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Shaping the landscape of research in Information Systems from the perspective of editorial boards

A scientometric study of 77 leading journals

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Abstract Characteristics of *JASIST* and 76 other journals listed in the *Information Systems* category of the *Journal Citation Reports – Science edition 2009* were analyzed. Besides reporting usual bibliographic indicators, we investigated the human cornerstone of any peer-reviewed journal: its editorial board. Demographic data about the 2,846 gatekeepers serving in IS editorial boards were collected. We discuss various scientometric indicators supported by descriptive statistics. Our findings reflect the great variety of IS journals in terms of research output, author communities, editorial boards, as well as gatekeeper demographics (e.g., diversity in gender and location), seniority, authority, and degree of involvement in editorial boards. We believe that these results may help the general public and scholars (e.g., readers, authors, journal gatekeepers, policy makers) to revise and increase their knowledge of scholarly communication in the IS field. The EB_IS_2009 dataset supporting this scientometric study is released as an online Supplementary Material to this article to foster further research on editorial boards.

Keywords Scientific journals · Information systems · Editorial boards · Gatekeepers · Scientometric study

Introduction

In his first editorial entitled *Changing of the Guard*, the newly appointed Editor-In-Chief of *JASIST* lifted the covers on the internal workings of the journal (Cronin 2009a). Several follow-up editorials discussed statistics about the *JASIST*'s peer review process (Cronin 2009c, 2011), author demographics (Cronin 2009b), and geographic diversity of editorial board members (Cronin 2009d). These scientometric[1] studies complemented other widely available bibliometrics, such as the Journal Impact Factor (Garfield 1955). They offered both readers and authors valuable knowledge about *JASIST*'s characteristics by shedding light on some of the journal internals.

The aim of the present work is to take a broader perspective on this issue. We intend to further investigate the research field in which *JASIST* is much involved: Information Systems (IS). We thus tackle the following questions: How to depict the landscape of research in IS? What are the characteristics underlying leading IS journals? Our purpose is twofold. First, we wish to increase the understanding of scholarly communication in IS. Second, we intend to compare the characteristics of *JASIST* (as a journal contributing to the research in IS) with the characteristics of the leading IS journals. This study ultimately shapes the landscape of IS research, and depicts how *JASIST* is involved.

Past literature from various scientific disciplines has been reflecting on scholarly communication in those fields. Scientometric studies have been attracting considerable interest in disciplines such as Accounting (Lowe and Van Fleet 2009), Chemistry (Zsindely et al 1982), Economics (Gibbons and Fish 1991; Baccini and Barabesi 2010), Education and Educational Psychology (Campanario et al 2006), and Nanoscience (Braun et al 2007a). Complementary studies comparing several scientific disciplines have also been undertaken (e.g., Nisonger 2002; Braun and Dióspatonyi 2005b; Braun et al 2007b; Bedeian et al 2009; Börner 2010; García-Carpintero et al 2010). The general purpose of such studies is to assure the research community and general public

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[1] Scientometrics refers to the study of science. The interested reader may refer to (Hood and Wilson 2001).

that peer-reviewed journals ensure high standards of scholarship (Bedeian et al 2009). These also set out to identify issues (e.g., the empaneling of editorial board members with lack of expertise) and suggest recommendations to fix them.

It is worth noting, however, that only a few scientometric studies addressed Computer Science. The work most related to *JASIST*'s topics was recently done by Baccini and Barabesi (2011), who scrutinized 61 journals of Information Science and Library Science. They documented the 'interlocking editorship' phenomenon, which refers to a gatekeeper[2] sitting on several editorial boards. If each gatekeeper influences the journal's editorial policy, as assumed by the authors, then occupying several seats increases the gatekeeper's power. In a previous study, Cronin (2009d) explored this phenomenon on a sample of 10 journals in Information Science, 21% gatekeepers of which were sitting at least on two editorial boards.

Interestingly, these studies did not focus on bibliometrics, but rather explored a valuable human factor of journals: their editorial boards. These gather scientists acknowledged in the field (Merton 1973), and represent a high quality indicator, as suggested in the literature (e.g., Braun 2005, 2009; Bedeian et al 2009). We elaborated on this idea to study IS journals from the perspective of their editorial board, thus continuing the works by Cronin (2009d), as well as Baccini and Barabesi (2011) in examining the human cornerstones of scientific journals: editorial boards.

Data about the editorial boards and articles published in 77 leading IS journals were collected. Thorough statistical analysis was applied to quantitative and qualitative data about journals, their editorial boards, and gatekeepers. Our scientometric study highlights the great variability in characteristics for the 77 IS journals. We believe that the findings of this article may contribute to increasing the understanding of scholarly communication in IS and 'make a difference to the way we see our world,' as encouraged in (Cronin 2009a).

The article is organized as follows. We introduce the data collected for analyzing the 77 leading IS journals in the first section. The methodology used in this study is described in the second section. Results are then addressed. We report and discuss findings about IS journals (third section), editorial boards (fourth section), and gatekeepers (fifth section). Past literature is reviewed throughout the article, in an attempt to put our results into perspective. Finally, we discuss our findings in the sixth section before concluding by giving some insights into future work.

[2] Crane (1967) was an early adopter of the term *gatekeeper*. This term has been picked up in scientometrics then (e.g., Zsindely et al 1982; Braun 2005, 2009). In the present paper, it refers to any non-technical editorial board member, whatever his or her role (e.g., Editor-In-Chief, Regional Editor, Senior Editor).

Data about journals, publications, and gatekeepers

The purpose of our scientometric study is to enhance the understanding of the IS field of Computer Science. We rely on leading peer-reviewed journals, which are expected to attract and crystallize high quality research work in IS. This section introduces the data collected regarding journals and the gatekeepers serving on their editorial boards.

Data about 77 leading IS journals

Our study is interested in the *Computer Science, Information Systems* category of the *Journal Citation Reports – Science edition 2009*. This is comprised of 116 journals, one of which is *JASIST*.

The *Journal Citation Reports*[3] *(JCR)* is an annual publication of Thomson Reuters providing information about academic journals in the Sciences and the Social Sciences. Journals are classified into categories corresponding to domains (e.g., *Computer Science*) and sub-domains (e.g., *Information Systems*). They can be compared with several indicators, as reviewed in (Bar-Ilan 2008, 'Indicators' section). Garfield's (1955) Journal Impact Factor (JIF) is one of the most popular indicator reported for journals (Glänzel and Moed 2002). For instance, one reads in the *JCR – Science edition 2009* that *JASIST* has a JIF value of 2.300. This means that *JASIST* papers published in 2007 and 2008 received 2.300 citations each, on average.

Reviewing the JIF literature, Campanario (2011a) echoes a criticism related to the citation window of 2 years, which is deemed "too brief to capture all relevant scientific impact." In addition, large variations of the JIF were observed from one year to the other. Most of these were attributed to a large increase in journal self-citation (Campanario 2011b). In this context, it is interesting to note that the *JCR* also reports 5-year impact factors (5YJIF). The present study relied on the 5YJIF, considered as a way to smooth the aforementioned short-term variations of the JIF. This requirement implied dropping 24 journals that were too recent to have a 5YJIF in the 2009 edition of the *JCR*. As a result, we focused on the remaining 92 journals with 5YJIF.

Data about researchers' publications

We intended to study the scholarly communication in IS journals. This involves several parties, such as authors and gatekeepers. In order to acquire data about these researchers, both journal articles and conference papers were considered. Indeed, Computer Science is a field where publication in conferences is an acknowledged way for disseminating research results (Bar-Ilan 2010b; Freyne et al 2010).

[3] http://www.webofknowledge.com/JCR

Table 1 The 15 journals excluded from our study, with rationale for exclusion

Rank	*JCR* abbreviated title	Publisher	5YJIF	Rationale for exclusion
1	*Annu Rev Inform Sci*	Information Today	3.030	Not in DBLP
2	*IBM Syst J*	IBM Corporation	1.975	Merged to *IBM J Res* in 2009
3	*Method Inform Med*	Schattauer	1.526	Not in DBLP
4	*Open Syst Inf Dyn*	Springer	1.205	Not in DBLP
5	*Med Inform Internet*	Taylor & Francis	1.160	Discontinued in 2008
6	*IET Inform Secur*	IET	0.892	Not in DBLP
7	*Photonic Netw Commun*	Springer	0.847	Not in DBLP
8	*Infor*	U. Toronto Press	0.843	Not in DBLP
9	*Inform Technol Libr*	Amer. Library Assoc.	0.696	Not in DBLP
10	*J VLSI Sig Proc Syst*	Springer	0.661	Discontinued in 2008
11	*ASLIB Proc*	Emerald	0.582	Not in DBLP
12	*IEICE T Inf Syst*	IEICE	0.429	Merged to #13 in DBLP
13	*IEICE T Fund Electr*	IEICE	0.394	Merged to #12 in DBLP
14	*Program-Electron Lib*	Emerald	0.349	Not in DBLP
15	*J Commun Netw-S Kor*	KICS	0.200	Not in DBLP

Many digital libraries collect Computer Science publications. We opted for the DBLP Computer Science Bibliography (Ley 2002) for four reasons. First, DBLP has a large coverage of the Computer Science literature. It was indexing 1,618,246 publications authored by 932,117 researchers at the time we started our study (April 3, 2011). DBLP provides records for conference papers and journal articles published by major publishing houses, such as the ACM, Elsevier, Springer, and Wiley. Second, DBLP records are created manually, making them more reliable than computer-generated Web-based bibliographic data like CiteSeer (Fiala 2011). Third, DBLP records are publicly released as the `dblp.xml` file, which was 834 MB in size on April 3, 2011. Fourth, DBLP has been already mined for research purposes, such as Lotka's Law validation (Elmacioglu and Lee 2005), expert search (Deng et al 2008), and assessment of inter-researcher similarity measures (Cabanac 2011).

From the previously selected 92 journals with 5YJIF, we had to reject 15 journals (Table 1). There were three exclusion criteria: 1) publication records for most of them were not found in the DBLP, 2) three journals were discontinued before 2009, and 3) two IEICE journals were merged in the DBLP. Dropping these 15 journals has limited influence on our study. Indeed, journals absent from the DBLP are expected to be poorly related to Computer Science, which seems to be the case for some listed in Table 1. In addition, all journals but *Annu Rev Inform Sci* have low 5YJIF, implying that we still managed to capture the top-quality IS journals.

Finally, the 77 IS journals considered in the present study are shown in Table 2, where journal titles (as abbreviated in the *JCR*) and publishers are provided. Journals are ranked by decreasing 5YJIF. The same rank is given to tied journals, such as *Inform Syst* and *Knowl Inf Syst* at rank 29 with a 2.302 5YJIF. Journal categories were defined to support exploratory studies. The limits of these four categories (labeled A, B, C, and D) rely on the quartiles of the 5YJIF distribution. Thus, Category A is concerned with the top 25% journals, Category B with the next 25% journals, and so on.

JASIST appears in bold in Table 2. It is abbreviated *J Am Soc Inf Sci Tec* and lies in Category B, since it is ranked 26th according to its 2.480 value of 5YJIF.

Data about editorial boards and gatekeepers

Each journal is run by an editorial board gathering prominent scientists of the journal's area of research. Leading scientists are invited to join editorial boards as an acknowledgment of their achievements (see, among others, Merton 1973; Faria 2005; Bedeian et al 2009; Powell 2010). In most cases, one researcher from the board is appointed as the Editor-In-Chief, who is responsible for the quality of papers published in the journal. Other positions may be appointed, such as Senior Editor, or Regional Editor (e.g., responsible for submissions coming from the Americas).

