THE SCHOLARLY JOURNAL RE-ENGINEERED: A CASE STUDY OF AN OPEN ACCESS JOURNAL IN CONSTRUCTION IT

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SUMMARY: *Open access is a new model for the publishing of scientific journals enabled by the Internet, in which the published articles are freely available for anyone to read. During the 1990's hundreds of individual open access journals were founded by groups of academics, supported by grants and unpaid voluntary work. During the last five years other types of open access journals, funded by author charges have started to emerge and also established publishers have started to experiment with different variations of open access. This article reports on the experiences of one open access journal (The Electronic Journal of Information Technology in Construction, ITcon) over its ten year history. In addition to a straightforward account of the lessons learned the journal is also benchmarked against a number of competitors in the same research area and its development is put into the larger perspective of changes in scholarly publishing. The main findings are: That a journal publishing around 20-30 articles per year, equivalent to a typical quarterly journal, can sustainable be produced using an open source like production model. The journal outperforms its competitors in some respects, such as the speed of publication, availability of the results and balanced global distribution of authorship, and is on a par with them in most other respects. The key statistics for ITcon are: Acceptance rate 55 %. Average speed of publication 6-7 months. 801 subscribers to email alerts. Average number of downloads by human readers per paper per month 21.*

KEYWORDS*: scientific journal, open access, construction IT*

1. INTRODUCTION

Now that the tenth volume of The Electronic Journal of Information Technology in Construction (ITcon) is nearing its completion it is a good time to take stock of the experiences gathered so far and put this individual scholarly journal into the larger perspective of developments in the scientific communication process enabled by the Internet. ITcon is just one out of more than one thousand scholarly peer reviewed journals using the open access paradigm.[1]

ITcon was originally started by a small group of enthusiasts who were thrilled by the opportunities offered by the Internet for making the spreading of scientific journal articles more efficient. At the time (1993-94) of the discussions leading up to the founding of ITcon, traditional commercial and society journals had not yet made the transition to parallel electronic publishing and there seemed to be a wide gulf between the potential of the web and what publishers were offering. The new medium seemed to offer excellent opportunities for new types of publication formats, free global availability of the articles, rapid turnaround time from submission to publication and novel forms of peer review.

[1] For a listing see the Directory of Open Access Journals, http://www.doaj.org/.

The editorial team behind ITcon opted for open access but a rather traditional format and blind peer review. Other open access journals founded in the same period have made slightly different choices. Early on the choices focused on technical aspects such as the presentation format or the organisation of the peer review. For example the journal of Electronic Transactions on Artificial Intelligence (ETAI - http://www.ida.liu.se/ext/etai/) has experimented with a new type of peer review, which is only possible through the web. Submissions to the journal are posted straight away. After a period of about half a year the feedback from the readers is used as input to the peer review and part of the submissions are promoted to full articles. The ETAI thus functions as a combined preprint repository and journal. The International Journal of Design Computing (http://www.arch.usyd.edu.au/kcdc/journal/) is an example of a journal, which attempts to use the technical possibilities offered by the Internet for layout, linking with hypermedia content etc. Thus this journal does not publish a printable version of the articles but rather the reader is assumed to study the content online.

At the time of the inception and start of ITcon the editorial team members where novices to the business of scientific publication and to the general developments in this field. Over the years some of us have, however, become deeply involved in international (http://www.scix.net/) and national (http://www.lib.helsinki.fi/finnoa/) developments to promote open access, and also academic research into the area (http://www.oacs.shh.fi/). We have been able to reflect on our own "hands-on" experiences against a knowledge of the general developments in the field and also to conduct experiments with both the journal and with open access repositories in the same research domain (Martens et al 2003).

This article thus is a longitudinal case study of one particular open access journal, set against the background of publishing in its academic domain and against the general developments in scholarly publications in the last ten years. From a methodological viewpoint it can be labeled action research.

There have been a few earlier studies of academic journals in the field of construction computing or construction economics, but these have more focused on studying the topics of papers published or spread of authorship and not on how well the journal is performing its task of communicating knowledge (ie. Lazmazaheri and Rasdorf 1998).

2. EVOLVING BUSINESS MODELS FOR OPEN ACCESS JOURNALS

In the 1990s hundreds of open access journals similar to ITcon were founded (for an interesting case study report see Wilson, 2005). Usually there were no subscriptions and the journals had no income from the publishing itself. Most journals have been run on shoestring budgets, sometimes partly funded by external grants and managed on the websites of the editor's university. This business model, which is very close to the one used in open source projects (Lerner and Tirole 2002, Von Krogh 2003), has helped in paving the way for open access publishing but does not seem very sustainable in the long run for large scale publishing operations. According to a study made as a part of the SciX project the average number of articles published per year by this type of journal was only 16 (Björk et al 2004), which can be compared to the figure of 123 reported by Tenopir & King (2000) for journals in general.

Towards the end of the decade the large scientific publishers started to offer electronic access to their journals and a new type of subscription, the big deal, encompassing hundreds of journals from the same publisher evolved. Thus access and delivery improved a lot, but the problems with high prices and limited availability still persisted.

Since 2000 a new type of scientific publisher has emerged on the market using a revenue model based on author charges to fund its large scale publishing operations. Significantly both leading publishers in this model, BioMed Central and Public Library of Science, operate in biomedicine, which is an area with very large research budgets and a thriving publishing industry. In this model an author of an accepted manuscript pays a fee typically ranging from 1000 to 1500 USD for the services rendered by the publisher in making the article available openly on the web. They have thus reversed the business idea from selling content to subscribers to providing services to authors who want to communicate their results as efficiently as possible. Due to initial problems in persuading individual authors to pay the author charges both now offer institutional membership as well.

There has been a lot of debate about the viability of the author pays business model and many of the strong established publishers have questioned it (Kaufman-Wills Group 2005). Nevertheless many large publishers are also currently experimenting with "author pays" open access for instance using a hybrid version where an author by paying an extra charge of typically 2500-3000 USD can make his individual article available as open access

amid closed access articles that only subscribers can see in full text (Blackwell, Oxford Univesity Press, Springer).

Yet another variation called delayed open access is practiced by traditional journals, which make their content available for free electronically after a certain period usually ranging from 6 to 36 months. Although not as valuable as full open access this nevertheless significantly helps researchers who want to get hold of an article based on a citation.

Thus the question today no longer seems to be if we should have open access journals at all but rather which business and organisational models work best in providing them and how widespread the model will become? The case study of ITcon, which is one of the older survivors of a particular type of open access journals, can hopefully shed light on the question.

3. HOW ITCON OPERATES

ITcon functions very much like an open source project. The basis is the voluntary work of the persons carrying out the work, and the trick is to align the interests of the journal with the interest of the individuals performing various essential functions so that they stay motivated to do a good and timely job. This type of collaborative work with no monetary transactions has always existed (for instance building a barn in rural communities) but is now undergoing a renaissance in the form of different types of web communities (Benkler 2002). Wikipedias or software development projects such as the one behind the Linux operating system are good examples.

ITcon is funded in such a way that the university departments of the editor-in-chief and the editor in charge of the web site implicitly fund a substantial part of the costs by allowing these persons and some additional personnel to use working time and computing equipment for ITcon. This is in line with how a majority of the smaller open access journals operate, according to recent studies with journal editors (Björk et al 2004, Kaufmann-Wills Group 2005). ITcon has not even tried to attract sponsorship or advertising money, although this is one possible revenue type used by some journals, particularly in areas like medicine.

When ITcon was started a preliminary budget was made, partly because of a grant application to the Swedish Board of Building Research (BFR). Putting a price tag on the four editors estimated time spent in working with the journal the yearly budget was estimated to be around 500000 SEK. Since no monetary transfers have been needed after the 300000 SEK initial funding from BFR, no further budgets have been made. ITcon could easily have been started even without this grant, but it made possible marketing activities such as printing up the first four volumes as paper versions for free distribution at conferences etc.

There are a hierarchy of functions in the management and running of ITcon, which are explained below.

3.1. Editor-in-chief

The editor-in-chief decides on who of the editors should take charge of the review process of incoming manuscripts (and takes care of a fair share himself). Some few manuscripts he rejects outright, or after consultation with a co-editor, if the topic is outside the scope of ITcon or if the manuscript is of such a low quality that it would be unfair to bother reviewers with it. He has a strong say in all matters relating to editorial and general policy, marketing of the journal etc. He is, like any journal editor motivated by the prestige, power and network that the editorship provides. In this particular case the joy of trying out something new and finding innovative ways of doing things has been the strongest motivator. Unlike some editors for journals published by commercial publishers he receives no monetary compensation for this work. On the other hand the hands-on-experience has been extremely valuable for starting research activities in the area of scholarly publishing and getting engaged in national and international OA promotions activities. He spends on average three months per year working with the journal.

3.2. Co-editor in charge of the web site

Since ITcon is an electronic-only journal the design and programming of the website has been a central issue. The system has since the start been maintained at the University of Ljubljana, Slovenia. In 1995 when the journal was started the decision to program the system in-house was the only realistic choice. In the early years the website contained static html pages. In 2003, the SciX project (http://www.scix.net/) enabled the transition towards a database driven content management system.

3.3. Other co-editors

The other three co-editors take part in general policy discussions about the journal and take turns in managing the review of papers. The five co-editors together form the team that makes all major decisions concerning ITcon.

3.4. Editorial assistant

The editorial assistant is based in Ljubljana, where the web site is located, and helps in the final copyediting of articles, conversion to PDF and uploading of articles and abstracts.

