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An Evaluation of Research Productivity in Academic IT

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RESEARCH

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ABSTRACT

Scholarly research continues to be a significant component of a faculty member's portfolio. The evaluation of the quality and quantity of that research is becoming increasingly important for tenure and promotion decisions and post-tenure reviews. Using surveys, several recent articles attempted to rank or group IT journals by quality perceptions. This study extends these previous studies by considering the quantity dimension of scholarly research by investigating the number of publications that appear in a set of top-tier IT journals by both individual author and institution. Data is presented on the most prolific publishers and the most productive IS departments in publishing in these "premier" journals. 1223 authors from 389 different universities were published with an average of 1.41 authors per IS article. Only three non-U.S. universities (National University of Singapore, Queen's University, and University of British Columbia) are in the top 24 publishing universities. 73% of researchers who published in these "premier" journals publish less than one adjusted count article in a top-tier journal in 5 years using the adjusted count. Only 49 authors had their names on 5 or more top-tier IS articles in 5 years leading to the conclusion that achieving tenure

is next to impossible if the "premier" journals are the only acceptable ones at a university.

Keywords: Research productivity, tenure and promotion, information systems research issues

I. INTRODUCTION

The significance of scholarly activity at an institution takes on many dimensions. Collectively, the scholarly output of an institution's faculty can be used to rank an institution relative to its peers. Individually, a faculty member's research productivity can be used for tenure and promotion decisions. For either of these two comparative dimensions to be accurate, peer data from other institutions must be obtained. Such peer data is usually obtained by questionnaires sent to institutions. The accuracy of this self-reported data has always been subject to debate. For example, an institution might report that their faculty average one publication per year in top-tier journals. Several problems with using such a statement for comparative analysis are immediately apparent. First, the list of top-tier journal varies from institution to institution. One institution might use a very select list of premier or A+ journals while another institution might use a less selective list of top journals. Second, institutions may count multiple-authored articles differently when arriving at the metric for faculty productivity.

After the list of journals is agreed upon within a college of department, the next dimension in evaluating a faculty member's research portfolio is usually to determine the number of publications that should be required from the various categories to meet tenure or promotion requirements. For example, faculty members may be required to publish three journal articles in top-tier journals over a five-year period. This decision can be as controversial as the composition of

the top-tier list with faculty arguing over what quantity of publications is "enough" or "tenurable".

The purpose of the current research is to determine distributions of the number of articles both by individual faculty and institutions in order to give IS departments and colleges a realistic picture of how many top-tier articles are actually produced by the leading IS researchers. These distributions should aid departments in setting a reasonable level of expectation for scholarly output. At the same time, this research analyzes the university affiliations of researchers who publish in different journals. This data will confirm or deny the common belief that certain universities have a distinct edge in publishing in certain journals.

II. REVIEW OF PREVIOUS RESEARCH

Multiple studies attempted to assess journal quality. Three recent studies stand out. Doke, Rebstock, and Luke [1995] surveyed AACSB schools to obtain journal publishing preference and familiarity for a list of 42 journals. Hardgrave and Walstrom [1997] extended the results of a previous study in 1995 by surveying MIS faculty from the *Directory of Management Information Faculty* concerning their perceptions of 53 journals. In a similar effort, Nord and Nord [1995] analyzed several previous studies to determine a list of first and second tier journals. Table 1 compares the results of these three studies.

Im et. al. (1998) also investigated the researchers in MIS using six journals. They found the U. of Arizona, MIT, and the U. of Minnesota to be the top research producing departments in MIS and Igbaria, Jarvenapaa, and Grover to be the top researchers in terms of numbers of articles published.

