Temporal perspectives in systems development

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Abstract. Today, most journal articles written concerning information systems development and/or evaluation of information systems fall into two categories: normative statements before or early in the development process, and evaluational statements taking place after the development process. It would seem that few articles are published concerning pre-hoc model evaluation. In this article a mapping of all articles from 2002-2007 in five journals are made along two axes; one temporal and one from normative to evaluational. It is shown that very few articles had an evaluational focus with a time perspective ranging from before to during the development process, within the IS journals, while the software engineering journals provided some input here.

Background

In my previous work (Palmius J 2005; Palmius J 2007) I have been studying approaches for evaluating information systems models before their realization. During my work it has surprised me that I have not run into more articles of a similar mind, and I have thus decided to make a more structured effort of mapping the field as of how it looks in present time.

Today, the majority (numbers will be presented below) of articles within the core information systems press is either *prescriptive*, postulating a method for constructing an information system with the implicit promise that if the method is followed the end result will be desirable, or *post-hoc evaluational*, stating a

method for evaluating if an existing system ended up good. To a lesser degree, this is also true within the software engineering press.

Together with these we find hybrids of prescriptive and evaluational methods which postulate *evolutionary* methods: methods where constant updates and evaluations provide the way towards the end product. To a very small degree we also have *predictive* literature; methods for predicting the outcome of a systems development before or during the development process, or for in a structured manner evaluating a design before its realization. These predictive methods articles are more common within software engineering than within core information systems.

In order to provide a structure for how the field could be mapped, the following is one option:

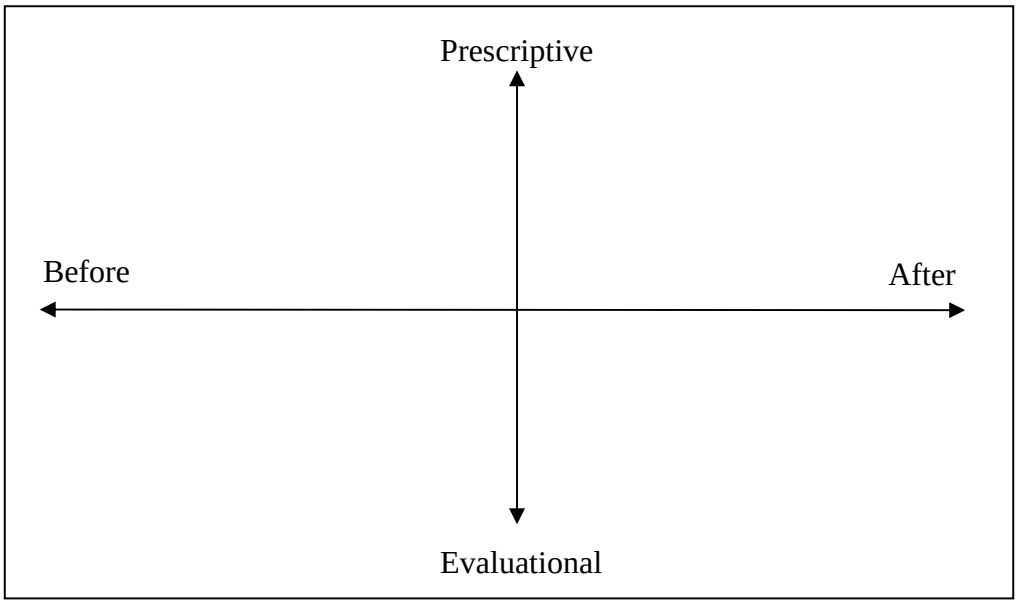

Figure 1: Journals ordered along two axes.

We can categorize articles according to two axes: one for what temporal focus the article has in relation to the construction of a system, and one what kind of method the article investigates or speaks for. To make the categorization more explicit, we can reformulate the axes as a cross tab:

Prescriptive Before (PB)	Prescriptive During (PD)	Prescriptive After (PA)
Prescriptive and evaluational Before (PEB)	Prescriptive and evaluational During (PED)	Prescriptive and evaluational After (PEA)
Evaluational Before (EB)	Evaluational During (ED)	Evaluational After (EA)

Figure 2: Axes reformulated as a cross tab.

