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Strategies and policies of Linköping University Electronic Press

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Abstract

Linköping University has recently created a separate entity, called *Linköping University Electronic Press*, for the *unrefereed electronic publication* of research articles and other university-related materials over the Internet. The present article presents the background for why the E-Press was created and the strategies which have been chosen for its operation at least during its initial period.

The article identifies three key problems in the context of this strategy:

- The purely *formal problems* concerning what counts as a publication;
- The *persistence problem* of making sure that an electronically published article does not change over time;
- The *reception problems* concerning how fellow researchersand the academic community regard electronically published articles.

We describe how the formal problems and the persistence problems have been addressed in the E-Press initiative. With respect to the reception problems, we argue that scientific journals and journal-like conferences presently perform four distinct functions, and that these functions can be performed better if they are "unbundled" and addressed by other means. The four functions are:

- Publication in the narrow sense – making the article publicly available;
- Scientific quality control through reviewing;
- Selection of relevant articles for the benefit of the researcher-reader;
- Promotion of the scientific results of the author.

The Electronic Press focusses on the first one of these four functions. We discuss how the other three functions can be separated and performed by other means than through a conventional journal or quality conference proceedings.

1 Introduction

Linköping University has recently created a separate entity, called *Linköping University Electronic Press*, for the publication of research articles and other university-related materials over the Internet. This Electronic Press, or E-Press for short, was created by a decision of the board of the university in April, 1996, and the first published article was issued on October 1, 1996. The present article presents the background for why the E-Press was created and the strategies which have been chosen for its operation at least during its initial period.

The author is the editor-in-chief of the Linköping University Electronic Press. The initial policy described here has been formulated by him and approved by the Rector of the University, Professor Anders Flodström.

2 Background

The creation of the E-Press was motivated by two kinds of problems: copyright problems and publication problems. In both cases, these problems existed even before the advent of widespread Internet usage, but they had become much more acute as the result of how researchers in some areas, such as computer science, used the Internet for communicating research results.

One must remember, first of all, that different scientific disciplines show large differences both with respect to Internet usage and with respect to publication habits. In the sequel we shall focus on the situation in those areas exhibiting large usage of Internet; the discussion below does not apply to all disciplines.

The *copyright problems* arise because authors are caught between two conflicting considerations. Many of their colleagues put research articles on-line on the Internet via their home pages, and in fields where this practice is widespread, each researcher feels that he or she has to do the same in order to stay competitive. After all, making sure that your papers get to be read is a basic consideration for every one of us. On the other hand, putting papers on-line is sometimes a violation of the publishing agreements that the author has entered into when his or her article was accepted for publication in a journal or at a conference.

The university has a stake in this as well, not only for protecting its employees, but also for protecting itself: since these articles are put on-line on university equipment, the university may in principle be liable or co-liable with the authors if it should be determined that a fault has been committed. Presumably nothing will happen in the short range, since the legislation and the interpretation of current legislation surrounding these issues is so unclear, but it was anyway considered important for our university as well as for its researchers to find another and less contestable approach to the matter.

The *publication problems* concern a key factor in the competitiveness of our research and our researchers: bringing research results to the "market" as fast and as efficiently as possible. In some areas, researchers have to deal with the combined effects of long reviewing delays, long delays between acceptance and publication, obvious errors in reviewing, leakage of research results during the review stage, and other similar problems. It was felt that we could use another publication method, where research results are brought very rapidly to the state of formally *having been published.*

It may be objected that publication is pointless if no one pays any notice to it, and that a method of publication which by-passes the conventional publication channels would find it very difficult to make itself seen and noticed. However, there are certainly plenty of examples of work which remained unnoticed *although* it was published in a strict sense; there are also examples of work which was noticed *in spite of* not being formally published. This suggests that one may consider other methods of making publications being noticed by the peers, besides the use of conventional journals and conference proceedings. In particular, the availability of the Internet may create new ways of "promotion" of research results which were not possible before.

3 The publication principle

In order to deal systematically with both the copyright problem and the publication problem, two important principles were formulated:

- It was necessary to find a mechanism for **electronic publication**, that is, a mechanism for putting articles on-line in a way that would truly count as *publishing* in every sense of that word.

Treating the on-line versions of the articles as publications is essential for relating them on an equal basis to other forms of publication, as well as for making them count as references to research results. Secondly,

- The new method of electronic publication should primarily be used for **unrefereed publication**, that is, publication that *precedes* the ordinary process of peer review and other scientific quality control.

This principle is motivated by the desire to give researchers a channel for very direct publication of their results, avoiding the delays and reviewing errors that sometimes occur in the conventional process of pre-publication refereeing.

With these leading decisions, there are three issues which immediately present themselves:

- The purely *formal problems* concerning what counts as a publication in a legal sense and from the point of view of the national and international library systems.
- The *persistence problem*: it is not meaningful to make a reference to a scientific article (or any other work) unless it can be retrieved whenever a reader wants it. This is problematic if the reference is to go to an Internet location whose contents can change over time.
- The *reception problems*: what does it take to make other scientists in the same field take notice of an article after unrefereed electronic publication. Also, even if they notice it, will they choose to acknowledge it properly in references.

This article will discuss how we deal with all of these problems in our approach.