Unlike the 5YJIF and other indicators released in the *JCR*, for instance, we failed to find a unique resource collecting the editorial boards for a given research field. This is especially true for IS. However, the need for such an 'up-to-date comprehensive computerized database of science gatekeepers' was notably expressed in (Braun 2005).

Since no dataset of IS editorial boards seemed to be publicly available, we managed to collect the editorial boards of the 77 leading IS journals under study. Editorial boards are published in the masthead of journal issues recording gatekeepers' name, affiliation (i.e., university or company), and role in the board (e.g., Editor-In-Chief, Senior Editor). The data model that we designed and manually populated from January to May of 2011 is shown in Figure 1. We retrieved the title of each journal (as featured in DBLP and *JCR*), its publisher, ISBN, and 5YJIF. Names of board members were matched to DBLP records to retrieve all their publication records. Here, we faced two problems. First, some journals

Table 2 Leading 77 IS journals ranked by decreasing 5YJIF. Categories A, B, C, and D are delimited by the quartiles of the 5YJIF distribution

Rank	*JCR* abbreviated title	Publisher	5YJIF	Category	Rank	*JCR* abbreviated title	Publisher	5YJIF	Category
1	*Mis Quart*	U. Minnesota	9.208	A	40	*IEEE Secur Priv*	IEEE	1.830	C
2	*VLDB J*	Springer	6.987	A	41	*Wirel Netw*	Springer	1.784	C
3	*ACM T Inform Syst*	ACM	5.774	A	42	*Inform Retrieval*	Springer	1.752	C
4	*J Am Med Inform Assn*	BMJ	5.199	A	43	*Mobile Netw Appl*	Springer	1.725	C
5	*IEEE T Wirel Commun*	IEEE	4.534	A	44	*Comput Secur*	Springer	1.718	C
6	*Data Min Knowl Disc*	Springer	4.432	A	45	*Comput Netw*	Elsevier	1.610	C
7	*IEEE Pervas Comput*	IEEE	4.395	A	46	*World Wide Web*	Springer	1.564	C
8	*Inform Manage-Amster*	Elsevier	4.297	A	47	*Distrib Parallel Dat*	Springer	1.543	C
9	*J ACM*	ACM	4.200	A	48	*Eur J Inform Syst*	Palgrave	1.534	C
10	*IEEE T Mobile Comput*	IEEE	3.956	A	49	*Int J Coop Inf Syst*	World Scientific	1.468	C
11	*IEEE T Inform Theory*	IEEE	3.936	A	50	*Inform Syst Manage*	Taylor & Francis	1.436	C
12	*IEEE T Knowl Data En*	IEEE	3.691	A	51	*Inform Software Tech*	Elsevier	1.426	C
13	*IEEE T Depend Secure*	IEEE	3.649	A	52	*Geoinformatica*	Springer	1.396	C
14	*J Chem Inf Model*	ACS	3.631	A	53	*J Vis Commun Image R*	Elsevier	1.389	C
15	*IEEE Network*	IEEE	3.529	A	54	*Int J Inf Tech Decis*	World Scientific	1.379	C
16	*ACM T Database Syst*	ACM	3.290	A	55	*Internet Res*	Emerald	1.346	C
17	*J Manage Inform Syst*	M.E. Sharpe	3.215	A	56	*Inform Syst Front*	Springer	1.298	C
18	*Inform Sciences*	Elsevier	3.089	A	57	*J Intell Inf Syst*	Springer	1.207	C
19	*Enterp Inform Syst*	Elsevier	3.085	A	58	*Comput J*	Oxford	1.194	C
20	*Int J Med Inform*	Elsevier	3.061	A	59	*Online Inform Rev*	Emerald	1.111	D
21	*Decis Support Syst*	Elsevier	2.842	B	60	*Comput Commun Rev*	ACM	1.079	D
22	*ACM T Web*	ACM	2.813	B	61	*Acta Inform*	Springer	1.072	D
23	*ACM T Auton Adap Sys*	ACM	2.707	B	62	*Comput Commun*	Elsevier	1.012	D
24	*J Inf Technol*	Palgrave	2.664	B	63	*Int J Distrib Sens N*	Taylor & Francis	0.882	D
25	*J Strategic Inf Syst*	Elsevier	2.531	B	64	*Inform Process Lett*	Elsevier	0.877	D
26	***J Am Soc Inf Sci Tec***	**Wiley**	**2.480**	**B**	65	*Informatica-Lithuan*	IOS Press	0.854	D
27	*IEEE T Multimedia*	IEEE	2.372	B	66	*Multimedia Syst*	Springer	0.852	D
28	*Int J Geogr Inf Sci*	Taylor & Francis	2.303	B	67	*J Org Comp Elect Com*	Taylor & Francis	0.851	D
29	*Inform Syst*	Elsevier	2.302	B	68	*IEEE Syst J*	IEEE	0.825	D
29	*Knowl Inf Syst*	Springer	2.302	B	69	*J Res Pract Inf Tech*	ACS	0.752	D
31	*IEEE T Inf Technol B*	IEEE	2.268	B	70	*Multimedia Tools Appl*	Springer	0.712	D
32	*SIGMOD Rec*	ACM	2.224	B	71	*J Signal Process Sys*	Springer	0.578	D
33	*Inform Process Manag*	Elsevier	2.106	B	72	*Sci China Ser F*	Springer	0.473	D
34	*Wirel Commun Mob Com*	Wiley	2.069	B	73	*Bell Labs Tech J*	Wiley	0.459	D
35	*Data Knowl Eng*	Elsevier	2.053	B	74	*RAIRO-Theor Inf Appl*	EDP Sciences	0.451	D
35	*J Database Manage*	IGI Global	2.053	B	75	*J High Speed Netw*	IOS Press	0.442	D
37	*IEEE Multimedia*	IEEE	2.020	B	76	*J Inf Sci Eng*	Academia Sinica	0.390	D
38	*J Inf Sci*	Sage	1.996	B	77	*KSII T Internet Inf*	KSII	0.200	D
39	*Requir Eng*	Springer	1.907	B					

do not provide gatekeepers' full name, but initials only (e.g., 'E. Garfield' who serves on *Scientometrics*). Second, some gatekeepers have namesakes, such as 'Chen Li' which is currently attributed to 8 different persons (Ley 2009). As suggested in previous studies (e.g., Bedeian et al 2009) we used names and affiliations in combination to identify the right person in DBLP.

An original aspect of our study is that we collected gatekeeper demographics (i.e., gender and location). We manually extracted these data from gatekeepers' web pages or biographies, as published in some journal papers. We failed to find the gender of 24 researchers among the 2,846 gatekeepers (i.e., 0.8%). We believe that this does not question the validity of our study.

Finally, we recorded gatekeepers' roles in boards with the 'level' attribute (see Figure 1). We did not subjectively assign a value to each of the dozen of encountered roles (e.g., Editor-in-Chief, Senior Editor, Advisory Editor, Regional Editor). We relied on the order in which roles are listed in journal mastheads instead. The role listed in last position was assigned level 1, while the role listed just above was as-

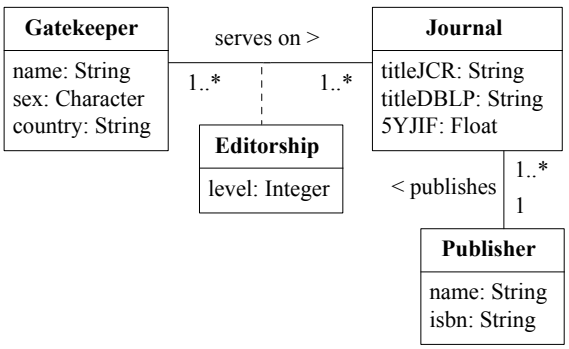

Fig. 1 UML class diagram for the dataset of editorial boards

signed level 2, and so on until the role listed in first position received the highest level. This procedure allowed the objective recording of role importance according to each journal's policy. It is illustrated in Table 3 for the editorial board of *JASIST*.

Table 3 Example of roles as listed in the masthead of *JASIST*, with associated level values

Level	Role	Count	Gatekeepers
4	Editor Emeritus	1	D. H. Kraft
3	Editor-In-Chief	1	B. Cronin
2	Associate Editors	3	J. Furner, D. Shaw, M. Thelwall
1	Editor	30	J. Bar-Ilan, . . . , P. Wouters

Overall, we collected data for the 2,846 researchers serving on editorial boards. We called this dataset EB_IS_2009 for 'editorial boards in IS listed in *JCR* edition 2009.' It is formatted in XML (see Appendix A). In reply to Braun's (2005) call for a database of science gatekeepers, we release EB_IS_2009 as an online Supplementary Material to this article. This contribution ensures the reproducibility of our findings, which is paramount in research. We also wish to foster further research involving editorial boards.

The EB_IS_2009 dataset introduced in this section was analyzed in various ways for gaining greater understanding of the IS field. The methodology supporting the conducted analyses is introduced in the next section.

Methodology

As suggested for bibliometric analysis (Wolfram 2006; Mallig 2010), we relied on a relational database and SQL for computing descriptive statistics about journals, editorial boards, and gatekeepers of the IS field. A two-level analysis was conducted as follows.

1. For the *Overall* level, statistics were computed over the 77 IS journals. Such coarse-grained statistics support the understanding of characteristics related to research in IS as a whole. For example, a coarse-grained statistic may report the 10 most frequent countries found in gatekeeper affiliations.
2. For the *Category* level, statistics were computed on one-fourth of the 77 IS journals. Categories A, B, C, and D derived from the 5YJIF (as listed in Table 2) were considered in turn for fine-grained analysis. For example, fine-grained statistics are involved when comparing the 10 most frequent countries found in gatekeeper affiliations between the top 25% IS journals (Category A) and the bottom 25% IS journals (Category D).

Other categorical analyses compared populations according to their gender. For example, we computed the ratio of males to females in editorial boards to assess the male-female parity in IS research.

Statistics are reported with supporting charts. Scatter plots show data points in a 2-dimensional Cartesian coordinate system. Bubble plots are scatter plots with varying sizes of data points, as a way to represent a third variable. Moreover, we use box plots for reporting statistics about the distribution of data. They show the spread of data, as well as the median value, and outliers (see, among others, Williamson et al 1989). Finally, we report gender-dependent statistics with population pyramids. All charts were generated by either Gnuplot or Graphviz.[4]

Findings about IS journals

In this section, we discuss several characteristics of IS journals: impact factors, publishing houses, research output, authors, coauthoring behavior, and topics.

Impact factors

The box plot in Figure 2 represents the 5YJIF values for the 77 IS journals listed in Table 2. These values lie between 0.200 (for *KSII T Internet Inf*) and 9.208 (for *Mis Quart*). The median 5YJIF value is 1.907, as shown by the segment in the box. According to the box, 50% of the journals have a 5YJIF between 1.192 and 3.061. The data are skewed towards low 5YJIF values since the median is closer to the lower bound of the box than to its upper bound. In other words, most of the journals have a 5YJIF lower than the middle of the box, which is $1.192 + \frac{1}{2} \cdot (3.061 - 1.192) = 2.126$.