For me, the interesting part would be the EB field. We will see below that it seems that the IS field is largely neglecting this box, while software engineering does have some input here.

There are of course other categorizations possible of the available literature, and many such categorizations have been done. For example, Iivari et al (Iivari J, Hirschheim R, Klein H 1998) has divided the field into five basic approaches according to their fundamental theory of science assumptions, something which in part seems to be a development of an earlier categorization into four categories (Hirschheim R, Klein H 1989). The latter works along two axes: one objectivism/subjectivism and one order/conflict. It should be stressed that the categorization I make is *a* categorization, not the only one possible. Another way of dividing literature would obviously yield another view of the field.

So, one may ask, why is all this interesting to practitioners and researchers? It is well known that many systems development projects fail, see for example (Smith H, Keil M 2003). If projects fail, and there are parts of the field that could be seen as under-researched, then one could hypothesize that maybe if the neglected fields gained more attention at least some projects could in the future get a higher probability of success? This is of course mere speculation, but a first logical step would be to see if something is missing within the field and then see what could be done about it.

In this article I will show that with this way of sorting the field we can se that a) there is a heavy focus on only parts of the available toolbox and that b) specific possible tools therefore might be neglected.

Method

To fulfill the purpose of the article, the following research questions were asked:

- What literature (journals) is available to IS researchers?
- Which of these journals are relevant for the topic?
- What is the distribution of articles categorized according to the above scales?

A similar (albeit far more ambitious) approach has been used in (Chen W, Hirschheim R, 2004), where all articles from 1991 to 2001 were categorized according to basic philosophy of science approach.

Procedure

An inventory of all available relevant journals was made. The definition of "all available journals" is here the union of (Saunders C, 2008a) and (Saunders C, 2008b). Unfortunately these lists only stated ISSN and short journal ID in the first case, and only journal title in the second case. Thus some initial work had to be done to decipher the listed entries and find their home pages and ISSN numbers.

Once a list of all journal homepages was available, each journal was analyzed to see if it was relevant for this study in specific. Journals were *excluded* on the following criteria:

- It publishes articles concerning IS, but not concerning development and/or evaluation of IS.
- It focuses on a specific application (such as databases) rather than IS as such.
- The journal homepage could not be found
- The journal has not published anything since 2002.
- Journal does not provide open access to at least abstracts
- Journal does not seem to be a scientific journal in the desired sense
- The journal had such a generic name that it was impossible to say which page was the indicated journal
- Journal is in another language than English
- Technical problems (such as the journal homepage not answering)

The complete list of found journals with indications on why they were included or excluded is available in appendix A. The remaining list of included journals is the following:

Journal Title	ISSN
ACM Transactions on Software Engineering and Methods	**1049-331X**
Australasian Journal of Information Systems	1326-2238
Empirical Software Engineering	1382-3256
European Journal of Information Systems	**0960-085x**
IEEE Internet Computing	1089-7801
IEEE Software	0740-7459
IEEE Transactions on Software Engineering	0098--5589
Industrial Management & Data Systems	0263-5577
Information Society	0197-2243
Information Systems Journal	**0306-4379**
Information Systems Research	**1047-7047**
Journal of Information Technology	0268-3962
Journal of Information Technology Management	1042-1319
Journal of Management Information Systems	0742-1222
Operations Research	0030-364X
Scandinavian Journal of Information Systems	0905-0167
Software Quality Journal	**0963-9314**

Table 1: Remaining journals after journal analysis. Journals selected for further study is marked in boldface.

Having found the relevant journals, a final selection was made (see below). The reason for this selection was that there were not enough resources to thoroughly analyze all the journals, so a representative selection had to be made. The criteria for the final selection of journals was a) an initial ocular inspection to see if they were likely to have few articles falling into an “uncategorizable” category, b) that the journal ended up high on the AIS ranking lists. Because of the latter, the Scandinavian Journal of Information System was not included, something which might have been expected in this context otherwise (SJIS ended up at the very bottom of one of the ranking lists, and did not even end up on the other).

