

Working Paper Series  
ISSN 1170-487X

**Authorship patterns in  
Information Systems**

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Working Paper 96/24  
October 1996

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# Authorship patterns in Information Systems

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**Abstract:** This paper examines the patterns of multiple authorship in five information systems journals. Specifically, we determine the distribution of the number of authors per paper in this field, the proportion of male and female authors, gender composition of research teams, and the incidence of collaborative relationships spanning institutional affiliations and across different geographic regions.

## 1. Introduction

In his seminal work *Little Science, Big Science* [Price, 1963], Derek J. De Solla Price drew attention to the 20th century trend of increasing team work in scientific research and co-authorship in publication—making a tongue-in-cheek prediction that “by 1980 the single author paper will be extinct”, and that scientific collaboration would continue to increase so that scholarly publications would “move steadily toward an infinity of authors per paper” (p. 89).

Since 1963, Price’s conjectures have been measured and, to a large extent, verified, for a number of domains in the social sciences, arts, and physical sciences. Characteristics of collaboration in research have been examined in a number of ways: for example, through bibliographic analysis of readily quantifiable variables such as the rate of co-authorship and mean number of co-authors per document (for an overview of this type of research, see [Harsanyi, 1993]); through studies of the social organizations that support collaboration in particular and research in general (such as the ground-breaking work of [Crane, 1972]); and by ethnographic descriptions of the patterns of behavior employed by researchers in finding collaborators, organizing the research tasks, and composing the written documentation of the work (for example, the examination of the philosophy research process presented in [Sievert and Sievert, 1989]).

This paper examines authorship patterns in the field of Information Systems (IS). IS is a relatively young discipline, an interdisciplinary field at the conjunction of computer science, management, and the social sciences. It concerns itself primarily managerial, and “people” issues that support information management (primarily in an organizational context), and to a lesser extent with hardware and software issues. Perhaps because it is an emerging, interdisciplinary field, IS has been the focus of few bibliometric/scientometric studies. The present work uses bibliometric techniques to examine the extent of collaborative authorship in the field, the geographic distribution of co-authors, and gender patterns in publication and collaboration.

## 2. Methodology

The journals and time periods examined for this study are listed in Table 1. Journal articles, rather than books or technical reports, were chosen for analysis because the journal is the primary source of information in IS, making up the bulk of documents cited [Cunningham, 1996]. Five journals were selected for study, based on the criteria that they well known internationally, cover a relatively broad set of topics in the IS field, have author

information available, and are published in the English language. It should be noted, however, that the journals selected tend to the management end of IS.

<i>Journal title</i>	<i>abbreviation</i>	<i>years</i>
<b>Journal of Systems Management</b>	JSM	1989-1995
<b>Information Systems Research</b>	ISR	1990-1995
<b>Strategic Information Systems</b>	SIS	1991-1995
<b>Management Information Systems Quarterly</b>	MISQ	1989-1995
<b>Decision Support Systems</b>	DSS	1989-1995

Table 1. Journals analyzed in this study

The following definitions and guidelines were used in gathering data from the five journals:

- **author:** All individuals identified as authors in the heading of the paper were included, and counted equally. Some journal volumes apparently enforced an alphabetic name ordering on authors, while other journals—or even other volumes of the same journal—did not; for this reason we did not attempt to record the rank orderings of authors. Only personal (rather than corporate) authors were included in this study.
- **article:** All refereed papers from each issue of each journal were considered for inclusion in the study. All other articles (book reviews, editorials, letters to the editor, reports of conferences, etc.) were excluded. While all refereed articles were included in the examination of co-authorship rates, some of these papers were omitted from the remainder of the study because the gender and/or the affiliation of one or more authors could not be determined.
- **gender:** Where possible, the gender of an author was determined from the author's biography or picture. If this information was not available or was inconclusive, the gender was inferred from the author's personal name(s). If any doubt remained for any co-author of an article (that is, if the author was listed only by initials or had an ambiguous personal name), then that article was omitted from the study of author gender.
- **institution:** For co-authored articles, we noted whether or not all authors were affiliated with the same institution (generally a university or company). A single institution could have more than one physical location.
- **geographic area:** Co-authored articles were examined to determine whether all authors' institutions are from the same geographic region. This somewhat subjective category was defined as follows: for highly populated and physically large countries such as the United States, authors were considered to be from the same region if their institution were located in the same or adjacent states; for lightly populated or physically compact countries (such as New Zealand or the Netherlands, respectively), the entire country was considered to be a single geographic region.

### 3. Results

This section discusses the amount of collaboration in publishing, the geographic/institutional spread of co-author affiliation, and the gender of authors in the IS literature.

