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Measuring Researcher-Production in Information Systems

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ABSTRACT

While many studies have assessed IS researcher-production, most have focused on either ranking IS journals or assessing prolific researchers using a restricted time frame and a small "basket" of journals (i.e., those journals selected for sampling). We found no research that has assessed the IS specificity of journals (i.e., the suitability of journals for publishing IS research) nor any that evaluated IS researcher-production measures.

Based on a coding of over 26,000 articles and more than 1,900 authors, this study attempts such an evaluation by (1) determining the rate of publication of IS researchers in 58 journals perceived by at least one IS institution as IS specific, (2) profiling prolific and typical IS researchers using descriptive statistics, (3) evaluating the convergent validity of various researcher-production measures, (4) assessing the reliability of these researcher-production measures by varying baskets of journals and time periods, and (5) comparing the sensitivity of measures across prolific and typical researchers.

The study demonstrates that many journals perceived to be of high quality by IS researchers are not specifically targeted to information systems. Changing the evaluation procedure has a significant impact on measures of typical and prolific IS researchers. For typical IS researchers, measures of production are strongly convergent and are not sensitive to changes in journal baskets. However, for prolific researchers, measures of production are not convergent and highly sensitive to changes in journal baskets. The evaluation of both prolific and typical IS researchers is also highly sensitive to temporal effects. The differences in convergent validity and reliability demonstrate that prolific researchers are more sensitive to minor variations in the assessment procedure.

Based on the empirical findings, the study closes with recommendations both for the evaluation of researcher-production and for developing institutional target journal lists, i.e., lists of journals viewed favorably by an institution.

Keywords: IS researcher production, IS methodology, IS paradigms, research communities, construct and measurement validity, journal baskets, counting methods

I. INTRODUCTION

Journal rankings and researcher productivity are frequently used to assess faculty performance, to identify prominent authors and institutions in a field, and to attract funding and students. Evidence suggests that these are relevant criteria as researcher productivity is correlated both with teaching effectiveness [Bell et al. 1993] and with academic prestige [Armstrong and Sperry 1994].

Of the various dimensions of researcher productivity, the one most frequently employed in the Information Systems (IS) research discipline is researcher-production [e.g., Athey and Plotnicki 2000; Bradbard and Niebuhr 1987; Ellis et al. 1999; Im et al. 1998; Jackson and Nath 1989; Lending and Wetherbe 1992; Remus 1991; Shim and English 1987; Shim et al. 1991; Trieschmann et al. 2000; Trower 1995; Van Over and Nelson 1986; Vogel and Wetherbe 1984]. Researcher-production as employed in IS research refers primarily to the quantity of a researcher's output in research journals and is a popular construct, because it is both easy to measure and because authors that are perceived to be productive overall often have large numbers of publications [de Solla Price 1986].

While some work on IS researcher-production has examined methods used for researcher-production assessment and the validity of researcher-production measures [e.g., Athey and Plotnicki 2000; Im et al. 1998; Trower 1995], at least four outstanding issues remain. First, even when production studies adopt similar analytical approaches, they come to vastly different conclusions. This suggests that measures used for researcher-production may not be reliable, stable over time, or construct-valid. Moreover, such findings may not have external validity and, thus, may not accurately reflect the production of individuals and institutions. Second, most prior research uses a small set of high quality journals to identify the most prolific researchers and institutions. Given Banville and Landry's [1989] argument that the IS field is a fragmented adhocracy, assessments of researcher-production based on only a small set of widely recognized journals undoubtedly excludes otherwise prolific researchers. Third, assessments of researcher-production do not address the publication characteristics of the typical IS researcher. And, fourth, while much research has assessed the perceived IS specificity (i.e., suitability as a venue for publishing IS research) of various journals to the information systems research discipline, little research has examined whether IS researchers publish in these venues.

This research attempts to address these issues through an empirical study of researcher-production measures. It contributes to the larger stream of researcher productivity work by identifying various concerns that impact the assessment of IS researcher-production. Specifically, this study

- demonstrates that the IS-specificity of journals should play a key role in surveys of journal quality
- finds evidence that the assessment of prolific researchers is highly sensitive to variations in the analytical procedure employed for measuring production
- shows that the yearly publication rates of researchers are highly variable
- makes recommendations for enhancing researcher-production measurement and IS departmental evaluation procedures.

The remainder of this paper is organized as follows. The second section presents related research. The third section presents the data collection and analytical procedures. Results of the analysis are presented in the fourth section, while the findings are interpreted in the fifth. The sixth section provides a confessional account of our research and its limitations. Finally, the seventh section draws final conclusions.

II. LITERATURE REVIEW

In this section, an overview of the broad landscape of empirical studies dealing with IS researcher-production is presented. This landscape supports a line of reasoning for why IS production research should continue to be performed in the future. We then review scientometric research within the IS research discipline, and classify this work into two streams: (1) assessment of journal prestige and (2) assessment of institutional and researcher-production based on journal prestige. Studies in both of these streams are then reviewed, and issues with these research approaches delineated. The whole is finally used to motivate the present study and research program.

THE INFORMATION SYSTEMS RESEARCH LANDSCAPE

Unlike some other research disciplines, information systems is characterized by its diversity [Robey 1996]. The IS research community has been described as a fragmented adhocracy [Banville and Landry 1989], so much so that subsets of IS researchers have difficulty in understanding and appreciating research outside their own subcommunity within the profession. Broadly speaking, subcommunities within information systems research can be categorized according to research methodology employed [Vogel and Wetherbe 1984], geographical perspective [Avgerou et al. 1999], reference discipline(s) relied upon [Teng and Galletta 1991], and topic of interest [Culnan 1986, 1987].[1]

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[1]We recognize that our survey of the IS research landscape is incomplete. Our goal here is to elucidate this diversity, and not to definitively capture it. We apologize to well-recognized subdisciplines in the IS research landscape not mentioned herein.

Methodological Subcommunities

IS researchers use an incredible array of research methodologies, including (but not limited to) analytical modeling, surveys, case studies, subjective/argumentative, lab experiments, field experiments, artifact engineering, theorem proof, simulation, ethnography, grounded theory, critical theory, and action research [Mingers 2001; Teng and Galletta 1991; Vogel and Wetherbe 1984]. Prior research suggests that IS departments tend to specialize in only one or two methodologies [Lending and Wetherbe 1992].[2] Since normative standards for reviewers to evaluate research differ according to the methodology chosen for a study [Straub et al. 1994], it is difficult for researchers to understand and evaluate research based on methodologies outside their experience and knowledge domain.

Geographic Subcommunities

Research comparing North American, European, and Australian researchers has identified numerous geographical variations in how research is perceived [Avgerou et al. 1999; Ridley and Keen 1998]. Europeans tend to advocate post-positivist research, prefer active participation in the research, and focus more on the relevance of their contribution than their North American counterparts. North American researchers are stronger advocates of positivist research, prefer empirical studies, and focus more on methodological rigor [Benbasat and Weber 1996; Evaristo et al. 1992]. Australian researchers employ interpretive and critical epistemologies less frequently than even American researchers [Ridley and Keen 1998], and collaborate infrequently with researchers outside of Australia [Ridley et al. 1998]. European and American researchers also differ in journal preferences [Avgerou et al. 1999, Mylonopoulos and Theoharakis 2001]. Even though, other than these studies, little cross-cultural work has been performed (see, however, Evaristo et al. [1992]), it is very likely that IS researchers from other regions and ethnicities also have varying research perspectives, considering the substantial differences between the geographic subcommunities mentioned.

Reference Discipline Subcommunities

IS researchers are also differentiated by the reference discipline(s)[3] against which they choose to frame their research. Many reference disciplines are cited as key to IS research, including organizational science, psychology, management science, economics, architecture, anthropology, and computer science [Bakos and Kemerer 1992; Baskerville and Myers 2002; Benbasat and Weber 1996; Cohen 1999; Teng and Galletta 1991]. Interestingly, most IS researchers individually tend to be familiar with only two of these subdisciplines [Teng and Galletta 1991]. As a result, research framed from the perspective of one reference discipline is often misunderstood or unappreciated by those knowledgeable in the other disciplines.

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[2]The number of methodologies employed appears to be related to the size of the faculty.

[3] Allen Lee, former editor-in-chief of *MIS Quarterly*, prefers the term “contributing disciplines,” indicating that other disciplines add to IS research, but are not the only basis (reference) for our work. To promote future use of this term, we make mention of this useful substitution here.

Topic of Interest

Finally, IS researchers work in multiple research streams. Calls for a “single dependent variable” in IS research [Keen 1980] have largely gone unheeded. In one study, Culnan [1986] identified at least nine streams of IS research through a co-citation analysis of the *Social Science Citation Index* (SSCI). Seven of these streams mapped to clearly definable topics in the IS literature (foundations/management theory, systems science, computing impacts/local government, MIS/DSS implementation, individual differences, human factors, and computer conferencing). As IS researchers also publish in non-social science forums (such as computer science-oriented journals), it is likely that IS research has even more streams than those acknowledged. For example, a targeted survey of Australian heads of department identified 20 distinct topics of interest [Pervan and Cecez-Kecmanovic 2001].

Need to Represent Diversity in Studies of IS as a Discipline

The range of these subdisciplines are good evidence that the IS field is, indeed, characterized by its diversity. Rather than viewing this diversity as a liability, we can see it as a strength. From this perspective, it becomes clear that studies on the discipline of IS might need to incorporate as much diversity as possible into sampling. We ask the reader to keep this in mind when, after discussing the scientometrics developed and tested in this study, we argue in favor of our large and broadly based sample of data about IS researchers and their works.

SCIENTOMETRICS IN INFORMATION SYSTEMS

Scientometrics is the quantitative study of the science process [Garfield 1979]. As a research discipline in its own right, it seeks to study the phenomenon of science and scientific progress by employing the tools of scientists [de Solla Price 1986]. Sources of scientometric data include counts of publications and authors; citation frequency of articles; link relationships between articles, journals, researchers, and institutions; and research funding [Lawani 1981; Nowaczyk and Underwood 1995]. Many scientometric studies employ citation indices such as the *Science Citation Index* (SCI), the *Social Science Citation Index* (SSCI) or the *Arts and Humanities Citation Index* [Osareh 1996].

Among its varied uses, scientometrics yields insights into the evolution of a research discipline [Pierce 1992], the sociology of research [Melin and Persson 1998], the formulation of government and institutional policy about research [Geisler 1999; United States General Accounting Office 1997], and comparisons of scientific disciplines [Borgman and Rice 1992].

Within the IS research discipline, scientometrics has focused primarily on two goals: (1) the assessment of journal prestige and (2) the assessment of researcher-production.

Assessment of Journal Prestige

Past work on the assessment of IS journal prestige has adopted one of two methodologies: ranks based on researcher perceptions and ranks based on numbers of citations. The former approach uses a list such as the Deans in the AACSB membership directory [Doke and Luke 1987] or the MISRC directory [Hardgrave and Walstrom 1997]. Respondents rate each journal on a Likert scale. The average rating of the respondents is then ordered to establish journal rank and prestige.

The second methodology uses citation analysis. In citation analysis, the researcher first selects a small "basket" of articles.[4] The articles are often selected from journals identified from the aforementioned surveys. The researcher then consults a citation index to measure the number of times each article is cited by other research. Journals with the larger number of citations are considered to be more prestigious. Table 1 presents a list of existing work that uses these techniques.

Table 1. Research on Journal Rankings

Article	Technique/Method Employed	Key Features
Vogel and Wetherbe [1984]	Opinion survey	291 experts surveyed
Van Over and Nelson [1986]	Citation/content analysis	Used journals from Vogel and Wetherbe [1984]
Doke and Luke [1987]	Opinion survey	Deans in AACSB Membership Directory
Koong and Weistroffer [1989]	Opinion survey	Used MISRC Directory for sampling
Walstrom et al. [1995]	Opinion survey	Used MISRC Directory for sampling
Cheng et al. [1996]	Citation/content analysis	Unclear selection process
Hardgrave and Walstrom [1997]	Opinion survey	Used MISRC Directory for sampling
Cheng et al. [1999]	Citation/content analysis	Unclear selection process
Avgerou et al. [1999]	Opinion survey	Focused on European IS researchers
Whitman et al. [1999]	Opinion survey	Used ISWorld listserve for sampling
Mylonopoulos and Theoharakis [2001]	Opinion survey	Used ISWorld listserve for sampling
Walstrom and Hardgrave [2001]	Opinion survey	Used ISWorld listserve for sampling
Bharati and Tarasewich [2002]	Opinion survey	Used ISWorld listserve for sampling; only e-commerce journals sampled

[4] A journal basket is the sample of journals selected for running a particular analysis. Both opinion surveys and citation/content analysis use sampling baskets since the entire population of journals cannot be known or, at the very least, cannot be studied. It may be possible someday to study all of the published journals in the world, but for the time being, this remains an intractable research problem.

There are limitations to methodologies that evaluate journals based on perceptions. The main limitation is the anchor effect [Kahneman et al. 1982], i.e., the human tendency to make an estimate based on information provided, regardless of the accuracy or completeness of that information. The result of the anchor effect in this case is that respondents are more likely to rate a journal presented to them than they are to suggest and rate a new journal. Thus, journals not on the presented list are unlikely to be added and/or rated.

This causes three related problems. First, the initial set of journals is biased by the researcher's own subjective experience. As the IS research community is a fragmented adhocracy of multiple subcommunities, the experience of the researcher is unlikely to be equivalent to that of the survey population. Moreover, as survey respondents are unlikely to suggest alternate journals, their true perspectives of journal ranking are not elicited. Also, journals that the study researchers consider to be specific to IS are likely to appear in the final results, regardless of their true specificity to the research discipline.

Second, the survey literature builds upon itself. Thus, the set of journals suggested by one researcher tends to become the set of journals incorporated in a survey by future researchers. As a result, niche communities of IS researchers become more disenfranchised over time.

Third, even when the journals of niche communities are represented, the surveys give the majority perspective disproportionately greater weight than minority perspectives, and minorities are treated as outliers that deviate from the central tendency. Regardless of the niche community's efforts to declare a particular journal as relevant, the fact that they are a niche community means that their total voice is overwhelmed by the voice of the majority of respondents on the survey. Thus, even when researchers in niche areas of IS determine specific, prestigious journals, their views are not recognized [Athey and Plotnicki 2000].

Citation analysis suffers from similar limitations. Given a specific IS journal, the articles within it will be more representative of some IS subgroups and less representative of others [Gisvold 1999]. Thus, articles within a journal will tend to cite those articles related to a specific subgroup. Disparities between the citation rates of journals can also often be attributed to the role of the journals and their degree of specialization [Amin and Mabe 2000]. For example, articles in review and survey journals tend to be more heavily cited than articles in pure research journals. As a result, although citation analysis offers objective measures [Cheng et al. 1996], it yields biased measures of journal prestige [Kostoff 1997]. As MacRoberts and MacRoberts [1989] argue,

> When only a fraction of influences are cited, when what is cited is a biased sample of what is used, when influences from the informal level of scientific communication are excluded, when citations are not all the same type, and so on, the "signal" may be repetitive, but it is also weak, distorted, fragmented, incoherent, filtered, and noisy.

Assessment of Researcher-Production

As with journal ranking, researcher-production is assessed in two ways, either by counting the number of articles published by an author in a given basket of journals (often identified through an assessment of journal prestige), or through citation analysis. Table 2 presents prior literature that has rated IS researcher-production.