Of the selected journals, three are “core” information systems journals, and two are more oriented towards software engineering.

The selected journals were *Information Systems Research, European Journal of Information systems, ACM Transactions on Software Engineering and*

Methods, *Software Quality Journal* and *Information Systems Journal*. All abstracts from 2002 (inclusive) to 2007 (inclusive) were read and categorized according to the model presented in figure 1 above. The numbers are presented in tables 2 to 7 under results. All in all some 560 articles were considered.

Categorization

The categorization was subjective and done through reading of the article abstracts. This may lead to biased results (see "method critique" under "discussion"). To offer a view of the general basis for categorization, these are the typical articles falling under each category, together with some examples taken from the categorization process:

- PB: The typical article of the prescriptive-before category discusses a use case of a specific modeling method, or the inclusion of a specific technology in the product. The statements here can be summarized as "do this and things will end up well" and "some guys did like this and the product ended up like that". An example could be (Purao S, Storey VC, Han T 2003)
- PD: The prescriptive-during articles mainly deal with the systems development process, and communication within the team. The statement here can be summarized as "do like this while you are constructing the system".
- PA: The prescriptive-after articles deal with implementation questions. The statement can be summarized as "Do like this when pushing the system to the users". An example of this would be (Bondarouk T, 2006).
- PEB: The prescriptive/evaluational-before category states that a model has to look in a specific way before you start to build, or in other words "Make sure that you have constructed a model looking like this".
- PED: The prescriptive/evaluational-during category generally co-incide with statements about "agile" methods such as XP and Scrum, and iterative user involvement in the construction phase. The statement here is "the goal is a system looking like this, check that we're still on the way and that the goal has not changed".
- PEA: The prescriptive/evaluational-after category deals with user involvement and feedback during the configuration and implementation phase. The statement here is "this is how you iteratively configure the system to make the users happy". An example of this would be (Gengatharen D, Standing C 2005).
- EB: The evaluational-before category deals with models analyzing the systems development before it starts, or analyses models of possible systems. This involves for example pre-hoc model evaluations, simulation

and economical risk/benefit analyses. The statement here is “This is how you measure the model of a possible system to see if you like it before you start”. An example would be (Shah MH, Ashley Braganza A, Morabito V, 2007).

- ED: The evaluational-during category deals with decisions on whether a systems development process should be aborted, and with iterative usability testing. The statement here is “This is how you iteratively measure if the system is still likely to become a success”.
- EA: The evaluational-after category deals with post-hoc evaluation. This includes user acceptance, return on investment, performance measurement and organizational adoption. The statement here is “how to measure if the system ended up like we wanted it to”. An example of this would be (Torkzadeh G, Dhillon G 2002).

Apart from these categories, there are the articles that were not possible to categorize. This is everything from meta-discussions about the state of the information systems field to analyses of IT adoption in enterprises. No specific important type of articles was found in this category.

Analysis

The analysis of the categorization was mainly quantitative. Once the articles had been sorted into the different categories, it was calculated how large the proportions between the article categories were, and how large the “failure rate” (uncategorizable articles) were.

Alternative methods considered

Early in the process a keyword analysis approach was considered. Although this was technically possible, it soon became apparent that it would be very difficult to choose relevant keywords.

Results

The following are the results of the article categorization of the five journals:

PB: 24	PD: 4	PA: 0
PEB: 2	PED: 3	PEA: 0
EB: 4	ED: 1	EA: 28

Table 2: Information systems research. Total articles considered is 119, articles considered but deemed uncategorizable is 53 (45%).

PB: 32	PD: 7	PA: 5
PEB: 2	PED: 10	PEA: 12
EB: 8	ED: 2	EA: 12

Table 3: European journal of information systems. Total articles considered is 173, articles considered but deemed uncategorizable is 90 (52%).