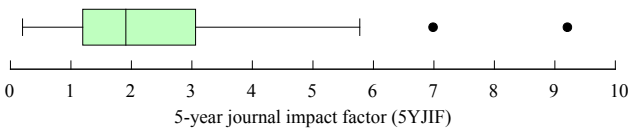

Fig. 2 Box plot of 5YJIF values for the 77 leading IS journals

There are two outlying IS journals, namely *Mis Quart* with a 5YJIF value of 9.208, and *VLDB J* with a 5YJIF value of 6.987. For the record, the 5YJIF of *JASIST* (2.480) is higher than the median value computed for the 77 IS journals.

Publishing houses

The 20 publishing houses issuing the 77 IS journals were listed. The bubble plot in Figure 3 shows the cumulated 5YJIF (y axis) of the 20 publishers sorted by decreasing cumulated 5YJIF (x axis). Bubble size is proportional to the

[4] http://gnuplot.sourceforge.net, http://www.graphviz.org

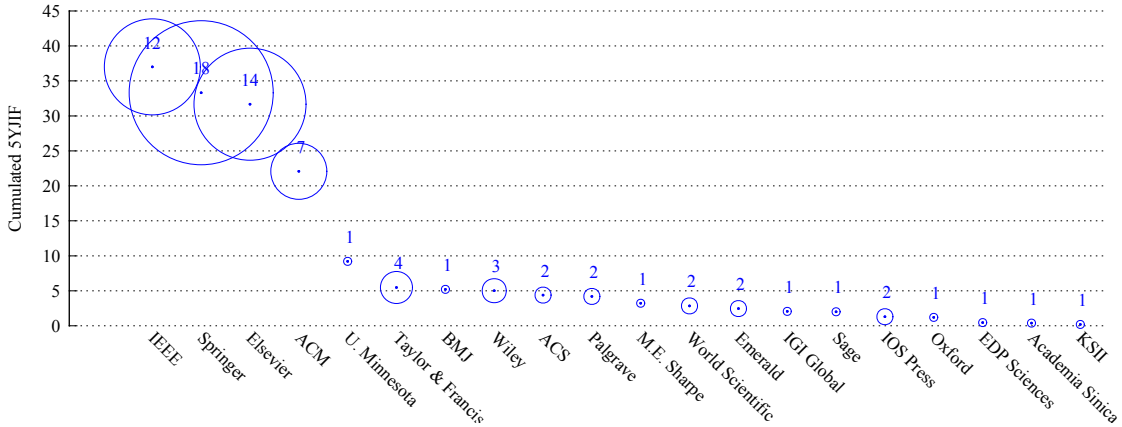

Fig. 3 Bubble plot of cumulated 5YJIF for each publishing house. Bubble size is proportional to the number of journals published by each publishing house (displayed above data points)

number of journals published by the associated publishing house. For instance, the IEEE publishes 12 of the 77 journals under study, whose cumulated 5YJIF reaches 37.005. This chart suggests that there are 4 leading publishers in IS regarding the 5YJIF, namely the IEEE, Springer, Elsevier, and the ACM. Although accounting for $4/20 = 5\%$ of the identified publishing houses, they publish $(12+18+14+7)/77 = 66\%$ of the IS journals under study.

We found no study addressing cumulative 5YJIF as we did. However, Braun and Dióspatonyi (2005b) studied 20 'core journals' in 12 scientific domains. Among the 10 top publishing houses selected according to the number of published journals, some also appear in Figure 3. These are Elsevier (ranked 1st), Wiley (2nd), Springer (5th), and Oxford (10th). The leading publishers in IS do not appear in Braun and Dióspatonyi's (2005b) list, as they may only be concerned with research in Computer Science. They may thus publish a handful of journals in this very field, instead of several journals in many fields. This difference seems especially relevant for associations (e.g., the ACM, the ACS).

It is beyond this study to offer an exhaustive account of the literature of scientific publishing. The interested reader is referred to (e.g., Dewatripont et al 2006) for detailed information about the market of journal publications.

Research output

The number of articles published by the 77 IS journals was examined. The box plots in Figure 4 show the average number of publications per year. Overall, an IS journal publishes a median of 45 articles a year. There is a great variability in publication rate since 50% of journals publish between 26 and 67 articles a year. *JASIST* published 189 articles a year on average, which is the outlying value of Category B.

There are 5 outlying IS journals whose publishing rates vary from 153 to 457 articles a year (i.e., 153 for *Inform Process Lett*, 189 for *J Am Soc Inf Sci Tec*, 226 for *J Chem Inf Model*, 239 for *IEEE T Inform Theory*, and 457 for *IEEE T Wirel Commun*).

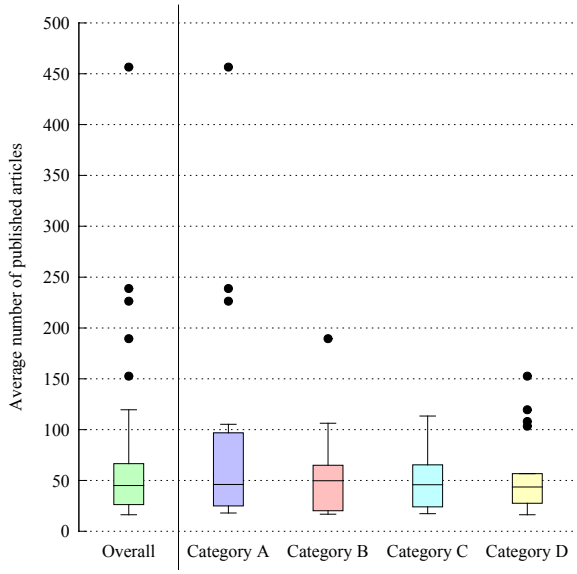

Fig. 4 Box plots of the average number of published articles per year for the 77 leading IS journals

A finer-grained analysis shows that journals publishing most papers come from Category A, as shown by outliers in this category. In addition, the large box with a high upper bound suggests that journals from Category A tend to publish more articles than the other categories do.

Authorship

Publication rate has an effect on the potential audience (i.e., readers and authors) of any journal. Let us consider the authors of a journal to be the researchers who had at least one

article published in this journal. The box plots in Figure 5 show the number of authors for the IS journals. We only considered the 2005-2010 period, and retained those 68 (active) journals having published articles throughout this period.

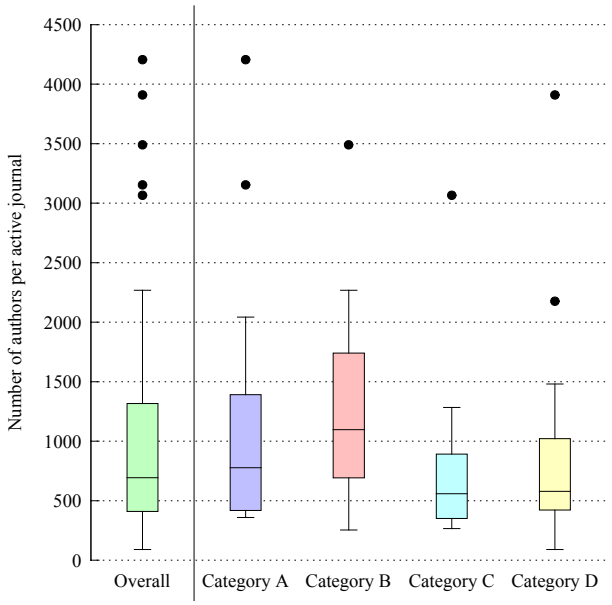

Fig. 5 Box plots of the number of authors for each of 68 IS journals active during the 2005-2010 period

Overall, an IS journal involves a variable number of authors, as shown by the lengthy whiskers ranging from 90 to 2,268 authors. According to the box size of the Overall box plot, half of the journals published between 413 and 1,300 authors from 2005 to 2010, with a median of 693 authors. For the record, *JASIST* published 1,798 authors during the same period.

There are 5 outlying journals having from 3,067 to 4,206 published authors (i.e., 3,067 for *Comput Netw*, 3,154 for *IEEE T Inform Theory*, 3,491 for *J Inf Sci Eng*, 3,910 for *Comput Commun*, and 4,206 for *IEEE T Wirel Commun*).

A finer-grained analysis shows that the median number of published authors lies between 559 (Category C) and 1,097 authors (Category B).

For a journal, having a large number of authors can result from 1) publishing many articles, or 2) having many coauthors per article, or 3) both. We already investigated 1) in the previous section. Let us investigate 2) in the following section.

Coauthorship

The bylines of the articles were analyzed to learn how researchers contribute as coauthors in IS. The box plots in Figure 6 show that 50% of IS journals publish articles authored by between 2.3 and 3.0 researchers on average, with a median value of 2.6 authors per article.

Bylines in *JASIST* credit papers with 2.0 authors on average, which is the lowest value of Category B. This is in line with figures reported in (Cronin 2009b): 'the average number of authors per *JASIST* paper increased, though not linearly, from 1.6 in 1980 to 2.4 in 2008.' Our result suggests that *JASIST* authors work alone or in smaller groups than the authors publishing in Category B.

The two outliers are journals concerned with IS and health issues, namely *J Am Med Inform Assn* (4.7 coauthors by article on average), and *IEEE T Inf Technol B* (4.2 coauthors by article on average). These domains are known to involve substantially more authors in bylines (Rennie et al 1997; Cronin 2001; Laine and Mulrow 2005).

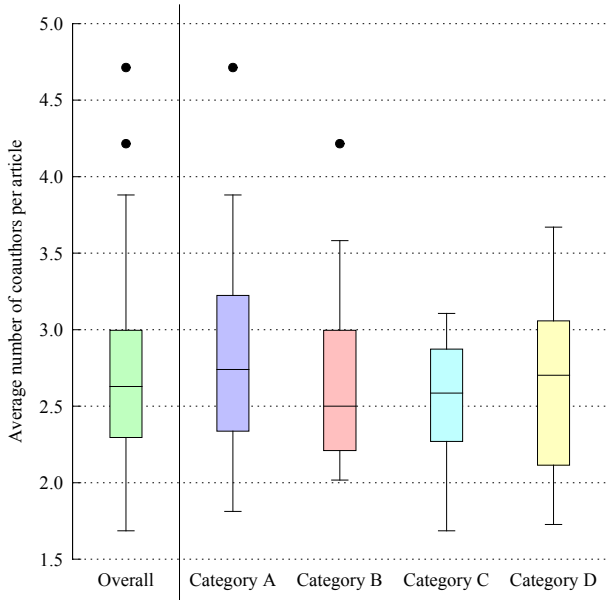

Fig. 6 Box plots of the number of coauthors per article, averaged for each of the 77 IS journals

Category-wise boxes suggest that papers in top journals tend to have more coauthors than in journals with low 5YJIF. The median number of coauthors is quite stable across categories, as it varies between 2.5 (Category B) and 2.7 (Category A).

Topics

Besides analyzing quantitative features of IS journals, we also considered qualitative features extracted from articles. In this section, we address the following question: Which are the most covered topics in IS research?

We hypothesized that the most representative topics in IS would be stated in the titles of articles, since these usually

Fig. 7 Word cloud of the 100 most representative terms (highest TF·IDF) extracted from titles of articles published in the 77 leading IS journals

convey the main concepts addressed in articles. Another reason for mining titles was that retrieving the full-text version of articles published by all the 20 publishers was impossible unless we subscribed to all of them. On the contrary, titles are provided in article records on publishers' websites or in DBLP.