3.5. The publisher

The formal publisher of ITcon has so far played a minor role. Since the editor in chief was based in the Royal Institute of Technology (KTH) at the time the journal started it was natural to have KTH as official publisher. In 2005 negotiations were concluded with the International Council for Building (CIB), a global organisation representing construction research organisations worldwide and CIB assumed the role of formal publisher of Itcon.

3.6. The editorial board

The editorial board of ITcon functions in much the same way as in the other journals in its field. Usually when a new journal is founded a number of well-known academics in its field are recruited to "lend their names" in order to give the journal respectability. Potential authors often check the names in the board before submitting their manuscripts. Members are seldom removed from the board unless they specifically request this. New members have in the case of ITcon been appointed due to services rendered for instance as guest editors of special issues or frequent reviews, or to represent new geographical areas of interest. Also the recent merger with IT-AEC (http://www.lboro.ac.uk/it-aec/) has led to a strengthening of the board.

A couple of times over the history of ITcon the editors have tried engage the full editorial board in email discussions about policy issues, but members have been quite passive. In the other five journals in which the editor-in-chief is or has been editorial board member there have never been any such discussions and the role of the editorial board has been a totally passive marketing related one.

3.7. The editors of special issues

Since the publication of the first special issue in 2001 guest editors have started to play an increasingly important role. They define the detailed calls for the special issues in co-operation with one of the regular editors and manage the whole review process. This creates a win-win situation in which on one hand the guest editors get academic merit and an increased network of colleagues they are in contact with, and on the other hand the workload of the regular editors is reduced.

3.8. The reviewers

ITcon reviewers are partly recruited from the editorial board, partly from the worldwide network of researchers in the field. For each manuscript the editor who takes the responsibility decides on appropriate reviewers and is in direct contact with them. At one stage the editor-in-chief proposed that the names of the reviewers should be made public as part of the publication of a paper. The reason for this proposal was that reviewers would get more credit and visibility for their work. The editorial team as a whole could not reach a consensus on such a policy and the idea was dropped.

3.9. The authors

Compared to some more traditional journals ITcon requires that the authors perform some of the functions that editorial office staff have taken care of. This concerns in particular the formatting of the final article and inclusion of figures in it and the checking of the language. The reasons are that due to its reliance on voluntary labour ITcon lacks the secretarial staff or financial means for outsourcing to take care of such tasks. Over the years, as academics have become more knowledgeable in using word processing and as electronic submission of

manuscripts has become the norm, more and more journals have, however, moved to a similar mode of operating, in particular concerning the layout work.

3.10. The readers

One cannot ignore the readers as one part of the overall "information system" of which ITcon is a part. Most of the authors are recruited from the active readers. Additionally readers play a very important part in the long-term marketing strategy of the journal. Firstly readers cite IT-con articles in their own work. Secondly they may via email inform colleagues about interesting articles published in ITcon. Once a third party has been informed of a potentially interesting article the steps to check it out are extremely simple, compared to subscription based journal articles.

4. MAJOR POLICY CHANGES DURING THE HISTORY OF ITCON

4.1. Change of primary publishing format

When ITcon was started most readers were used to view information directly on the web via their browsers and the use of PDF as a neutral format was not as common as today. For the first years ITcon articles were published in two formats in parallel, HTML for screen reading and PDF for printing out. A study of the weblogs of the first four years revealed that the use of the HTML version was decreasing and the use of PDF increasing. Since the technical work in formatting an HTML version is more laborious it was decided to drop the HTML version. With today's fast Internet connections it is quite easy to read a PDF document from the screen in any case. Most researchers prefer to read the full article from a printout, the screen is mainly used for scanning the article to determine whether it is worth printing.

This is in contrast with several other open journals founded around the same time as ITcon and which still stick to HTML as their only publishing format[2]. Recently founded OA journals tend to publish in PDF[3].

4.2. Parallel print version dropped

Two archival paper volumes were printed for the years 1996-97 and 1998-99. Most of these were handed out as promotional material to colleagues, at conferences etc. In the early days it was felt that having a professional looking paper version was important for getting credibility for the journal. There was also a plan to sell copies to libraries etc. and a notice was inserted in the website, but only a handful of copies were sold. From the year 2000 onwards, as submissions and the number of published papers started to increase, the print version was dropped. This was partly because it would have become quite expensive, and partly because it seemed evident that it added very little value.

4.3. Publication of Special Issues

Because one of the major aims of ITcon was to speed up the submission to publishing cycle, the editors early on decided not to publish in issues, but individually as soon as articles where ready. Other Open Access journals have opted for bundling articles into issues appearing at the same time, because it is felt that issues which are publicized via email lists increase the likelihood of attracting readers. A sort of bundling occurs in ITcon in any case since readers who subscribe to the altering service don't necessarily want to be bothered with emails for every new article published, and thus the typically quarterly alerting messages form virtual issues.

The aim of fast publishing also initially ruled out special issues. This proved, however, after a while to have been a mistake. The editors had been optimistic and assumed that because most researchers welcomed the idea of an open access journal as readers, they would also submit their best manuscripts to the journal. The perception of quality which goes with a journal indexed by the ISI or published by an association such as ASCE, was however, more important than the promise of a wider dissemination that ITcon could offer. Thus until the 2001 issue ITcon didn't publish enough papers and would have been stopped if it had been operated as a subscription journal. After the first special issue had been published it was found that it is much easier to attract researchers to submit to special issues than as individual submissions. For the individual researcher the special issue promises more and better focused readership, also for his individual article. The drawback of course is the longer

[2] Information Research, First Monday, Journal of Electronic Publishing
[3] Electronic Journal of Structural Engineering, Lean Construction Journal

publication delay caused by waiting for all the articles to be ready before the special issue is ready. An additional benefit is the spread of the workload of managing the review process also to colleagues outside the core editor team.

4.4. Change of web infrastructure

The initial volumes of ITcon were published on an HP workstation running CERN's Web Server software. The audience was expected to use the Netscape browser. Conservative HTML (omitting such basic elements as table) was used because typically academic readers were not equipped with the latest version of the browser. The site was edited using plain text editors (line Notepad) resulting in clean HTML and fast interaction with the site. A second major redesign of the site happened in 2001. The site was still based on static HTML files but used tables to achieve the design and Macromedia Dreamweaver was used for editing. Style sheets were used to achieve some design coherence. With the growing influx of papers requiring the involvement of an editorial assistant, the site was moved to the SciX Open Publishing Platform (Cerovšek et al 2004). All but a handful of pages are delivered out of a content management system that can be easily used by personnel not versed in Web publishing or HTML language. The system also includes the support for the editorial workflow, which is being gradually put to use during 2005 and 2006.

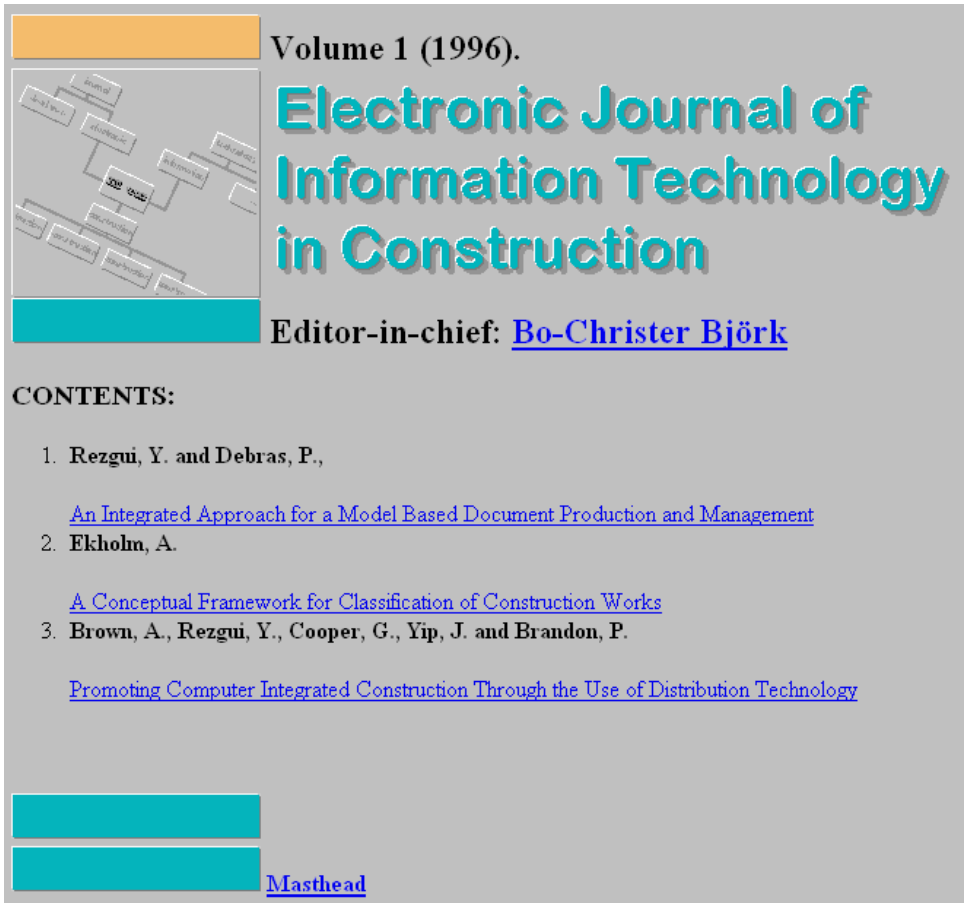

FIG. 1: The earlier versions of the ITcon used conservative HTML. In those days download speeds and the readers' browser versions were important factors to take into consideration in the design.