PB: 8	PD: 14	PA: 4
PEB: 0	PED: 3	PEA: 1
EB: 2	ED: 1	EA: 12

Table 4: Information Systems Journal. Total articles considered is 96, articles considered but deemed uncategorizable is 51 (53%).

PB: 13	PD: 4	PA: 0
PEB: 6	PED: 6	PEA: 0
EB: 3	ED: 10	EA: 2

Table 5: ACM Transactions on Software Engineering and Methods. Total articles considered is 72, articles considered but deemed uncategorizable is 28 (39%).

PB: 15	PD: 8	PA: 0
PEB: 3	PED: 7	PEA: 0
EB: 8	ED: 15	EA: 18

Table 6: Software Quality Journal. Total articles considered is 101, articles considered but deemed uncategorizable is 35 (35%).

As we can see in tables 2 to 4, the information systems journal tend to have a

heavy weight in the PB and EA fields. Looking at tables 5 and 6, we can see that the software engineering journals have the weight shifted somewhat towards evaluational methods, and here we also find some pre-hoc evaluational articles.

For a consolidated comparison, we can see table 7:

PB: 33%/26%	PD: 13%/11%	PA: 4%/0%
PEB: 2%/8%	PED: 8%/12%	PEA: 3%/0%
EB: 7%/10%	ED: 2%/21%	EA: 27%/9%

Table 7: Aggregated results divided on information systems journals (first figure) and software engineering journals (second figure). No normalization was made; figures are percentage of total number of articles within the journal category.

Discussion

The PA and PEA fields are empty in three of the journals. This is hardly surprising, since they consist of prescriptive statements about implementation, something which has traditionally been neglected. It is, however, an indication that this could use more research though.

For my part, the EB and ED fields are what interest me. Where are the methods for evaluating the probability of systems development success before the system is actually built? Where are the methods for evaluating a design before it is implemented? In the IS field they seem to be lacking, at least for the publication years I have studied. There are available articles in the EB field, but most of them have in common that they are economical risk/benefit analyses. The methods for evaluating probable success ("critical success factors") are available too, but are very few. The methods for measuring probable quality and compliance to customer desire are close to none in the studied material. For the IS field, the ED field is very under-populated too: Where are the quantitative methods for evaluating the quality of the systems development during the time it proceeds? Comparing this to the software engineering field, we can there find several methods for evaluating designs before realization. Granted, most of them are mechanic, but there are still methods available.

As a possibly off-topic reflection: Maybe this all comes from the focus on the journals. While there are several journals relevant for information systems development, there is (in my list of journals) no journal completely focusing on it. Where is the "international journal of information systems *development*"? This makes me suspect that I might be missing something important.

Method critique

There are some points that should be mentioned concerning the method. First, the categorization was subjective and another researcher might have reached another result. It is not improbable that I am biased in my analysis, since I was looking specifically for pre-hoc evaluation articles. In a later stage, the categorization should be done in parallel by two persons as to validate that the categorization is reasonable. I would not be surprised if the categorization differed quite a lot when the basis is only the abstracts.

Second, it could be claimed that the result would be very different if I had chosen other journals. I would not entirely agree with this critique though. There is a rather limited set of relevant journals in table 1, and I have at least skimmed all of them before making the final selection. I feel confident that the remaining journals would not be more on topic. (There still remains the issue that I might totally have missed some journals of course).

Thirdly, the span of investigated articles is only five years and quite recent. Maybe it simply was not popular to write about pre-hoc criteria models during these years, and another time span would have produced different results?

As a fourth point, the categorization was based solely on the abstracts. Out of experience, it is often difficult to understand what an article is all about only from reading the abstract. Maybe the results would have been difficult if the actual contents of the article had been read? For practical reasons this was not possible to do, but I agree that the quality of the categorization would have been better if the actual articles had been read.

Finally, no journal specifically targeting information systems development was included. I did not find such a journal within Saunders' lists, and I am not aware of one existing outside of it. What I have found is software engineering journals, but that is not the same thing as an information systems development journal, although they share many points. If there is an important journal I have missed, the results might be different too. After all, the journals I investigated did not specifically target information systems development or evaluation of information systems.