Building on Information Retrieval techniques, the 100 most representative terms used in the titles of published articles were identified. The word cloud in Figure 7 lays out these top 100 terms with a varying font size according to their importance. Orientation of words (horizontal or vertical) does not convey any meaning, since it is chosen only for shrinking the word cloud. Color gradient has no meaning either, since color variation is only used to distinguish between words.

Representative terms were retrieved by relying on the indexing process implemented in common search engines (e.g., Manning et al 2008, Chap. 6). A variation of this process comprising the 6 following steps was used.

1. Article titles were lowercased to standardize their form. For example, 'Advances in the Semantic Web' was turned to 'advances in the semantic web.'
2. Words were extracted by tokenizing lowercased titles, that is splitting up title strings on any whitespace (e.g., space, tabulation) or punctuation. For example, 'time-constrained scheduling' results in the 3 words 'time,' 'constrained,' and 'scheduling.'
3. Meaningless words were filtered out. These are known as 'stop words' in Information Retrieval. They usually are articles (e.g., a, the), pronouns (e.g., I, you), and some adverbs (e.g., again, often). Stop word lists are provided with search engines.[5]
4. Remaining words were processed with Harman's (1991) S-stemmer to remove suspected plural forms by trimming the final 's' of words. For example, 'models' was turned to 'model.'
5. The frequency of words (TF: Term Frequency) was computed, and then combined to the associated IDF (Inverse Document Frequency) computed against the article titles of the 1,090 journals listed in DBLP. We refer the reader to (Manning et al 2008, Chap. 6) for a presentation of the TF·IDF weighting scheme, which is common in Information Retrieval. This TF·IDF score constitutes a 'representativity' score for words, assuming that the more a term is used in IS journals and rare in other journals, the more it is representative of the IS journals.
6. The 100 terms with highest TF·IDF were selected. Note that poorly representative terms were ruled out manually beforehand (e.g., 'based' coming from 'information-based' or 'multi' stemming from 'multi-modal'). Moreover, we added a final 's' to words that were stemmed inappropriately (e.g., 'wireles' was restored to 'wireless').

The top 100 words were laid out using Wordle[6] (Viégas et al 2009), as illustrated in Figure 7. The five most representative terms of the IS field are *network*, *system*, *information*, *code*, and *data*. When indexing *JASIST* articles only, we

[5] http://snowball.tartarus.org/algorithms/english/stop.txt
[6] http://www.wordle.net

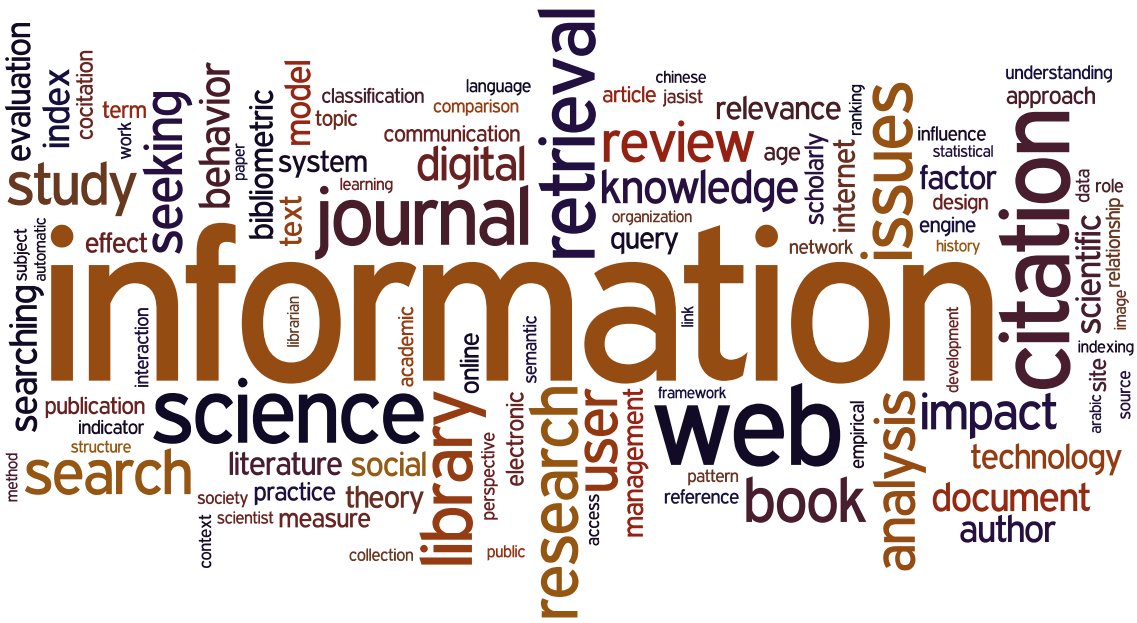

Fig. 8 Word cloud of the 100 most representative terms (highest TF·IDF) extracted from titles of articles published in *JASIST*

found that *information*, *web*, *citation*, *science*, and *journal* are the five most frequent terms in titles (Figure 8).

From a broader perspective, we investigated the relationships among IS journals with respect to the topics they address. Again, we used paper titles to capture journal topics. We used Salton's (1979) Vector Space Model for computing inter-journal similarity based on the TF·IDF weighting scheme. Each journal was modeled as a document vector $\mathbf{d_i} = (w_i^1, \ldots, w_i^n)$ in the n-dimensional vector space of the indexing language (i.e., the terms used in paper titles). A weight $w_i^j \in \mathbb{R}_+$ is calculated for each dimension j. Classically, $w_i^j = tf(\mathbf{d_i}, t_j) \cdot idf(t_j)$, where the weight of a term t_j in $\mathbf{d_i}$ is higher when t_j is frequent in the journal and at the same time rare in all other IS journals. The higher the weight w_i^j, the more characteristic of document d_i the term t_j is. Finally, the similarity between two journals j_i and j_j is computed by $\cos(\mathbf{d_i}, \mathbf{d_j}) \in [0, 1]$.

A map of the 77 leading IS journals organized by topic similarity is showed in Figure 9. Each journal is represented as a vertex whose color reflects the category of the journal. We used Kamada and Kawai's (1989) force-directed placement algorithm to lay out the vertices according to constraints set on the edges of the graph. Two vertices are connected by an edge whose length is inversely proportional to the similarity computed between the two associated journals. Hence, two journals sharing common vocabulary and topics are drawn close to each other.

The force-directed placement of journals based on their textual contents revealed a great variety of research topics. These are shown by journal clusters appearing on Figure 9. While dividing this map into several fixed areas would be highly subjective — where should the lines be drawn? — we may observe that some topics concentrate in some parts of the map. Most prominent topic clusters are those of Database (northwest), Information Theory (northeast), Multimedia and Networking (east), Information Management (south), and Information Technology (southwest). *JASIST* lies in the latter location. Interestingly, we notice that most of Category D journals (in yellow) lie in the eastern part of the map, while there are no journals from Category D in the northwest. This suggests that the distribution of 5YJIF among clusters (i.e., topics) is not homogeneous. Note that a reference classification of journals into topics would be needed to further investigate this point.

In this section, we studied IS journals as black boxes, since we reported statistics about their inputs and outputs. Indeed, we considered the number of published papers, the number of authors involved and their coauthoring habits, as well as 5YJIF values. In the next section, we intend to open this black box up for studying the internal machinery of IS journals, which relies on skilled researchers serving on journal editorial boards.

Findings about IS editorial boards

Much research has been devoted to the study of journals according to published papers, authors, as well as outgoing and incoming citations (e.g., Bar-Ilan 2010a; Sin 2011). However, little research has considered the cornerstone of any journal: its editorial board. Intending to raise the understanding of scholarly publishing in IS, we present in this section findings about the editorial boards of the 77 IS journals under study.

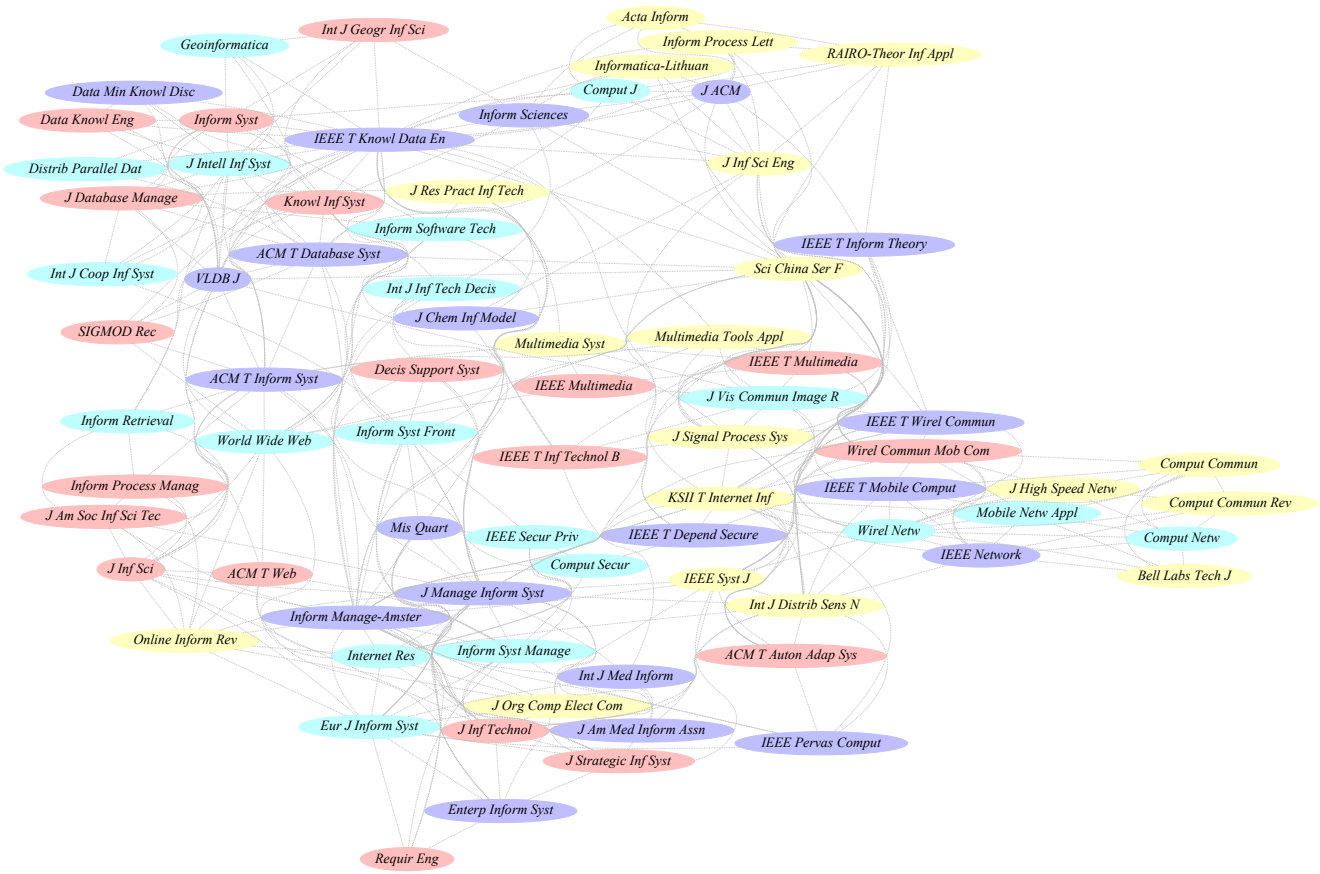

Fig. 9 Map of the 77 leading IS journals laid out according to their topic similarity. Each vertex of the graph represents a journal, whose category is shown by the color of the vertex (A , B , C , or D). An edge connects two vertices; its length is inversely proportional to similarity between the vertices. Vertices were laid out using Kamada and Kawai's (1989) force-directed placement algorithm.