Table 2. Previous Work on Researcher-Production

Article	Purpose	# Journals	Method	Time Period	Top Authors
Vogel and Wetherbe [1984]	Determine top ranked institutions	15	Article count	1977–1983	N/A
Culnan [1986]	Determine IS research subfields	Used the *Social Science Citation Index*	Co-citation analysis	1972–1982	N/A
Van Over and Nelson [1986]	Determine ranking of journals, articles, and authors	16	Citation analysis	1980–1985	Nolan, Keen, Lucas, Benbasat, Zmud
Shim and English [1987]	Determine top ranked institutions and authors	5	Article count	1980–1986	Ives, Olson, Benbasat, Robey, DeSanctis
Bradbard and Niebuhr [1987]	Determine top ranked institutions	4	Article count	1979–1985	N/A
Jackson and Nath [1989]	Determine top ranked authors	10	Article count	1975–1987	Lucas, Benbasat, Wetherbe, Ives, Konsynski
Remus [1991]	Determine top ranked authors	4	Article count	1987–1991	Jarvenpaa, Ahituv, Beath, Doll, Gillenson, Straub, Culnan, Remus
Shim et al. [1991]	Determine ranking of journals and authors	8	Article count	1980–1988	Ives, Benbasat, DeSanctis, Robey, Lucas
Lending and Wetherbe [1992]	Determine ranking of journals and institutions	14	Article count	1984–1990	N/A
Trower [1995]	Determine ranking of authors	2	Article Count	1990–1994	Straub, Jarvenpaa, Benbasat, Orlikowski, Robey

Table 2. Previous Work on Researcher-Production (continued)

Article	Purpose	# Journals	Method	Time Period	Top Authors
Athey and Plotnicki [2000]	Determine ranking of institutions and authors	8	Article count	1992–1996	Igbaria, Clemons, Grover, King, Brynjolfsson
Trieschmann et al. [2000]	Explore relationship between editorships, funding and other factors on MBA and research performance	20 business journals	Article Count	1986–1998	N/A

As the "Top Authors" column of Table 2 demonstrates, rankings of researcher-production are highly variable. Three possible explanations include the lack of an accepted, unbiased measure of researcher-production [Van Over and Nelson 1986], the sensitivity of researcher-production measures to changing baskets of journals, and the effect of the time frame of analysis on researcher-production measures.

Researchers use incongruous and noncomparable techniques for measuring researcher-production. These methods may measure similar but distinct constructs, yet it is uncertain that this is the case. Table 3 presents extant measures of researcher-production and their inherent assumptions.

Researcher-production measures can also be sensitive to the basket of journals used in the analysis [Jackson and Nath 1989; Vogel and Wetherbe 1984]. This effect may be especially prevalent in a fragmented adhocracy where journals cater to specific subcommunities within the research discipline.

It is also likely that researcher-production measures are time sensitive. Prolific researchers may obtain tenure and cease to publish [Levin and Stephan 1991]. There is also a high degree of randomness associated with the publication cycle [Amin and Mabe 2000]. For example, it has been observed that in the years 1995 to 2001, acceptance rates at the *MIS Quarterly* ranged from 6 percent to 23 percent [Weber 2002]. Finally, even if every article has the same average time-to-publication, papers are still queued for publication at the journals. Thus, an author's researcher-production distribution is likely to resemble a Poisson distribution [Miller and Miller 1999].

As a measure of researcher-production, citation analysis shares all of the limitations of article counting. In addition, it has a bias toward possible incorrect (i.e., possibly flawed[5]) work, methodology papers, and journals in the English language, and is sensitive to changes in citation indices and errors due to inconsistencies in spelling [Kostoff 1997].

[5]Work that at least some other scientists view as flawed generates response articles and this very notoriety leads to even further citations. For example, Fergusson and Horwood's [1984] paper was reanalyzed by Fergusson and Horwood [1986] and Rigdon [1994]. Adams et al.'s [1992] analysis of TAM was later reanalyzed by Hendrickson et al. [1993]. Pitt et al.'s [1995] ServQual instrument was critiqued by Van Dyke et al. [1997].

Table 3. Article Count Measures and Assumptions

Measure*	Description	Assumptions	Used By
Normal-Count	Every coauthor of an article receives one point	All authors perform equivalent work. Articles with more authors are more valuable than articles with fewer authors	Athey and Plotnicki [2000]; Bradbard and Niebuhr [1987]; Im et al. [1998]; Jackson and Nath [1989]; Shim and English [1987]
Weighted-Count	Articles are given a reduced weight based on the number of authors. For example, Shim et al. [1991] give 1 point to solo-authored works, 0.7 points to the works with two authors, and 0.5 points to works with three authors.	The marginal contribution of an author is greater for works with fewer authors. Articles with more authors are weighted higher, but less than with “Normal-Count.”	Shim et al. [1991]
Adjusted-Count	Similar to weighted-count, except that the weight of each article is 1 divided by the total number of authors.**	Every article is equivalent. The contribution of every author is assumed to be equal.	Athey and Plotnicki [2000]; Im et al. [1998]; Jackson and Nath [1989]; Remus [1991]; Trower [1995]
Straight-Count	Only the first author is given credit for a work.	Every article is equivalent. The first author is assumed to be solely responsible for idea creation.	Jackson and Nath [1989]
Weighted-Page-Count	A page count is used to adjust the weight of the article.	Production is associated with article length.	Im et al. [1998]; Trieschmann et al. [2000]

*While these are the terms employed in the literature, a better term for normal-count could be simple-count, and straight-count may be more appropriately referred to as single-count It is difficult to change terminology once established in a field, so we simply offer this as an observation.

**As defined by Lindsey [1980], each author can be assigned weights depending on the author’s position in the author list. However, what is described is the most common implementation of adjusted count.

POSSIBLE CONFOUNDS IN THE RESEARCHER-PRODUCTION LITERATURE

The existence of such possible confounds to the measurement of researcher-production is a cause for concern. Because these rankings have an influence on so many dimensions of the IS academic community and because they are in widespread use, there are serious repercussions if they do not accurately represent their target phenomenon. Researcher-production measures are routinely used for such critical matters as (1) faculty performance evaluation [Anonymous 2002; Clarke 1995; Dutch Royal Society 1996; Robey 1995; Shim 2001], (2) recognition of prominent individuals and institutions within the IS community (see Table 2 for a list of such work), and (3) attraction of funding and students [Phelan 2000].

If such measures are unreliable and the findings not generalizable beyond the journal baskets and time frame used in the analyses, then any allocation of resources and prominence based on these measures will be based on highly constrained and possibly erroneous premises. It is useful, therefore, to evaluate these measures to determine the relative impact of confounding effects.

III. METHOD

In this research, we examine the IS-specificity of various journals, empirically contrast prolific and typical IS researchers, and test the validity and reliability of various researcher-production measures. Specific questions studied are presented in Table 4. To study these research questions, we developed a specialized methodology whereby we matched faculty who identified themselves as IS researchers with 58 peer-reviewed journals[6] that an academic institution or prior survey had identified as IS specific. Expressly, we entered in a database citation information for the 11 year period 1990 through 2000 and matched authors to directories or Web sites of IS faculty. The total number of authors upon whom we were able to gather requisite information was 1,929. The total number of articles gathered in the 58 selected journals was 26,024. This blending of the concepts of knowledge creators (IS research professionals) and knowledge dissemination (the journals) gives the current study its unique position in the IS researcher-production literature.[7]

The assumptions that underlie the approach are:

- **Researchers who see themselves as members of the IS community either list themselves in the online MISRC-ISWorld Faculty Directory,[8] are subscribed to the ISWorld mailing list, or are members of the IS faculty in their institution.** In this study, it is possible that the IS

[6]We employed journals instead of other research outlets such as conferences or books for comparability with past literature. Most research focuses exclusively on journals, however there are exceptions [e.g., Ridley 1997].

[7]This approach also strengthens scientometrics as a research discipline by linking the dissemination and creation of knowledge.

[8]For many years this directory was published and distributed free as a service to the IS field by McGraw-Hill. Today, as in the past, the list is maintained by Janice I. DeGross and David Naumann at the University of Minnesota, where it is affiliated with the MIS Research Center (MISRC) in the Carlson School of Management. The directory became global and has been accessible online through **http://webfoot.csom.umn.edu/isworld/facdir/default.htm** since about 1996. The directory is partially supported by funding from the Association for Information Systems.

faculty in a given institution is associated administratively with a school of information studies, a computer science school, or even an engineering school in addition to the most common administrative home, the business school. The important desideratum is that the department or individual publicly recognizes itself or him/herself to be about information systems by being on one of these two lists. This we believe to be an innovative and more accurate means of identifying members of the IS academic community.

- **Journals that publish articles by members of this self-designated scientific community are, *per force*, more or less "specific" to the field.** By identifying articles and journals in this way, we minimize the introduction of biases that originate from our respective subcommunities and ourselves.

- **Coverage must be broader than in existing studies.** One of the research questions under evaluation was the effect of time-frame on researcher-production measures. A time frame of 11 years was chosen because it was roughly twice as large as time-frames employed in many prior studies of researcher-production [Athey and Plotnicki 2000; Im et al. 1998; Remus 1991; Shim and English 1987; Trower 1995; Van Over and Nelson 1986].

RESEARCH QUESTIONS

For data analysis purposes, a series of statistical tests will address the research questions. Table 4 presents the research questions and the analytical method used for each question.

RQ1, the first research question—"How specific are various journals to IS research?"—can be answered by comparing the number of articles published in each journal to the number of articles published in the journal by IS researchers. If a journal only has a small number of articles published by IS researchers, this would suggest that either the journal does not welcome IS researchers or that IS researchers do not submit to the journal. In either case, we argue that the journal is not specific to the IS field, from the standpoint of being a usual publication outlet.[9]

RQ2, the second research question— "How dissimilar are prolific and typical IS researchers?" —can be answered by calculating the frequency distribution function of IS publications by researcher. As the actual frequency of publication could vary by the selected measure of production, by journal baskets, or by time, it is necessary to determine if the shape of the frequency distribution remains the same when these parameters are systematically varied. If the shape of the distribution remains the same, then a general statement contrasting prolific and typical IS researchers can be made [Banks 1998; Efron and Tibshirani 1993].[10] Prolific researchers were defined as the top 10 percent of researchers.

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[9]Note that this in no way conflicts with an appreciation of the diversity in IS research. A subcommunity must have a minimum number of members to be viable, and if fewer than, say, 10 researchers are interested in a topic, they likely do not have a sufficient critical mass to form a subcommunity.

[10]The logic of the analysis is similar to bootstrapping, or sensitivity analysis in simulation studies, i.e., by varying parameters that could influence the distribution of a statistic, we can analyze the statistic's robustness (i.e., reliability). However, unlike these two methods, parameters can only be varied across known values, there being no way of measuring the number of publications per author in unknown journals, or across an unknown time period.

Table 4. Research Questions and Analytical Methods

#	Research Question	Analytical Method
1	How specific are various journals to IS research?	Ratio of articles published by IS faculty in the journal to articles published in the journal (i.e., total publication frequencies of IS faculty per journal). Journals that publish at least 1% of articles in the data set are highlighted. Journals that publish at least 5% of articles in the data set are accorded additional emphasis.
2	How dissimilar are prolific and typical IS researchers in their publication rates?	Graph of the publication frequency distribution of articles published by author. To evaluate the consistency of the graph, systematically change the selected measure of researcher-production, journal baskets, and time period considered.
2a	Does seniority influence an author's prolificity?	ANOVA of publication rate by decade Ph.D. was awarded.
3b	What is the convergent validity of measures of researcher-production for prolific researchers?	Pearson correlations between measures of researcher-production for the top 10% of researchers by each measure of researcher-production. LISREL confirmatory factor analysis.
4	How reliable are measures of researcher-production across different baskets of journals?	Pearson correlations between baskets of journals for each measure of researcher-production.
4a	How reliable are measures of researcher-production across different baskets of journals for moderately productive researchers?	Pearson correlations between baskets of journals for all IS researchers in the sample. Compare for each measure of researcher-production.
4b	How reliable are measures of researcher-production across different baskets of journals for prolific researchers?	Pearson correlations between baskets of journals for the top 10% of researchers in the sample. Compare for each measure of researcher-production. The top 10% of researchers is identified by the measure of researcher-production.
5	How reliable are measures of researcher-production across time periods?	Pearson correlations between time periods. Compare for each measure of researcher-production.
5a	How reliable are measures of researcher-production across time periods for moderately productive researchers?	Pearson correlations between time periods for all IS researchers in the sample. Compare for each measure of researcher-production.
5b	How reliable are measures of researcher-production across time periods for prolific researchers?	Pearson correlations between time periods for the top 10% of researchers in the sample. Compare for each measure of researcher-production.

Given distinctions between prolific and typical IS researchers, it may be helpful to determine if researcher-production is related to seniority (research question 2a). To answer this question, an ANOVA is performed comparing researchers' production to the year they obtained their Ph.D.

The third, fourth and fifth research questions concern the effect on researcher-production evaluation of (RQ3) selected measures of production, (RQ4) journal baskets, and (RQ5) time. Each of these three research questions has two subquestions. The first subquestion concerns the effect of these measures on the evaluation of typical researchers and the second concerns the effect of these measures on the evaluation of prolific researchers. The third question can be answered through a LISREL confirmatory factor analysis [Jöreskog and Sörbom 1996], while the fourth and fifth questions can be answered through Pearson correlational analysis. In questions three to five, data analysis is performed while systematically varying measures employed, journal baskets, and time periods during which researcher-production was evaluated.

DATA COLLECTION

As noted above, two kinds of data were combined in this study: (1) data on journal articles, and (2) data on IS faculty members. Unlike prior research that focused only on journals perceived as top-tier, an attempt was made to capture as broad a list of journals as possible to reflect the diversity of the information systems field. To reduce bias in the sampling of journals, multiple sources were used to identify IS journals, including preexisting surveys [Avgerou et al. 1999; Cheng et al. 1996, 1999; Doke and Luke 1987; Hardgrave and Walstrom 1997; Koong and Weistroffer 1989; Mylonopoulos and Theoharakis 2001; Van Over and Nelson 1986; Vogel and Wetherbe 1984; Walstrom and Hardgrave 2001; Walstrom et al. 1995; Whitman et al. 1999], new journal issue announcements on ISWorld [IS World 2001], and the target journal lists of various universities and institutions including those of the Australian National University [Clarke 1995], Georgia State University [Robey 1995], University of Houston [Anonymous 2002], Mississippi State University [Shim 2001], and the Dutch Royal Society [Dutch Royal Society 1996].[11]

A total of 156 journals were identified from these sources (presented in Appendix A), and bibliographic information for these journals from the 11 year period 1990 through 2000 was collected from online sources including Proquest [Bell and Howell Inc. 2001], EBSCOHost [EBSCOHost 2001], CARL Uncover [CARL Corporation 2001], Computer Science Bibliographies [Achilles 2001], Beebe's bibliographies [Beebe 2001], DBLP bibliographies [Ley 2001], HCI Bibliographies [Perlman 2001], journal Web sites, and journal announcements on ISWorld. Only data on research articles and research notes were collected for this study; data on editorials were not gathered nor were books or any other scholarly product.

Intensive data collection and cleaning for the 26,000 plus articles and 1,900 plus authors took over one year and more than 1,000 hours. In spite of this extensive effort, however, complete bibliographic information for the time period could be obtained for only 58 of the 156 journals. For this massive amount of data, the use of paper sources and manual data coding would have been intractable, given available researcher time and funding. A decision was made, therefore, to use only electronic sources.

[11]Our objective in creating this initial list was to have a wide range of journals from different representative sources. The variety of the sources ensures that this goal was met.

Table 5 shows the characteristics of the journals studied. Appendix B shows characteristics of journals where only incomplete information could be obtained. Appendices C and D break down the number of articles and authors published by year.