Conclusions

In this article it has been shown that contemporary articles in three information systems journals generally fall into two different categories: prescriptive statements before or early in the development process, and evaluational statements late in or after the development process. Evaluational statements are underrepresented both before and during the development process. For comparison it was shown that in two software engineering journals, there were more methods available for pre-hoc model evaluation.

To tie back to the introduction, I will with this conclude that my suspicion that very little is published around the topic of pre-hoc model evaluation within the IS field, and this could merit some more focus in the future.

References

Bondarouk T (2006): **Action-oriented group learning in the implementation of information technologies: results from three case studies**. European Journal of Information Systems 15: 42-53

Chen W, Hirschheim R (2004): **A Paradigmatic and Methodological Examination of Information Systems Research from 1991 to 2001**. Information Systems Journal. Vol 14, issue 3.

Gengatharen D, Standing C (2005): **A framework to assess the factors affecting success or failure of the implementation of government-supported regional e-marketplaces for SMEs**. European Journal of Information Systems 14: 417–433

Hirschheim R, Klein H

Iivari J, Hirschheim R, Klein H (1998): **A Paradigmatic Analysis Contrasting Information Systems Development Approaches and Methodologies**. Information Systems Research. Vol 9, No 2.

Palmius J (2005): **A Theoretical Base for the Simulation of Information Systems**. Licentiate thesis. Mid Sweden University, Sweden.

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Purao S, Storey VC, Han T (2003): **Improving Analysis Pattern Reuse in Conceptual Design: Augmenting Automated Processes with Supervised Learning**. Information Systems Research. Vol. 14, No. 3, September 2003, pp. 269-290

Saunders C (2008a): **IS Journals Impact Factors (ISI Citations)**. Homepage of the AIS; http://www.isworld.org/csaunders/isiimpact.htm.

Saunders C (2008b): **MIS Journal Rankings**. Homepage of the AIS; http://www.isworld.org/csaunders/rankings.htm

Shah MH, Ashley Braganza A, Morabito V (2007): **A survey of critical success factors in e-Banking: an organisational perspective**. European Journal of Information Systems. 16: 511–524.

Smith J, Keil M (2003): **The Reluctance to Report Bad News on Troubled Software Projects**. Information Systems Journal. Vol 13, issue 1.

Torkzadeh G, Dhillon G (2002): **Measuring Factors that Influence the Success of Internet Commerce**. Information Systems Research. Vol 13: 187-204

Appendix A – All examined journals

Note that ISSN is the *print* ISSN where available. If print ISSN is not available it is the online ISSN. If neither was found, the field is left with a question mark.

Journal Title	**ISSN**	**Included?**
Academy of Management Journal	0001-4273	No (9)
Academy of Management Review	0363-7425	No (1)
ACM Computing Surveys	0360-0300	No (1)
ACM Transactions on Database Systems	0362-5915	No (2)
ACM Transactions on Design Automation of Electronic Systems	1084-4309	No (2)
ACM Transactions on Graphics	0730-0301	No (2)
ACM Transactions on Information Systems	1046-8188	No (1)
ACM Transactions on Mathematical Software	0098-3500	No (2)
ACM Transactions on Programming Languages and Systems	0164-0925	No (1)
ACM Transactions on Software Engineering and Methods	1049-331X	Yes
Administrative Science Quarterly	0001-8392	No (1)
AI Expert	0888-3785	No (2)
AI Magazine	0738-4602	No (2)
Artificial Intelligence	0004-3702	No (2)
Australasian Journal of Information Systems (renamed)	1326-2238	Yes
Behavior and Information Technology	1362-3001	No (5)
Business Horizons	0007-6813	No (5)
California Management Review	0008-1256	No (5)
Communication Research	0093-6502	No (1)
Communications of the ACM	0001-0782	No (5)
Communications of the AIS	1529-3181	No (1)
Computer Animation and Virtual Worlds (renamed)	1049-8907	No (2)
Computer Decisions	0898-1825	No (5)
Computer Journal	0010-4620	No (5)
Computer Supported Cooperative Work	0925-9724	No (1)
Computers & Education	0360-1315	No (2)
Computers and Automation	0887-4549	No (3)
Computers and Operations Research	0305-0548	No (5)
Computers in Human Behavior	0747-5632	No (5)
Data & Knowledge Engineering	0169-023x	No (5)
Data Management	?	No (3)
Data Mining and Knowledge Discovery	1384-5810	No (9)
Database Programming and Design	?	No (6)
Datamation	?	No (6)
Decision Sciences Journal	0011-7315	No (1)
Decision Support Systems	0167-9236	No (2)
E-Service Journal	?	No (1)
Electronic Commerce Research and Application	1567-4223	No (5)
Electronic Markets	?	No (1)