Board size

From the dataset we collected (see Appendix A), we counted the number of gatekeepers serving on editorial boards. According to the Overall box plot in Figure 10, there are between 28 and 56 gatekeepers in 50% of IS journals. Moreover the editorial board size varies from 10 to 98 gatekeepers, with a median of 40 gatekeepers (43.6 on average).

This result is higher than the 32.8 average board size for the journals in the *Information Science & Library Science* category of the *JCR – Social Science edition 2008* analyzed by Baccini and Barabesi (2011). Another study reported an average of 35.8 gatekeepers per journal for the top 20 journals of 15 scientific disciplines extracted from the *JCR – Science edition 2009* (García-Carpintero et al 2010).

At the time the EB_IS_2009 dataset was collected, there were 32 gatekeepers in *JASIST*.

A category-wise analysis suggests that journals with higher 5YJIF have larger editorial boards according to the median: 46 gatekeepers for Category A, 41 gatekeepers for Category B, 40 gatekeepers for Category C, and 32 gatekeepers for Category D.

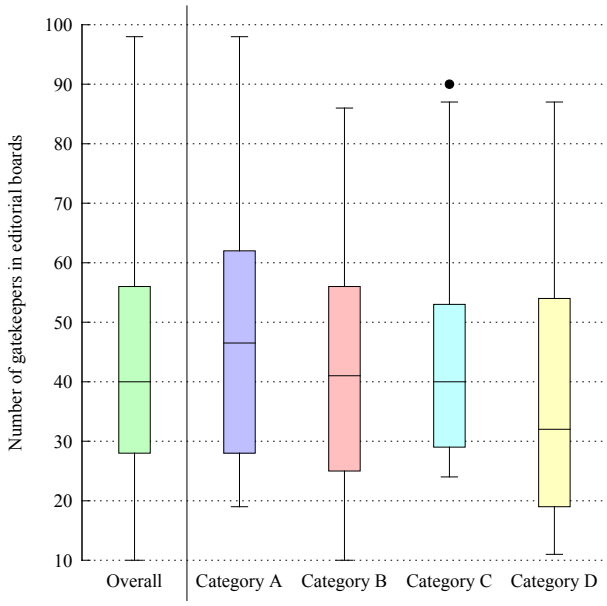

Fig. 10 Box plots of the number of gatekeepers serving on the editorial boards of the 77 leading IS journals

Estimate of gatekeeper workload

Accurate determination of gatekeeper workload requires information not readily available for all journals, such as number of reviewers per submission, total number of submissions, and proportion of papers rejected without review. However, we do have this information for *JASIST*. It is known that *JASIST* receives about 600 submissions a year, that 30% of submissions are rejected with no review by the Editor-In-Chief, and that other submissions are usually assigned to 2 or 3 editors who serve as reviewers (Cronin 2011).

We started by measuring the ratio of published articles per year to the number of gatekeepers serving a given journal. The Overall box plot in Figure 11 shows a great variability since this ratio ranges from 0.3 to 11.9 papers a year, with several outliers. For the 50% of the journals represented in the box, this ratio ranges from 0.6 to 1.8 articles per gatekeeper per year.

The ratio for *JASIST* is 5.9 published articles per gatekeeper per year. This is the highest value for Category B journals, suggesting that *JASIST* gatekeepers are much called upon compared to those serving on other journals.

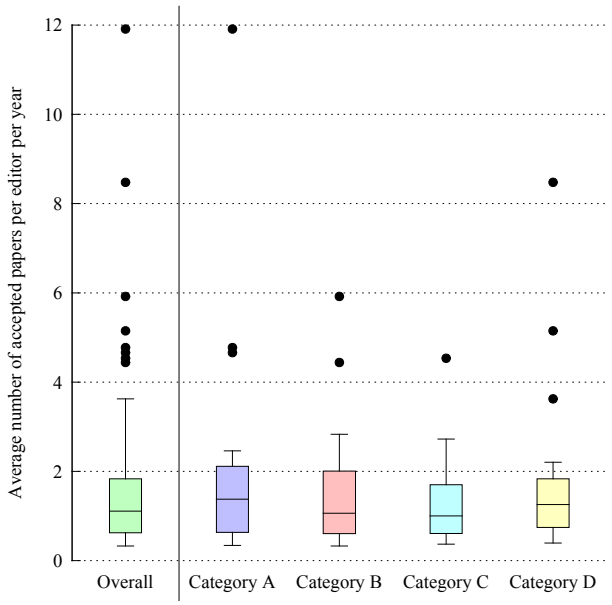

Fig. 11 Box plots of the average number of accepted papers per gatekeeper per year in the 77 leading IS journals

In an attempt to estimate gatekeeper workload, let us consider a journal with an acceptance rate of 30%, and the median ratio of 1.1 (case of the Overall box plot in Figure 11). With a 3-referee approach, each gatekeeper of this hypothetical journal would be assigned $3 \times 1.1 \times {}^{100}/_{30} = 11$ papers a year. Notice that, as for *JASIST* (Cronin 2009a, 2011), most journals also rely on additional reviewers, whom we cannot take into account here since they are not part of the editorial board.

In this section, we reported findings about editorial boards as a whole. In order to further this scientometric study, we consider gatekeepers and their characteristics in the next section.

Findings about gatekeepers of IS journals

As we failed to find any study of gatekeeper characteristics in IS, we investigate the following in this section: involvement in editorial boards, demographics, seniority, authority, geographic diversity, and gender distribution.

Involvement in editorial boards

Gatekeepers' degree of involvement in the 77 IS journals was studied by counting their participation in editorial boards. Then, two ranking policies were used for ordering them in Table 4, where the name, country,[7] and gender of each gatekeeper are given, along with a numerical value used to sort table rows. This value is computed as follows.

- In the left column labeled *Gatekeepers' involvement*, we report the number of journals (#Journals) in which researchers serve as gatekeeper. This does not account, however, for the gatekeepers' roles in boards. In other words, an Editor-In-Chief position contributes to #J as 1, just like other positions (e.g., advisory board member).
- In the right column labeled *Gatekeepers' weighted involvement*, we report a score depending on the roles they hold in editorial boards. Let us recall that 'roles' have been introduced and illustrated with the case of *JASIST* in Table 3. Roles were mapped to levels encoded in a numerical value in $\mathbb{N}_+$. In order to handle various journals with different number of levels (e.g., *J Am Soc Inf Sci Tec* has 4 levels, while *ACM T Inform Syst* has 2 levels only), we normalized the level values of any journal into the range $]0, 1]$. Regarding the example in Table 3, the normalized level is computed by dividing the level value by 4, since it is the greatest level value of *JASIST*.

Several gatekeepers occupy more than one seat on IS editorial boards. This was documented as 'interlocking editorship' by Baccini and Barabesi (2010). Elisa Bertino serves on 8 IS editorial boards, for instance. On average, a gatekeeper occupies 1.18 seats on IS editorial boards. This is slightly higher than 1.14 reported for the 61 journals of the 'Information Science & Library Science' in (Baccini and Barabesi 2011).

[7] In the remainder of this article, a 2-letter country code is used for referring to countries. These are known as ISO 3166-1-alpha-2, see http://www.iso.org/iso/list-en1-semic-3.txt.

Table 4 Top 50 gatekeepers serving on the 77 leading IS journals in year 2011

Rank	Gatekeepers' involvement				Gatekeepers' weighted involvement			
	Gatekeeper	Country	Sex	#Journals	Gatekeeper	Country	Sex	Score
1	Elisa Bertino	us	f	8	Elisa Bertino	us	f	3.50
2	Andrew B. Whinston	us	m	5	Andrew B. Whinston	us	m	3.17
3	Athanasios V. Vasilakos	gr	m	5	Hsiao-Hwa Chen	tw	m	2.58
4	Benjamin W. Wah	us	m	5	Benjamin W. Wah	us	m	2.25
5	Qian Zhang	hk	f	5	Anthony S. Acampora	us	m	2.17
6	Anthony S. Acampora	us	m	4	Pericles Loucopoulos	uk	m	2.17
7	Edward A. Fox	us	m	4	Justin Zobel	au	m	2.08
8	Fabio Crestani	ch	m	4	Imrich Chlamtac	it	m	2.00
9	Hsiao-Hwa Chen	tw	m	4	Qian Zhang	hk	f	2.00
10	Johannes Gehrke	us	m	4	Fabio Crestani	ch	m	1.92
11	Justin Zobel	au	m	4	James R. Marsden	us	m	1.92
12	Kalle Lyytinen	us	m	4	Lotfi A. Zadeh	us	m	1.92
13	Lotfi A. Zadeh	us	m	4	Ricardo A. Baeza-Yates	cl	m	1.92
14	Matthias Jarke	de	m	4	Amit P. Sheth	us	m	1.83
15	Robert J. Kauffman	us	m	4	Beng Chin Ooi	sg	m	1.83
16	Sid L. Huff	nz	m	4	Mike P. Papazoglou	nl	m	1.83
17	Sudha Ram	us	f	4	Sudha Ram	us	f	1.83
18	Aidong Zhang	us	f	3	Leonid Libkin	uk	m	1.75
19	Amit P. Sheth	us	m	3	Marianne Winslett	us	f	1.75
20	Andrzej Skowron	pl	m	3	Robert J. Kauffman	us	m	1.75
21	Antonio Capone	it	m	3	Ugur Çetintemel	us	m	1.75
22	Athman Bouguettaya	au	m	3	Athanasios V. Vasilakos	gr	m	1.67
23	Beng Chin Ooi	sg	m	3	Clyde W. Holsapple	us	m	1.67
24	Bernard C. Y. Tan	sg	m	3	Gary J. Koehler	us	m	1.67
25	Blaize Horner Reich	ca	f	3	Kian-Lee Tan	sg	m	1.67
26	Bruce W. Weber	uk	m	3	Leonard Kleinrock	us	m	1.67
27	ChengXiang Zhai	us	m	3	Mischa Schwartz	us	m	1.67
28	Chris Jermaine	us	m	3	Mohsen Guizani	kw	m	1.67
29	Christina Fragouli	ch	f	3	Philip A. Bernstein	us	m	1.67
30	Colette Rolland	fr	f	3	Sid L. Huff	nz	m	1.67
31	Daniel Dajun Zeng	us	m	3	Wen-Lian Hsu	tw	m	1.67
32	David L. Olson	us	m	3	Witold Pedrycz	ca	m	1.67
33	Dominik Slezak	ca	m	3	Keng Siau	us	m	1.60
34	Douglas W. Oard	us	m	3	Edward A. Fox	us	m	1.58
35	Edie M. Rasmussen	us	f	3	Johannes Gehrke	us	m	1.58
36	Fabrizio Sebastiani	it	m	3	Minho Jo	kr	m	1.58
37	Gary J. Koehler	us	m	3	Bernard C. Y. Tan	sg	m	1.50
38	Hasan Pirkul	us	m	3	ChengXiang Zhai	us	m	1.50
39	Ian Ruthven	uk	m	3	Erol Gelenbe	uk	m	1.50
40	Iris Vessey	us	f	3	Ling Liu	us	f	1.50
41	James R. Marsden	us	m	3	Marek Rusinkiewicz	us	m	1.50
42	Javier Lopez	es	m	3	Nigel Davies	uk	m	1.50
43	Jayant R. Haritsa	in	m	3	Prabuddha De	us	m	1.50
44	Jiangchuan Liu	ca	m	3	Richard Baskerville	us	m	1.50
45	John C. Henderson	us	m	3	Srinivasan Keshav	ca	m	1.50
46	John Leslie King	us	m	3	Vijay K. Vaishnavi	us	m	1.50
47	Jon Crowcroft	uk	m	3	Matthias Jarke	de	m	1.48
48	Kar Yan Tam	hk	m	3	Sihem Amer-Yahia	us	f	1.42
49	Kian-Lee Tan	sg	m	3	Kalle Lyytinen	us	m	1.40
50	Leonard Kleinrock	us	m	3	Colette Rolland	fr	f	1.35

The large body of gatekeepers with the strongest involvement listed in Table 4 are affiliated to the USA (46% in the left column, and 57% in the right column). Interestingly, this figure concerning all IS is consistent with the 47% reported for 10 Information Science journals in (Cronin 2009d). This suggests that these journals represent an accurate sample of all IS journals, at least regarding the location of gatekeepers.