#### *degree of collaborative authorship*

Tables 2—4 summarize authorship collaboration in IS. Approximately 38% of the articles have a single author; the majority of the papers are co-authored, with two or three authors (Table 2). The maximum number of authors for a single paper was six, found in a vanishingly small minority of the articles (less than 0.5%). Viewed strictly in terms of the percentage of co-authored papers (Table 3), it is readily apparent that co-authorship is the norm for all journals, over the entire period of study. The journal with the smallest degree of co-authorship, the *Journal of Systems Management* (JSM), saw its percentage of collaboratively written articles rise from approximately one-third to one-half; the remainder of the journals have a co-authorship rate ranging from 40% to 100%. The percentage of co-authored papers has risen slightly between 1989 and 1995 in four of the five journals—perhaps reflecting the trend to increased co-authorship reported in other fields, as the subjects matured (Beaver and Rosen, 1979).

<i>number of authors</i>	<i>number of articles</i>	<i>percentage</i>
<b>1</b>	368	37.74%
<b>2</b>	391	40.10%
<b>3</b>	171	17.54%
<b>4</b>	37	3.80%
<b>5</b>	4	0.41%
<b>6</b>	4	0.41%
<b>Total</b>	975	100.00%

Table 2. Distribution of number of co-authors per paper

	JSM	ISR	SIS	MISQ	DSS	average
1989	36%			68%	73%	59%
1990	29%	75%		68%	57%	57%
1991	39%	92%	60%	77%	71%	68%
1992	41%	100%	40%	81%	68%	66%
1993	48%	92%	63%	89%	70%	72%
1994	46%	90%	67%	82%	70%	71%
1995	54%	87%	58%	87%	79%	75%

Table 3. Percentage of co-authored articles

	Mean	Variance	Std dev	std error	Number of articles
<b>JSM</b>	1.50	.466	.682	.039	308
<b>ISR</b>	2.175	.604	.777	.079	97
<b>SIS</b>	1.739	.655	.809	.086	88
<b>MISQ</b>	2.251	.954	.977	.075	171
<b>DSS</b>	2.071	.866	.931	.053	311
<b>Total</b>	1.903	.799	.894	.029	975

Table 4a. Mean number of co-authors per paper

**Unpaired t-test**  
**Hypothesized difference = 0**

	Mean Diff.	DF	t-Value	P-Value
JSM, ISR	-.675	403	-8.212	<.0001
JSM, DSS	-.571	617	-8.694	<.0001
JSM, MISQ	-.751	477	-9.851	<.0001
JSM, SIS	-.239	394	-2.771	.0059
ISR, DSS	.105	406	1.002	.3168
ISR, MISQ	-.076	266	-.659	.5105
ISR, SIS	.437	183	3.741	.0002
DSS, MISQ	-.181	480	-2.004	.0456
DSS, SIS	.332	397	3.038	.0025
MISQ, SIS	.513	257	4.233	<.0001

Table 4b. T-test of mean number of co-authors

The mean number of authors per article ranged from 1.5 (for the Journal of Systems Management) to 2.175 (for Information Systems Research), with an overall mean of 1.903 (Table 4a). As was noted when considering the distribution of numbers of co-authors in Table 2, while collaboration is the norm, the size of the research team in IS is relatively small. Differences in mean between the journals was generally not statistically significant, with the exception of ISR/DSS and ISR/MISQ (Table 4b).

*institutional affiliation and geographic region*

Table 5 presents the institutional and geographical commonalities found amongst co-authors. As noted in Section 2, at this point we use a subset of the articles examined in this study: those papers for which we could identify the institutional affiliation and gender of all authors. For nearly half of the co-authored articles of this subset—46%—all authors for an article are either affiliated with the same institution *or* are resident in the same geographic region. Just over half of the multiply authored papers, then, involve a collaboration across

significant distances. For nearly one-third (32%) of the co-authored papers, all authors are affiliated with the same institution—again, indicating a significant degree of collaboration across institutional boundaries. The collaborative relationships of working groups are thus surprisingly dispersed, suggesting that IS is a field with a healthy “invisible college”.

	JSM	ISR	SIS	MISQ	DSS	average
	1989-1994	1990-1994	1991-1994	1989-1994	1989-1994	
Co-authored articles						
occurrences	147	71	35	128	133	514
out of	364	80	62	166	189	861
percentage	40%	89%	56%	77%	70%	60%
co-authors from same institution OR same geographical area						
occurrences	95	15	20	48	61	239
out of	147	71	35	128	133	514
percentage	65%	21%	58%	38%	46%	46%
co-authors from same area, different institutions						
occurrences	34	1	5	11	23	74
out of	147	71	35	128	133	514
percentage	23%	1%	14%	9%	17%	14%

Table 5. Percentage of co-authors from the same institution or geographical area

*gender of authors*

Gender was recorded for *all* authors for whom it was explicitly stated or could be inferred; this could be determined for 861 papers, with 1021 authors. As no attempt was made to maintain a list of names, it is unknown how many unique individuals are represented in that total. Approximately four-fifths of the authors were male (Table 6), with male authors being in the majority for each journal.