Table 1. Journal Rankings from Previous Studies

	Doke, Rebstock and Luke (Rank)	Hardgrave and Walstrom (Rank)	Nord and Nord (Tiers)
MIS Quarterly *	1	1	1st
Management Science *	2	3	1st
Communications of the ACM *	3	4	1st
Decision Sciences *	4	6	1st
Info. Systems Research *	5	2	NR
J. of Management Information Systems *	6	5	1st
Harvard Business Review *	7	9	2nd
Sloan Management Review *	8	13	2nd
J. of ACM	9	17[1]	NR
Decision Support Systems	10	10	NR
Information and Management *	11	20	1st
IEEE Transactions on Software Engineering *	12	7	2nd
Proceedings of ICIS	13	[2]	NR
Interfaces (INFORMS)	14	28	2nd
Academy of Management Journal	15	15	NR
Computer (IEEE)	16	12 [3]	NR
OMEGA	17	24	NR
Academy of Management Review	18	19	NR
Data Base	19	29	NR
J. of Computer Info. Systems	20	27	1st

[1] Reported as any ACM publication
[2] Conference quality was assessed separately but ICIS ranked the highest of any conference.
[3] Reported as any IEEE publication
* included in current research

OBSERVATIONS ABOUT JOURNAL RANKINGS IN THE PREVIOUS STUDIES

- The top six journals were essentially the same in all studies and are included among the 10 journals in this research.

- Journals in the second tier varied greatly depending on whether the focus of the study was applied research, such as the Doke study using AACSB schools, or more theoretical research.

- The most surprising discrepancy in the studies was the ranking of the *Journal of Computer Information Systems.*

- The standard methodology of all these studies was a survey instrument. The very nature of the survey eliminates any specialized journal as a top tier publication. For example, a researcher specializing in database would consider the *ACM Transactions on Database Systems* as a premier journal. Due to the general survey audience in the above studies, only journals of general interest would receive the necessary votes to be classified as top-tier.

III. METHODOLOGY

To limit the scope of the research to a manageable level, a list of 10 "premier" journals was developed. This list was based primarily on the research cited above. While many similarities exist in the above lists, significant differences also occur. Since this study focuses on IT rather than computer science, several modifications were made from the previous lists.

- The *Journal of the ACM* was not included because of its more theoretical nature with an emphasis on computer science research.

- *Harvard Business Review* and *Sloan Management Review* were added because of their applied focus.

- The *IEEE Transactions on Software Engineering* was included because of its applied focus and its emphasis on a major information systems subject area.

    The final list of journals used in this research is shown in Table 2.

Table 2. Journals Used in Research
(in alphabetic order)

Communications of the ACM
Decision Sciences
Harvard Business Review
IEEE Transactions on Software Engineering
Information and Management
Information Systems Research
Journal of Management Information Systems
Management Science
MIS Quarterly
Sloan Management Review

First, all of the articles published during 1992-1996 in these 10 journals were considered in the research for a total of 2763 articles.[1] Then, the authors were analyzed and only articles written by at least one IS faculty member were included reducing the list to 972 articles. The determining factor for inclusion as an IS author was either belonging to an IS department (self-reported in article) or listing in the ISWorld web directory of IS faculty (http://webfoot.csom .umn.edu/ISWorld/FacDir/default.htm). Only 35% of the articles in this sample were authored by IS faculty.

For each article, the author and author's institution were recorded. A weighting based on the number of authors in an article was also calculated. For example, if an article had two authors, then each author receives credit for 0.5 of an article. This is the <u>adjusted count approach</u> suggested by Lindsey [1980]. A <u>normal count</u> suggested by Jackson and Nath [1989] was calculated. In this method, an author receives one credit for any article on which his/her name appears (Figure 1).

Adjusted Count: Weighting based on the number of authors for an article. Each author receives fractional credit

 Normal Count: An author receives a credit of 1 for any article in which his/her name appears.

Figure 1. Definitions

Only research articles were included in the sample. Book reviews, letters, notes were not included. No distinction was made between what could be called "MIS" articles or "Computer Science" articles since IS research agendas can include fairly technical work.

IV. RESULTS

2763 articles were entered into the database, 972 of them by IS authors. 4295 different authors representing 650 universities and 498 non-university organizations wrote the articles. Of these, 3211 were from universities and 1084 were from non-university organizations. The average number of authors per article was 1.54.

After the non-IS people were removed, 1381 authors remained for the 972 articles. 158 came from non-university organizations and 1223 from 389 different universities. There were 1.41 authors per article using only the IS authored articles. The current ISWorld Directory of faculty members shows 2398 U.S/Canadian faculty and 4274 worldwide. These numbers include some people who teach in IS and some graduate students. They also include people who took their degrees after 1992. Because the number of different authors is much smaller than the total population of faculty, it is fair to conclude that many of the people working in the field did not publish even one article in our list of 'premier' journals during the 1992-1996 time period.