Since the late 1990s standard inexpensive Intel PC hardware has been used for the server, costing about 2000 Euros and hosting three dozen web sites in addition to ITcon. The hardware is upgraded about every other year. The entire ITcon Website, including its entire history of papers, still fits on a single CD-ROM.

4.5. Change of publisher

In the commercial publishing world it is quite common that journals change publishers as a result of mergers and acquisitions between publishers. Also in the case of some journals editors have needed to find new publishers because earlier publishers have decided to stop a journal due to insufficient subscription revenue.

After the editor-in-chief moved from the Royal Institute of Technology (KTH) to the Swedish School of Economics and Business Administration in 2000 the ties with KTH became minor (only one editorial board member). Moving the official publication site to the editor's new university, which is a business school, would not have made sense from a "brand" view-point, and a more neutral solution than any of the co-editors universities was discussed. Commercial publishers were out of the question due to the lack of revenue. Thus when CIB, which from the start had endorsed ITcon, started to get interested in open access publishing of construction research an understanding that CIB would take over as official publisher was quickly reached. While the arrangement has had few practical consequences for ITcon itself, it acts as a signal to the construction research community in general and could hopefully trigger the founding of other open access journals as well as encourage CIB working groups organising conferences to post the proceedings on the web for free.

4.6. Merger with IT-AEC

One of the other journals in our research domain was IT in Architecture, Engineering and Construction, which previously had been published under the name of Computer Integrated Design and Construction. The experiences of the editor of IT-AEC of working with small commercial publishers demonstrated rather clearly the difficulties the subscription model is starting to run into for new niche journals, unless backed by the really big publishers operating hundreds of journals. Negotiations about a merger with ITcon started and were rapidly concluded. This merger is thus not comparable to an acquisition but rather of two collaboration networks merging due to an alignment of interests. As part of the agreement the editor and part of the editorial board joined ITcon and authors whose papers were in the review pipeline of IT-AEC were offered the chance of being published in ITcon instead. In the long run this should strengthen ITcon since it adds more dedicated individuals to the network producing the journal.

4.7. Conclusions about hands-on-experiences

Currently ITcon has reached a relatively stable level of publishing 25-30 articles per year. This is a level which can be handled using the current organisational model, and equates to a normal quarterly journal. Increasing the level further would put too much strain on the participating key persons working time, and would also imply the employment of at least a half time editorial assistant.

An argument that commercial publishers often use for justifying their high subscription prices is the value added that they bring to the process, and items which are often mentioned include:

- Organising the review process
- Language checking
- Packaging the articles in a nice layout
- Providing information about the articles to various indexing services
- Marketing the journal

Of these functions ITcon, with its business model of no monetary budget, can perform the most essential ones. Organising the review process is in any case in most journals a process based on voluntary service of academics. While providing information about a journals content to commercial indexing services was extremely important prior to the Internet, the situation today is different and many researchers today rely extensively on general search engines like Google for searching for information. Language checking by professional staff is one item where ITcon has had to compromise and rely on the authors and reviewers doing this as well as they can. On the other hand one can argue that extremely polished language isn't a necessity for conveying the message of most articles in our domain. Most authors who are skilled in the use of word processors can also easily deliver the articles in the format required and spelling checkers find many of the language mistakes.

As for marketing, rather than relying on expensive travelling sales representatives, publicity material on glossy paper and the still used off-prints, we have used a technique nowadays called viral marketing, where it is assumed that news about something good available for free on the web spreads quickly via individuals using the

forwarding functions of their email systems[4] While this has been relatively effective, it is now clear that the marketing could be even more efficient if there were more resources for it.

The choice of a rather traditional look and feel of the journal, which prints easily as PDF files and which necessitates little editorial work, seems to have been the right one. Nothing prevents authors from including references to external hypermedia material on their own websites, but this possibility has rarely been used.

5. Construction IT research: the broader picture

In order to study the performance characteristics of ITcon it is useful to look at the publishing practice of our field of research in general. The academic research field concerning IT applications in construction employs a few hundred researchers worldwide. Compared to scientific disciplines in general certain areas (UK, Nordic countries) are strongly represented. These researchers participate in a handful of regular conference series (ASCE, W78, ECPPM, eCAADe and its regional counterparts, CAD Futures, INCITE, ISARC) and their journal articles are predominantly published in half-a-dozen scientific journals, which will be studied more in detail below.

TABLE 1: Peer-reviewed journals in the IT in construction domain

Journal name	**Abbreviation**	**Founding year**	**Publisher**	**Articles in 2004**
Automation in Construction	AIC	1992	Elsevier	57
Computer-Aided Civil and Infrastructure Engineering[5]	CACIE	1985	Blackwell	35
Construction Innovation[6]	CI	1993	Arnold	16
Electronic Journal of Information Technology in Construction	ITcon	1996	CIB	27
International Journal of Architectural Computing	IJAC	2003	Multi-Science	32
International Journal of Design Computing	IJDC	1997	University of Sydney	3
IT in architecture, engineering and construction[7]	IT-AEC	1999	Millpress	26[8]
Journal of Computing in Civil Engineering	JCCE	1987	ASCE	39
Total number of articles				**235**

In the following these journals are very briefly introduced.

Automation in construction (AIC)

Published since the start by the globally leading commercial publisher Elsevier. Automation in construction has tried to cater to two branches of readers, those more interested in design computing topics such as CAD and product modelling and those interested in site automation and robotics. Thus there have earlier been strong ties to the conference series run by the eCAADe and ISARC associations. Automation in Construction benefits from using the sophisticated web infrastructure of a large publisher and is increasingly available through bundled license deals (Science Direct). It has the largest publishing volume of the journals studied, which partly can be explained by a practice of publishing special issues of selected papers from earlier conferences[9].

Computer-aided Civil and Infrastructure Engineering (CACIE)

CACIE is already into its 20th year, and was earlier called Microcomputers in Civil Engineering. Compared to the other journals it focuses more on research related to IT in engineering computations, algorithms, site operations and logistics. CACIE was earlier published by Elsevier but acquired by Blackwell in the early 1990's.

[4] The success of the free-telephony company Skype was to a large part due to viral marketing
[5] Previously known as Microcomputers in Civil Engineering
[6] Previously known as International Journal of Construction Information Technology
[7] Previously known as Computer Integrated Design and Construction
[8] Since the journal stopped publishing in mid 2004 the Figure is from 2003
[9] 16 of the articles published by Automation in construction 2004 were selected papers from the 2002 ISARC and ACADIA conferences.

Construction Innovation (CI)
This journal started out in 1993 as the International Journal of Information Technology in Construction and was for a number of years published by the University of Salford, without the support of a separate publishers organisation. From 2001 the journal is published by a smaller publisher and has changed its scope to cover not only IT application but also innovation in construction processes. Nevertheless a substantial part of the content is dealing with construction IT issues[10] and the editors and editorial board remained essentially the same.

International Journal of Architectural Computing (IJAC)

The most recent entrant to this field (2003). Formed by a number of associations which, organise regular conferences in the area of architectural computing (CAADe, CAADRIA, ACADIA, SIGRADI and Caad Futures foundation). The members of the founding associations have a reduced price for individual subscriptions. Published by a small commercial publisher. The responsibility for compiling each issue is rotated between editorial board members from the four regional CAD associations.

International Journal of Design Computing (IJDC)

IJDC is the other open access journal in the sample and is published by the Faculty of Architecture of the University of Sydney. It has a more hypermedia type of user interface to the articles. The number of articles published per year has always been below ten and seems to declining.

IT in Architecture, Engineering and Construction (IT-AEC)

This journal was first published in 1999-2001 under the label Computer-integrated Design and Construction by the Institute of Structural Engineers (UK). In 2003-2004 essentially the same journal was published by Millpress as IT in Architecture, Engineering and Construction. In 2005 the journal merged with ITcon.

Journal of Computing in Civil Engineering (JCCE)

One of the 30 journals published by the American Society of Civil Engineers. Quite general in terms of topics covered. Has currently the highest impact factor of the journals in this sample. A very high proportion of authors tend to be North Americans.

Analysis of Journals

In 2004 these journals published in all 235 articles peer reviewed articles. If the submission to publication rate would be assumed to be equal to 50 % this would mean that the research collective would submit around 500 manuscripts annually to these journals. This does not take into the account the fact that papers rejected by one journal often are submitted to another. Figure 2 below shows the total number of articles published by these journals in 2004[11] as a pie chart.

Since the total number of submissions in this discipline is likely to be relatively constant from year to year and there are half-a-dozen specialised journals the competition for submissions has been quite tough. In many fields of science an established high-quality journal needs little marketing and soliciting to attract a sufficient number of high quality submissions. In our field, where there are several comparable journals but no acknowledged top journal, this “push” type of submitting has been complemented by a “pull” type of soliciting where journal editors actively scout for good papers in particular from conference papers. Somewhat questionable is the practice of recycling selected papers from named conferences to make up “special issues”. The main organiser of the W78 conference in 2000 was for instance approached by three journal editors who wanted to do just this (Björk and Turk 2000).

[10] 7 out of 16 articles in 2004 in Construction Innovation are in the field of construction IT
[11] For IT-AEC the figures for 2003 have been used, since the 2004 volume was not completed.