There are $7/50 = 14\%$ of female gatekeepers in the top 50 with weighted involvement. We wondered whether this statistic is accurate for the remaining gatekeepers in the next section.

Demographics

Gatekeeper demographics were analyzed by examining their gender and age. While gender has been collected (see Appendix A), there is no way to know the age of the 2,846 gatekeepers. Nevertheless, we estimated a gatekeeper's seniority by mining DBLP records. Let us define the seniority of a gatekeeper as the number of years since his/her first scholarly article was published. The population pyramid in Figure 12 shows the distribution of gatekeeper seniority (in years) according to gender.

Overall, male gatekeepers (85%) clearly outnumber female gatekeepers (15%). One explanation for this large female/male imbalance may involve the falling proportion of Computer Science degrees going to women. As commented in (De Palma 2001), this tendency has been increasing from the mid-1980s (when women received 35% of Computer Science degrees) to nowadays. Stross (2008) even reports that women account for less than 10% of the newest undergraduates in many Computer Science departments. This shortage of female graduates surely has an influence on the number of women entering the academia, and later on the number of female gatekeepers. According to the figures reported by Stross (2008), we may expect the ratio of female to male gatekeepers to substantially decrease in the near future if no affirmative action is taken.

Regarding seniority, the distribution for male gatekeepers peaks at 18 years of seniority, whereas the peaking value is 13 years for female gatekeepers. Incidentally, the doyens of gatekeepers are Dana S. Scott and Friedrich L. Bauer, as their oldest articles present in DBLP date from 1958.

Regardless of their gender, there are a few gatekeepers with a small number of years since their first article was published (see the bottom of the pyramid in Figure 12). These may be junior researchers or researchers publishing in domains not covered by DBLP (e.g., physics). As a result, we cannot conclude that gatekeepers with low seniority have limited research experience.

Seniority

We refined this demographic analysis by studying seniority according to journal categories. The median seniority was computed for each journal. We opted for the median instead of the average because the former is robust to outliers while the latter is not. The Overall box plot in Figure 13 shows that 50% of the IS journals involve gatekeepers whose median seniority lies between 15 and 21 years, the median being 18 years, as shown by the segment in the box. Median seniority for categories are similar (18 years for Category A, 19 years for Category B, 20 years for Category C, and 18 years for Category D).

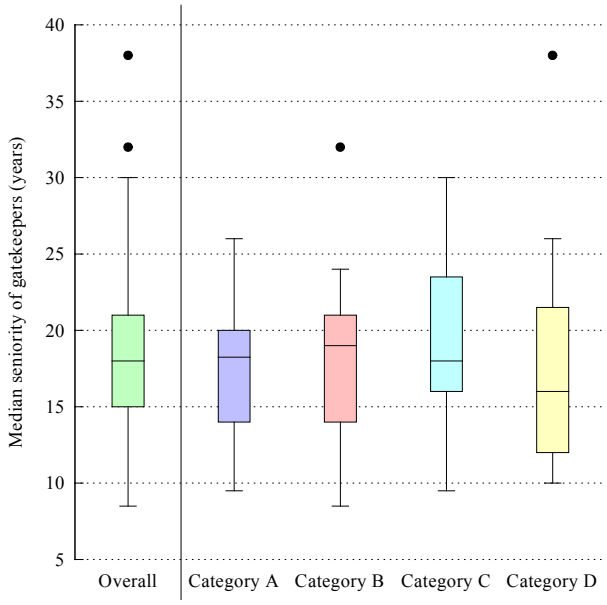

Fig. 13 Box plots showing the median seniority of gatekeepers serving on the 77 leading IS journals

The two outliers are *Acta Inform* from Category D with 38 years of median seniority, and *Data Knowl Eng* from Category B with 32 years of median seniority. Gatekeepers of *JASIST* have a median seniority of 19 years, which corresponds to the median value in Category B.

Authority

Seniority may be one factor of gatekeeper expertise. A more accurate evidence of scientific achievement may be conveyed by a large number of published journal articles. We call this indicator *authority*. In the literature, gatekeeper authority was studied for selected journals in various domains, such as Management, Economics, Psychology, and Sociology (Bedeian et al 2009; Lowe and Van Fleet 2009). However, we failed to find any study on the IS field.

The median number of journal articles published per gatekeeper was computed for each journal. The Overall box plot in Figure 14 shows that this value lies between 12.5 and 24.5 for 50% of the journals, with a median of 17.5 articles. The outlying journal is *Acta Inform*, with a median of 49.0 published journal articles per gatekeeper.

Category-wise medians show some variability that does not seem to depend on journal quality (18.5 articles for Category A, 17.5 articles for Category B, 21.5 articles for Category C, and 14.0 articles for Category D).

JASIST gatekeepers published a median of 14.0 journal articles, which is lower than the median 17.5 articles. This difference may be due to the tendency of *JASIST* authors to write papers with fewer coauthors than in other journals (see Figure 6). Assuming that *JASIST* authors and gatekeepers

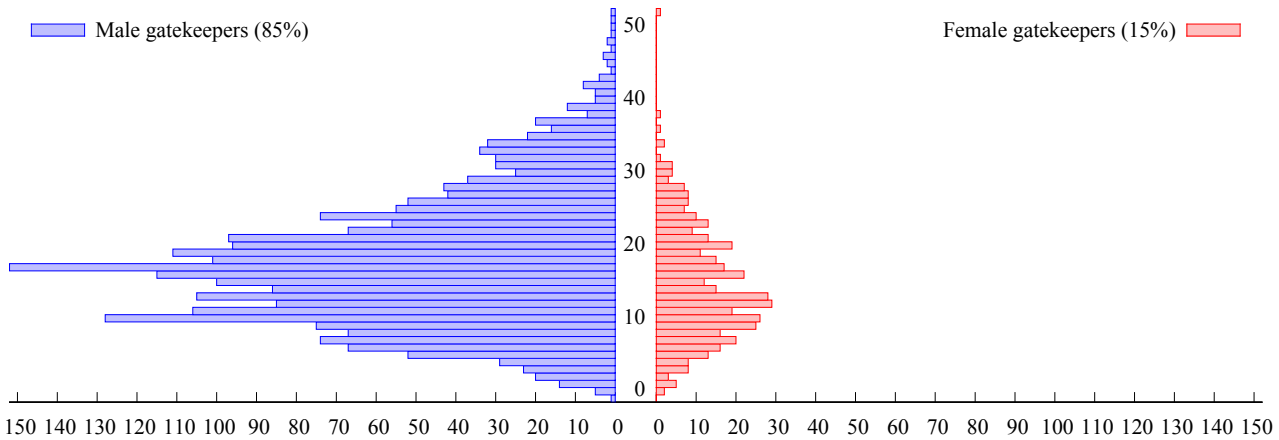

Fig. 12 Population pyramid of gatekeepers serving on the 77 leading IS journals, showing the distribution of seniority (i.e., number of years since first published scholarly article) with respect to gender

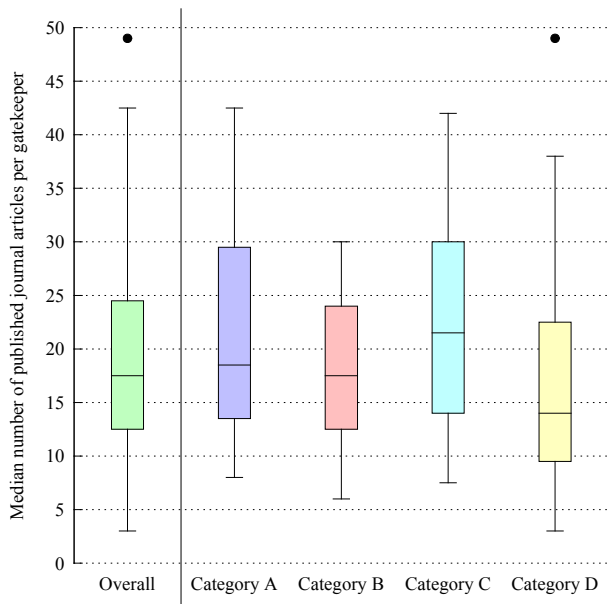

Fig. 14 Box plots showing the median number of journal papers published by gatekeepers, for each of the 77 leading IS journal

may share this trait, then it is more difficult for them to have as many papers as researchers collaborating with many coauthors. This remark echoes Põder's (2010) Letter to the Editor.

Geographic diversity

Having considered gatekeepers' gender, seniority, and authority, we now investigate their geographic diversity with varying level of granularity.

Geographic diversity at the level of IS research

Gatekeeper countries were deduced from their affiliations. The bar chart in Figure 15 shows the country distribution of the 2,846 gatekeepers. The *x* axis lists countries sorted by decreasing number of gatekeepers. A base-2 logarithmic scale was used for the *y* axis, since there are large variations across countries. The number of gatekeepers for each country is displayed above the associated bar for ease of reading. Due to space limitations, countries hosting less than 12 gatekeepers are not displayed. Interestingly, countries from the 5 inhabited continents appear in the figure: Africa with South Africa (za), America with the USA (us), Asia with China (cn), Australia (au), and Europe with the UK (uk).

For the 2,846 gatekeepers under study, we found 54 countries of affiliation. A large body of these gatekeepers are affiliated to the USA (44%). Despite contributing 7 times less gatekeepers, the UK is the second country with most gatekeepers (6%). It is worth noting that these two countries altogether host half of all gatekeepers in the world. The predominance of the USA and the UK has been previously reported for the core 20 journals of 12 science fields (Braun and Dióspatonyi 2005a,b; Braun et al 2007b). Braun (2005) found that 75% of the seats at these editorial boards were held by 10 countries. Similar figures were reported in the aforementioned study by García-Carpintero et al (2010). Focusing on 10 Information Science journals, Cronin (2009d) found that gatekeepers from the USA occupy 47% of the seats. Regarding *JASIST*, Cronin (2009a) welcomed newly appointed gatekeepers and noticed that they come from various countries. The geographic diversity of gatekeepers is deemed to be a desirable property for international journals (García-Carpintero et al 2010).