ANALYSIS BY UNIVERSITY

The normal and adjusted count methods were used to determine the institutional credit. Universities received credit based on the location of the author at the time of publication. Obviously, some authors changed universities since the articles were published. Table 3 lists the 24 most active research universities, based on the adjusted count.

Table 3. Top 24 Universities for 5-Year Period

University	Ph.D. Program in IS or CS	Average Number of Authors per Article	# of Articles with Univ. Name (Normal count)	# of Articles with University Name (Adjusted count)
U of Arizona	Yes	2.44	66	26.45
New York U	Yes	2.16	56	25.97
MIT	Yes	1.90	46	24.33
National U of Singapore	Yes	2.37	47	19.82
U of Pennsylvania	Yes	2.04	35	17.16
Drexel U	Yes	2.16	33	15.66
U of South Carolina	Yes	2.81	43	15.25
U of Minnesota	Yes	2.50	38	15.18
U of Texas, Austin	Yes	2.50	35	14.15
Carnegie Mellon	Yes	2.50	35	13.98
Georgia State U	Yes	2.08	27	12.98
Florida International	Yes	2.0	25	12.5
U of Memphis	Yes	2.06	25	12.16
U of Georgia	Yes	2.23	24	10.75
U of Pittsburgh	Yes	2.58	27	10.46
U of British Columbia	Yes	2.03	21	10.33
Queen's U	Yes	2.25	22	9.75
U of Houston	Yes	2.07	20	9.66
Florida State U	Yes	1.91	18	9.41
Penn State U	Yes	2.14	19	8.83
Texas A&M	Yes	2.19	19	8.66
Arizona State U	Yes	1.98	17	8.58
U of Toledo	No	2.18	18	8.25
U of California, Irvine	Yes	3.11	25	8.02

Observations About the Top Publishing Universities

- Obviously, the size of the IS faculty has a bearing on the number of publications.

- Three non-U.S. universities (National University of Singapore, Queen's University, and University of British Columbia) are in the top 24 publishing universities.

- Florida State, Arizona State and MIT have the lowest number of authors/article leading to the conclusion that their faculty write more singly authored papers. However, the number of authors per article only ranges from 1.90 - 3.11 in these top 24 schools.

- All of these universities except the University of Toledo have Ph.D. programs in Information Systems.
- Given the number of Ph.D. granting institutions, an interesting metric would be to examine the number of graduate students who co-authored these papers . This data was not available for this analysis.

Distribution of Research Activity by University

Even allowing for the difference in sizes of Information Systems Departments, the data in Table 4 makes it apparent that publishing in the top tier journals is not limited to a few select universities. 389 different universities had articles by IS faculty published in this study. However, only 42 universities had five or more adjusted count articles in 5 years in the top journals and 104 schools had five or more normal count articles (more than one author on the papers) in 5 years.

Table 4. Distribution of University Research Activity for the 5-Year Period

Articles Credited to a University	Normal Count Method		Adjusted Count Method	
	Number of Universities	Percentage	Number of Universities	Percentage
50 -- 99.99	2	0.77%	0	0%
25 – 49.99	14	3.1%	2	0.77%
10 – 24.99	35	8.9%	14	3.3%
5 - 9.99	54	13.9%	26	6.6%
2 - 4.99	140	35.9%	79	20.3%
1 - 1.99	145	37.3%	131	33.7%
< 1	0	0	137	35.2%

Departments should seriously consider this data when creating their lists of top tier journals for tenure decisions. Unless authors at the same university decide to write jointly authored papers, the probability of three untenured faculty in the same department publishing two or more top tier articles in 5 years is very low.

ANALYSIS BY INDIVIDUAL AUTHOR

   Table 5 considers the contributions of the 26 individual IS authors with the highest article credit.