<i>Gender</i>	<i>Number</i>	<i>Percentage</i>
<b>male</b>	804	78.7%
<b>female</b>	217	21.3%

Table 6. Gender of authors

The preponderance of male authors appears to mirror the under-representation of women in the Management/IS disciplines of academia, in which opportunities for publication and research are more likely than in commercial enterprises (McKeen et al, 1994; Still, 1993). IS departments are generally located within the business or management faculty in universities, where women tend to be over-represented as instructors, lecturers, contract researchers, and other untenured staff positions. In the mid-eighties in the US, for

example, women held 52% of the instructor and lower teaching positions and 36% of the assistant professorships in business schools, but accounted for only 6% of the full professorships (Aisenberg and Harrington, 1988). These lower level positions provide fewer opportunities for research funding, and generally involve a higher teaching load (with proportionally less time for research).

Next, we examine the question of whether or not males and female have the same patterns of collaboration and co-authorship (Table 7). The percentage of male authors who published a single-authored paper is 37.31% ([343 male single authors] / [804 male authors]); the percentage of female authors who published solo is 18.89% ([41 single author females] / [217 female authors]). The percentage of male authors involved in male-only co-authored papers is 42.66% ([343 / 804]), while the percentage of female authors who published in female-only groups is 6.91% (15/217). Clearly, then, a female author is more likely to co-publish than a male author, and more likely to publish in mixed gender research teams.

	<i>single male author</i>	<i>multiple authors, male only</i>	<i>single female author</i>	<i>multiple authors, female only</i>	<i>multiple authors, male and female</i>
<b>number</b>	<b>300</b>	343	41	15	161
<b>percentage</b>	<b>34.9%</b>	39.9%	4.8%	1.7%	18.7%

Table 7. Gender composition of publishing teams

#### 4. Conclusions

The high proportion of multiply-authored papers is characteristic of the physical and life sciences rather than the social sciences. In the "hard" sciences the percentage of co-authored articles is reported to range from two-thirds and up (Clarke, 1964; Meadows, 1974), with nearly universal co-authorship in fields for which research is based on complex, expensive instruments/equipment (Meadows and O'Connor, 1971, as reported in Gordon, 1980). By way of contrast, the proportion of single-authored papers is much higher in the humanities and social sciences: in philosophy, for example, collaboration is so unusual that some researchers find it difficult to imagine how a joint project could be produced [Sievert and Sievert, 1989]. Even in these disciplines, however, sub-fields may vary in their degree of collaboration, often reflecting equipment or team needs outside the norm for that discipline (for example, biophysical and archaeological anthropology show higher degrees of collaboration than sociocultural and linguistic anthropology [Choi, 1988]). IS, then, seems to fit more into the multiply-authored norm of the physical or experimental sciences than the humanities/social sciences.

This point is slightly muddled, however, when comparing the mean number of authors in IS with the mean of other fields (Table 8). IS articles tend to have a smaller average number of co-authors than the "hard" sciences, even though the rate of co-authorship is high. Two hypotheses present themselves: that the experimental team needed to support IS research is smaller than the team size necessary for managing the instruments for the physical sciences; and/or that the support personnel for IS research may not be acknowledged with authorship, as seems to be the case in some of the sciences.

<i>Discipline</i>	<i>authors/paper</i>	<i>year(s) of study</i>	<i>Reference</i>
<b>Library science</b>	1.17	1989-90	Raptis, 1992
<b>Counseling</b>	1.45	1971-1982	Gladding, 1984
<b>Anthropology</b>	1.79	1983	Choi, 1988
<b>Applied, physical, analytical chemistry</b>	2.13	1978-1980	Stephanik, 1982
<b>Chemical engineering</b>	2.13		Subrahmanyam & Stephens, 1982
<b>Biomedicine (basic life sciences)</b>	2.21	1961-1978	Satyanarayana & Ratnakar, 1989
<b>Biomedicine (preclinical basic research)</b>	2.25	1961-1978	Satyanarayana & Ratnakar, 1989
<b>Biochemistry</b>	2.41	1978-1980	Stephanik, 1982
<b>Biomedicine (clinical research)</b>	2.71	1961-1978	Satyanarayana & Ratnakar, 1989
<b>Biochemistry</b>	2.72		Subrahmanyam & Stephens, 1982
<b>Chemistry</b>	2.82	1974-1975	Heffner, 1981
<b>Schistosomiasis</b>	2.92	1972-1986	Pao, 1992
<b>Political Science</b>	3.54	1974-1975	Heffner, 1981
<b>Biology</b>	3.97	1974-1975	Heffner, 1981
<b>Psychology</b>	4.58	1974-1975	Heffner, 1981
<b>Astronomy &amp; astrophysics</b>	7.4	1974	Abt, 1984

Table 8. Average number of authors for a variety of fields

The degree of collaboration in IS that crosses institutional and geographic boundaries is significant, and warrants further attention—in particular, to investigate the communication techniques that support co-authorship. Traditionally, collaboration occurs through face-to-face meetings, telephone, and postal correspondence; it is likely that email and other Internet-based communication modes also see significant use, given the naturally high degree of computer literacy in this field.

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