Table 5. Journals Used in the Current Study

	No	Journal (Code)†	No. of IS Faculty Published	No. of IS Articles	Percentage of IS Articles
*	*1*	*Accounting, Management and Information Technology* (AMIT, now *Information & Organization*)	96	77/122	.631
*	2	*ACM Computing Surveys* (SURV)	24	32/666	.048
*	*3*	*ACM Letters/Transactions on Programming Languages and Systems* (TOPLAS)	10	13/387	.034
	4	*ACM Transactions on Computer Systems*	0	0/136	.000
*	*5*	*ACM Transactions on Computer-Human Interaction* (TOCHI)	22	15/87	.172
*	*6*	*ACM Transactions on Database Systems* (TODS)	39	32/169	.189
	7	*ACM Transactions on Design Automation of Electronic Systems* (TODAES)	1	1/114	.009
	8	*ACM Transactions on Graphics* (TOG)	3	3/178	.017
	9	*ACM Transactions on Information and System Security* (TISSEC)	1	1/30	.033
*	*10*	*ACM Transactions on Information Systems* (TOIS)	54	46/171	.269
	11	*ACM Transactions on Mathematical Software* (TOMS)	7	7/341	.021
*	*12*	*ACM Transactions on Modeling and Computer Simulation* (TOMACS)	9	10/146	.068
	13	*ACM Transactions on Software Engineering and Methodology* (TOSEM)	7	4/119	.034
*	*14*	*Acta Informatica* (ACTA)	12	14/364	.038

Table 5. Journals Used in the Current Study (continued)

	No	Journal (Code)[†]	No. of IS Faculty Published	No. of IS Articles	Percentage of IS Articles
*	*15*	*Artificial Intelligence*(AI)	21	24/965	.025
*	*16*	*Communications of the ACM* (CACM)	347	351/1923	.183
*	*17*	*Communications of the AIS* (CAIS)	89	74/81	.914
*	*18*	*Data and Knowledge Engineering* (DKE)	62	84/402	.209
*	*19*	*Electronic Markets*	58	73/278	.263
*	*20*	*Harvard Business Review*	46	63/1371	.046
*	*21*	*IEEE Computer* (COMP)	79	92/1802	.051
*	*22*	*IEEE Computer Graphics and Applications* (CGA)	14	28/821	.034
	23	*IEEE Computing in Science and Engineering/Computational Science and Engineering (CSE)*	2	3/196	.015
*	*24*	*IEEE Internet Computing*	17	17/349	.049
	25	*IEEE Parallel and Distributed Technology* (PDS)	1	1/148	.007
*	*26*	*IEEE Software* (SOFT)	70	87/1192	.073
*	*27*	*IEEE Transactions on Computers* (TOCS)	26	34/1611	.022
*	*28*	*IEEE Transactions on Engineering Management* (TEM)	153	156/443	.352
	29	*IEEE Transactions on Evolutionary Computation (TEC)/IEEE Transactions on Fuzzy Systems*	3	4/334	.012
*	*30*	*IEEE Transactions on Knowledge and Data Engineering* (TKDE)	101	125/767	.163
*	*31*	*IEEE Transactions on Neural Networks* (TNN)	6	12/647	.019
*	*32*	*IEEE Transactions on Parallel and Distributed Systems* (TPDS)	13	16/1026	.016

Table 5. Journals Used in the Current Study (continued)

	No	Journal (Code)†	No. of IS Faculty Published	No. of IS Articles	Percentage of IS Articles
*	*33*	*IEEE Transactions on Software Engineering* (TSE)	87	85/928	.092
	34	*IEEE Transactions on Visualization and Computer Graphics* (TVCG)	2	2/70	.029
	35	*IEEE/ACM Transactions on Networking* (TON)	6	8/536	.015
*	*36*	*Information Systems* (IS)	70	79/372	.212
*	*37*	*Information Systems Frontiers* (ISF)	44	38/54	.704
*	*38*	*Information Systems Research* (ISR)	252	202/212	.953
*	*39*	*International Journal of Electronic Commerce* (IJEC)	89	80/100	.800
*	*40*	*International Journal of Human Computer Interaction* (IJHCI)	14	12/189	.063
*	*41*	*International Journal of Man-Machine Studies/International Journal of Human Computer Studies* (IJHCS)	114	109/702	.155
*	*42*	*Journal of Algorithms* (JALG)	9	15/563	.027
*	*43*	*Journal of Computer and System Science* (JCSS)	12	24/587	.041
*	*44*	*Journal of Electronic Commerce Research* (JECR)	14	10/16	.625
*	*45*	*Journal of Global Information Management* (JGIM)	96	78/102	.765
*	*46*	*Journal of Information Technology Theory and Application* (JITTA)	6	6/10	.600
*	*47*	*Journal of Management Information Systems* (JMIS)	423	392/426	.920
*	*48*	*Journal of Strategic Information Systems*	141	183/257	.712
*	*49*	*Journal of Systems and Information Technology*	15	13/18	.722
	50	*Journal of the ACM* (JACM)	9	10/390	.026

Table 5. Journals Used in the Current Study (continued)

	No	Journal (Code)†	No. of IS Faculty Published	No. of IS Articles	Percentage of IS Articles
*	*51*	*Journal of the AIS* (JAIS)	18	8/10	.800
*	*52*	*Knowledge and Information Systems* (KIS)	5	6/46	.130
*	*53*	*Management Science* (MS)	435	574/1262	.455
*	*54*	*MIS Quarterly* (MISQ)	309	235/245	.959
*	*55*	*SIAM Journal on Computing* (SJOC)	21	25/883	.028
*	*56*	*Sloan Management Review*	89	106/343	.309
*	*57*	*The DATA BASE for Advances in Information Systems* (DB)	190	127/151	.841
*	*58*	*VLDB Journal* (VLDB)	18	20/166	.120
		Total		3948/26024	

* Journal was found to be "specific" to the IS research discipline. Journal was considered specific if it had at least 11 IS authors, or 11 IS articles, or at least 5% of articles are by IS authors, all over the 11 year period.

[dark shading] Contains at least 1% of IS articles in the sample.

[light shading] Contains at least 5% of IS articles in the sample.

†An anonymous reviewer performed a portion of this analysis. We gratefully acknowledge this contribution.

Data on IS faculty was collected from four sources. IS institutions were identified from the MISRC directory [DeGross et al. 1989] and the ISWorld list serve [IS World 2001]. Web sites of institutions represented in either source were then visited to gather further information on IS faculty members. Additional faculty and institution data was obtained by consulting the ISWorld Net Faculty Directory. A total of 2,543 faculty members were identified using this method of whom 1929 published in the 58 journals for the period 1990 through 2000. The year of graduation of 1,207 of these 1,929 faculty was also obtained from the ISWorld Net Faculty Directory. Table 6 presents the breakdown of faculty by represented countries.

For the purpose of this study, IS articles were defined as any article in the 58 journals with at least one IS author. To identify such articles, the faculty data was cross-indexed by the journal article data. The distribution of IS articles is presented in Table 5.

Table 6. Breakdown of Faculty by Country

No.	Country	No. of Faculty
1	Australia	51
2	Austria	8
3	Azerbaijan	1
4	Belgium	6
5	Canada	69
6	Denmark	12
7	Egypt	3
8	Finland	14
9	France	16
10	Germany	32
11	Greece	4
12	India	3
13	Ireland	5
14	Israel	8
15	Italy	11
16	Japan	4
17	Korea	9
18	Kuwait	1
19	Malaysia	1
20	Mexico	3
21	Netherlands	24
22	New Zealand	20
23	Norway	9
24	Peoples Republic of China	27
25	Portugal	2
26	Saudi Arabia	1
27	Singapore	26
28	Slovenia	2
29	South Africa	1
30	Spain	6
31	Sweden	5
32	Switzerland	9
33	Thailand	1
34	Tunisia	1
35	Republic of China	12
36	United Kingdom	73
37	USA	1449

DATA ANALYTICAL PROCEDURE

To determine the effect of basket size on the evaluation of journal production measures, journals were organized into four baskets containing differing numbers of journals. The four groupings were as follows: (1) a basket of four journals commonly utilized in IS production research (*MIS Quarterly*, *Information Systems Research*, *Communications of the ACM*, and *Journal of Management Information Systems*) (see Table 1 for relevant citations), (2) a basket of 10 journals commonly cited as high ranking journals (the four journals from group 1, plus *ACM Transactions on Database Systems, IEEE Transactions on Software Engineering, IEEE Transactions on Knowledge and Data Engineering, Accounting, Management and Information Technology, Management Science, and ACM Computing Surveys*) (see Table 1 for relevant citations), (3) a basket of the 11 journals that (in our analysis) contained at least 100 IS articles (the four journals from group 1 plus *Management Science*, *Journal of Strategic Information Systems*, *Sloan Management Review*, *IEEE Transactions on Engineering Management*, *IEEE Transactions on Knowledge and Data Engineering*, *The Database of Advances in Information Systems*, and the *International Journal of Human Computer Studies*), and (4) a basket of all 58 journals.

Publication Frequencies in the IS Research Community

To evaluate RQ1, the specificity of journals to the IS community, and to estimate the IS researcher-production frequency distribution, four kinds of analyses were performed: (1) an analysis of the ratio of IS publications to other publications within each journal (presented in Table 5), (2) an analysis of publication frequencies for the four journal baskets (presented in Figure 1), (3) a breakdown of publication frequency for the 58-journal basket by the year the Ph.D. was obtained (presented in Table 7), and (4) an ANOVA comparing publication frequency by the decade the PhD was obtained.

Table 5 shows the percentage of IS articles published in each journal for the period 1990 through 2000. This table reveals that many journals considered to be prestigious are not highly specific to the IS community. Premier quality journals such as the *Journal of the ACM* and *ACM Computing Surveys* allocate less than 5 percent of their article count to IS-type research. Some, such as the *ACM Transactions on Computer Systems,* have no IS representation at all. While these numbers are likely to be biased (i.e., due to IS faculty unidentified in our data gathering), they are nonetheless striking. Despite bias, over 90 percent of articles in *Information Systems Research*, *Journal of Management Information Systems*, and the *MIS Quarterly* had at least one IS author. However, for the *Journal of the ACM*, less than one article per year could be identified as having an IS author. In many cases, authors in journals with low specificity often had joint appointments with a computer science department. For example, the three IS authors represented in the *ACM Transactions on Graphics* all had such joint appointments. Thus, these articles could have been written to target a computer science, as opposed to information systems, audience and may not be IS articles.

The breakdown of articles in Table 5 supports the conjecture that the anchor effect has an impact on journal rankings. For example, the *Journal of the ACM* is often rated as a premier quality IS journal, sometimes outranking other ACM publications [e.g., Gillenson and Stutz 1991; Whitman et al. 1999]. From the period 1990 through 2000, however, fewer than one IS article per year appeared

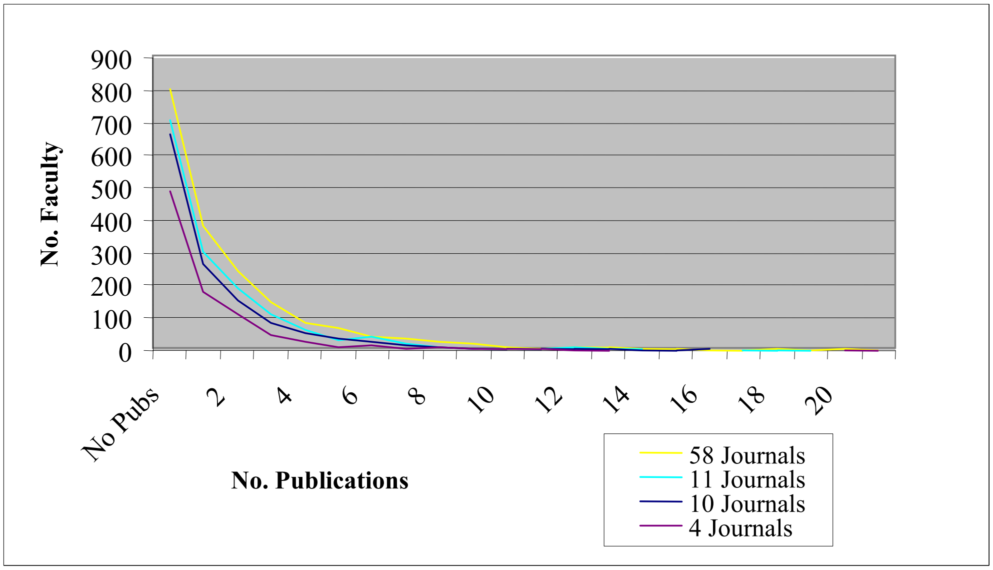

Figure 1. Publication Frequency by Normal Count[12]

in the journal. This suggests that IS researchers may not be sufficiently familiar with this journal to rate it effectively. In brief, it is not truly an IS specific journal. That is, it is not a "usual" publication outlet for IS researchers.[13]

Figure 1 presents the publication frequency of faculty across all four journal baskets by normal-count. As the figure demonstrates (and in accordance with studies on the nature of science [de Solla Price 1986]), researcher-production follows an inverse exponential distribution, regardless of the size of the journal basket. Please note how closely the shape of the curves match, irrespective of size of journal basket.

Also interesting, and reinforcing Athey and Plotnicki's [2000] arguments, the data show that the vast majority of IS researchers have published between one and five articles over the 11-year period. Almost two-thirds have published two or fewer articles. This publication frequency distribution was similar for all of the other publication count measures employed.

[12]While some researchers had more than 22 journal publications, they do not appear visually on a line graph where the major unit of the Y axis is 100. For the basket containing 58 journals, 1 author had 24, 25, 27, 29, 31, and 42 articles respectively. For the basket containing 11 journals, 1 author had 24, 25, 29, and 39 articles respectively. For the basket containing 10 journals, 2 authors had 23 articles, and 1 author had 35 articles. For the basket containing 4 journals, 1 author had 35 articles.

[13]The present study focuses primarily on journals as vehicles of knowledge dissemination. However, journals can also be viewed as vehicles of knowledge creation. From this perspective, it would be interesting to determine which journals are most heavily read and cited. It would furthermore be enlightening to determine the reference and contributing disciplines that form the basis of IS knowledge creation.

While Figure 1 presents the frequency distribution across all IS faculty, it does not consider the effect of seniority on the frequency distribution. Faculty that have been active within the IS community for a longer period have greater experience and more contacts and research assistants [Daft et al. 1987]. This could lead to a larger number of publications. Alternatively, senior faculty may be drawn away from research because of other university obligations [Levin and Stephan 1991] and, therefore, their publication frequency could decline. An analysis of publications across all 58 journals by year of graduation (Table 7) using descriptive statistics revealed that except for a slight increase in researcher-production, the inverse exponential publication distribution was consistent across seniority levels. A visual analysis of the breakdown (Figure 2) suggested that the distribution of researcher-production did not vary materially by year of publication.

To test whether there were significant differences between graduation cohorts, we performed an ANOVA on the data. Six groups were defined, five based on the decade in which the Ph.D. was awarded, and one for researchers with unknown graduation dates. The result was statistically significant ($F = 17.072$, df = 1928, $p < .05$), but not practically so (adjusted $\eta^2 = .04$). Furthermore, *post hoc* t-tests on the data using Bonferroni's adjustment revealed that significant differences ($p < .05$) were primarily driven by two groups: (1) researchers with an unknown date of graduation and (2) researchers graduating between the period 1990 through 2000. The former group includes relatively fewer eminent researchers, and the latter had fewer opportunities to publish in the given time frame.[14]

Thus, given this explanation of the original findings, we interpret this to mean that there is no strong evidence to support seniority as a predictor of a researcher's frequency of publication. Similarly, the canard that seniority in the field inevitably leads to lower rates of production because they are serving in other professional roles also finds no support in this analysis.

Table 7. Publication Frequency by Year of Graduation*

Year of Graduation	Mean (StdDev)	Median	Min	Max	N
1950–1959	3.800 (5.718)	1	1	14	5
1960–1969	5.157 (7.245)	3	1	42	51
1970–1979	3.457 (3.783)	2	1	27	197
1980–1989	4.040 (4.023)	3	1	24	401
1990–2000	2.645 (2.786)	2	1	31	552
Unknown	2.553 (2.496)	2	1	19	723

*One researcher who graduated in the 1940s and had four publications is omitted from the table and the analysis.

[14] There was also a significant difference between researchers who graduated in the 1960s and researchers who graduated in the 1970s. However, this result was driven primarily by the output of a single researcher who graduated in the 1960s having over 40 journal publications in the period of assessment. As we had relatively little data on researchers who graduated in the 1960s, this single outlier radically shifted the mean for the 1960s researchers. In fact, this outlier was so powerful that when this researcher's data was omitted, the overall results were no longer statistically significant.