Table 5. 24 Authors with the Highest Article Credit for the 5-Year Period

Author	Current University (1/31/2000)	Adjusted Article Count	Normal Article Count
Igbaria, M	Claremont Graduate U	10.58	23
Clemons, E	U of Pennsylvania	6.5	13
Grover, V	U of South Carolina	5.75	15
King, W	U of Pittsburgh	5.5	11
Brynjolfsson, E	MIT	5.25	8
Nunamaker, J	U of Arizona	4.96	15
Jarvenpaa, S	U of Texas, Austin	4.5	10
Guimaraes, T	Tennessee Tech U	4.5	11
Kemerer, C	U of Pittsburgh	4.25	8
Lucas, H	New York U	3.91	7
Sprague, R	U of Hawaii	3.75	6
George, J	Florida State U	3.74	7
Vessey, I	Indiana U	3.66	7
Szajna, B	Texas Christian U	3.5	4
Zack, M	Northeastern U	3.5	4
Palvia, P	U of Memphis	3.41	6
Baroudi, J	New York U	3.33	7
Benbasat, I	U of British Columbia	3.33	7
Alavi, M	U of Maryland	3.33	5
Robey, D	Georgia State U	3.33	5
Lederer, A	U of Kentucky	3.25	6
Orlikowski, W	MIT	3.0	4
Todd, P	U of Houston	3	7
Chau, P	U of Hong Kong	3	3

Observations About Individual Authors

- The most prolific authors are Igbaria, Clemons, Grover, King, and Brynjolfsson on an adjusted basis. Nunamaker becomes part of the top five list on a normal basis. This data does not agree one-to-one with Im, Kim, and Kim (1998) because of the difference in the journals sampled. Their research also included 1991 while this research included 1992-96.

- The importance of the decisions as to which journals to include in the tenure and promotion list cannot be overemphasized. By comparing the author lists, one can make some assumptions about where authors publish. For example,

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Dennis (with 6 normal count and 2.5 adjusted count articles) is not in this top list but is in the top 10 of the Im, Kim, and Kim paper (9 normal and 3.28 adjusted count). Obviously, Dennis's other research has been published in the journals not included in this list.

- All of the universities with the most prolific publishers have Ph.D. programs except Texas Christian University, Tennessee Tech, Santa Clara University, and Northeastern University.

- Only two authors are currently at non-U.S. universities.

Table 6 summarizes the distribution of the number of articles by individual authors using both the adjusted and normal count methods.

Table 6. Distribution of Individual Author Research Activity for 5-Year Period

Article Credit	Normal Count Method		Adjusted Count Method	
	Number of Authors	Percentage	Number of Authors	Percentage
>= 10	7	0.64%	1	0.08%
5 – 9.99	37	3.30%	4	0.56%
3 – 4.99	106	8.77%	20	1.77%
2 – 2.99	195	15.6%	53	4.10%
1 – 1.99	878	71.7%	242	20.1%
< 1	0	0%	903	73.4%

Observations about Individual Research Productivity

- The vast majority of researchers who published in these "premier" journals (73%) publish less than one article in a top-tier journal in 5 years using the adjusted count. Only 5 authors had their names on 5 or more adjusted count top-tier IS articles in 5 years. Unless the list of top tier journals is expanded and credit given for jointly authored articles, tenure will be out of reach for many faculty whose university suggests 1 top tier article a year to receive tenure.

- Giving credit for jointly authored articles produces better results. 45 (1.1%) authors had their names on five or more articles in 5 years. 72% of researchers who published in these "premier" journals had their names on

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only one premier article in 5 years (normal count).   This result clearly speaks to the need to accept other outlets in making tenure and promotion decisions.

ANALYSIS OF UNIVERSITY AFFILIATION BY JOURNAL

Many researchers in the IS field assume that they should not even try to publish in certain journals because they do not have the "right" university affiliation. The data was analyzed in the research to determine if journals do have a prevalence of authors from one or two universities. Table 7 provides the most prevalent university affiliations for nine journals in the study using a normal count. [1]

Table 7. Most Frequent University Author Affiliations by Journal

MIS Quarterly		Info Systems Research		Decision Sciences	
U of Minnesota	8	MIT	6	U of South Carolina	5
U of Georgia	9	Georgia State U	6	Drexel	3
Queen's U.	6	Carnegie Mellon	6	Penn State U	3
U of British Columbia	5	Florida International U	6	Texas A&M	3
U of Memphis	5	New York U	5	Oklahoma State U	3
U of Colorado, Boulder	4	U of Washington	4		
MIT	4	U of Texas, Austin	4		
U of California, Irvine	3	U of British Columbia	4		
Drexel U	3				
HEC	3				