Empirical Software Engineering	1382-3256	Yes
European Journal of Information Systems	0960-085x	Yes
European Journal of Operations Research	0377-2217	No (5)
Expert Systems Review	0959-6038	No (3)
Expert Systems with Applications	0957-4174	No (2)
Group Decision and Negotiation	0926-2644	No (1)
Harvard Business Review	0017-8012	No (5)
Human-Computer Interaction	?	No (5)
IBM Systems Journal	0018-8670	No (1)
IBSCUG Quarterly	?	No (3)
IEEE Computer	?	No (9)
IEEE Computer Graphics and Applications	0272-1716	No (2)
IEEE Internet Computing	1089-7801	Yes
IEEE Micro	0272-1732	No (1)
IEEE Multimedia	1070-986x	No (2)
IEEE Network	0890-8044	No (5)
IEEE Pervasive Computing	1536-1268	No (2)
IEEE Software	0740-7459	Yes
IEEE Transaction on Knowledge & Data Engineering	1041-4347	No (2)
IEEE Transaction on Visualization and Computer Graphics	1077-2626	No (2)
IEEE Transactions on Computers	?	No (9)
IEEE Transactions on Dependable and Secure Computing	1545-5971	No (2)
IEEE Transactions on Engineering Management	0018-9291	No (5)
IEEE Transactions on Information Technology in Biomedicine	1089-7771	No (2)
IEEE Transactions on Information Theory	0018-9448	No (5)
IEEE Transactions on Mobile Computing	1536-1233	No (2)
IEEE Transactions on Multimedia	1520-9210	No (2)
IEEE Transactions on Reliability	0018-9529	No (5)
IEEE Transactions on Software Engineering	0098--5589	Yes
IEEE Transactions on Systems, Man & Cybernetics	1094-6977	No (4)
IEEE Wireless Communications	1536-1284	No (5)
Industrial Management & Data Systems	0263-5577	Yes
INFOR	0315-5986	No (5)
Information	1343-4500	No (1)
Information & Management	0378-7206	No (5)
Information and Organization	1471-7727	No (5)
Information and Software Technology	0950-5849	No (5)
Information Processing & Management	0306-4573	No (5)
Information Processing Letters	0020-0190	No (5)
Information Research	1368-1613	No (1)
Information Resources Management Journal	1040-1628	No (5)
Information Retrieval	1386-4564	No (2)
Information Sciences	0020-0255	No (5)
Information Society	0197-2243	Yes
Information Systems Frontiers	1387-3326	No (5)
Information Systems Journal	0306-4379	Yes
Information Systems Journal	1350-1917	Yes
Information Systems Management	0739-9014	No (5)