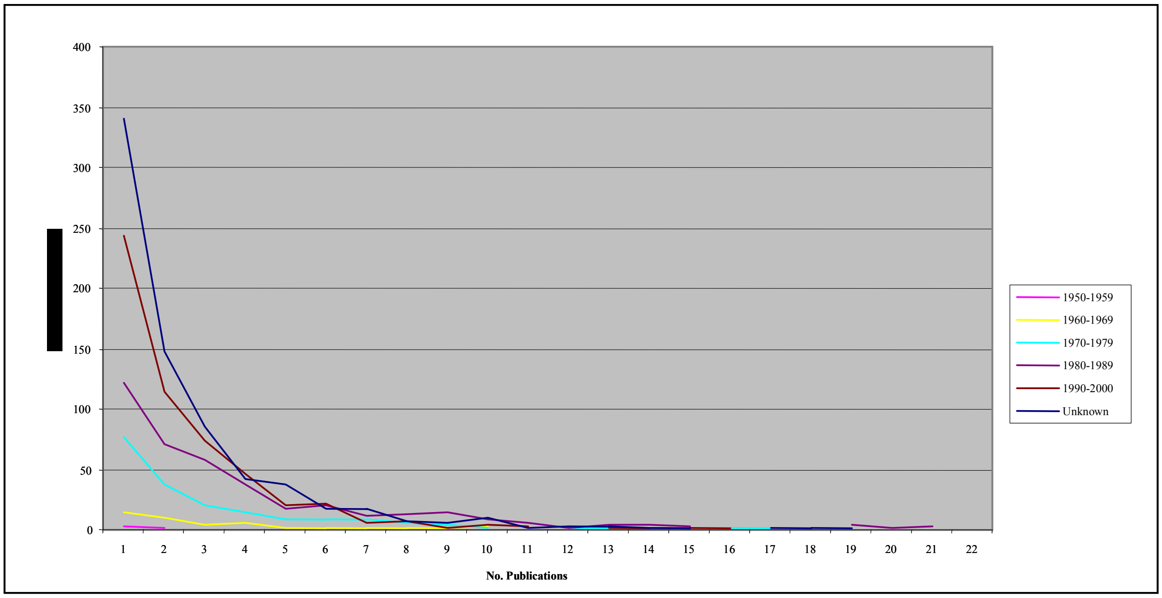

Figure 2. Publication Frequency by Normal Count and Year of Graduation

Evaluation of IS Researcher-Production Measures

IS researcher-production measures are assessed next. This was accomplished by testing (1) the convergent validity of the measures, (2) sensitivity of the measures to various journal baskets, and (3) effect of the analysis time frame on measures of productivity. The inverse exponential frequency distribution (presented in Figure 1) demonstrated that an analysis of typical researchers (i.e., those not in the top 10 percent, or 90 percent of IS researchers)[15] would likely yield results that would not be applicable to prolific researchers. For typical researchers, the probability of publishing an additional article (i.e., the slope of the line tangent to the frequency distribution) dropped asymptotically. However, for prolific researchers, the probability of publishing another article was essentially linear [de Solla Price 1986]. Since the analysis of publication frequencies demonstrated that the publication distribution of prolific researchers was not congruous with that of typical researchers, all analyses performed on typical researchers were replicated against the top 10 percent of researchers. The figure of 10 percent was established as a cutoff to balance two methodological issues. First, it was necessary to include a sufficient number of prolific researchers for statistical analysis. However, the number of prolific researchers had to be constrained to preserve the linear distribution of publications. Note that the top 10 percent of the entire sample by normal-count included 199 individuals, all of whom had seven or more publications. This group continues to reflect a linear distribution of publications.

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[15]Our definition of a typical researcher is based on a visual inspection of the production distribution and is somewhat arbitrary. However, it should be immediately obvious that the patterns described also hold true for any reasonable definition of a typical researcher.

Two related statistical techniques, Pearson correlation and LISREL, were selected for data analysis. Both techniques required data to conform to a multivariate normal distribution [Hair et al. 1998]. As the original distributional form of data concerning all researchers resembled an inverse exponential distribution, an inverse square root transformation function $\frac{1}{\sqrt{x}}$ was used. This transformation was preferred over alternate transformations involving logarithms, as a substantial portion of the data had a value of one article published. A logarithmic transformation would have been unable to successfully transform such data.

Convergent Validity: To examine the convergent validity of the various measures, the normal-count, straight-count, and adjusted-count for each journal basket was calculated. Weighted-count was not used because many articles had more than three authors. Shim et al. [1991], who proposed the weighted-count, only defined weights for articles with three or fewer authors. Count by page number was not used for two reasons. First, formulas for page number count have not been consistently applied between researchers. Second, page numbers for several journals could not be obtained.

The Pearson correlation of these measures was then obtained and employed for the LISREL analysis.[16] The factor model presented in Figure 3 was used for the LISREL analysis. To allow for statistical model identification, the variance of the production construct was set to 1. Since production is a latent construct, setting its variance to an arbitrary value does not affect the testing of underlying theoretical model(s) [Jöreskog and Sörbom 1996].

Sensitivity to Changes in Journal Baskets: To evaluate the sensitivity of the measures to changes in the journal baskets for the baskets containing 4, 10, and 11 journals, the production measures of *n* baskets containing *n*-1 journals were correlated to each of the journal baskets. For example, for the four journal basket, measures were correlated against four baskets containing three journals, (*ISR, MISQ, JMIS*), (*CACM, MISQ, JMIS*), (*CACM, ISR, JMIS*), and (*CACM, ISR, MISQ*).

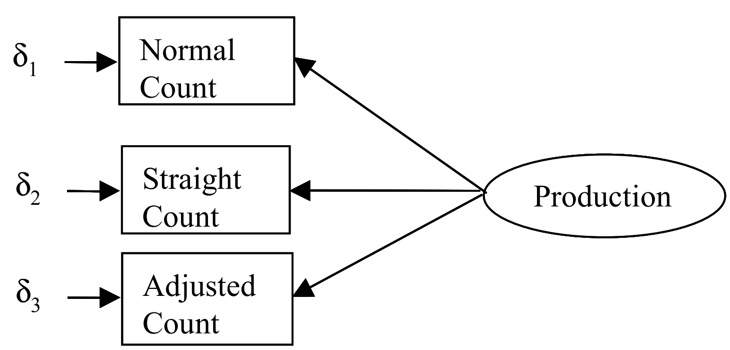

Figure 3. LISREL Factor Model

[16]Sometimes the analysis of correlation matrices in SEM produces inaccurate standardized error variances [Cudeck 1989]. This is not one of those cases. An analysis employing covariance matrices produces identical results.

For the basket containing 58 journals, only a sensitivity analysis for the 11 journals from the 11-journal basket is presented. The results for the remaining 47 journals is similar to that for the 11 journals, and does not add to our understanding of the sensitivity of research measures to changes in the journal basket. In most cases, journals not presented behaved similarly to the journals presented. In other cases, the journals had few publications, and as a result negligibly impacted the sensitivity analysis. These 11 journals were found to be representative of the 58-journal basket and were used to compare sensitivities among baskets.

Effect of Time Frame: To measure the effect of the analysis time frame on the measures, the three measures of researcher-production were compared on the three journal baskets over six-year intervals. Six-year intervals were employed for three reasons. First, most existing production research [e.g., Athey and Plotnicki 2000; Im et al. 1998; Remus 1991; Shim and English 1987; Trower 1995; Van Over and Nelson 1986] employ time frames of six years or less. Second, an analysis time frame that was half of our data collection time frame (i.e., 1990 through 2000, 11 years) enabled us to strike a healthy balance between the inter-frame (e.g., comparing the period 1990–1995 to the period 1995–2000) and intra-frame (i.e., the six year period) components of the analysis. Third, tenure decisions are often made based on the first six years of a researcher's career. Thus, our results become relevant for tenure decisions.

The measures were compared over the periods 1990–1995, 1991–1996, 1992–1997, 1993–1998, 1994–1999, and 1995–2000. The period 1990–1995 was chosen as the base year for comparison. By selecting a base time period on one end of the scale, we were able to measure the effect of a five-year difference in the assessment period. Were we to have selected a base time period in the middle of the scale, only the effect of a three-year difference in assessment period would have been obtained.

IV. RESULTS

CONVERGENT VALIDITY OF IS RESEARCHER-PRODUCTION MEASURES

Tables 8, 9, 10, and 11 present correlation matrices (reported as *R*) of the measures on the baskets containing 4, 10, 11, and 58 journals respectively. For each column, correlation matrices are calculated only for the specific sample described. Thus, in the column "Top 10% by Normal-Count," the 199 most prolific authors by normal-count were employed as the sample. Table 12 presents the standardized error variance (reported as R^2) computed by LISREL 8.0 [Jöreskog and Sörbom 1996], and Appendix E presents means and standard deviations. As Table 12 demonstrates, adopting different measures of researcher-production has a moderate impact on the assessment of the typical researcher.[17] Employing different measures of researcher-production explains between 10 percent and 35 percent of the variance.

However, for determining the most prolific researchers, the measures are highly unstable representations of production. In the LISREL analysis, many of the standardized error variances are

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[17]In defining *moderate* for this research, it is important to view this from the standpoint of a researcher who is being assessed by an administrator employing measures of researcher-production. A 35 percent error variance means that 35 percent of a researcher's assessment originates from the measure, instead of from the researcher's effort. For this research, $R^2 \leq 0.10$ is considered low, $0.10 < R^2 \leq 0.40$ is moderate, and $R^2 > 0.40$ is high.

below zero, some even exceeding –1. A standardized error variance less than 0 means that the measure has somehow explained more than 100 percent of the variance in the production construct, which is theoretically impossible. Thus the measures together are poor surrogates of production for highly prolific researchers. As a LISREL statistical test of construct validity requires at least three measures [Bekker et al. 1994],[18] it is not possible for us to identify the poor measures.

Table 8. Relationship Between Measures: Basket of Four Journals

	Researcher Grouping							
	All Researchers		**Top 10% based on Normal-Count**		**Top 10% based on Straight-Count**		**Top 10% based on Adjusted-Count**	
	Normal-Count	**Straight-Count**	**Normal-Count**	**Straight-Count**	**Normal-Count**	**Straight-Count**	**Normal-Count**	**Straight-Count**
Straight-Count	0.715		0.313		0.767		0.152	
Adjusted-Count	0.765	0.845	0.787	0.718	0.965	0.902	0.839	0.551

Table 9. Relationship Between Measures: Basket of 10 Journals

	Researcher Grouping							
	All Researchers		**Top 10% based on Normal-Count**		**Top 10% based on Straight-Count**		**Top 10% based on Adjusted-Count**	
	Normal-Count	**Straight-Count**	**Normal-Count**	**Straight-Count**	**Normal-Count**	**Straight-Count**	**Normal-Count**	**Straight-Count**
Straight-Count	0.786		0.770		0.845		0.961	
Adjusted-Count	0.754	0.868	0.330	0.755	0.114	0.535	0.722	0.877

[18]The "rule of three" states that a factor is statistically identified only when it has at least three items. The covariance between the first two items is used to *measure* the variance of the factor. The covariance with the third item is used to *test* the variance of the factor. In a model with multiple factors, it is possible to employ only two items. The third item is then the covariance between the various factors.

Table 10. Relationship Between Measures: Basket of 11 Journals

	Researcher Grouping							
	All Researchers		Top 10% Based on Normal-Count		Top 10% Based on Straight-Count		Top 10% – Adjusted-Count	
	Normal-Count	Straight-Count	Normal-Count	Straight-Count	Normal-Count	Straight-Count	Normal-Count	Straight-Count
Straight-Count	0.801		0.777		0.857		0.970	
Adjusted-Count	0.747	0.867	0.394	0.793	0.117	0.574	0.745	0.876

Table 11. Relationship Between Measures: Basket of 58 Journals

	Researcher Grouping							
	All Researchers		Top 10% based on Normal Count		Top 10% based on Straight Count		Top 10% based on Adjusted Count	
	Normal-Count	Straight-Count	Normal-Count	Straight-Count	Normal-Count	Straight-Count	Normal-Count	Straight-Count
Straight-Count	0.822		0.764		0.845		0.965	
Adjusted-Count	0.767	0.881	0.307	0.746	0.118	0.546	0.715	0.865

Table 12. Estimated LISREL Error Variances on Construct "Production"

	Normal-Count (δ_1)	Straight-Count (δ_2)	Adjusted-Count (δ_3)
All Researchers			
4 Journals	0.35	0.21	0.10
10 Journals	0.32	0.10	0.17
11 Journals	0.31	0.07	0.19
58 Journals	0.28	0.06	0.18
Top 10% — Normal Count			
4 Journals	0.66	0.71	-0.81
10 Journals	0.66	-0.76	0.68
11 Journals	0.61	-0.56	0.60
58 Journals	0.69	-0.86	0.70
Top 10% — Straight Count			
4 Journals	0.18	0.28	-0.13
10 Journals	0.82	-2.97	0.93
11 Journals	0.83	-3.20	0.92
58 Journals	0.82	-2.91	0.92
Top 10% — Adjusted Count			
4 Journals	0.77	-0.90	-2.04
10 Journals	0.21	-0.17	0.34
11 Journals	0.18	-0.14	0.33
58 Journals	0.20	-0.17	0.36

SENSITIVITY TO JOURNAL BASKET

Tables 13, 14, 15, and 16 present the results of the journal basket sensitivity analysis. As the tables demonstrate, the removal of a single journal does not materially change the production measure of the typical IS researcher, but can have a tremendous impact on the production measure of those who are identified as prolific IS researchers.

To assess the impact of each measure, we calculated the error variance associated with each measure by employing the formula 1-R^2, where R is the Pearson coefficient in the tables. R^2 measures the common standardized variance between two measures, thus (1-R^2) measures the unexplained, or error, variance. Traditionally, the error variance has little theoretical value, because it reflects the unknown. However, in this case, the error variance captures differences in measurement caused entirely by computation. For example, for Table 16, under the column normal count, for the top 10 percent of researchers by normal count, the variance explained by dropping *JMIS* would be $(1 - 0.576^2)$ or 0.668. Note that variations of this formula are employed in traditional statistical analyses to estimate error variance. For example, in LISREL or other covariance-based SEM techniques, the formula is $(1-\lambda^2)$, where λ denotes the standardized loading (i.e., correlation) with the factor.

In all of the tables, the removal of *Journal of Management Information Systems* causes the production measures of prolific researchers to change dramatically. In the case of the basket of 58 journals (Table 16), removing *JMIS* explained 66.8 percent of the variance for the normal-count measure on the top 10 percent of researchers by normal-count. This is because a large number of the most prolific researchers have published a great deal of their work in this single journal. When this journal is removed from a basket, their production drops substantively. Several other journals share this property, for example, the *Journal of Strategic Information Systems* and *Management Science*.

The tables also illustrate that measures of researcher-production have varying sensitivities. For measuring the general research population (i.e., all researchers), the adjusted-count was the least sensitive measure. However, for evaluating the top 10 percent of the research population, the straight-count was the least sensitive measure. Interestingly, for the case where the top 10 percent of the research population was determined by straight-count, the normal-count became the best measure.