Comparing countries according to their number of gatekeepers as presented in Figure 15 does not account for each country's population. However, this factor has a tremendous

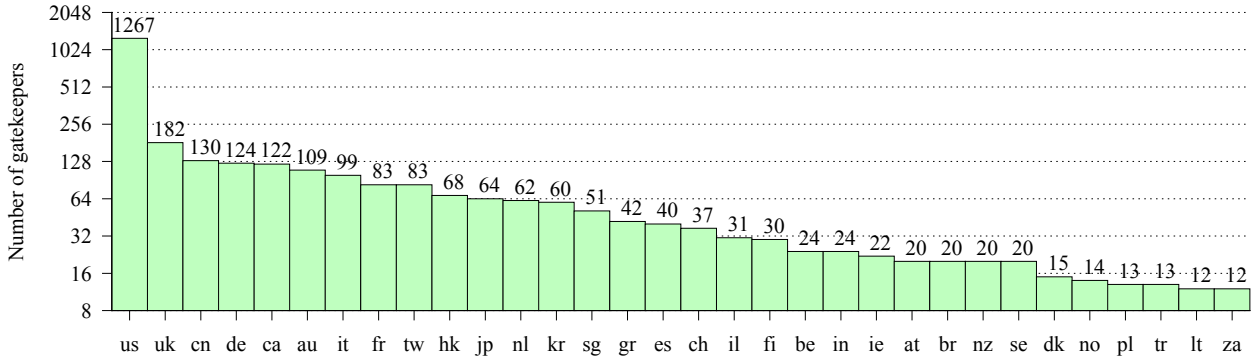

Fig. 15 Number of gatekeepers serving on the 77 leading IS journals for each country, as declared in their affiliation. Countries with less than 12 gatekeepers are not shown due to space limitations

effect on the number of potential researchers in Computer Science. We thus normalized each country's number of gatekeepers by its population.[8] This ratio is showed in Figure 16, where the top 5 countries are now Hong Kong (hk), Finland (fi), Singapore (sg), Ireland (ie), and Australia (au). This result suggests that, compared to other countries, a larger body of these 5 countries' populations serve as gatekeepers in IS journals.

Geographic diversity at the journal category level

Does journal category have an effect on the location of gatekeepers? We studied gatekeeper affiliations in the light of journal categories to answer this question.

The bar charts in Figure 17 show the percentage of gatekeepers affiliated to countries listed on the *x* axis. The prominent role of the USA is established for the 4 categories, as gatekeepers from this country account for between 52.4% and 36.4% of all gatekeepers. Journals with low 5YJIF seem to involve less gatekeepers from the USA in favor of researchers from other countries. Interestingly, scientists from Asia (especially from China, Taiwan, and South Korea) represent 18% of all gatekeepers in Category D (Figure 17(d)).

Geographic diversity at the journal level

Geographic diversity was studied at the global level of IS research (Figure 15), then according to journal category (Figure 17). In this section, we wonder whether this diversity is equally distributed in journals or not. In other words, do all journals equally foster geographic diversity?

The ratio of the number of distinct gatekeeper countries to the total number of gatekeepers in the board of the journal was computed. For example, *Mis Quart* (5YJIF = 9.208) has 56 gatekeepers from 13 distinct countries, leading to a geographic diversity of $13/56 = 0.23$. This ratio is higher when journals involve gatekeepers from various distinct countries.

[8] http://en.wikipedia.org/wiki/List_of_countries_by_population

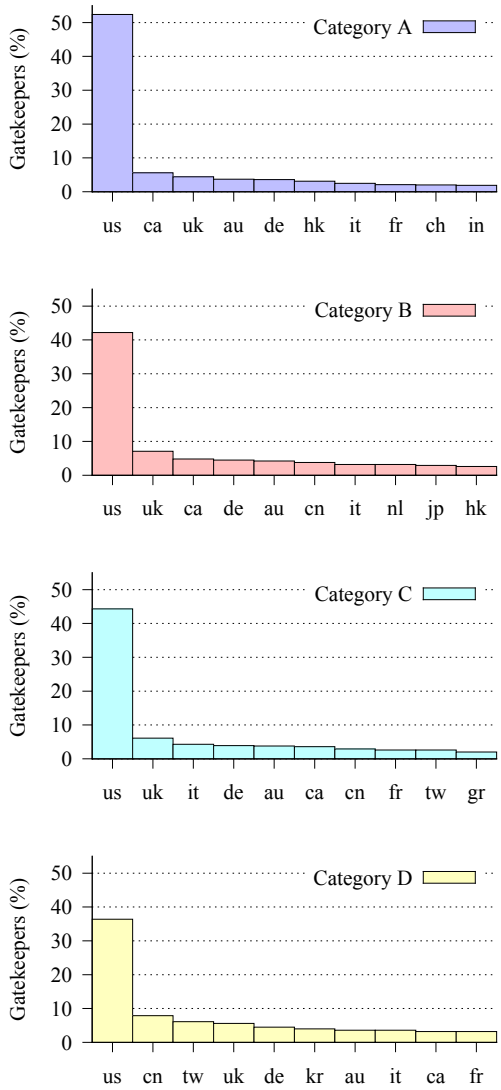

Fig. 17 Bar charts showing the proportion of most representative countries (as extracted from editors' affiliations) for the 4 journal categories shown in Table 2

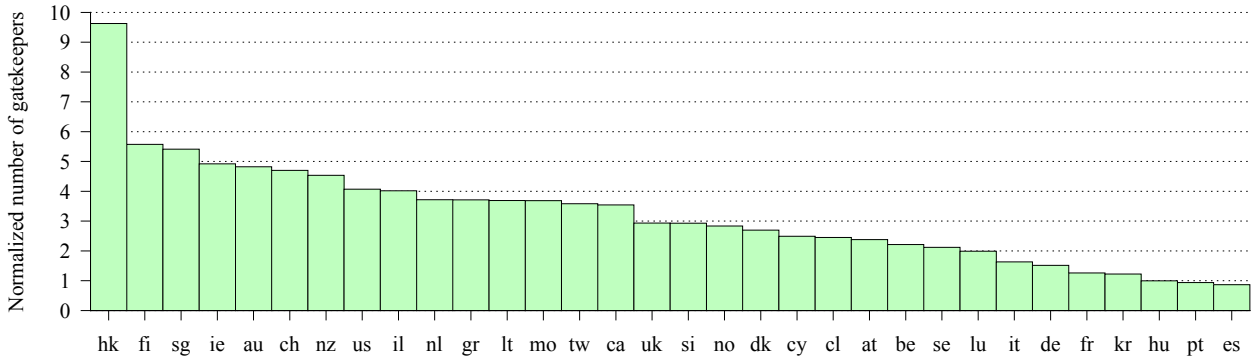

Fig. 16 Number of gatekeepers serving on the 77 leading IS journals for each country, normalized by the country's population. Due to space limitations, only the top 32 countries are displayed (same number of countries as in Figure 15)

The box plot in Figure 18 shows the values of geographic diversity, which ranges from 0.07 (*J High Speed Netw* with 5YJIF = 0.442) to 0.61 (*Inform Process Lett* with 5YJIF = 0.877), with a median ratio of 0.32 (*IEEE MultiMedia* with 5YJIF = 2.020).

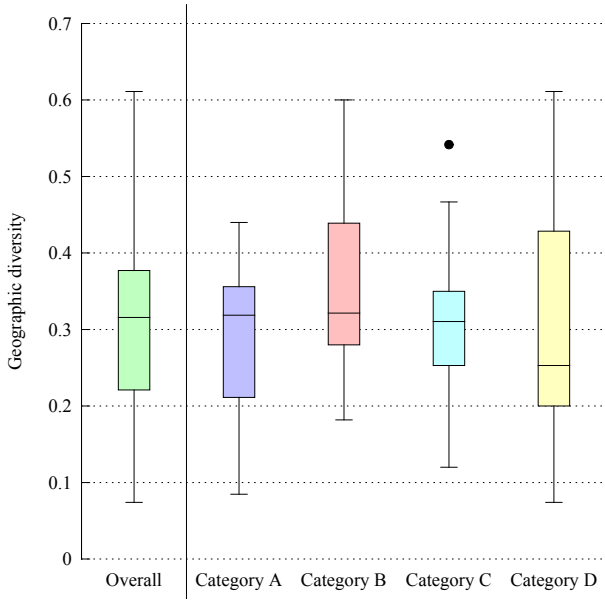

Fig. 18 Box plot showing the geographic diversity of gatekeepers in the 77 leading IS journals.

For the record, *JASIST* has a 0.28 geographic diversity and it seems that relying on gatekeepers from several locations is important for this journal, as advertised in the *Changing of the Guard* editorial (Cronin 2009a).

Refining this analysis, the scatter plot in Figure 19 shows the 77 IS journals as data points whose coordinates depend on the 5YJIF (x axis) and geographic diversity (y axis). *JASIST* is pinpointed. The linear regression trend line is also graphed, suggesting that journals with higher 5YJIF have slightly less geographic diversity than others. Nevertheless, the weak coefficient of determination ($R^2 = 0.0039$) suggests that the trend line is not a good approximation of all the data points. This confirms the perception of great variability across journals regarding geographic diversity.

Overall, some journals are run by boards representing very few countries. For instance, 12 IS journals have less than a 20% geographic diversity. This kind of hegemony or nationalism may be an issue, since these editorial boards may not encompass the variety of point of views that one would expect from an international journal. In addition, they may not attract as many papers from worldwide researchers as journals with higher geographic diversity (Braun 2005; García-Carpintero et al 2010).

Gender distribution

Examining the profile of *JASIST* authors, Cronin (2009b) reported that females account for 33% of all authors in 2008. Regarding editorial board members, however, we failed to find studies on gatekeeper gender distribution (either in IS or other disciplines). This question, however, seems worth studying to get a better understanding of gatekeeper demographics. Just as Cronin (2009b) encourages female authors, journals may also involve and encourage more females to serve on their boards.

The ratio of female to male gatekeepers was computed. The box plot in Figure 20 shows that 50% of IS journals involve between 9% and 22% of female gatekeepers, the median proportion being 14%. The two outliers are *Internet Res* involving 45%, and *Inform Syst Manage* involving 42% of female gatekeepers. For the record, the editorial board of *JASIST* is comprised of 37% of female gatekeepers, which is the highest value among Category B journals.