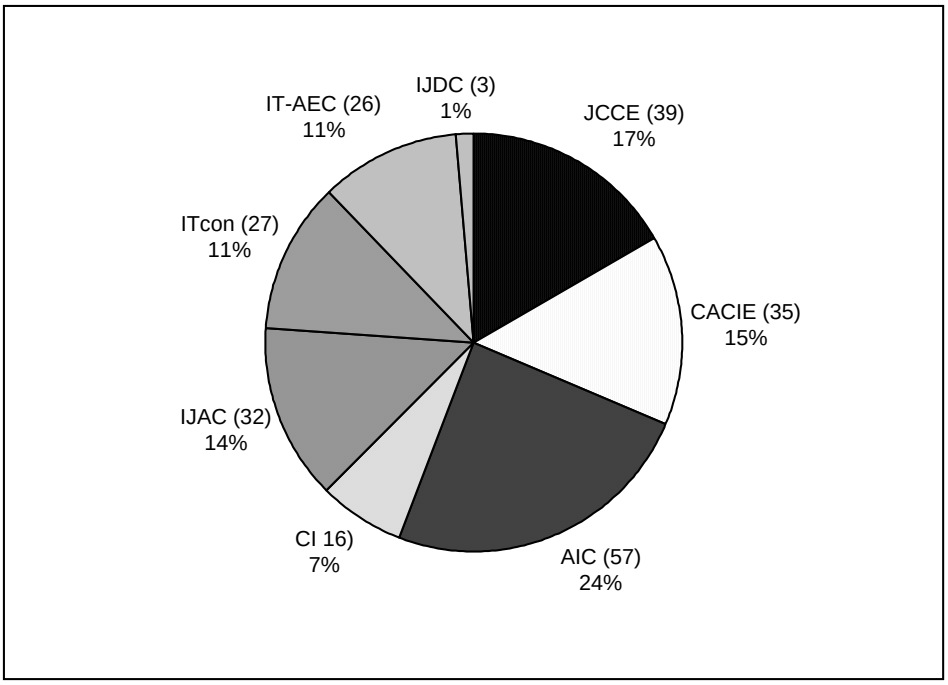

FIG. 2: Number of articles published in the core IT in construction journals in 2004.

Outside this group of "core" journals there are several other journals, which researchers in our domain regularly follow and which often publish articles dealing with construction IT issues. Many Construction IT researchers also sit on the editorial boards of such journals. Examples can be found in for instance construction management, general IT research and IT subfields. A few important ones are listed below:

- Computer-Aided Design
- Advanced Engineering Informatics
- Engineering, Construction and Architectural Management
- Construction Management and Economics
- Journal of Construction Engineering and Management
- Design Studies

6. BENCHMARKING ITCON

Benchmarking is a technique, which is often used when a company wants to compare its overall performance or certain aspects of it with competitors or successful companies from other industries. This technique has also been used in construction (Clark et al 1999). In the field of scientific publishing the impact factors calculated for journals by the Institute for Scientific Information provide a relatively objective measure of the scientific impact of journals (Saha et al 2003). Many academic institutions and in some cases also scientific associations have also published rankings of journals in their field, usually based on surveys with members etc. (Win 1997, Lowry et al 2004). Such ratings provide younger academics with guidance as to where it is worth submitting papers, since such ratings also influence the evaluation of authors or their grant applications, research assessment exercises etc. No such rating for the construction IT field have been published although a web survey performed in the year 2000 (Björk & Turk 2000) included questions related to this.

Rankings of this kind concentrate mainly on the scientific quality of the articles published, or on the prestige of the journals, which is assumed to correlate with the quality. In addition a well-established big publisher such as Elsevier or the American Society of Civil Engineers lends brand prestige to a journal irrespective of the actual quality of the individual journal.

If an author is interested in how efficiently he can communicate his research results to peers and practitioners there are, however, many other important factors that should influence the choice of journal. In a recent study of authors of ISI indexed journal articles (Rowlands and Nicholas 2005) the authors where asked about the importance of the following journal characteristics for choosing the last journal in which they had published an

article. The answer to this question provides a good starting point for our benchmarking exercise, particularly in the ordering of the characteristics:

TABLE 2. The importance of various journal characteristics for submitting an article to it (5=very important, 1=not at all important).

Reputation of the journal	4,50
Readership	4,21
Impact factor	4,04
Speed of publication	4,04
Reputation of the editorial board	3,55
Online manuscript submission	3,43
Print and electronic versions	3,21
Permission to post post-print	2,58
Permission to post pre-print	2,34
Permission to retain copyright	2,31

In the following ITcon is evaluated against the other journals in construction IT as well as some construction management journals. Comparisons cannot be made to all journals concerning all criteria, due to the lack of available data.

6.1. Speed of Publication

Speed of publication in the form of the time lag from the initial submission to final publication it is an important factor, as shown in the above authors survey and especially so in rapidly developing areas such as IT. For traditional paper based journals the time lags have seldom been below 12 months and lags up to three years have been experienced by the authors of this article. The time lags have to do with two factors. Firstly the speed of the review process and the rigor of the follow up in terms of revision handling and secondly the delay caused by the publishing schedule of the journal. Journal editors prefer to have a back-log of already processed articles waiting in line to be published rather than to be in short supply when the next publishing deadline approaches. The long delays have been one of the major critiques of the current system and open access journals that don't publish regular issues have managed to shortcut this.

Using publicly available data from the web sites or paper issues the average time was calculated for some of the other journals. For ITcon and Construction Innovation the lags are based on published dates of submission and publication. ITcon over its history showed that the overall average was 6,7 months with 6,1 for individually submitted articles and 7,1 for special issue articles. For Construction Innovation submission dates were not shown for all articles. For the 25 articles which included both submission and acceptance dates it was possible to calculate both components of the delay, since the publication month of the issue was known. The average delay between submission and acceptance was 10,2 months and between acceptance and publication 7,8 months resulting in an overall time lag of 18 months.

AIC has only published information on the acceptance date and thus it is difficult to calculate the former part. The unknown delay from submission to acceptance was for the purpose of this calculation assumed to be equal to the average of the delays of ITcon and Construction Innovation ((6,1 + 10,2) / 2 = 8 months). For the case of AIC the submission date for articles belonging to a special issue, which contains selected papers from a particular conference, was assumed to be the date of the conference, making it possible to calculate the overall delays of these articles. The overall average for 205 papers from 2001 onwards was 18,7 month (15,6 for individually submitted papers and 22 month for the special issues).

Very little data has been published concerning the average time lags in different journals. One case, which has been reported is IEEE Transactions on Geoscience and Remote Sensing (Raney 1998). For 151 individually submitted papers published in 1997 the mean publishing delay was 21,8 months, thus slightly exceeding the averages of Construction Innovation and Automation in Construction. Figure 3 shows the average speed of publication for some journals.

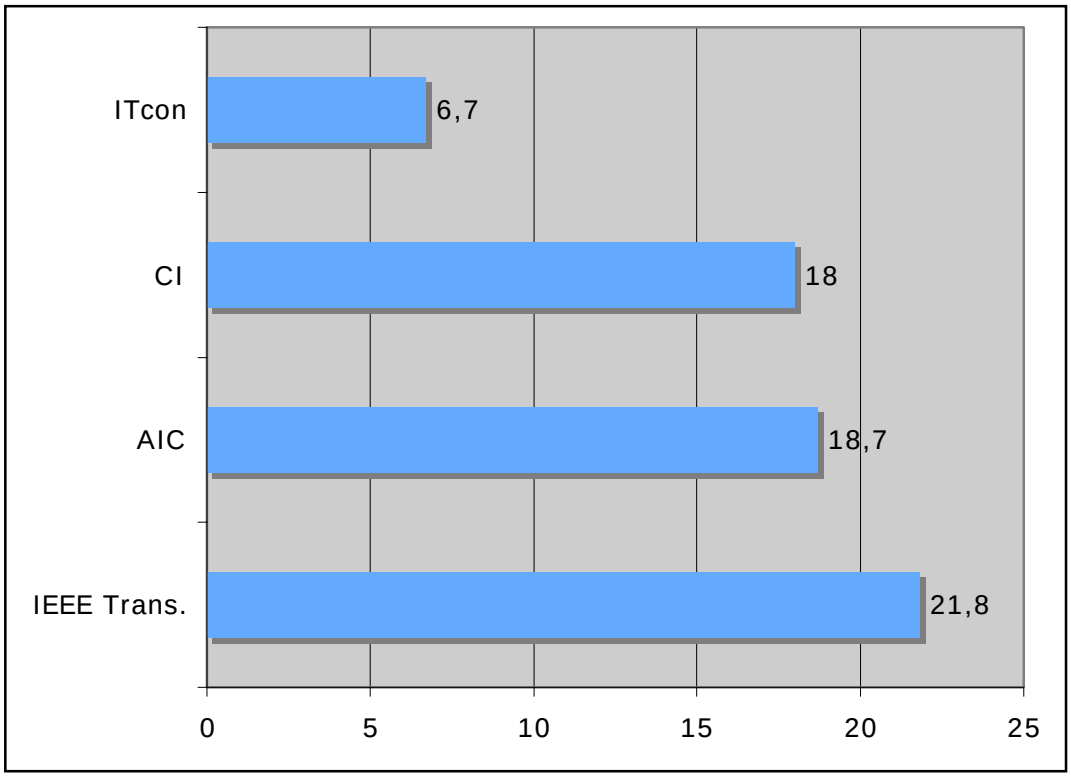

FIG. 3: The speed of publication (from submission to final publication of accepted papers) is an important factor for submitting authors.