Table 13. Relationship Between Measures: Basket of Four Journals

	Normal-Count	Straight-Count	Adjusted-Count
All Researchers			
Remove CACM	0.900	0.877	0.938
Remove ISR	0.924	0.903	0.952
Remove JMIS	0.810	0.828	0.879
Remove MISQ	0.904	0.875	0.936
Top 10% by Normal-Count			
Remove CACM	0.682	0.807	0.653
Remove ISR	0.747	0.831	0.725
Remove JMIS	0.402	0.745	0.491
Remove MISQ	0.692	0.822	0.756
Top 10% by Straight-Count			
Remove CACM	0.711	0.615	0.653
Remove ISR	0.796	0.688	0.751
Remove JMIS	0.622	0.441	0.486
Remove MISQ	0.724	0.672	0.702
Top 10% by Adjusted-Count			
Remove CACM	0.737	0.749	0.672
Remove ISR	0.807	0.805	0.762
Remove JMIS	0.400	0.619	0.312
Remove MISQ	0.725	0.780	0.714

Table 14. Relationship Between Measures: Basket of 10 Journals

	Normal-Count	Straight-Count	Adjusted-Count
All Researchers			
Remove AMIT	0.988	0.981	0.992
Remove COMPSURV	0.998	0.996	0.999
Remove TODS	0.995	0.997	0.996
Remove CACM	0.935	0.926	0.952
Remove TKDE	0.985	0.979	0.992
Remove TSE	0.985	0.988	0.988
Remove ISR	0.958	0.945	0.972
Remove JMIS	0.890	0.904	0.920
Remove MS	0.941	0.937	0.960
Remove MISQ	0.938	0.920	0.958
Top 10% by Normal-Count			
Remove AMIT	0.934	0.970	0.950
Remove COMPSURV	0.970	0.995	0.962
Remove TODS	0.958	0.996	0.962
Remove CACM	0.610	0.865	0.697
Remove TKDE	0.817	0.952	0.872
Remove TSE	0.809	0.983	0.732
Remove ISR	0.745	0.879	0.784
Remove JMIS	0.423	0.882	0.546
Remove MS	0.553	0.887	0.583
Remove MISQ	0.696	0.879	0.724
Top 10% by Straight-Count			
Remove AMIT	0.923	0.857	0.898
Remove COMPSURV	0.984	0.967	0.977
Remove TODS	0.984	0.972	0.979
Remove CACM	0.677	0.581	0.619
Remove TKDE	0.857	0.810	0.831
Remove TSE	0.984	0.964	0.978
Remove ISR	0.782	0.725	0.738
Remove JMIS	0.677	0.564	0.577
Remove MS	0.671	0.617	0.625
Remove MISQ	0.739	0.700	0.669

Table 14. Relationship Between Measures: Basket of 10 Journals (continued)

	Normal-Count	Straight-Count	Adjusted-Count
Top 10% by Adjusted-Count			
Remove AMIT	0.950	0.973	0.937
Remove COMPSURV	0.983	0.992	0.980
Remove TODS	0.978	0.990	0.972
Remove CACM	0.644	0.781	0.562
Remove TKDE	0.839	0.902	0.816
Remove TSE	0.961	0.976	0.922
Remove ISR	0.785	0.846	0.734
Remove JMIS	0.545	0.712	0.422
Remove MS	0.622	0.779	0.566
Remove MISQ	0.704	0.822	0.626

Table 15. Relationship Between Measures: Basket of 11 Journals

	Normal-Count	Straight-Count	Adjusted-Count
All Researchers			
Remove CACM	0.947	0.936	0.961
Remove TEM	0.974	0.971	0.983
Remove TKDE	0.987	0.992	0.987
Remove ISR	0.967	0.948	0.980
Remove IJHCS	0.985	0.977	0.989
Remove JMIS	0.914	0.924	0.936
Remove JSIS	0.977	0.974	0.981
Remove MS	0.931	0.945	0.949
Remove MISQ	0.955	0.940	0.972
Remove SMR	0.982	0.984	0.985
Remove DB	0.981	0.969	0.978

Table 15. Relationship Between Measures: Basket of 11 Journals (continued)

	Normal-Count	Straight-Count	Adjusted-Count
Top 10% by Normal-Count			
Remove CACM	0.645	0.874	0.675
Remove TEM	0.757	0.979	0.716
Remove TKDE	0.930	0.982	0.960
Remove ISR	0.768	0.897	0.821
Remove IJHCS	0.958	0.969	0.960
Remove JMIS	0.526	0.903	0.626
Remove JSIS	0.736	0.952	0.634
Remove MS	0.522	0.898	0.521
Remove MISQ	0.809	0.919	0.852
Remove SMR	0.845	0.966	0.915
Remove DB	0.963	0.976	0.979
Top 10% by Straight-Count			
Remove CACM	0.747	0.668	0.623
Remove TEM	0.837	0.792	0.737
Remove TKDE	0.968	0.948	0.960
Remove ISR	0.840	0.739	0.792
Remove IJHCS	0.887	0.814	0.855
Remove JMIS	0.743	0.656	0.662
Remove JSIS	0.812	0.742	0.602
Remove MS	0.678	0.656	0.506
Remove MISQ	0.855	0.766	0.814
Remove SMR	0.920	0.862	0.900
Remove DB	0.936	0.849	0.913
Top 10% by Adjusted-Count			
Remove CACM	0.668	0.791	0.498
Remove TEM	0.841	0.947	0.677
Remove TKDE	0.942	0.957	0.928
Remove ISR	0.798	0.835	0.759
Remove IJHCS	0.845	0.891	0.801
Remove JMIS	0.985	0.779	0.495
Remove JSIS	0.608	0.892	0.485
Remove MS	0.756	0.781	0.414
Remove MISQ	0.587	0.867	0.797
Remove SMR	0.848	0.918	0.821
Remove DB	0.977	0.938	0.958

Table 16. Relationship Between Measures: Basket of 58 Journals

	Normal-Count	Straight-Count	Adjusted-Count
All Researchers			
Remove CACM	0.961	0.953	0.971
Remove TEM	0.984	0.980	0.989
Remove TKDE	0.991	0.986	0.994
Remove ISR	0.980	0.973	0.986
Remove IJHCS	0.983	0.977	0.984
Remove JMIS	0.948	0.946	0.955
Remove JSIS	0.978	0.973	0.987
Remove MS	0.950	0.960	0.962
Remove MISQ	0.974	0.964	0.983
Remove SMR	0.990	0.990	0.991
Remove DB	0.988	0.984	0.988
Top 10% by Normal-Count			
Remove CACM	0.790	0.908	0.824
Remove TEM	0.924	0.971	0.905
Remove TKDE	0.941	0.970	0.915
Remove ISR	0.892	0.935	0.909
Remove IJHCS	0.913	0.936	0.911
Remove JMIS	0.576	0.907	0.641
Remove JSIS	0.718	0.929	0.716
Remove MS	0.524	0.900	0.508
Remove MISQ	0.852	0.918	0.875
Remove SMR	0.882	0.960	0.918
Remove DB	0.975	0.969	0.978
Top 10% by Straight-Count			
Remove CACM	0.894	0.724	0.827
Remove TEM	0.889	0.949	0.738
Remove TKDE	0.952	0.882	0.896
Remove ISR	0.864	0.817	0.838
Remove IJHCS	0.818	0.721	0.701
Remove JMIS	0.773	0.678	0.683
Remove JSIS	0.826	0.689	0.694
Remove MS	0.685	0.639	0.510
Remove MISQ	0.915	0.818	0.869
Remove SMR	0.954	0.872	0.929
Remove DB	0.965	0.873	0.949

Table 16. Relationship Between Measures: Basket of 58 Journals (continued)

	Normal-Count	Straight-Count	Adjusted-Count
Top 10% by Adjusted-Count			
Remove CACM	0.842	0.855	0.770
Remove TEM	0.841	0.951	0.677
Remove TKDE	0.953	0.966	0.891
Remove ISR	0.812	0.889	0.786
Remove IJHCS	0.916	0.892	0.853
Remove JMIS	0.766	0.878	0.637
Remove JSIS	0.763	0.841	0.622
Remove MS	0.606	0.786	0.454
Remove MISQ	0.879	0.886	0.829
Remove SMR	0.927	0.928	0.894
Remove DB	0.980	0.942	0.964

EFFECT OF TIME FRAME

Tables 17, 18, 19, and 20 present the correlation matrix of the journal baskets across time. In these tables, each of the measures is compared against itself across distinct time periods and samples. The measures are not being compared against the other measures. For example, the cell Straight/Top 10% by Normal Count/1991–1996 compares the straight-count measure calculated on the most productive 10 percent of researchers by normal-count from the period 1990–1995 with the straight-count measure on those same researchers for the period 1991–1996.

As the results demonstrate, researcher-production in IS is a highly time-sensitive phenomenon. After only a two year gap, the least sensitive measure—adjusted-count—had a shared variance in researcher-production of 48.4 percent (i.e., 0.696^2) for the typical researcher and less than 16 percent (i.e., all $R < 0.400$) for the prolific researcher on the basket of 58 journals. This means that 51.6 percent of the variance in researcher-production for the typical researcher and at least 84 percent of the variance of the prolific researcher is explained by altering the measurement time frame by two years. For some of the other measures, no significant correlation could be obtained after a two year difference in assessment. All measures decreased in sensitivity as the number of journals in the basket increased.

Table 17. Relationship Between Years: Basket of Four Journals

1990–1995 (base period)	**Normal-Count**	**Straight-Count**	**Adjusted-Count**
All Researchers			
1991–1996	0.880	0.883	0.905
1992–1997	0.782	0.764	0.863
1993–1998	0.635	0.531	0.745
1994–1999	0.528	0.488	0.655
1995–2000	0.422	0.403	0.563
Top 10% by Normal-Count			
1991–1996	0.822	0.834	0.689
1992–1997	0.587	0.615	0.557
1993–1998	0.344	0.334	0.308
1994–1999	0.220	0.355	0.204
1995–2000	0.034	0.208	0.059
Top 10% by Straight-Count			
1991–1996	0.897	0.798	0.869
1992–1997	0.700	0.535	0.669
1993–1998	0.423	0.095	0.378
1994–1999	0.364	0.108	0.284
1995–2000	0.235	-0.022	0.140
Top 10% by Adjusted-Count			
1991–1996	0.882	0.809	0.827
1992–1997	0.568	0.580	0.466
1993–1998	0.381	0.229	0.307
1994–1999	0.275	0.250	0.159
1995–2000	0.182	0.071	0.045

Table 18. Relationship Between Years: Basket of 10 Journals

1990–1995 (base period)	**Normal-Count**	**Straight-Count**	**Adjusted-Count**
All Researchers			
1991–1996	0.852	0.837	0.889
1992–1997	0.743	0.687	0.823
1993–1998	0.596	0.503	0.697
1994–1999	0.497	0.417	0.621
1995–2000	0.398	0.363	0.515
Top 10% by Normal-Count			
1991–1996	0.765	0.790	0.700
1992–1997	0.549	0.558	0.566
1993–1998	0.267	0.357	0.285
1994–1999	0.035	0.273	0.075
1995–2000	-0.109	0.174	-0.039
Top 10% by Straight-Count			
1991–1996	0.785	0.738	0.688
1992–1997	0.594	0.477	0.509
1993–1998	0.357	0.138	0.250
1994–1999	0.214	0.039	0.038
1995–2000	0.123	-0.082	-0.047
Top 10% by Adjusted-Count			
1991–1996	0.822	0.731	0.754
1992–1997	0.601	0.498	0.506
1993–1998	0.378	0.225	0.206
1994–1999	0.147	0.109	-0.042
1995–2000	0.014	-0.064	-0.155

Table 19. Relationship Between Years: Basket of 11 Journals

1990–1995 (base period)	**Normal-Count**	**Straight-Count**	**Adjusted-Count**
All Researchers			
1991–1996	0.869	0.846	0.907
1992–1997	0.750	0.698	0.840
1993–1998	0.605	0.504	0.721
1994–1999	0.507	0.435	0.633
1995–2000	0.405	0.341	0.522
Top 10% by Normal-Count			
1991–1996	0.787	0.802	0.767
1992–1997	0.583	0.592	0.650
1993–1998	0.305	0.352	0.395
1994–1999	0.110	0.244	0.194
1995–2000	-0.072	0.102	0.020
Top 10% by Straight-Count			
1991–1996	0.808	0.745	0.793
1992–1997	0.620	0.476	0.541
1993–1998	0.377	0.098	0.239
1994–1999	0.256	0.000	0.101
1995–2000	0.183	-0.128	-0.003
Top 10% by Adjusted-Count			
1991–1996	0.843	0.755	0.779
1992–1997	0.655	0.522	0.565
1993–1998	0.396	0.200	0.246
1994–1999	0.247	0.089	0.071
1995–2000	0.073	-0.080	-0.118

Table 20. Relationship Between Years: Basket of 58 Journals

1990–1995 (base period)	**Normal-Count**	**Straight-Count**	**Adjusted-Count**
All Researchers			
1991–1996	0.860	0.841	0.896
1992–1997	0.748	0.701	0.821
1993–1998	0.598	0.545	0.696
1994–1999	0.493	0.432	0.589
1995–2000	0.421	0.380	0.479
Top 10% by Normal-Count			
1991–1996	0.799	0.768	0.768
1992–1997	0.596	0.600	0.632
1993–1998	0.276	0.395	0.272
1994–1999	0.042	0.270	0.100
1995–2000	-0.148	0.114	-0.078
Top 10% by Straight-Count			
1991–1996	0.820	0.733	0.785
1992–1997	0.591	0.483	0.545
1993–1998	0.360	0.191	0.279
1994–1999	0.207	-0.008	0.095
1995–2000	0.077	-0.181	-0.072
Top 10% by Adjusted-Count			
1991–1996	0.817	0.746	0.788
1992–1997	0.575	0.556	0.532
1993–1998	0.319	0.321	0.208
1994–1999	0.143	0.147	0.045
1995–2000	-0.025	-0.001	-0.172

This analytical result implies that the publication rate of prolific researchers is highly variable. A prolific researcher may publish one article in one year, and three or four the next. Typical researchers, on the other hand, drop out of the game for periods, or permanently. However, because the change in production for typical researchers is small as compared to prolific researchers, their production assessment remains fairly constant from year to year.[19]

The result has profound implications for research reward systems. For example, it suggests that an institution cannot expect that a researcher will continue to be prolific just because the researcher had a strong publishing record in the past. Tenure cases that hinge on past production as a strong indicator of research potential are very common, but do not have an empirical basis, at least in our study.

For another point, it means that longer windows of time should be used to evaluate faculty. A one year time period for assessment of researcher-production is especially ludicrous. The fact of the matter is that IS researcher-production is "lumpy." Incidentally, there is no reason to believe that IS researcher-production differs from other disciplines in this way, but this has not been empirically tested.

V. DISCUSSION

The breakdown of IS articles by journal in Table 5 implies that many journals considered to be premier in the IS field are not IS specific. Furthermore, as each journal only accepts articles covering a narrow spectrum of topics, the breakdown also identifies topics of interest to the IS community by identifying the types of journals in which IS researchers actually publish. For example, while a substantial portion of the IS community publishes in journals that focus on software engineering, database, and human-computer interaction, few researchers publish in journals that deal with computer graphics, parallel and distributed technology, and hardware issues.

An examination of the journals that individually account for greater than 5 percent of our sample leads to expected conclusions. The journals *MISQ*, *ISR, CACM, JMIS,* and *Management Science* are widely regarded in the field and have been employed in prior research that has assessed production. However, an examination of the journals that individually occupy at least 1 percent of the sample does produce surprises. Many of these journals, such as *ACM Transactions on Information Systems, IEEE Transactions on Engineering Management,* and *Data and Knowledge Engineering,* have been neglected in prior research on production despite their obvious importance as research outlets for the community.[20] The list also indicates that specialty areas in IS, such as work on neural networking and hardware issues, have a relatively low percentage of IS researchers who publish in niche, specialty journals such as *IEEE Transactions on Neural Networks* or *IEEE Transactions on Parallel and Distributed Systems.* Researchers who study researcher-production need to keep such issues of journal-specificity in mind when forming their journal baskets. Clearly, as the baskets become more IS specific, the findings will be more representative and valuable to the field.

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[19]Note that this does not contradict the earlier finding from Figure 1. If the probability of an occurrence is uniform, the actual incidence of that occurrence will follow a Poisson distribution [Miller and Miller 1999]. Thus, the finding that the publication rate of prolific researchers varies across years is hardly surprising.

[20]We would like to thank an anonymous reviewer for this analysis.

Work on IS researcher-production, however, should also consider as many subcommunities as possible. Thus, baskets of journals should not be identified solely from empirical rankings. Instead, the basket should be determined by defining criteria for IS-specificity. Journals that do not meet these criteria may be considered non-IS specific. For example, in Table 5, we defined three criteria for specificity: (1) at least 11 IS authors must have published in 11 years, or (2) at least 11 IS articles must have been published in 11 years, or (3) the percentage of IS publications must have exceeded 5 percent. Each of these criteria addresses a distinct dimension of specificity. The first assumes that there must be a sufficiently large IS community publishing in the journal; the second that the journal grants access to the IS community; the third that the journal's IS representation is balanced against that of the journal's other constituents.

Regardless of the measurement method, there are order of magnitude differences between prolific researchers and the other producers, in contradistinction to a monotonic increase in production from one group to the next. In other words, the distribution of production in the field is skewed toward little to no production, with small differences in numbers when we move up to the category of moderate production. With respect to the category of prolific researchers, there is a leap to new and much higher levels of production, so much so that it could be hypothesized that this group must be operating according to a totally different production function.