Information Systems Research	1047-7047	Yes
Information Technology and Management	1385-951X	No (5)
Information Technology and People	0959-3845	No (5)
Informing Science	1521-4672	No (1)
INFORMS Journal on Computing	1091-9856	No (5)
Infosystems	?	No (3)
Interface: The Computer Education Quarterly	?	No (3)
Interfaces	0092-2102	No (1)
International Journal of Electronics and Communications	1086-4415	No (2)
International Journal of Human-Computer Studies	1071-5819	No (5)
International Journal of Human-Computer Studies (renamed)	1071-5819	No (5)
International Journal of Information Management	0268-4012	No (5)
International Journal of IT Management Systems	?	No (3)
International Journal Of Software Engineering and Knowledge Engineering	0218-1940	No (5)
International Journal of Technology Management	0267-5730	No (1)
Journal of Business and Technical Communication	1050-6519	No (1)
Journal of Computer and System Sciences	0022-0000	No (5)
Journal of Computer Information Systems	0887-4417	No (5)
Journal of Computers and Security	0167-4048	No (2)
Journal of Database Administration	?	No (3)
Journal of Database Management	1063-8016	No (2)
Journal of Education for Management Information Systems	?	No (3)
Journal of Engineering and Technology Management	0923-4748	No (5)
Journal of Global Information Management	1062-7375	No (1)
Journal of Global Information Technology Management	?	No (1)
Journal of Information Management	?	No (3)
Journal of Information Science	0165-5515	No (1)
Journal of Information Systems (accounting)	?	No (2)
Journal of Information Systems (education)	?	No (3)
Journal of Information Systems Education	?	No (2)
Journal of Information Systems Management	0739-9014	No (5)
Journal of Information Technology	0268-3962	Yes
Journal of Information Technology Education	1547-9714	No (2)
Journal of Information Technology Management	1042-1319	Yes
Journal of Information Technology Theory and Application	1552-6496	No (5)
Journal of Intelligent Information Systems	0925-9902	No (2)
Journal of International Information Management	1063-519X	No (1)
Journal of Internet Research	1066-2243	No (9)
Journal of IT Cases and Application	?	No (1)
Journal of Management	0149-2063	No (1)
Journal of Management Information Systems	0742-1222	Yes
Journal of Management Systems	?	No (9)
Journal of Microcomputer Systems Management	?	No (3)
Journal of Operations Research	?	No (3)
Journal of Organizational and End User Computing	1546-2234	No (5)
Journal of Organizational Computing and Electronic Commerce	1091-9292	No (2)
Journal of Software Maintenance	1040-550X	No (9)

Journal of Strategic Information Systems	0963-8687	No (5)
Journal of Systems and Software	0164-1212	No (5)
Journal of Systems Management	?	No (3)
Journal of the ACM	0004-5411	No (5)
Journal of the AIS	?	No (1)
Journal of the American Society for Information Science	1532-2882	No (5)
Journal of Visual Languages and Computing	1045-926x	No (5)
Journal on Computing	?	No (7)
Knowledge Based Systems	0950-7051	No (5)
Management Science	0025-1909	No (5)
MIS Quarterly	0276-7783	No (1)
MISQ Discovery	?	No (4)
MIT Sloan Management Review	1532-9194	No (5)
Multimedia Systems	0042-4962	No (2)
Omega	0305-0483	No (1)
Operations Research	0030-364X	Yes
Organization Science	1047-7039	No (5)
Organizational Behavior and Human Decision Processes	0749-5978	No (5)
PC World	?	No (6)
Quality Progress	?	No (5)
Scandinavian Journal of Information Systems	0905-0167	Yes
Simulation	0037-5497	No (1)
Social Science Computer Review	0894-4393	No (1)
Soft Computing	1432-7643	No (2)
Software Quality Journal	0963-9314	Yes
The Academy of Management Perspectives (renamed)	0896-3789	No (1)
The Computer Journal	0018-9162	No (5)
The DATABASE for Advances in Information Systems	?	No (1)
The Information Society	?	No (1)
The Visual Computer	0178-2789	No (2)
Very Large Databases Journal	1066-8888	No (2)
WIRT (Wirtschaftsinformatik)	?	No (8)
World Wide Web	1386-145x	No (2)

1: Journal does not focus on development and/or evaluation of IS
2: Journal focuses on a specific application, not information systems in general
3: Could not find the journal's homepage
4: No recent issues (recent = publications after 2002)
5: Journal does not provide online access to abstracts
6: Does not seem to be a scientific journal
7: Too many hits: cannot say which of the journals is indicated
8: Journal not in English
9: Journal homepage seems temporarily unavailable