6.2. Acceptancy rate

One of the most important aspects of a journal that prospective authors evaluate when choosing where to submit their manuscripts is the quality and stringency of the peer review. This is a many faceted question. On one hand there is a high correlation between a low acceptancy rate and a high quality of the published articles. On the other hand not only the acceptancy rate as such but also the quality of the reviews and comments and the effort the reviewers put into helping the author improve a manuscript is important. Thus a journal with a relatively high acceptancy rate might still be publishing relatively high quality papers, if they have been significantly improved as a result of the review. For the average author it might be a wiser choice to choose this type of journal since submitting to a journal with a high rejection rate would mean losing valuable time in getting the results published if the article is eventually rejected. A study of the 125 manuscripts that were rejected in 1989 by the American Journal of Surgery (the acceptance rate for this journal was 29 %) found that at least 38 % were later published in other journals with an average delay of 17 months (Abby et al 1994).

One way of finding out about the quality of the review would be to interview or survey authors of a particular journal or even better authors in a field, who would be asked to compare the quality of the peer review of different journals. Two proxies, which can be used to at least give some indication of the stringency of the peer review are the ISI impact factor (if the journal is indexed by ISI) or the journal statistics on acceptance rates. Both are problematic. The impact factors are only calculated for a limited set of typically older and established journals, and are not comparable across scientific disciplines due to different citation traditions. Journal statistics on acceptance rates again are usually not publicly available, and many journal editors would not be likely to want to reveal them.

A recent study on scientific publishing performed by the Kaufman-Wills Group (2005) provides statistics on acceptance rates for around 500 journals from different types of publishers, covering both subscription based and open access journals. Thus the average acceptance rate for the subscription-based journals published by the Association of Learned and Professional Society Publishers was 42 %. The average for open access journals indexed by the Directory of Open Access Journals (DOAJ) was 64 %, but if one excludes two large biomedical open access publishers (ISP and BioMed Central) the average was 55 %.

One journal for which quite detailed statistics on submissions and acceptancy rates is available on the web is Construction Management and Economics (http://www.tandf.co.uk/journals/pdf/rcme_stats.pdf). Over the period 1992-2004 the acceptancy rate (calculated as an average of the yearly reported acceptancy rates) was 51 %.

The acceptance rate for individually submitted ITcon manuscripts during 1995-1999 was 61 % and for those submitted 2000-2004 53 %. There are no statistics for the special issues since the work of managing the submissions and reviews has been handled independently by the guest editors. The overall acceptance rate for ITcon of 55 % is very close to the DOAJ average excluding the two biomedical publishers.

6.3. Regional spread of authorship

The history and background of a journal as well as the affiliations of its editors and editorial board strongly colour the regional spread of its authors and thus the research it reports on. The readership also strongly influences the authorship. People submit to journals, which they regularly follow given that their institutes or they themselves subscribe to the journals. In certain areas of science such as management science European authors often complain that it is difficult for them to get their papers accepted in American journals, due to differences in research traditions, frequent citations to the journal submitted to etc.

It is relatively straightforward to calculate the geographic spread of journal authors since the affiliations of the authors are published with the articles. The actual analysis was done on a country-by-country basis but in the following figures the results are reported for a number of regions. Thus Europe, from where 28 % of the articles stem, has been divided into four regions (UK, Central Europe, Scandinavia, Eastern and Southern Europe). In the analysis each author for an article was counted, which means that an article with multiple author gets more weight. In addition to the regional spread for each journal the regional spread for all authors to the construction IT journals has been calculated. This is not an average where each journal has an equal weight, but rather each article has equal weight, which means that it quite accurately reflects the whole body of journal articles in the field. The percentages and numbers are presented in table 3 below.

*TABLE 3. Geographic Spread of Authors (%) and Total Number of Authors and Articles per Journal**

	ITcon	CI	JCCE	AIC	CACIE	Percentage of authorships
North America	20,2	13,7	66,7	21,4	45,8	37,5%
South America	0	0	0,2	0	0	0,1%
Africa	1	0	0,7	0	0	0,3%
Great Britain	25,3	24	4,5	14,7	3	12,1%
Central Europe	15,8	5,1	4	7,5	8,7	8,1%
Northern Europe	21,5	1,1	0	0,3	1,5	4,2%
South & East Europe	6,4	1,7	1,4	2	7,2	3,8%
Asia	8,4	33,2	20,9	48,9	32,1	29,5%
Australia & Oceania	1,4	21,2	1,6	5,2	1,7	4,5%
Total number of authorships	287	175	425	410	402	100,0%
Total number of articles (N=768)	107	69	167	274	169	

*) In the table the term ‘authorship’ is used since one author may have published more than one article in more than one journal with one or more co-authors. In this table all instances of authorship have been counted. The data has been calculated using data for 2001 to 2005 for all journals except ITcon where data from 1996 to 2005 was used.

6.4. Readership

In the earlier world of paper journals the number of paper copies distributed or subscribed to was a very good measure of how widely read a journal was. Obtaining circulation figures for individual print journals has not, however, been easy since publishers have tended to keep these figures as trade secrets. Making low circulation figures public would probably scare off potential authors who would realise that publishing their key results in such journals would be counterproductive. According to Tenopir & King (2000) the average circulation figures for all scholarly journals in 1995 was 5800. More significant than the average is however, the median was very near 1900. The circulation figures of most of the construction IT journals, prior to electronic publication, were much lower than this.

Today most of the reading of journal articles is done using copies obtained over the web either via electronic university licenses or because articles are openly available. Data concerning the spread of such licenses for individual journals is very difficult to obtain and the picture is further complicated by the “journal bundles” that major publishers are offering, where a license to a construction IT journal such as AIC can be bundled with site licenses to over a thousand other titles. The best measures of readership would be web log data on downloads from the publisher’s site, but this data is again difficult to obtain.

It should be noted that the most significant advantage for open access journals like ITcon is the readership by practitioners, researchers in developing countries etc. who normally do not have possibilities to pay expensive subscriptions. Again web logs would provide good insights. A way around this dilemma would be to make a wide survey with academic readers in a field and ask about their reading of different journals. Mailing lists such as CNBR (Computer network of building researchers - http://cic.vtt.fi/links/cnbr-l.html) could be used for this but here the risk is the potential regional biases of such lists. Therefore for this factor no actual comparison can be made. Below are however some key download statistics for ITcon. It is also important to note that the number of “subscribers” to ITcon, that is persons who have requested the regular email updates about new papers published, is currently 801.

For the purpose of this analysis downloads from the ITcon site for the period October 2002 – August 2005 were analysed. The majority of all requests came from various web robots and indexing engines. After a best effort was made to identify human users it turned out that less than one third of all requests were made by humans. The statistics is made with respect to these requests only. Also discarded are all requests that were just checking if the content of the page on ITcon changed (e.g. a reader downloading a paper more than once and his browser finding it already downloaded a copy).

Users seem to get to an ITcon page by various means, but the main service that directs them to ITcon is Google. Various Google services contribute to 45% of all external referrals to ITcon. Interestingly, the main Google site contributes only 19 and Google scholar only 1 of these 45 percentage points. All other are national flavours of the Google search engine (like google.co.uk). The next popular entrance paths are Yahoo search at 11%, Ask.com at 6% and the directory of Open access journals www.doaj.org at 4%. This reinforces ITcon policy to remain Google friendly and identifies an issue to resolve about Google scholar. Either ITcon is not well covered there or the ITcon readership simply uses plain Google. The top search terms in the search engines were: construction, technology, information, management, industry, project, journal, knowledge, computer, system, design, pdf, building. Interestingly the terms "references" or "introduction" which are typically used by scholars to single out research papers from the rest of the web pages did not make the top search term list.
Of ITcon readers 85% used the Internet Explorer browser which is exactly as cited as Internet Average by www.onestat.com.

Analysing the net figures is not straightforward either. Firstly 49 of the total of 120 papers included in the statistics had been published already before the start of the web data analysis, and some could have been less attractive to readers due to age. Secondly there has been a constant rising trend in paper downloads over this three year period, which counters the natural tendency of paper readership to drop as time progresses. The monthly figures have also been affected by the mailing of alerting messages, separate advertisement of special issues in different email lists and the renewal of the web site that, may have influenced the visibility of ITcon articles in general search engines.

Looking just at the number of downloads of full text pdf files reveales, that an average paper get about 21 downloads per month, however, a new paper is more likely to get more downloads (about 70 in the month immediately after publication). This number falls off, but not too sharply; some papers in ITcon are still read years after being published (Figure 4). The paper with the highest number of downloads over the three year period analysed, 1539, was not surprisingly a state-of-the-art review paper (Amor and Betts 2002). All in all the ratio of downloads of the least read papers to the most popular ones is a ratio of 1 to 5.