We refined this analysis by studying the proportion of female gatekeepers at the journal level. The scatter plot in Figure 21 shows the 77 IS journals as data points whose coordinates depend of the 5YJIF (x axis) and female proportion (y axis). *JASIST* is pinpointed. The linear regression trend line

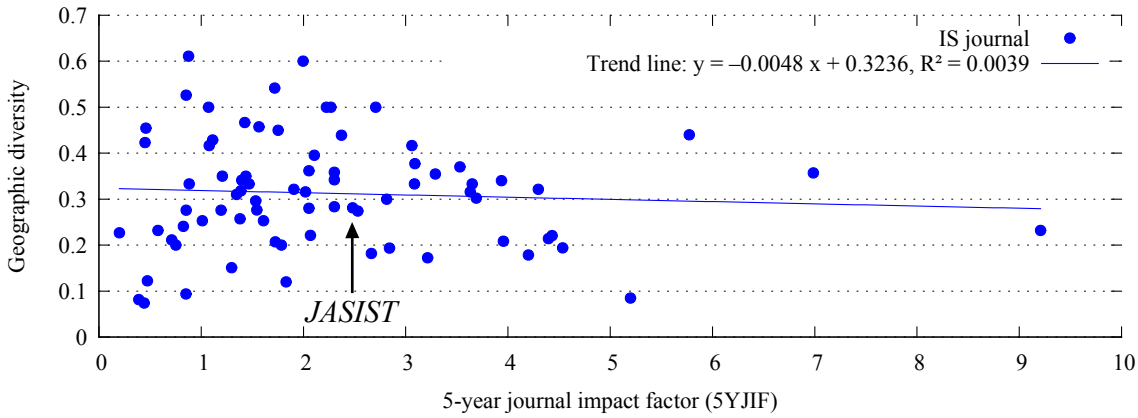

Fig. 19 Scatter plot showing the geographic diversity of gatekeepers in the 77 leading IS journals. Each data point represents a journal according to its 5YJIF (*x* axis) and its geographic diversity: the ratio of distinct countries from editors' affiliations over the number of editors serving on its editorial board (*y* axis)

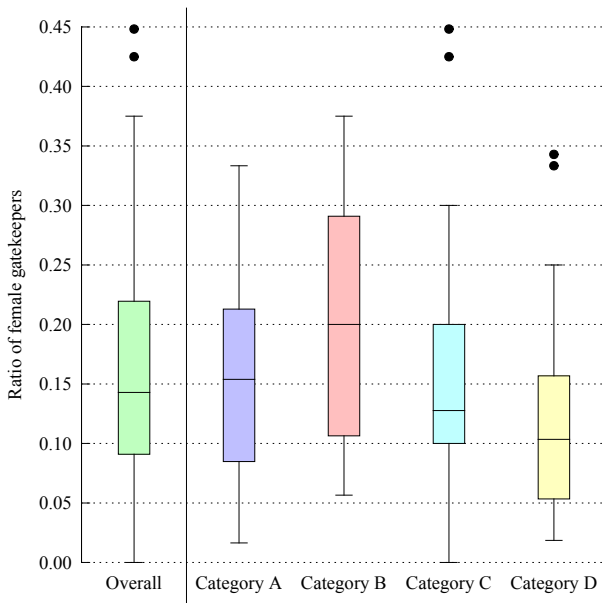

Fig. 20 Box plot showing the proportion of female gatekeepers in the boards of the 77 leading IS journals.

is also graphed, suggesting that journals with higher 5YJIF involve more female gatekeepers than others. Nevertheless, the weak coefficient of determination ($R^2 = 0.0331$) suggests that the trend line is not a good approximation of all the data points. This confirms the perception of great variability across journals regarding female participation as gatekeepers.

In this section, we shaped the landscape of research in IS by considering the human cornerstone of every science journal: its editorial board. We studied the demographics of gatekeepers according to gender, seniority, authority, and the countries they are affiliated to.

Throughout this article, extensive data analysis allowed the setting of a scene depicting IS research as of 2011. Several of our findings help to draw the profile of the typical IS journal having the following characteristics:

- The typical IS journal publishes 45 articles a year.
- The typical IS journal has a 1.907 5YJIF.
- The typical IS journal is run by 40 gatekeepers.
  - 18 of whom are affiliated in the USA.
  - 6 of whom are female scientists.
  - Gatekeepers typically published their first article 18 years ago.
  - Gatekeepers have typically published a total of 17.5 journal articles.
- Editorial boards of journals with high 5YJIF tend to have lower geographic diversity than other journals.
- Editorial boards of journals with high 5YJIF tend to involve more female gatekeepers than other journals.

Discussion

The scientometric study reported in this article intended to shape the landscape of IS research. We relied on the *JCR – Science edition 2009*, as an acknowledged list of peer-reviewed journals. We selected the *Information Systems* category, which is also the category of *JASIST*, among the following available categories for Computer Science.

- *Artificial Intelligence*
- *Cybernetics*
- *Hardware & Architecture*
- *Information Systems*
- *Interdisciplinary Application*
- *Software Engineering*
- *Theory & Methods*

Various investigations led us to believe that the IS category is not exclusively dedicated to IS journals, strictly speaking. Several journals related to Networking appear in

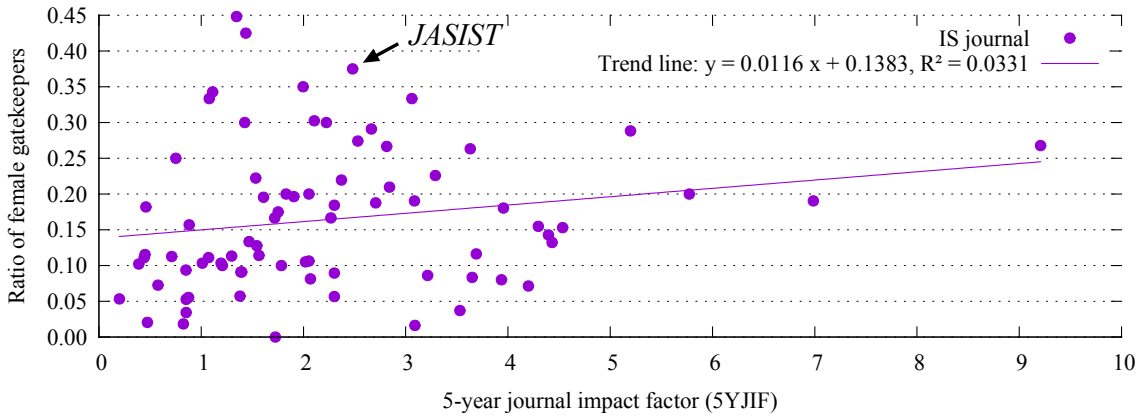

Fig. 21 Scatter plot showing the proportion of female gatekeepers in the boards of the 77 leading IS journals. Each data point represents a journal according to its 5YJIF (*x* axis) and the ratio of female over male gatekeepers serving on its board (*y* axis)

Table 2, such as *IEEE T Wirel Commun*, and *IEEE T Mobile Comput*. In our view, there are at least 11 out of the 77 journals that could join a hypothetical Networking category in *JCR*. These are located in the east of the map of IS journals clustered by topics (Figure 9). Networking journals may have characteristics different from 'pure' IS journals. For instance, we found that *IEEE T Wirel Commun* is an outlying journal when it comes to research output (Figure 4) and authorship (Figure 5). In addition, the word cloud for IS research (Figure 7) contains many Networking terms (e.g., network, wireless, routing) compared to *JASIST*'s word cloud (Figure 8). This observation has a practical implication. Studies of IS journals based on the *Information Systems* category of the *JCR* (including ours) may be influenced by Networking journals.

Conclusion

The landscape of research in Information Systems (IS) has been investigated in this article. We tackled the research question: What are the characteristics of journals in IS?

From the *Computer Science, Information Systems* category of the *Journal Citation Reports – Science edition 2009*, we studied 77 leading IS journals. Extensive statistical analysis was applied to quantitative and qualitative data about journals, editorial boards, and gatekeepers. Scientometric indicators were reported at two levels of granularity with supporting charts, such as box plots. On the one hand, *overall* statistics concerned all the 77 journals. These offered a global insight into journal characteristics. On the other hand, *category-wise* statistics were reported for journals grouped into 4 categories according to decreasing 5YJIF. These refined overall statistics by assessing the variation of the observed statistic according to journal quality, as estimated by the 5YJIF. The place of *JASIST* in the landscape of IS journals was discussed regarding the various indicators and existing scientometric studies about this journal (Cronin 2009b,c,d, 2011).

The EB_IS_2009 dataset collected for our scientometric study covers the 77 IS journals, their editorial boards, and associated 2,846 gatekeepers (with name, gender, and country). This dataset is released as an online Supplementary Material to this article to enable researchers to reproduce our results and further our study. Despite Braun's (2005) call for building a database of science journal gatekeepers, we found no such material in the literature. As a result, to the best of our knowledge, EB_IS_2009 is the first publicly available dataset of gatekeepers in IS. We hope that this dataset will serve as a base for future studies on editorial boards.

Improving our understanding of scholarly communication in other fields of Computer Science (e.g., Artificial Intelligence), as well as other scientific domains is a goal that we believe to be worth pursuing. Recent and ongoing controversies (see Bar-Ilan 2008, 'Research evaluation' section) suggest that the evaluation of research cannot rely on bibliometric indicators only. We hope that the present scientometric study has gone some way towards enhancing our understanding of the scholarly communication in IS journals.

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Appendix A. The EB_IS_2009 dataset of editorial boards from 77 journals in IS

The EB_IS_2009 dataset is supplied as an XML file, and released as an online Supplementary Material to this article (Available here: http://www.irit.fr/publis/SIG/2012_JASIST_C.xml). An excerpt of the dataset

Listing 1 Editorial boards of 77 journals in IS encoded in XML format

```
<?xml version="1.0" encoding="ISO-8859-1" standalone="yes"?>
<!--
  EB_IS_2009: Editorial boards of Information System journals (JCR 2009 edition)
  @version 31-MAY-2011
  @author Guillaume Cabanac (guillaume.cabanac@univ-tlse3.fr)
-->
<!DOCTYPE boards [
  <!ELEMENT boards     (journal+)>
  <!ELEMENT journal    (titleISI,titleDBLP,isbn,publisher,if5years,researcher+)>

  <!ELEMENT titleISI   (#PCDATA)>
  <!ELEMENT titleDBLP  (#PCDATA)>
  <!ELEMENT isbn       (#PCDATA)>
  <!ELEMENT if5years   (#PCDATA)>
  <!ELEMENT publisher  (#PCDATA)>
  <!ELEMENT researcher (#PCDATA)>

  <!ATTLIST researcher sex     (m|f|n) #REQUIRED
                       country CDATA   #REQUIRED
                       level   CDATA   #REQUIRED>
]>
<boards>
  <journal>
    <titleISI>Mis Quart</titleISI>
    <titleDBLP>MIS Quarterly</titleDBLP>
    <isbn>0276-7783</isbn>
    <publisher>U. Minnesota</publisher>
    <if5years>9.208</if5years>
    <researcher sex="m" country="us" level="3">Detmar W. Straub</researcher>
    <researcher sex="f" country="sg" level="2">Soon Ang</researcher>
    <researcher sex="m" country="us" level="2">Ravi Bapna</researcher>
    <!-- ... -->
    <researcher sex="f" country="us" level="1">Manju K. Ahuja</researcher>
    <!-- ... -->
    <researcher sex="m" country="us" level="1">Youngjin Yoo</researcher>
  </journal>
  <!-- ... -->
  <journal>
    <titleISI>KSII T Internet Inf</titleISI>
    <titleDBLP>TIIS</titleDBLP>
    <isbn>1976-7277</isbn>
    <publisher>KSII</publisher>
    <if5years>0.200</if5years>
    <researcher sex="m" country="tw" level="3">Hsiao-Hwa Chen</researcher>
    <researcher sex="m" country="kr" level="3">Minho Jo</researcher>
    <researcher sex="m" country="us" level="2">Clarence A. Ellis</researcher>
    <researcher sex="m" country="kw" level="2">Mohsen Guizani</researcher>
    <researcher sex="n" country="kr" level="2">Yunsik Lee</researcher>
    <researcher sex="m" country="kr" level="2">Byungwook Lee</researcher>
    <researcher sex="m" country="us" level="2">Nitin H. Vaidya</researcher>
    <researcher sex="m" country="ca" level="1">Imran Ahmad</researcher>
    <!-- ... -->
    <researcher sex="n" country="de" level="1">Liang Zhou</researcher>
  </journal>
</boards>
```

is shown in Listing 1, where the document type definition (DTD) precedes the records of the 77 leading IS journals.

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