In terms of measurement, however, results are not highly stable with this group. The identification of prolific researchers is very sensitive to measurement method and journal basket. In fact, for prolific researchers, the various measurement methods do not measure the same construct.

Yet, these measures do yield similar results for typical researchers. In most cases, the addition or deletion of a single journal in the basket of journals used to assess researcher-production does not change the production of the typical researcher. This disparity between the measurement of prolific and typical researchers can be explained statistically as a result of the inverse exponential distribution demonstrated in Figure 1 and Table 7. In an inverse exponential distribution, the prolific researchers capture most of the variance. As a result, any variance that is not shared between production measures greatly impacts the performance assessment of prolific researchers.

It is fascinating to note that the assessment of both typical and prolific researchers is very sensitive to changes in the time frame for analysis. This suggests that the publication frequency of all researchers from year to year is highly variable.

The findings of this study have implications for two constituencies in the IS research communities: (1) research on IS researcher-production and (2) IS departmental institutions, i.e., IS departments in universities or IS research centers.

IMPLICATIONS FOR RESEARCH ON IS RESEARCHER-PRODUCTION

Scientometrics and the scientific study of IS researcher-production is critical as it enables the research discipline to defend its achievements through knowledge of its own accomplishments. Also, regardless of whether the field evaluates itself, it will continue to be evaluated by external parties [Phelan 2000]. By evaluating itself, the information systems research discipline can establish evaluation criteria that more accurately reflect its role in the overall scientific community.

However, as with all positivist research, a procedure must be constructed to minimize the effect of confounds on the research results. This research has demonstrated that measurement methods, journal baskets, and time period of analysis have a strong impact on researcher-production results, especially if the goal is to identify prolific IS researchers (and thereby institutions).

Some researchers suggest that the adjusted-count is the most appropriate measure [e.g., Athey and Plotnicki 2000; Jackson and Nath 1989]. However, our empirical findings indicate that adjusted-count is more sensitive to journal basket and time frame employed than other measures of researcher-production. While high sensitivity may be desirable in some situations, our results suggest that adjusted-count is not as robust as previously believed. In fact, none of the researcher-production measures is insensitive to variations in procedure.

We conclude, therefore, that research evaluating IS researcher-production should employ multiple measures to evaluate production. These measures should be modeled as reflections of an underlying construct. Thus, the shared variance of all the researcher-production measures becomes the actual measure of researcher-production, and the individual measures become items on a multi-item scale. Research evaluating IS researcher-production should also explicitly articulate a definition of production and ensure that measures used conform to that definition. The development of a theory base for deriving these definitions and the presentation of evidence for or against the theories would be a heartening development. There is no reason why the phenomenon of scientific work cannot be studied like any other causal phenomenon, and thereby create robust metrics.

Furthermore, research evaluating IS researcher-production should not be exempt from traditional standards of positivist research. Specifically, research on IS researcher-production must address the issue of construct validity by pre-validating measures [Straub 1989]. We have found in this study that the larger the number of journals in the journal basket, the more stable will be the findings over the factors of time frame, seniority, and class of researcher. That being said, studies of niche areas in the field may have to select baskets on the basis of specificity to that niche. Thus, instead of focusing solely on a set of premier journals, researchers should consider the representativeness of their journal baskets. Subcommunities in information systems, such as the software engineering or European IS communities, are frequently marginalized, as their premier journals are not contained within the journal basket used for analysis. Studies that identify the various constituent groups in information systems [e.g., Culnan 1986, 1987; Keen 1980; Lending and Wetherbe 1992; Mingers 2001; Straub et al. 1994; Teng and Galletta 1991; Vogel and Wetherbe 1984] should be used to determine subcommunities.

Due to temporal effects, researcher-production evaluation should be performed over as long a time period as reasonably possible. The proliferation of various digital libraries has greatly simplified the collection of large quantities of bibliographic data, thereby making research over long time periods feasible. Researchers identified as being most productive by a given study should be awarded temporary honors at best.

Finally, research on IS researcher-production should make every effort to approach researcher-production from multiple perspectives. Multiple authorship should be encouraged, with the authors originating from multiple subcommunities. In this way, the biases of one specific subcommunity are unlikely to overwhelm the research results. Multiple bibliographic data sources, and faculty directories should also be identified in scientometric work. This reduces the probability that IS researcher-production research will marginalize one or another IS subcommunity.

INSTITUTIONS

This study's results have implications for two IS departmental institutional activities: (1) the creation of target journal lists and (2) the evaluation of faculty as researchers.

A target journal list is intended both to provide a transparent method of researcher assessment, and a method of focusing research in a departmental institution toward specific goals.[21] An example of such a list can be seen at **http://www.robinson.gsu.edu/facultyresearch/journals/index.html**.

Because target journal lists are employed to channel the collective energy of an institution's researchers, the number of journals within the list tends to be small [Robey 1995]. The establishment of a target journal list is, therefore, a dialectical process. On the one hand, an IS departmental institution strives to capture the essence of IS using the list. On the other hand, the departmental institution is under pressure to keep the list to a manageable size.

One way that departments can reduce the scope of the problem is by considering the specificity of journals to both the IS community and their own researchers. Many prestigious journals (e.g., *Journal of the ACM*) publish very few IS articles. It is very possibly a disservice to the faculty in most IS departments to retain such journals on their target journal list, especially if none of the faculty will ever consider these journals as publication outlets.

Also, researchers may want to tailor the target journal list to the research methods and paradigms preferred at their own institution. For example, researchers at an institution that has strong interpretivist leanings are unlikely to target positivist journals. By considering the preferred publication outlets of their staff, an IS institution can significantly trim their target journal list without compromising the intended use of the list. By maintaining a small list, the IS institution demonstrates its focus to the IS community. At the same time, because the journals on the list are, in fact, the journals that the institution's researchers target, the list does not disenfranchise any of its researchers.

This suggests that institutional target journal lists should not be standardized across institutions. Instead, such lists should be used to reflect the strengths of individual institutions in the IS community and their long-run strategic objectives. For example, *Journal of the ACM* should only appear on institutional target journal lists if researchers in the institution publish in the journal, or express an interest in the journal's themes. However, the collective target journal lists of all IS institutions can also be used to identify the journals that many or most IS institutions perceive as specific.

The danger of a small, targeted journal list is that it encourages researchers to focus on publishing only in those journals. Cross-disciplinary research may thereby be discouraged. To overcome this problem, it is important to recognize the achievements of IS researchers when they publish in a target journal list of another department within the same institution, or publish in a journal that another institution or the IS community at large recognizes.

It must also be recognized that target journal lists are not immutable. As a research discipline matures, certain journals can become more IS specific over time while others become less specific. Subcommunities within the whole gain members, and thereby a voice. The character of an academic department also changes as new faculty are hired and old faculty retire or move elsewhere. Furthermore, as our understanding of science improves, our process of evaluating science must improve with it. An academic institution that does not change its target journal list to reflect changes in the institution's environment may find its researcher-production reduced as its evaluation criteria no longer reward productive endeavors.

The results also reinforce the findings of Athey and Plotnicki [2000], who state that institutions need to seek out alternative ways of evaluating researcher-production. While Athey and Plotnicki found that the number of IS researchers publishing in their top-tier basket of journals was small, our

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[21]This paper does not take a position on the benefits or drawbacks of departmental target journal lists. However, we believe that the guidelines presented here are useful for institutions interested in establishing such lists.

study finds that about one-third of all IS faculty publish regularly and consistently in the full range of our journals. Of the 1,929 faculty identified, only 745, or 38.6 percent, have published three or more articles over 11 years in the inclusive basket of 58 journals. Furthermore, the publication distribution remains the same regardless of the journal basket selected (see Figure 1) [de Solla Price 1986]. Thus, if journal articles are the sole criterion used for evaluating researcher-production, the vast majority of IS researchers are unlikely to be tenured.

This research opens the question of how those who do not achieve the status of prolific IS researcher should organize their careers. As the vast majority of IS researchers fall into this category, it is important for the institution as a whole to address this question. Possible answers to this question include liaising with members of industry, teaching, liaising with the popular press, or disseminating research in nontraditional outlets. It is also important that the IS research discipline determine the importance of these nontraditional roles. For example, the popularity of the information systems field has steadily increased, and it can be argued that typical IS researchers and those with no research production have still played a major role in this development.

Administrators must also become aware that arbitrary thresholds of production are inappropriate for promotion and tenure decisions. The data suggests that an academic who publishes some work, but does not meet thresholds during the first six years of his or her career, may perform spectacularly in the next two years. Similarly, strong performance in an academic's early career does not lead inevitably to strong performance in the future. This is a disturbing finding in that tenure is often awarded on the basis of potential for future productivity and the basis of that decision is significantly weighted toward evidence of past performance.

We expect that this set of just-presented inferences and conclusions may be controversial and we welcome IS community dialogue on the implications of our study.

VI. EXPERIENCES AND LIMITATIONS

All research is influenced by the biases of its authors, and has its limitations. Our research is no exception. In recognition of the plurality of the IS research discipline, we present our biases and limitations through a confessional account in the interpretive tradition [Schultze 2000].

CONFESSIONAL ACCOUNT OF THE CONDUCT OF THIS RESEARCH

This research began as part of a Ph.D. seminar course in positivist research methodology taught in a large university in the southern United States. In keeping with one philosophical stance in the university [Vaishnavi et al. 1991], students were exposed to the belief that positivism was only one of the myriad methodologies that should be acceptable within the IS research discipline.[22] Students in the course were also introduced to the concept of the target journal list, which had been employed for promotion and tenure processes at this university.

The first author, who was one of the students enrolled in the course, has had a long-standing interest in research methods and the practice of research. To better appreciate the research

[22]One module of the course introduced students to alternate epistemologies; another module introduced students to the concept of journal rankings.

discipline's methodological diversity, he began collecting bibliographic information on the journals in the university's target journal list. He presented the data to the course supervisor, the fourth author, who expressed an interest in the use of the data for research. The course supervisor broadcast a request for volunteers to assist with the research project, and a team of four Ph.D. students (including the first author) and two faculty (including the supervisor) was assembled.

The research team was chosen to be as diverse as possible. Of the students, the first author had previously performed research in data mining and data modeling, and thus had a grounding in both the technical and positivist traditions. One of the other students was interested in an interpretive dissertation, while the others leaned toward software engineering. One of the faculty has been recognized for his contribution to positivist research in information systems while the other was known for his contribution to algorithms, data structures, and intelligent agents. The initial data gathering for the project took over one year, and is documented elsewhere [Chua et al. 2002].

As the data was to be made available publicly, the first author asked faculty within the university to comment and make suggestions. One faculty member expressed concern that information about his publications would become so easily available, and was alarmed at the political ramifications of the project. As a result, the research team resolved that any research they would conduct would focus on the research discipline as a whole and would avoid political statements that would divide the various IS subcommunities.[23]

In casting about for a politically neutral research topic, the first author returned to his interest in IS research practice and reviewed the publications in that research stream. He came to realize that the IS research discipline did not truly know itself. Some research had attempted an empirical study of the research discipline [Avgerou et al. 1999; Culnan 1986, 1987]; however, most papers discussing the nature of the IS research discipline [Banville and Landry 1989; Baskerville and Myers 2002; Benbasat and Weber 1996; Robey 1996] adopted a conceptual focus (as opposed to an empirical focus).

The first author realized, furthermore, that while the IS research discipline had made great strides in research methodology [Boudreau et al. 2001], methodology for evaluating IS researcher-production appeared to be stagnant. Specifically, in contravention of recommendations by Straub [1989], such research never tested for the reliability or validity of the production construct.

Thus, it was decided that this research would focus entirely on (1) understanding Information Systems as a research discipline by way of journal publications and (2) an evaluation of the production construct as implemented in Information Systems. By focusing on these two themes, it was felt that the research would make a statement about the Information Systems research discipline without undermining the critical interests of the research discipline. Despite this focus, two of the original researchers on the team felt that the paper was still making too strong a political statement, and chose not to participate in authorship.

[23]The team recognized that as the data was publicly available, others could employ it to suit their own political objectives. However, the data was collected from publicly available sources to begin with. Furthermore, it was felt that public availability of the data would do more good than harm, as it would help the various subcommunities of the IS discipline to understand each others' research. The data is available at **http://readable.eci.gsu.edu:8080/examples/servlet/isbib**.

LIMITATIONS

Our research has a number of limitations, including (1) epistemological bias, (2) geographic bias, (3) sampling bias, (4) content bias, (5) ontological bias, and (6) restricted interpretation of the data. Nevertheless, we feel that, despite these limitations, the research does make an important contribution to the IS research discipline.

Epistemological Bias: The research relies on the positivist epistemology, and on quantitative data and analysis. Qualitative data was not employed, and the researchers attempted to submerge their identity in keeping with the positivist tradition [Walsham 1995a, 1995b]. As a result, this research suffers from mono-method bias [Campbell and Fiske 1959]. Alternate interpretations and data could shed light on phenomena that we neglected, or could identify alternate mechanisms for viewing our interpretations. This bias is especially severe given that this research attempts to explore the entire IS research discipline. However, while we recognize the value of these alternate lenses, we also recognize the large dataset that can be made available for analysis by employing the positivist lens alone. Thus, we believe that alternate lenses are best left for another study, and we encourage other schools of IS research to pursue these.

Geographic Bias: All of the researchers were educated in the North American research tradition,[24] and thus have ontological perspectives biased in favor of North American research. Furthermore, for the time period that we analyzed, most of the non-North American journals we knew of were not available in electronic archives. As a result, there is a distinct North American bias in our research. Researchers in the United States occupy 75 percent of the positions on our data set, but represent only 50 percent of the positions on the ISWorld listserve. While we admit to a geographic bias, we do not perceive the effect to be significant. Our primary findings demonstrate that concerns with the validity and reliability of the various measures of production are justifiable, and obtaining a more representative sample is unlikely to change this finding. Publication rates tend to follow an inverse exponential distribution, which mirrors results by other researchers in other research disciplines [de Solla Price 1986]. Therefore, geographic bias is unlikely to have a major impact on our findings.

The sole finding likely to be compromised by this bias is the IS-specificity of the various journals. However, our findings do have face validity. For example, many of the journals we have identified as not IS specific have fallen out of the latest journal ranking study [Mylonopoulos and Theoharakis 2001].

Sampling Bias: Our research is also likely to have underestimated the number of IS faculty. First, many researchers who perceive themselves as IS researchers but who were not on the lists we employed would not be in our data. Furthermore, because of variations in name, many IS faculty are likely to be unidentified. For example, some female IS faculty may have changed their surnames as a result of changes in their marital status. We do not believe that the effect of sampling bias is overly large for the same reasons as the geographic bias.

Content Bias: Our research also introduced various methodological artifacts that could confound the results. For example, we stressed the count of publications within journals without weighting the prestige of the journals or the quality of the research. A high quality publication is clearly more valuable to the IS research discipline than a low quality one, but our research does not

[24]We can also note that most of the authors do not view ourselves culturally as North American in that we were born and raised elsewhere.

accommodate this factor. Had we considered journal prestige or article quality, we would likely have further biased our research against an IS subcommunity. Different subcommunities in IS evaluate journals and articles in distinct ways. Europeans, especially, have a wide range of opinions concerning journal quality [Avgerou et al. 1999].

Similarly, we identified articles as belonging to IS based on the self-identification of authors. It is possible for an IS researcher to perform non-IS research, just as it is possible for a non-IS researcher to perform IS research.

We again encourage other researchers to take on this analysis and expand the number of variables being considered. There is no doubt that journal quality is an important factor in overall research productivity. Similarly, there is no doubt that enhancing our measurement instruments will lead to more accurate results.

Ontological Bias: Our research also serves to reify the existing institutional structure, in that we position the work on the existing institutional context. For example, some implicit assumptions we make are that: (1) research productivity should be rewarded,[25] (2) researcher-production is one good indicator of research productivity, and (3) while there are problems with the status quo, these problems are not so severe that the institutional structure should be reconstructed in its entirety. However, those among our authors who are less senior adopt the pragmatic perspective of our relatively low seniority, that is, that we cannot defy the institutional systems and advocate radical change. Furthermore, these are the assumptions under which the institutional structure operates. By contributing to the discourse, we may be able to influence institutional policy to improve the life of the average IS researcher without causing short-term disruption.