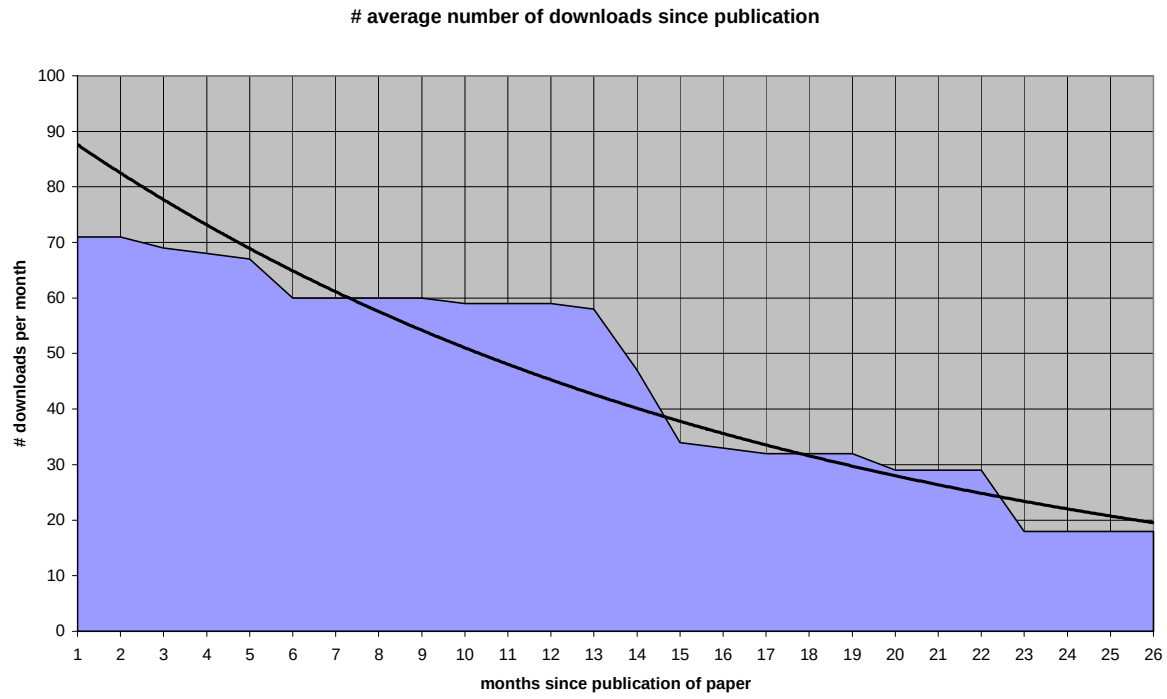

FIG. 4: Number of downloads of an average paper vs. its age - its time after publication.

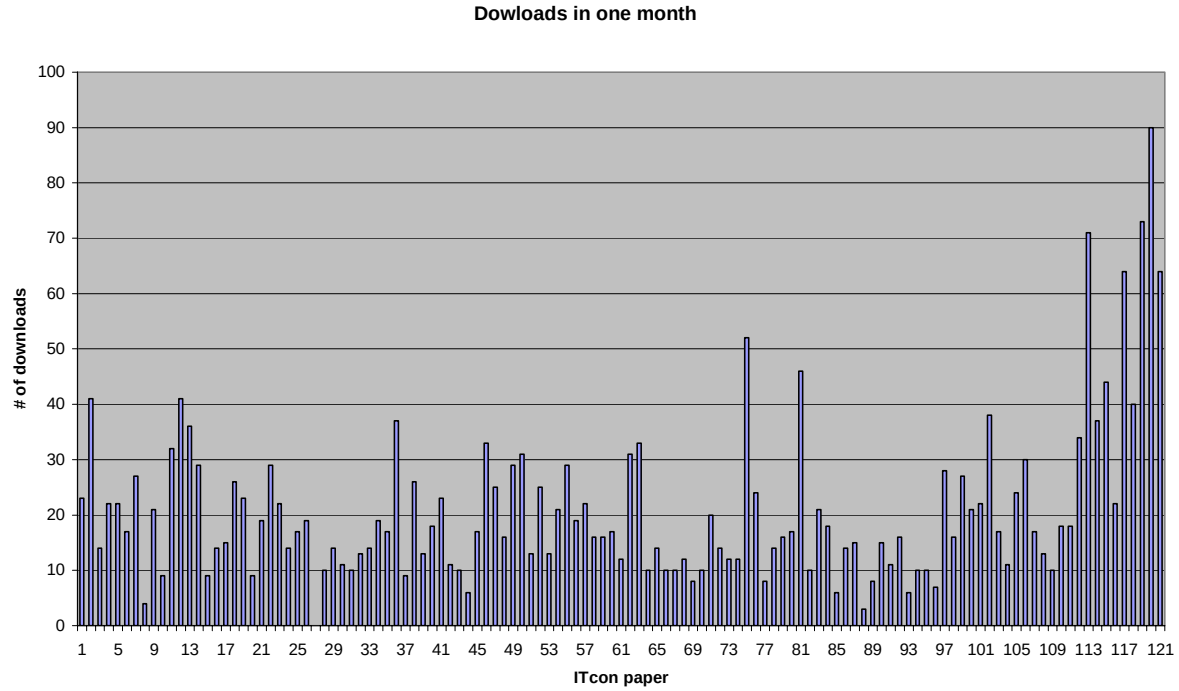

FIG. 5: On the X axis is the ITcon paper number - #1 is the very first paper published in 1996, #121 is a recent paper published in late 2005. It is clear that recent papers get more downloads but old work is still read.

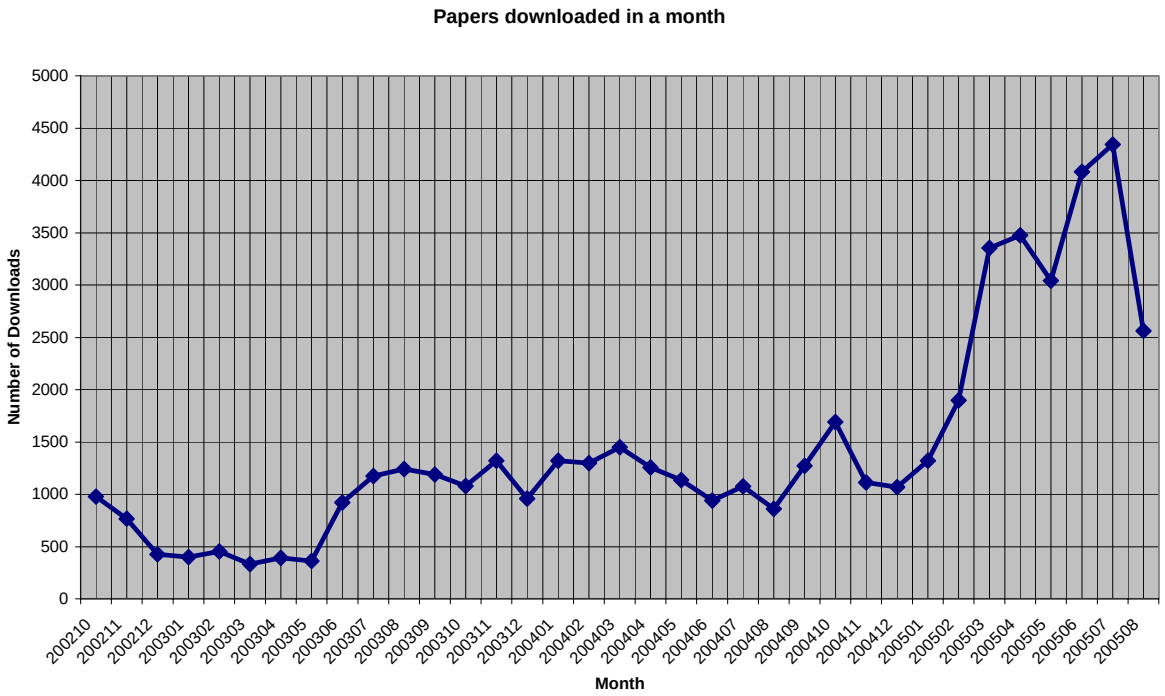

FIG. 6: Number of paper downloads in a given month. The sharp rise in may/june 2003 and in march/april 2005 could coincide with the intensified promotial activites related to ITcon site updates.

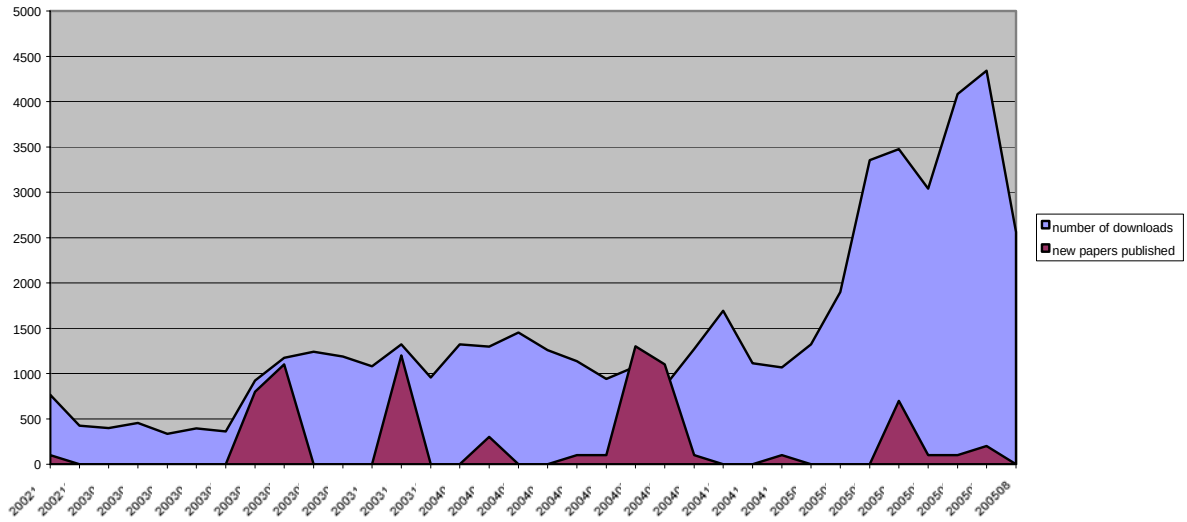

FIG. 7: The number of paper downloads and the number of new papers published (using different scale of course) show another explanation for the changes in readership. Publishing of new papers also draws attention to already existing papers. The lack of publishing new papers causes a drop in overall download numbers.