Communications of the ACM		Management Science		Journal of MIS	
U of Arizona	6	Arizona State U	6	U of Arizona	17
New York U	6	MIT	4	New York U	17
Georgia State U	5	Ohio State U	3	U of Pennsylvania	11
MIT	5	U of Florida	3	U of Georgia	9
Carnegie Mellon	4	U of Pennsylvania	3	Carnegie –Mellon	7
Aarhus, Denmark	3	New York U	3	U of South Carolina	7
Texas A&M	3	U of Texas, Austin	3	Minnesota	7
Penn State U	3	U of Southern California	3	Pittsburgh	6
U of Minnesota	3	Penn State U	3	National U of Singapore	6
				Penn State U	6
				Hong Kong U	6

1 *Harvard Business Review* is not included because of the low number of IS articles.

Information & Management		Sloan Management Review		IEEE Software Engineering	
Nat'l U of Singapore	12	MIT	12	Ohio State U	6
Drexel U	11	Claremont Graduate U	3	Naval Postgraduate School	5
U of Arizona	10	U of Pennsylvania	3	New York U	4
U of Memphis	10	U of Texas, Austin	2	U of California, Irvine	3
U of Texas, Austin	9	Harvard	2	Queen's U	3
U of South Carolina	7	Templeton College	2	U of Houston	3
U of Toledo	7	Syracuse U	2	U of Minnesota	3
Tennessee Tech U	6	Southern Methodist U	2		
		U of Missouri	2		
		London School of Business	2		

The normal article count for an institution in Table 7 represents at least one author on an article from that institution. If two authors from the same institution are on the article, they count only once.   It is interesting to note that publishers from one university (MIT) dominate *Sloan Management Review. Journal of MIS* has a high number of authors from the U of Arizona and New York U.   The other publications, however, appear to have a cross section of universities represented.

International researchers play an increasing role in IT research. *MIS Quarterly,* with three non-U.S. universities among their top publishers, all of which are Canadian, has the largest number of international university contributors. Both the *Journal of MIS* and *Sloan Management Review* have two international universities among their top publishers. The other international journals have at most one international university on their top contributor list but only the National University of Singapore is on two journal lists as top publisher.

ANALYSIS OF FAVORED UNIVERSITY PUBLICATION OUTLETS

Many universities tend to concentrate their publication efforts in certain journals. Of the ten premier journals considered in this study, no school published in all them, although the U of Texas, Austin published in nine different journals and four universities (Boston U, U of Houston, NYU, Penn State)

published in eight different journals. Table 8 summarizes this data for the number of universities who published in a diversity of journals. The implication is that the vast majority of universities who published in these premier journals (72%) published in two or fewer of them for this five-year period.

Table 8. Number of Different Journals in which a University Published

Number of Different Journals Represented	Number of Universities
9	1
8	4
7	10
6	15
5	19
4	21
3	42
2	73
1	207

ANALYSIS OF AUTHOR AFFILIATION

Table 9 shows the large number of different organizations, academic and non-academic, that had IS-authored articles in the journals considered in this study. *Information and Management* had 263 different affiliations represented in the articles while *Journal of MIS* had authors from 144 different organizations. Table 9 also shows the number of authors broken down by university and non-university affiliation (Business). *Information and Management* and *Communications of the ACM* had the highest number of non-university authors. Since at least one author of each article had to be an IS faculty member to be included in the study, this points out the amount of collaboration going on between universities and business.