Restricted Interpretation: Finally, we recognize that our interpretation of the data was at the surface level of detail. We chose not to delve too deeply into our data, as further interpretation ran the risk of alienating various IS subcommunities. As things stood, two of the original members of our research team already felt that the existing interpretations were politically sensitive enough to withdraw from authorship. Nevertheless, we feel that this research makes a significant contribution to the IS research discipline's understanding of itself. First, we provide an empirical basis for evaluating the average IS researcher by demonstrating how difficult it has been for the average IS researcher to publish. Second, we provide a foundation for further study of IS as a research discipline. Third, we provide a simple methodology for evaluating the specificity of IS journals. Finally, we demonstrate concerns with existing measures of researcher-production and a possible solution.

VII. CONCLUSION

This study explored the effect of (1) different measures of researcher-production, (2) different journal baskets, and (3) separate analysis time frames on the assessment of researcher-production. As a result of a factor and correlation matrix analysis of 58 journals and 1,929 IS researchers, three major findings emerged. First, only the time period has a strong impact on the assessment of production for typical researchers. Second, all three factors (i.e., measurement method, journal basket, and time period of analysis) have profound impacts on the assessment of the prolific

[25] As researchers, we can all agree that research is valuable. However, there remains the question as to whether research should be valued more highly than other forms of academic contribution such as teaching.

researcher. Finally, many journals considered as prestigious by the IS community are, in fact, not specific to the majority of IS institutions in that these journals publish very few articles written by IS academics. Many of the journals identified as premier by earlier research allocate less than 5 percent of their space to IS research. Some publish less than one IS article per year.

The results of this study have implications for two subcommunities in Information Systems, namely, researchers performing evaluations of IS production and institutions for IS research. For researchers, the results suggest that greater effort should be made to triangulate from multiple data sources, and obtain multiple perspectives to achieve a better understanding of the IS community, and thereby provide a less biased assessment of production.

For IS departments, the results suggest two actions. First, institutional target journal lists should be heavily customized to reflect both the strengths of researchers within the institution and the institution's future objectives. Second, institutions should not constrain themselves to using journals as the sole criterion for researcher-production evaluation.

The research has opened up a myriad of research possibilities. First, while it has demonstrated that there are distinctions between prolific, typical, and low producing IS researchers, it has not identified mechanisms that encourage researchers to be prolific. Second, while it has demonstrated that various journals are not specific to Information Systems, it has not identified the reasons why various IS groups originally perceived these journals as specific. It could very well be that these journals were formerly specific to Information Systems, but over time, as substitute research outlets emerged, researchers ceased to publish in these journals. Third, in this research, non-North American countries were underrepresented. It would be interesting to replicate this study in non-North American countries to determine the extent to which these findings hold. Fourth, while this research found that the majority of IS researchers are not highly productive in publishing research, it has not identified the activities that these researchers perform in lieu of research. Fifth, alternate measures of researcher-production must be developed that increase the robustness of our scientometrics. Finally, while we have suggested that there are multitudinous subgroups in IS research, we have not developed a comprehensive taxonomy of these subgroups. Such a taxonomy would be useful for further empirical research concerning researcher-production in IS.

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X. ABOUT THE AUTHORS

Cecil Eng Huang Chua is a Ph.D. student at Georgia State University. He received both a Bachelor of Business Administration in Computer Information Systems and Economics and a Master's Certificate in Telecommunications Management from the University of Miami. He also received a Master's of Business by Research from Nanyang Technological University. His research interests include (1) reconstructing the relationship between database and software engineering theories, (2) research methodology especially as it pertains to design research, and (3) understanding the role of technology in social conflict. Cecil's research has been published in such journals as *Communications of the AIS*, *Data and Knowledge Engineering*, *Decision Support Systems*, and

Journal of Database Management. Cecil maintains the IS Bibliographic Repository, a store of bibliographic information on IS journals.

Lan Cao is a Ph.D. student in Computer Information Systems at Georgia State University. She received a Master's of Science in Computer Information Systems from Georgia State University, and a Master of Science in textiles from the Georgia Institute of Technology. Her research interests include information system development, workflow management, and coordination theory.

Karlene Cousins is a Ph.D. student in the Department of Computer Information Systems at Georgia State University. Her research interests lie in Virtual Teams, Ubiquitous Computing and Mobile Commerce. She received her bachelor's and master's degrees in Management Information Systems from the University of the West Indies in Kingston, Jamaica. Karlene is the Managing Editor of *Information and Organization*.

Detmar W. Straub is the J. Mack Robinson Distinguished Professor of Information Systems at Georgia State University. Detmar has conducted research in the areas of IS methods, e-Commerce, computer security, technological innovation, and international IT studies. He holds a DBA in MIS from Indiana University and a Ph.D. in English from Penn State. He has published over 100 papers in journals such as *Management Science*, *Information Systems Research*, *MIS Quarterly*, *Organization Science*, *Journal of MIS*, *Journal of the AIS*, *Information & Management*, *Journal of Global Information Management*, *Communications of the AIS*, *Academy of Management Executive*, *Communications of the ACM*, and *Sloan Management Review*. Currently, he is an associate editor for *Management Science* and *Information Systems Research*. A former coeditor of *DATA BASE for Advances in Information Systems*, a senior editor for the special issue of *Information Systems Research* on e-Commerce Metrics, an associate editor and associate publisher for *MIS Quarterly*, he has consulted widely in industry in the computer security area as well as in the areas of e-Commerce and technological innovation. He also serves as the Director of Research and Doctoral Programs at the Robinson College of Business.

APPENDIX A: ORIGINAL JOURNALS EMPLOYED IN THE STUDY

No.	Title	Remarks	Source Used
1	*Academy of Management Executive*	Outside scope	
2	*Academy of Management Journal*	Outside scope	
3	*Academy of Management Review*	Outside scope	
4	*Accounting, Management, and Information Technologies/Information and Organization*	Included in analysis	Journal Web Page, ISWorld announcements
5	*ACM Computer Communication Review*	No data available	
6	*ACM Computing Surveys*	Included in analysis	ACM DL/ DBLP/ Nelson Beebe's Bibliographies/ Computer Science Bibliographies
7	*ACM Transactions/Letters on Programming Languages and Systems*	Included in analysis	
8	*ACM Transactions on Computational Logic*	Began in 2000	
9	*ACM Transactions on Computer Systems*	Included in analysis	
10	*ACM Transactions on Computer-Human Interaction*	Included in analysis	
11	*ACM Transactions on Database Systems*	Included in analysis	
12	*ACM Transactions on Design Automation of Electronic Systems*	Included in analysis	
13	*ACM Transactions on Graphics*	Included in analysis	
14	*ACM Transactions on Information and System Security*	Included in analysis	
15	*ACM Transactions on Information Systems*	Included in analysis	
16	*ACM Transactions on Mathematical Software*	Included in analysis	
17	*ACM Transactions on Modeling and Computer Simulation*	Included in analysis	
18	*ACM Transactions on [Office] Information Systems*	Included in analysis	
19	*ACM Transactions on Internet Technology*	Began in 2001	
20	*ACM Transactions on Programming Languages and Systems*	Included in analysis	
21	*ACM Transactions on Software Engineering and Methodology*	Included in analysis	
22	*Acta Informatica*	Included in analysis	DBLP
23	*Advances in Computers*	No data available	
24	*AI magazine*	Missing years	Journal Web page

No.	Title	Remarks	Source Used
25	*Annals of Cases on Information Technology*	No data available	
26	*Annals of Operations Research*	Outside scope	
27	*Annals of Software Engineering*	No data available	
28	*Artificial Intelligence*	Included in analysis	See ACM Transactions
29	*Australian Journal of Information Systems*	Data difficult to compile	Journal Web page
30	*BIT*	No data after 1993	
31	*Business Perspectives*	No data available	
32	*Communications of the ACM*	Included in analysis	See ACM Transactions
33	*Communications of the Association for Information Systems*	Included in analysis	Journal Web page
34	*Computer Communications*	No data available	
35	*Computer Graphics and Information Processing*	No data available	
36	*Computer Personnel*	No data available	
37	*Computers and Security*	No data available	
38	*Computing*	No data available	
39	*Concurrent Engineering: Issues and Applications*	No data available	
40	*Cutter IT Journal*	No data before 1995	Journal Web page
41	*Data and Knowledge Engineering*	Included in analysis	See ACM Transactions
42	*Data Management*	No data available	
43	*Decision Sciences*	No data available	
44	*Decision Support Systems*	No data before 1994	Journal Web page
45	*Electronic Journal on Information Systems in Developing Countries*	Began in 2000	Journal Web page/IS World announcements
46	*Electronic Markets*	Included in analysis	Journal Web page
47	*E-Services Journal*	Began in 2001	Journal Web page
48	*European Journal of Information Systems*	No data before 1994	Journal Web page, Felix Tan's Endnote bibliographies, OCLC Firstsearch
49	*European Management Journal*	Outside scope	
50	*Expert Systems and Applications*	No data available	
51	*Failure and Lessons Learned in Information Technology Management*	No data available	
52	*Group Decision and Negotiation*	No data before 1995	Felix Tan's Endnote bibliographies
53	*Harvard Business Review*	Included in analysis	Proquest
54	*Human Communication Research*	Outside scope	
55	*Human Relations*	Outside scope	
56	*Human Resource Management*	Outside scope	

No.	Title	Remarks	Source Used
57	*IEEE Computational/Computing in Science and Engineering*	Included in analysis	See ACM Transactions
58	*IEEE Computer*	Included in analysis	
59	*IEEE Computer Graphics and Applications*	Included in analysis	
60	*IEEE Concurrency*	No data before 1997	
61	*IEEE Expert*	No data available	
62	*IEEE Internet Computing*	Included in analysis	
63	*IEEE Micro*	Included in analysis	
64	*IEEE Parallel and Distributed Technology*	Included in analysis	
65	*IEEE Software*	Included in analysis	
66	*IEEE Transactions on Acoustics, Speech, and Signal Processing*	No data available	
67	*IEEE Transactions on Computers*	Included in analysis	
68	*IEEE Transactions on Engineering Management*	Included in analysis	
69	*IEEE Transactions on Evolutionary Computation*	Included in analysis	
70	*IEEE Transactions on Fuzzy Systems*	Included in analysis	
71	*IEEE Transactions on Knowledge and Data Engineering*	Included in analysis	
72	*IEEE Transactions on Neural Networks*	Included in analysis	
73	*IEEE transactions on parallel and distributed systems*	Included in analysis	
74	*IEEE Transactions on Pattern and Machine Intelligence*	No data before 1995	
75	*IEEE Transactions on Professional Communication*	No data available	
76	*IEEE Transactions on Software Engineering*	Included in analysis	
77	*IEEE Transactions on Visualization and Computer Graphics*	Included in analysis	
78	*IEEE/ACM Transactions on Networking*	Included in analysis	
79	*Information Age*	No data available	
80	*Information and Management*	No data before 1995	Journal Web page/Proquest
81	*Information Management*	No data before 2000	
82	*Information Resources Management Journal*	No data before 2001	
83	*Information Sciences*	No data available	
84	*Information Systems*	Included in analysis	DBLP

No.	Title	Remarks	Source Used
85	*Information Systems Frontiers*	Included in analysis	Journal Web page
86	*Information Systems Journal*	No data before 1995	Journal Web page
87	*Information Systems Management*	No data available	
88	*Information Systems Research*	Included in analysis	Proquest/EBSCOHost
89	*Information Technology and Management*	No data available	
90	*Information Technology and People*	No data before 1992	Journal Web page
91	*Informing Science*	Missing years	Journal Web page
92	*International CIS Journal*	No data available	
93	*International Information Systems*	No data available	
94	*International Journal of Computer Mathematics*	Outside scope	
95	*International Journal of Electronic Commerce*	Included in analysis	Journal Web page
96	*International Journal of Expert Systems*	No data available	
97	*International Journal of Human Computer Interaction*	Included in analysis	HCIBib, Journal Web page
98	*International Journal of Human Computer/Man Machine Studies*	Included in analysis	HCIBib, Journal Web page
99	*International Journal of Information Management*	No data available	
100	*International Journal of Intelligent Systems in Accounting, Finance, and Management*	No data available	
101	*IS Audit and Control Journal*	No data available	
102	*Journal of Algorithms*	Outside scope	
103	*Journal of Computer and System Science*	Included in analysis	DBLP
104	*Journal of Computer Information Systems*	No data available	
105	*Journal of the computer society Of India*	No data available	
106	*Journal of Database Administration*	No data available	
107	*Journal of Database Management*	No data before 2000	ISWorld announcements
108	*Journal of Defense Software Engineering*	No data available	
109	*Journal of Educational Resources in Computing*	Began in 2001	
110	*Journal of Electronic Commerce Research*	Included in analysis	Journal Web page
111	*Journal of End User Computing*	No data before 2000	ISWorld announcements
112	*Journal of Experimental Algorithmics*	No data after 1999	
113	*Journal of Global Information Management*	Included in analysis	Journal Web page

No.	Title	Remarks	Source Used
114	*Journal of Global Information Technology and Management*	Missing years	Journal Web page
115	*Journal of Information Systems*	No data available	
116	*Journal of Information Technology*	No data before 1993	Journal Web page
117	*Journal of Information Technology Cases and Applications*	Missing years	Journal Web page, ISWorld announcements
118	*Journal of Information Technology Education*	Began in 2002	
119	*Journal of Information Technology Management*	No data available	
120	*Journal of Information Technology Theory and Application*	Included in analysis	Journal Web page
121	*Journal of Information Warfare*	Began in 2001	Journal Web page
122	*Journal of Management Information Systems*	Included in analysis	Journal Web page, PROQuest
123	*Journal of Management Studies*	Outside scope	
124	*Journal of Management Systems*	No data available	
125	*Journal of MIS Education*	No data available	
126	*Journal of Strategic Information Systems*	Included in analysis	Journal Web page
127	*Journal of Systems and Information Technology*	No data available	
128	*Journal of Systems and Software*	No data available	
129	*Journal of Systems Integration*	No data available	
130	*Journal of the ACM*	Included in analysis	See ACM Transactions
131	*Journal of the American Society for Information Science*	Missing years	Journal Web page, DBLP
132	*Journal of the Association for Information Systems*	Included in analysis	Journal Web page
133	*Knowledge and Information Systems*	Included in analysis	Journal Web page
134	*Logistics Information Management*	No data before 1991	ISWorld announcements, journal web page
135	*Management en Organisatie van Automatiseringsmiddelen*	No data available	
136	*Management International Review*	Outside scope	
137	*Management Science*	Included in analysis	PROQuest
138	*MIS Quarterly*	Included in analysis	Journal Web page, Proquest
139	*Organization*	No data before 1995	Felix Tan's Endnote bibliographies
140	*Organization and Administrative Sciences*	Outside scope	
141	*Organization Science*	No data before 1992	Felix Tan's Endnote bibliographies

No.	Title	Remarks	Source Used
142	*Organizational Behavior and Human Performance*	Outside scope	
143	*Personnel Journal*	Outside scope	
144	*Psychological Reports*	Outside scope	
145	*Quarterly Journal of Electronic Commerce*	Began in 2000	Journal Web page
146	*Scandinavian Journal of Information Systems*	No data available	
147	*Security, Audit, and Control Review*	No data available	
148	*SIAM Journal on Computing*	Included in analysis	DBLP
149	*Simulation*	No data available	
150	*Sloan Management Review*	Yes	Journal Web page, Proquest
151	*The Database for Advances in Information Systems*	Yes	Journal Web page, DBLP
152	*The Information Society*	Missing years	
153	*The Journal of Systems and Information Technology*	Included in analysis	DBLP
154	*The Lazerdisk Professional*	No data available	
155	*VLDB Journal*	Included in analysis	DBLP, Journal Web page
156	*World Wide Web Journal*	Missing years	Journal Web page, ISWorld journal announcements

APPENDIX B: IS ARTICLES IN JOURNALS WITH INCOMPLETE INFORMATION

The authors also collected information on a large collection of other journals. However, because complete information for the period 1990–2000 could not be collected, these journals were omitted from the analysis. As the analysis of these journals is incomplete, the results presented here should be treated with caution.