Some more statistics on the ITcon site usage can be found at www.ITcon.org/statistics/2005/

Since comparable figures are not available for the other journals no benchmarking can be made for this factor. Even if circulation or subscription figures were available these cannot be directly compared to article downloads or readership. Academics only read a small part of articles in for instance paper journals that reach them as personal copies or in the organisation's internal circulation. On the other hand with institutional subscriptions, there may be several readers per subscription or site licence.

6.5. Price

A question related to the circulation is the price or effort involved in getting access to articles, either for following a journal regularly or for getting access to an article based on citation by a third party. In today's web world most readers appreciate the fact that a cited article is hyperlinked, just one mouse click away. This is where the main difference between subscription based vs. open access information lies.

To compare journals according to this criterion the subscription prices for institutional subscribers for electronic access is the most relevant. Figures for pay per view of individual articles are also interesting, but this way of obtaining material is not widely used. Also for some journals subscriptions are bundled in big deals, which makes the calculation of a separate subscription for that journal very difficult to calculate.

In the following subscription prices for the relevant journals have been calculated on a per article basis (the total subscription divided by the number of articles published per year). A few other journals which construction ITC researchers should be familiar have been included for comparison. The figures are in line with the trend observed in other studies that journals from commercial publishers are much more expensive than journals published by professional or scientific societies. The case of ECAM, the most expensive of the journals in the graph is instructive. When Emerald purchased the journal from Blackwell the subscription prices rose sharply. The UK price for 1999 was 345 £ and for 2005 869 £. This represents a nominal price increase of 152 %. On the surface the journal changed from four to six issues per year during this period, but the actual increase in both the number of yearly research articles and pages was only 4 % from 1999-2000 to 2003-2004. The volume adjusted price increase was thus 142 %.

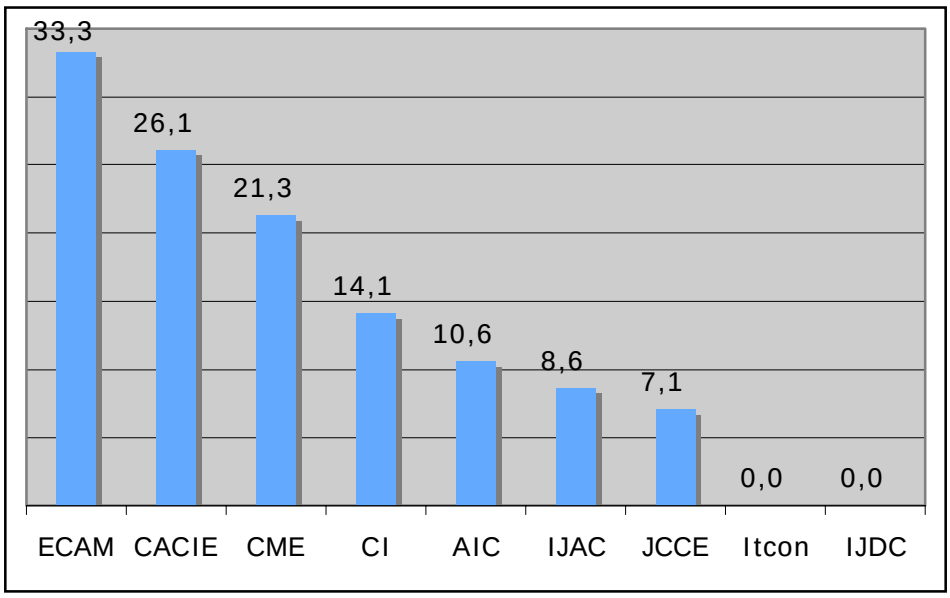

FIG. 8. Price per article (Euros per article)[12]

The price differences between journals have nothing to do with scientific quality, but rather with profit margins and the number of paying subscribers. The cheapest of the subscription journals here studied, JCCE, has the highest impact factor. Other researchers have studied samples of journals from different disciplines and found a strong inverse relationship if quality is measured by impact factors, that is the more expensive commercial journals have much lower impact factors than their cheaper society counterparts (Bergstrom 2001)!

6.6. Citation frequency

While readership of an article is important the citations that an article receives from peers is a very important measure of the contribution an article has made to its discipline. The more citations an article in a particular journal receives on average, the higher the quality and prestige of the journal gets. Currently the only relatively reliable measure of this is the journal impact factor that Thomson Scientific calculates for a limited set of

[12] Currency rates as of 01.11.2005. Prices for CI, CME and ECAM are for 2005 other prices are for 2006. ECAM = Engineering, Construction and Architectural Management, CME= Construction Management and Economics.

journals. It has usually been very difficult for new journals to get included in their indexes (only 1 in 10 of candidate journals has been included).
The journal impact factor is calculated by dividing the number of citations in the year of study to articles published in the two previous years by the total number of articles published in the two previous years (http://jcrweb.com/www/help/hjcrgls2.htm). For example the 2004 impact factor for Automation in Construction is calculated by dividing the number of times articles published in AIC in 2002 and 2003 that were cited in SCI indexed journals in 2004, by the number of articles published in 2002 and 2003 by AIC. Table 4 presents the data for Automation in Construction.

TABLE 4. Calculating the Journal Impact Factor for Automation in Construction[13]

Year	Cites in 2004 to articles published	Number of articles published
2003	13	62
2002	28	52
Total	41	114

The 41 citations to articles for 2002 and 2003 are divided by the 114 articles for 2002 and 2003 which yields an impact factor of 0,360.

Many older journals or journals published by big established publishers have been included in SCI while recently started journals or even quite prestigious journals have not (Construction Management and Economics as an example). Thus the fact that a journal is indexed by the SCI is not as such a measure of quality, although it has been an important marketing factor to obtain submissions and is an important criteria in determining short lists of journals used by university administrations, granting organisations etc. Table 5 presents the journals from table 3 that have impact factors.

TABLE 5. Journal Impact Factors and relative rankings for JCCE, AIC and CACIE[14]

	2004 Impact factor	Engineering, Civil	Computer science, Interdisciplinary applications
JCCE	0,678	24th of 79	46 th of 83
AIC	0,360	43rd of 79	-
CACIE	0,219	57th of 79	76th of 83

Also citing patterns vary between disciplines (number of references per article, the role of journal versus conference publishing) which means that the relative position within a discipline is more important that the absolute value of the impact factor. In the table the relative position of the journal in the disciplines where it's listed is shown by its ranking and the total number of ranked journals.

Since some of the interesting journals in the construction IT field are not included in ISI interesting data would be possible to generate by a study of the cross and self-references between these journals, but this would require substantial manual work.

Several studies have shown that other factors being equal articles for which the author has also posted freely available digital copies on the web receive more citations than those for which they are only available by subscription (http://opcit.eprints.org/oacitation-biblio.html).

A cross-journal citation analysis between the three ISI indexed journals revealed some interesting patterns. ISI provides detailed data on which journals are cited in the journals they track. Thus for articles which appeared in 2004 there are detailed statistics on articles (from any year) that they cite. The statistics are given both ways. Thus of the 148 citations in articles (in SCI journals) published in 2004, which referenced articles from any year in Automation in Construction 55 where in the same journal (a self-reference rate of 37 %). JCCE and CAICE had much lower self-reference rates of 10 % and 12 % respectively.

The most interesting figures are however the relative degrees of references between the journals in question. These are shown in the figure below.

[13] Source: 2004 JCR Science Edition
[14] Source: 2004 JCR Science Edition

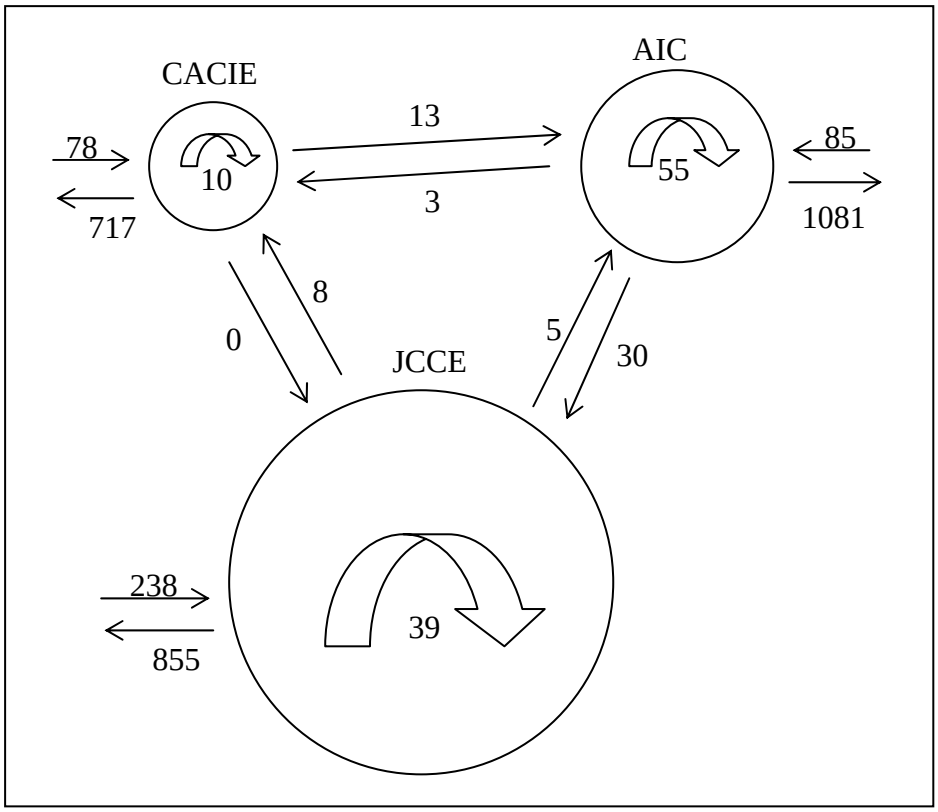

FIG. 9: Citation patterns between CACIE, AIC, and JCCE.