Table 9. Number of Issues, Articles, and Organizations by Journal

Journal	No. of Issues	No. of Articles	No. of IS-Authored Articles
Information and Management	52	280	280 (100%)
Journal of MIS	24	187	186 (99.5%)
MIS Quarterly	20	116	116 (100%)
Information Systems Research	20	92	92 (100%)
Communications of the ACM	60	596	90 (15.2%)
Management Science	60	621	73 (11.8%)
IEEE Software Engineering	60	362	51 (14.3%)
Decision Sciences	24	135	48 (35.5%)
Sloan Management Review	20	161	29 (20%)
Harvard Business Review	30	194	1 (0.5%)

Table 9 shows the percentage of IS authored articles out of the total articles published by the journals. Harvard Business Review has the smallest percentage of IS authored articles while *Information Systems Research, Information and Management, MIS Quarterly*, and *Journal of MIS* are almost exclusively an outlet for IS faculty to publish. Authors should note these percentages when deciding on publication outlets since some journals have multiple missions and reduced space for IS articles.

ANALYSIS OF NON-ACADEMIC AUTHORS BY JOURNALS

Another issue that seems to be important in tenure review is the difference between academic journals and practitioner/applied journals. Many tenure committees make some vague distinction between these two categories of journals. The most common distinction is based on readership affiliations. Another possible way to determine academic versus practitioner orientation of a journal would be authorship of the articles that appear in it. Table 10 list the percentage of articles that are contributed from non-academic institutions.

Table 10. Summary of Non-Academic Affiliations by Journal

Journal	Percentage non-academic	Observations about Non-Academic Authorship
Communications of the ACM	23.1%	5 non-academic in the top 40 contributing organizations (IBM, ATT Bell, US West, Incontext, FedEx)
Sloan Management Review	20%	5 non-academic out of 25 contributing organizations
IEEE Software Engineering	19.7%	13 non-academic publishers out of 66 contributing organizations (Andersen Consulting was 4th most frequent publisher)
Journal of MIS	13.9%	No non-academic in top 50 contributing organizations; 20 out of 144 publishers
Information and Management	13.5%	1 (FDA) non-academic in top 25 contributing organizations; 35 out of 259 publishers
Management Science	8.3%	0 non-academic in top 30 contributing organizations; 7 out of 84 publishers
Information Systems Research	2.4%	Only 2 non-academic publishers out of 98 total
Decision Sciences	1.5%	1 non-academic in 67 contributing organizations

Decision Sciences (1 non-academic out of 67 publishers) and *Information Systems Research* have the lowest percentage of non-academic organizations publishing in them. On the other hand, *Communications of the ACM, Sloan Management Review,* and *IEEE Software Engineering* have the largest percentage of non-academic authors. Most of these articles are joint authorships between academia and a business.

V. CONCLUSIONS

Promotion and Tenure Committees should be very careful in setting rigid top-tier journal publication standards for promotion and tenure. If the committee sets a "numbers" requirement from a general list of top-tier journals similar to the ones considered in this research, some unexpected results may occur. Table 11 presents several possible scenarios.

Table 11. Research Productivity Scenarios

Requirement	Implication
The equivalent of one single-authored top-tier publication per year (assuming 5 years of publications before applying for tenure)	Based on the Adjusted Count Method, only 5 researchers would qualify with >= 5 articles.
One top-tier publication per year (multiple authors are acceptable and count as a full article) (assuming 5-6 years for tenure)	Based on the Normal Count Method, only about 44 researchers would qualify
The equivalent of one single-authored top-tier publication for a 5 year period	Based on the Adjusted Count Method, only 320 researchers would qualify (7.5% of all faculty and 13.3% of U.S/Canadian faculty)
Three or more top-tier publications for a 5 year period multiple authors are acceptable (multiple authors are acceptable and count as a full article)	Based on the Normal Count Method, only 106 (2.5% of ISWorld Faculty worldwide and 4.4% of U.S/Canadian faculty) of the researchers would qualify.

Based on the above implications, many institutions will probably also consider specialized top-tier journals when evaluating research productivity. Some institutions have also added a second-tier list of journals with some equivalency between these journals and top-tier journals (e.g., three publications in second-tier journals are equivalent to one publication in a "premier" journal).

One observation that is crystal clear is that if an institution sets a rigorous standard based on a small set of top-tier journals, few of its junior faculty will be either tenured or promoted.

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John Plotnicki is Associate Professor and Chair in the Department of Computer Information Systems at Colorado State University. He graduated with a B.S. from the University of Tennessee, an MBA from Colorado State University, and a Ph.D. from the University of Tennessee in Management Science. His research interests include industry trends in the IT job market and IT education.