Journal	**Period Collected***	No. IS Authors	No. Articles	Percent IS Articles
Annals of Cases on Information Technology	1999–2000	21	19/34	0.559
AI Magazine	1990–2000	14	14/486	0.029
BIT	1990–1993	1	1/102	0.010
Decision Support Systems	1994–2000	299	250/442	0.566
European Journal of Information Systems	1995–2000	75†	62/118	0.525
Electronic Journal on Information Systems in Developing Countries	2000–2000	4	3/19	0.158
Group Decision and Negotiation	1995–2000	38†	44/177	0.249
IEEE Concurrency	1997–2000	2	2/162	0.012
IEEE Transactions on Pattern and Machine Intelligence	1995–2000	5	5/815	0.006
Information and Management	1995–2000	254	212/285	0.744
The Information Society	1990–2000	34†	52/266	0.195
Informing Science	1997–2000	12	11/49	0.224
Information Systems Journal	1995–2000	82	63/98	0.643
Information Technology and Management	2000–2000	31	20/25	0.800
Information Technology and People	1992–2000	41†	45/139	0.324
Journal of the American Society for Information Science	1990–2000	123	261/1210	0.216
Journal of Database Administration	2000–2000	1	1/4	0.250
Journal of Experimental Algorithmics	1996–1999	0	0/25	0.000
Journal of End User Computing	2000–2000	11	9/9	1.000
Journal of Global Information Technology Management	1998–2000	44	41/60	0.683
Journal of Information	1993–2000	108†	102/187	0.545

Technology				
Journal of Information Technology Cases and Application	1999–2000	41	37/44	0.841
Logistics Information Management	1991–2000	39	44/335	0.131
Organization	1995–2000	2	3/304	0.010
Organization Science	1992–2000	38	40/287	0.139
Quarterly Journal of Electronic Commerce	2000–2000	1	1/11	0.091
World Wide Web Journal	1998–2000	4	4/55	0.073

*Missing intervening years are not reported.
†Data on authors was mainly in the form first initial, last name, thus matching these authors with the directories was problematic.

APPENDIX C: IS ARTICLES IN JOURNALS PER YEAR

An X denotes that the journal did not exist during that year.

Journal	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total
ACTA	2	0	1	1	0	1	2	3	1	1	2	14
AI	0	1	1	5	3	1	3	2	4	1	3	24
AMIT	X	5	9	6	10	10	14	4	4	8	7	77
CACM	24	16	22	23	20	34	22	28	68	44	50	351
CAIS	X	X	X	X	X	X	X	X	X	39	35	74
CGA	3	5	4	1	1	3	5	1	1	2	2	28
COMP	2	6	2	2	6	9	15	14	11	15	10	92
CSE	0	0	0	0	0	0	0	0	0	3	0	3
DB	7	7	19	11	8	10	17	6	14	18	10	127
DKE	1	7	7	6	5	8	12	6	15	6	11	84
EM	X	0	1	4	2	6	2	11	13	23	11	73
HBR	2	1	4	4	3	4	6	12	9	4	14	63
IJEC	X	X	X	X	X	X	10	18	15	21	16	80
IJHCI	3	1	1	1	2	3	1	0	0	0	0	12
IJHCS	15	9	14	15	8	3	3	14	13	3	12	109
INTC	0	0	0	0	0	0	0	11	3	3	0	17
IS	12	8	9	3	13	4	10	4	4	6	6	79
ISF	X	X	X	X	X	X	X	X	X	14	24	38
ISR	20	12	15	12	18	15	23	21	20	21	25	202
JACM	1	1	2	0	2	1	1	0	0	1	1	10
JAIS	X	X	X	X	X	X	X	X	X	X	8	8
JALG	0	0	0	0	1	3	2	1	3	3	2	15
JCSS	1	0	3	2	3	3	4	2	1	2	3	24

Journal	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total
JECR	X	X	X	X	X	X	X	X	X	X	10	10
JGIM	X	X	X	9	9	8	9	9	10	13	11	78
JITTA	X	X	X	X	X	X	X	X	X	3	3	6
JMIS	29	27	62	35	33	33	32	36	34	28	43	392
JOSIT	X	X	X	X	X	X	X	2	3	5	3	18
JSIS	X	4	19	21	24	25	15	18	14	26	17	183
KIS	X	X	X	X	X	X	X	X	X	4	2	6
MISQ	21	26	27	23	10	22	19	15	22	21	29	235
MS	43	53	45	52	49	78	52	67	54	43	38	574
PDT	X	X	X	1	0	0	0	0	0	0	0	1
SJOC	2	2	0	2	5	3	1	2	2	3	3	25
SMR	7	9	9	11	13	8	9	11	10	8	11	106
SOFT	6	2	10	0	6	16	8	9	11	9	10	87
SURV	2	0	0	2	1	2	15	0	2	7	1	32
TEC	X	X	X	0	0	0	1	1	1	0	1	4
TEM	11	15	16	11	14	17	12	20	7	15	18	156
TISSEC	X	X	X	X	X	X	X	X	0	1	0	1
TKDE	4	8	6	16	9	13	14	20	15	9	11	125
TNN	0	0	0	0	0	0	1	4	2	3	2	12
TOCHI	X	X	X	X	3	2	2	3	1	3	1	15
TOCS	3	5	6	2	0	2	4	4	2	2	4	34
TODAES	X	X	X	X	X	X	X	0	0	0	1	1
TODS	2	1	5	1	4	1	6	4	2	5	1	32
TOG	0	1	0	0	0	1	0	1	0	0	0	3
TOIS	4	3	3	5	6	7	7	2	5	3	1	46
TOMACS	X	1	2	2	1	2	0	0	0	0	2	10
TOMS	1	1	1	2	0	0	1	1	0	0	0	7
TON	X	X	X	1	1	2	0	1	1	2	0	8
TOPLAS	0	0	3	2	1	3	2	1	0	1	0	13
TOSEM	X	X	0	0	1	1	0	0	1	1	0	4
TPDS	0	0	2	1	4	2	1	2	1	1	2	16
TSE	7	15	12	10	4	5	7	8	7	7	3	85
TVCG	0	0	0	0	0	1	1	0	0	0	0	2
VLDB	X	X	0	2	3	3	5	0	2	0	5	20

APPENDIX D: IS AUTHORS IN JOURNALS PER YEAR

Journal	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total
ACTA	2	0	1	1	0	1	2	3	1	1	2	12
AI	0	1	1	6	3	1	3	2	4	1	3	21
AMIT	X	8	13	10	17	15	17	6	5	12	12	96
CACM	22	23	31	26	21	49	30	37	95	55	76	347
CAIS	X	X	X	X	X	X	X	X	X	52	47	89
CGA	3	4	2	1	1	3	4	1	1	3	2	14
COMP	2	6	2	2	7	10	18	15	13	16	10	79
CSE	0	0	0	0	0	0	0	0	0	2	0	2
DB	12	10	27	15	19	16	27	7	26	28	26	190
DKE	2	8	6	6	7	9	14	7	18	9	11	62
EM	X	0	1	4	2	4	2	11	13	28	11	58
HBR	3	1	3	4	3	6	6	12	9	4	15	46
IJEC	X	X	X	X	X	X	17	26	21	35	20	89
IJHCI	3	1	1	1	4	4	1	0	0	0	0	14
IJHCS	17	12	20	19	9	3	3	17	13	2	20	114
INTC	0	0	0	0	0	0	0	12	2	3	0	17
IS	15	8	13	3	11	5	11	6	4	6	9	70
ISF	X	X	X	X	X	X	X	X	X	24	32	44
ISR	31	19	27	23	31	26	36	40	31	37	46	252
JACM	1	1	2	1	1	1	1	0	0	1	1	9
JAIS	X	X	X	X	X	X	X	X	X	X	18	18
JALG	0	0	0	0	1	3	2	1	2	3	2	9
JCSS	1	0	3	2	3	3	4	2	1	2	3	12
JECR	X	X	X	X	X	X	X	X	X	X	14	14
JGIM	X	X	X	12	14	10	9	16	15	20	14	96
JITTA	X	X	X	X	X	X	X	X	X	3	4	6
JMIS	47	41	69	64	55	66	56	76	64	53	67	423
JOSIT	X	X	X	X	X	X	X	3	5	8	5	15
JSIS	X	5	16	25	18	20	17	22	19	27	19	141
KIS	X	X	X	X	X	X	X	X	X	3	2	5
MISQ	41	38	49	42	16	49	32	27	39	37	53	309
MS	59	74	54	61	66	100	58	84	85	47	59	435
PDT	X	X	X	1	0	0	0	0	0	0	0	1
SJOC	2	2	0	2	6	3	1	3	2	3	3	21
SMR	9	10	10	14	14	11	16	14	18	9	14	89
SOFT	5	3	12	0	5	10	6	11	11	11	13	70
SURV	1	0	0	3	1	2	9	0	2	5	1	24
TEC	X	X	X	0	0	0	1	1	1	0	1	3
TEM	13	24	17	13	21	22	15	26	7	23	30	153
TISSEC	X	X	X	X	X	X	X	X	0	1	0	1

Journal	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total
TKDE	4	11	11	17	12	17	15	24	16	10	11	101
TNN	0	0	0	0	0	0	1	3	1	3	1	6
TOCHI	X	X	X	X	4	3	4	4	2	6	1	22
TOCS	3	4	8	1	0	3	4	3	2	2	4	26
TODAES	X	X	X	X	X	X	X	0	0	0	1	1
TODS	3	1	6	2	7	1	7	8	2	10	1	39
TOG	0	1	0	0	0	1	0	1	0	0	0	3
TOIS	5	5	4	6	6	8	9	3	6	6	1	54
TOMACS	X	1	2	3	1	2	0	0	0	0	2	9
TOMS	1	1	1	2	0	0	1	2	0	0	0	7
TON	X	X	X	1	1	2	0	1	1	1	1	6
TOPLAS	0	0	3	2	1	3	2	1	0	1	0	10
TOSEM	X	X	0	0	1	1	0	0	2	3	0	7
TPDS	0	0	3	1	4	1	1	2	1	1	2	13
TSE	12	18	18	15	5	5	9	8	11	11	3	87
TVCG	0	0	0	0	0	1	1	0	0	0	0	2
VLDB	X	X	0	2	4	4	6	0	2	0	5	18

APPENDIX E: MEANS/STANDARD DEVIATIONS OF CONSTRUCTS[26]

	Normal (σ_1)	Straight (σ_2)	Adjusted (σ_3)
All Researchers			
4 Journals	2.287 (2.587)	1.101 (1.627)	1.616 (1.905)
10 Journals	2.493 (2.684)	1.198 (1.700)	1.767 (1.989)
11 Journals	2.682 (2.916)	1.341 (1.848)	1.930 (2.182)
58 Journals	3.057 (3.360)	1.539 (2.072)	2.202 (2.489)
Top 10% – Normal Count			
4 Journals	6.752 (4.350)	3.168 (3.086)	4.733 (3.249)
10 Journals	7.806 (4.078)	3.672 (3.114)	5.492 (3.117)
11 Journals	8.148 (4.411)	3.959 (3.285)	5.813 (3.386)
58 Journals	11.936 (5.071)	5.667 (4.010)	8.416 (3.871)
Top 10% – Straight Count			
4 Journals	6.474 (5.006)	4.474 (2.982)	5.337 (3.574)
10 Journals	6.778 (4.482)	4.394 (2.635)	5.458 (3.105)
11 Journals	6.571 (4.726)	4.571 (2.697)	5.470 (3.361)
58 Journals	8.899 (5.239)	6.032 (2.940)	7.322 (3.659)
Top 10% – Adjusted Count			
4 Journals	7.777 (4.899)	4.106 (3.281)	5.721 (3.489)
10 Journals	8.160 (4.503)	4.559 (3.027)	6.175 (3.154)
11 Journals	8.551 (4.806)	4.852 (3.144)	6.518 (3.390)
58 Journals	11.052 (5.301)	6.250 (3.382)	8.393 (3.588)

[26]These are the unadjusted means and standard deviations and should be interpreted cautiously as the distribution is non-normal.

APPENDIX F: INTERACTION EFFECT: JOURNAL AND YEAR

Tables F1 through F3 present a limited analysis of the interaction effect between the journal basket and the year of publication for the basket of 58 journals. In these tables, internal values reflect deviations from expectations. For example, the expected correlation between the base group (all 58 journals for the period 1990–1995) and the interaction group "All journals excluding JMIS for the period 1991–1996" would be the product of "All journals excluding JMIS for the period 1990–1995," and "All 58 journals for the period 1991–1996" [Sharma et al. 1981].

Table F4 presents means and standard deviations of these results. As the standard deviation exceeds the mean for all tests (and thus the beta coefficient of the interaction effect is probably 0), we cannot conclude the existence of an interaction effect. However, especially for assessments on the top 10 percent of researchers, there do exist cases where varying both the journal basket and time period of assessment can vary the correlation by as much as an additional 10 percent.

Table F1. Interaction Effect: Journal and Year by Normal Count

	All	***JMIS***	***MISQ***
All Researchers			
1990–1995	1.000	0.918	0.954
1991–1996	0.860	-0.002	-0.008
1992–1997	0.748	+0.010	-0.007
1993–1998	0.598	-0.004	+0.009
Top 10% – Normal Count			
1990–1995	1.000	0.811	0.917
1991–1996	0.799	+0.031	-0.005
1992–1997	0.596	+0.137	+0.061
1993–1998	0.276	+0.082	-0.012
Top 10% – Straight Count			
1990–1995	1.000	0.886	0.924
1991–1996	0.820	+0.040	-0.011
1992–1997	0.591	+0.073	+0.023
1993–1998	0.360	+0.028	+0.021
Top 10% – Adjusted Count			
1990–1995	1.000	0.870	0.922
1991–1996	0.817	+0.041	-0.012
1992–1997	0.575	+0.111	+0.019
1993–1998	0.319	+0.074	+0.096

Table F2. Interaction Effect: Journal and Year by Straight Count

1990–1995	**All**	***JMIS***	***MISQ***
All Researchers			
1990–1995	1.000	0.924	0.937
1991–1996	0.841	+0.001	-0.006
1992–1997	0.701	+0.005	-0.027
1993–1998	0.545	-0.016	-0.030
Top 10% – Normal Count			
1990–1995	1.000	0.899	0.908
1991–1996	0.768	-0.012	-0.014
1992–1997	0.600	-0.051	-0.022
1993–1998	0.395	-0.014	-0.051
Top 10% – Straight Count			
1990–1995	1.000	0.876	0.904
1991–1996	0.733	+0.022	-0.012
1992–1997	0.483	+0.038	-0.011
1993–1998	0.191	+0.047	-0.040
Top 10% – Adjusted Count			
1990–1995	1.000	0.902	0.907
1991–1996	0.746	+0.007	-0.019
1992–1997	0.556	-0.019	-0.029
1993–1998	0.321	+0.014	-0.060

Table F3. Interaction Effect: Journal and Year by Adjusted Count

1990–1995	All	*JMIS*	*MISQ*
All Researchers			
1990–1995	1.000	0.945	0.979
1991–1996	0.896	-0.006	+0.011
1992–1997	0.821	+0.003	+0.021
1993–1998	0.696	-0.003	+0.053
Top 10% – Normal Count			
1990–1995	1.000	0.782	0.922
1991–1996	0.768	+0.015	+0.013
1992–1997	0.632	+0.120	+0.090
1993–1998	0.272	+0.028	+0.076
Top 10% – Straight Count			
1990–1995	1.000	0.856	0.931
1991–1996	0.785	+0.049	+0.019
1992–1997	0.545	+0.111	+0.127
1993–1998	0.279	+0.060	+0.076
Top 10% – Adjusted Count			
1990–1995	1.000	0.837	0.927
1991–1996	0.788	+0.037	+0.008
1992–1997	0.532	+0.133	+0.077
1993–1998	0.208	+0.037	-0.158

Table F4. Mean and Standard Deviation of Possible Interaction Effects

	Normal	Straight	Adjusted
All Researchers			
Mean	0.000	-0.012	0.013
Standard Deviation	0.008	0.015	0.022
Top 10%			
Mean	0.044	-0.013	0.051
Standard Deviation	0.044	0.030	0.066

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