choose to mentor, some choose to do research, some choose to do both, and some do neither. This is surprising and somewhat disturbing. It is essential to examine this pattern in other fields to determine whether this occurs across fields or if other factors can be used to explain the data. It may be that the self-expectation and external expectation demands that come with promotion to associate professor are again magnified by promotion to full professor, while the effects of age continue to affect available mental cycles and physical performance. In highly volatile areas or domains, students may be attracted to younger faculty who study the timeliest topics. At small schools with few doctoral programs, full professors may want to give junior faculty opportunities to work with doctoral students who can help them execute research projects. It may be that achieving the top rank of a career gives people the freedom to choose in which ways they wish to invest their time. Because both citation counts and MPACT strongly lag actual productivity, longitudinal analysis through the early years of retirement is also prudent. However, the lack of consistency in this post-promotion phase (and the fact that some full professors do not mentor at all) may indicate that there is not a unified, culturally institutionalized reward structure in place for mentoring. The choices to mentor may depend on the individual, the culture of the school, and the availability of resources (funding, students, labs, etc.). While the accumulation is monotonic, there is some evidence that annual citation count patterns are not strictly linear over a career (Cronin & Meho, 2007). Although the data are quite sparse, it will be interesting to see if dissertation service patterns spike over a career. As the Big Science model of collaboration and multidisciplinarity continue to gain influence within the field of LIS, one may expect to see changes in the mentoring structure and activity. It will be particularly useful to note how changes in other productivity metrics, such as amount of grant funding received, may impact the current structure of mentoring. It may also be interesting to see if the trend toward post-tenure review considers mentoring , if so, how indicators such as MPACT are considered. Most crucially, it remains to be determined whether the observed pattern of uncorrelated full professor mentoring and publication is an artifact of the LIS field and its evolution or if it can be more generally observed across disciplines.

Perhaps it should not be surprising that mentoring and citation patterns differ because they arise from different activities, abilities, and preferences. Mentoring and apprenticeship is more than teaching or sharing knowledge. Written products are manifestations of cognition, whereas the products of mentoring include attitudes and feelings, both personal and communal. Mentoring products (such as dissertations) reflect both knowledge sharing and personal relationships that are steeped in shared time, space, and affect. Mentoring is not classroom performance or instruction, but in ideal situations it is an ongoing collaboration between people who aim to grow and learn. Classically, there is more initiation and control by the mentor rather than the mentee. However, as a mentoring relationship matures, the contributions become more balanced and mentors learn and evolve too. As Kram's (1985) model of mentoring demonstrates, mentoring activities are as much about psychosocial exchange as content and career advice. Mentoring must be done in a context: topics of discussion range beyond the topic of interest to ideas, feelings, and events central to the respective people. Mentoring takes time—time to develop trust and establish common communication patterns. Admittedly, this is a highly idealized notion of mentoring, but most successful adults can point to one or more mentors that influenced their lives.

Although the relationship between dissertation advisor and student is not always one that involves even a few aspects of mentorship, it stands as the most consistent and public exemplar of mentoring in the academy. Thus, MPACT factors are one way to measure how much mentoring a professor does over a career. It is crucial to qualify MPACT analysis with the recognition that dissertation advising or committeeship are neither necessary nor sufficient to good mentors and only represent one kind of mentoring that faculty do. However, MPACT is a strong indication of mentoring and it is relatively direct to collect the necessary data. However, the ease of collection does not excuse educators from assessing this crucial endeavor with a broad range of hard-to-acquire evidence (co-publication, student evaluations, surveys of graduates/alumni, etc.). Additionally, strong caution is encouraged when applying MPACT to assistant professors.

Future research should examine how one could better explain the relationship between mentorship and influence on the field. For example, one could potentially map the academic family tree (lineages of advisorships) in order to illuminate its influence on the discipline. Additionally, LIS is a highly interdisciplinary/multidisciplinary field that trades ideas with other disciplines. It includes faculty members with disciplinary backgrounds/terminal degrees in other domains (see Cronin & Meho, 2008). For this reason, future research should focus on other domains to provide a broader understanding on the influence of mentoring within the entire academic community. Such research will allow for greater contextualization of mentorship across the entire academic spectrum, as well as greater insight into the role that mentoring plays in the community.

6. Conclusion

This study shows that MPACT indicators are measuring something distinct from citation counts. This distinction, however, deals primarily with pure academic productivity and does not address the greater issues of the spread of knowledge. While it is well-recognized that the traditional academic triad of research, teaching, and service all contribute to the spread of knowledge, mentorship has not yet been granted a seat at this table. However, it could be argued that mentorship embodies the essence of these three and thereby demands a greater role.

If one assumes that mentorship is in fact a critical part of the spread of knowledge, why does there not exits a unified system for promoting, rewarding, and assessing mentoring within the field and greater academic community? Arguably, those members of the community with years of academic experience (i.e., full professors) may be in the best position to mentor. However, as the data shows, although full professors are continuing to be productive in other areas (e.g., receiving citations), they are not necessarily mentoring doctoral students.

This work demonstrates that mentoring and writing are distinct scholarly activities. As professors progress through the stages of their careers, they make choices about which of these activities to emphasize. Although there would ideally be a balance between these activities, the academic culture and personal choices interact to force prioritizations. MPACT is offered as an indicator of these choices.

Academic units might use MPACT to measure the impact of one important kind of mentoring, and MPACT can thus be used as an indicator of professorial scholarship alongside citation counts. Our hope is that the existence of such indicators may also motivate the academic community to discuss mentoring more actively and practice mentoring as a valuable component of scholarship.

Appendix A. Current location of the 120 faculty member sample (29 ALA-accredited schools within North America)

Drexel University
Indiana University Bloomington
Kent State University
Long Island University
McGill University
Rutgers University
Simmons College
Syracuse University
Université de Montréal
University at Buffalo, SUNY
University of Arizona
University of California, Los Angeles
University of Hawaii
University of Illinois, Urbana-Champaign
University of Maryland
University of Michigan
University of North Carolina, Chapel Hill
University of North Texas
University of Oklahoma
University of Pittsburgh
University of Rhode Island
University of South Carolina
University of Southern Mississippi
University of Tennessee, Knoxville
University of Texas, Austin
University of Toronto
University of Washington
University of Western Ontario
University of Wisconsin, Milwaukee

Appendix B. Schools that issued dissertations and contributed to the MPACT scores for the 120 faculty member sample (from 30 ALA-accredited schools within North America)

Columbia University
Drexel University
Florida State University
Indiana University Bloomington
Long Island University
McGill University
Rutgers University
Simmons College
Syracuse University
Texas Woman's University
Université de Montréal
University at Albany, SUNY
University of Arizona
University of California, Los Angeles
University of Hawaii
University of Illinois, Urbana-Champaign
University of Kentucky
University of Maryland
University of Michigan
University of Missouri
University of North Carolina, Chapel Hill
University of North Texas
University of Pittsburgh
University of Tennessee, Knoxville
University of Texas, Austin
University of Toronto
University of Washington
University of Western Ontario
University of Wisconsin, Madison
University of Wisconsin, Milwaukee

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