In figure 9 the arrows show how different journals cite each other. The sizes of the journal circles are proportional to the total number of citations received, thus JCCE, which had the highest impact factor is the largest. The arrows inside the circles are journal self-citations. The arrows pointing outside the figure are citations to and from all other journals. For example, AIC has cited CACIE 3 times and JCCE 30 times , itself 55 times and all other journals, conference papers etc. 1081 times. AIC has received 13 citations from CACIE, 5 from JCCE, 55 from itself and 85 from all other journals. The conclusions are that authors of AIC papers seem to cite (and probably read) JCCE quite a lot and CACIE to a much lesser degree.

6.7. Editorial board

According to the Rowlands and Nicholas (2005) study the reputation of the editorial board is an important factor when authors decide where they submit their papers. In principle it could be possible to use for instance ISI date to measure the average citation counts per editorial board member. This would however be a very tedious exercise.

In order get a picture of the situation a very simple count was made of the editorial members of the journals in question, in particular concentrating on the overlaps, since several academics are editors and or editorial board members in more than one of these. There were altogether 172 academics engaged as editors or scientific editorial board members in the studied journals. While most academics had just one membership, 11 % were members of two or more editorial boards, with the highest number being four out of the six journals (John Gero from University of New South Wales). Three of the journals had relatively independent editorial boards, JCCE (3 overlapping memberships/23 total members), AI (2/28) and CACIE (1/28). ITcon, AIC and CI on the other hand formed a very clear cluster. Eleven out of 28 editorial board members of CI where also members of the editorial board of ITcon and three academics participated in all three journals. The reason why the editorial board of ITcon is bigger than the other two is mostly part due to the recent merger with IT-AEC which brought around 15 new editorial members. Had the analysis been made with the data from a year back the cluster would additionally have included IT-AEC.

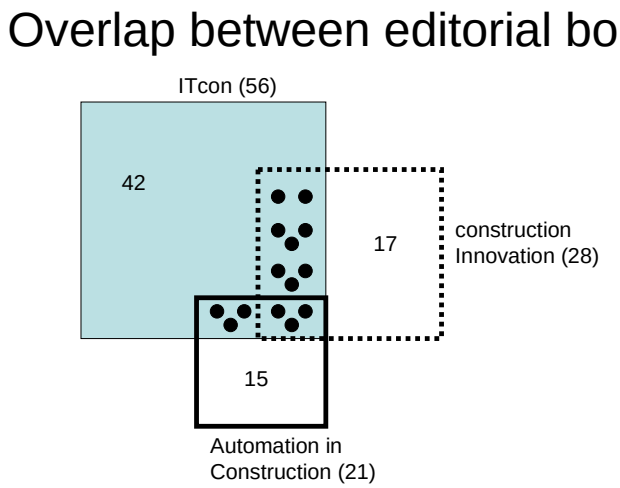

FIG. 10: The overlap between the editorial boards of ITcon, Automation in construction and construction innovation.

In conclusion most of the journals in the field seem to be rather equal in terms of the prestige of the editorial board and there is one clear cluster of journals, which seems to be rather tightly overlapped.

6.8. Copyright restrictions

Publishers differ considerably in what rights they give authors in terms of posting copies of the articles on the web. In their copyright statements publishers often justify why an author should surrender them the full copyright by saying that this allows them to protect and look after the interests of the authors. But at least in our field there are no reported cases of authors having received extra royalties for third party use of the articles or of publishers having sued third parties for break of copyright!

TABLE 6: Copyright policies of a select number of journals

	AIC	CACIE	CI	ITcon	IJAC[15]	IJDC	JCCE[16]	LCJ[17]
Does not allow posting								
Allows preprint only								
Allows postprint as personal version	X		X					
Allows posting of copy of published PDF								
Allows any of the above but with a delay		X						
Open access from the start				X		X		X
Open access with a delay								
Author retains copyright				X		partially		

[15] Status unclear, see http://www.sherpa.ac.uk/romeo.php
[16] Status unclear, see http://www.pubs.asce.org/journals/submisscp.html
[17] LCJ stands for Lean Construction Journal <http://www.leanconstructionjournal.org/>

From the author's viewpoint the ideal subscription based journal is one which allows the author to post an exact copy of the pdf file as published by the journal on the institutional repository of the author or his own web pages. Reasonably satisfactory is the alternative where the publisher allows posting of the author's manuscript after revision but before final copyediting, layout etc (usually referred to as personal version). Other possibilities are allowing the manuscript before reviewing or allowing any of these but after a delay. In the following the copyright policies of the journals studies is listed.

6.9. Conclusions about the comparative performance of ITcon

What can be concluded about the performance of ITcon with respect to its closest substitutes?

- ITcon outperforms its competitors in speed of publication
- ITcon outperforms its competitors in availability due to the open access regime. Direct readership comparisons are however almost impossible to carry out
- The regional spread of authorship is more globally balanced compared to most competitors
- ITcon is on a par with open access journals in general in acceptance rate. Comparison to the other studied journals is difficult due to lack of data, except for Construction Management and Economics, which has approximately the same acceptance rate as ITcon.
- The copyright policy of ITcon is more advantageous to the authors than the non open-access journals studied

7. CONCLUSIONS

The experience with ITcon has proved that it is possible to run a successful peer-reviewed open access journal in the field of construction IT. In the early days the editorial team underestimated the difficulties in attracting a large enough number of good manuscripts. Although colleagues were very supportive of the journal and eager to use it as readers, the decisions where to submit were guided by questions of "what counts" in their respective universities and environments, and clearly an electronic only journal which was not published by a well-known publisher or professional association and which wasn't indexed by the ISI was not first choice. Later studies of author attitudes have confirmed this Dr. Jekyll – Mr. Hyde situation. Authors like open access as readers but are reluctant to submit their best work to such journals (Björk and Turk 2000, Rowlands and Nicholas 2005).

Fortunately a journal such as ITcon, which could not have survived its early years as a subscription journal, and which also probably had not survived had an author charge been applied, has had the needed staying power. Since 2003 a stable level of 20-30 articles/year has been reached, equivalent to a typical quarterly journal.

This level is probably the optimal one and can be sustained by the current open source like operation of ITcon with a team of five editors. Running a journal with more published articles (and thus also submissions) would put a lot of pressure on employing some editorial office staff which would necessitate securing some regular income for the journal.

The current web interface is working sufficiently well. The essential thing for readers is to get reliable access to the articles as quickly as possible. Also the ability for potential readers to find an article via general search engines like Google is important.

The benchmarking with the competing journals in the field revealed that ITcon is superior in terms of speed of publication and that the spread of authorship is more evenly globally spread than in most of the competing journals. In price ITcon clearly is superior for readers compared to the rather expensive journals in the field, which furthermore in our discipline seldom are part of the big licence deals of major publishers. This should also translate into a bigger readership.

Due to a lack of data it is difficult to compare factors such as acceptance rate, but in this respect ITcon represents an about average open access journal according to a recent study. No comparisons could be made to the other journals in the study.

In interpreting this case study it is important to remember that the ITcon experiment includes two different aspects, the effects of which are very difficult to separate. Firstly publishing a journal as open access in an environment dominated by subscription based journal and secondly founding and marketing a new journal in a research area which already had a sufficient number of journals to cater to the needs of authors to find channels for their manuscripts. The initial difficulties reported probably have as much to do with being new as being open

access. In this respect it is very interesting to compare with recent reports on the experiences of traditional subscription based journals, which have made the transition to some form of open access. Plutchak (2005) for instance notes the much increased readership, and hence citations, to Journal of the Medical Library Association since it started to make its articles freely available on PubMedCentral.

In a broader perspective the important factor is if the research discipline as a whole benefits from having an open access alternative like ITcon. We believe that the experiences and feedback received demonstrate that this is the case. The recent launch of the Lean Construction Journal and CIB's interest in promoting open access publishing of its conference proceedings is also an indication that the message is getting through and that more and more researchers are starting to see the value of the global reach of open access.

8. ACKNOWLEDGEMENTS

Robert Klinc assisted the authors with compiling Web server statistics. In addition the work of the other co-editors, the editorial assistant Mateja Šmid, the editors of special issues, editorial board members, reviewers, authors and readers for helping creating and sustaining ITcon is heartily acknowledged.

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