3.1 The persistence problem

Does the posting of an article on the Internet count as publication? In particular, does a URL leading to a scientific article count as a reference to that article?

The answer to these questions is obviously "yes" in one precise sense: if publishing is taken literally to mean "making public" or "making publicly available" then Internet and WWW availability is undoubtedly a very effective means of publishing, probably much more effective than the traditional ways.

On the other hand, if one takes electronic publication in the particular sense that each author puts his or her article on-line in a computer system that she controls directly herself, then persistence is very problematic. What guarantee does one have that the article will continue to be available at the same URL when the author has moved to another employer, or retired, or after the next reorganization of the computing services in her department? And maybe even worse, what guarantee does one have that the author does not retroactively "improve" the results in an article which he published some years before? We do not believe, of course, that a serious researcher would do that, but the mere technical possibility is enough to raise questions about the validity of electronic publications as references.

A solution to the persistence problem is therefore absolutely necessary if electronic publication is to be taken seriously. The solution should include both a technical and an administrative component: technical solutions such as the use of checksums and public-key encryption, and administrative solutions whereby the responsibility for publication is separated from the direct control of the author, and where issues such as reliable back-up and migration to new text formats (successors of postscript, PDF, etc) are cared for. Finally, if checksums are used as an electronic lock on the articles, there must anyway be administrative routines for administrating those checksums and for verifying that they are not violated.

A final aspect of the persistence problem is the one of commitment. *Someone* has to make a promise to keep articles on-line for an extensive period of time, just like libraries make an explicit or implicit promise to retain their copies of books and journals for many years. If there is just one or a few servers for a body of electronic articles, and those servers will remove any article from service as soon as it is not profitable enough, then that whole body of electronic articles will lose credibility as references. In the case of Linköping University E-Press, it was thought that 25 years would be a sufficient publication period for normal cases: we should commit to keep each electronic article on-line for 25 years, counted from its date of publication. We would leave it to our successors in the year 2021 and later to decide whether to keep articles on-line even longer, or to refer forthcoming readers to archived copies on paper, CD, or whatever other medium will be in generarl use at that time. However, it is obvious that a commitment to keep something on-line for 25 years is not taken without careful consideration.

3.2 The changing technology problem

The rapid pace of technological change is problematic in view of the persistence issue. It is serious enough to promise to keep things on-line for 25 years under an assumption that the technology will not change. However, it would be extremely surprising if it did not change considerably between now and 2020, and every change of technology will require a migration method. When postscript is abandoned, what shall we do with all the articles that have been published in postscript, and whose integrity is safeguarded by a checksum on the postscript file?

One might consider the possibility that the E-Press should retain source texts in e.g. Latex format or SGML format from which the concrete article format (postscript, PDF, etc) is generated, and that the E-Press would regenerate the article in the new format. However, that option is excluded for several reasons: it would compromise the system for integrity assurance of the articles, since there would be an obvious opportunity to improve an article at the time when it is regenerated, and since new checksums would have to be calculated. Also, there is no reason to believe that the source formats will be unchanged for such a long time, or that software support for old formats will continue to be available.

Another possible scheme would be to publish the source text in Latex or SGML, but then the time delay and the error-proneness of processing those formats would be transferred from the E-Press to the individual reader.

3.3 The problem of growing appetite

The possibility of electronic publication is a fascinating one for the technologically interested. If articles are kept on-line, then one can imagine at once a number of additional improvements and extensions to the concept. Multimedia articles with live pictures and with sound effects become possible. Direct dialogue with the author becomes possible, and can then be replaced by direct dialogue with a simulator for the author. Intelligent full-text search engines become possible, or become at least a topic of research: software agents may move around the Internet and look for articles that match the interests of their masters, these software agents may cooperate to exchange information, or they may buy and sell knowledge or get into conflicts... the possibilities are unlimited, and one is almost embarrassed to mention the simpler extensions such as clickable reference lists (whereby the reader can make direct access to referenced articles) and search on the full text of the article.

It may be very tempting for an E-Press to engage itself in some or all of these very interesting directions. Not doing so would appear to lose many of the potential advantages of electronic publication itself. At the same time, services of this kind can easily become a heavy duty for the E-Press to carry, in particular if they are to be provided for the whole body of articles which have been published over a period of many years.

4 The chosen publishing strategy

The Linköping E-Press has chosen the following approach for dealing with the complicated and often contradictory problems that have now been described.

4.1 A limited role

First of all, we decided that the Linköping E-Press must not attempt to do everything. It is not a matter of not doing everything at once, it is a matter of not ever doing everything

More specifically, the mission of the E-Press is *to receive articles and other works in electronic form, and to make them persistently available over the Internet in such a way that they will count seriously as having been published.* That is all, and it is enough. Concretely speaking, the E-Press requires the author to submit her or his article in one of a few standard forms, where postscript is one, and this is what the E-Press makes available in a reliable fashion. The E-Press will be very careful before extending itself outside the basic mission.

This chosen role still involves a number of non-trivial issues: decisions about uniform appearance and quality control of the articles, mastering the technologies of document production and of operating the servers, copyright issues and publication agreements with authors, and finding a proper place in a world that is dominated by conventional publishers and paper-oriented library systems, to name just the major ones. Undertaking to do more than that would be too much.

4.2 Add-on services and the cover page

At the same time, the strategy must allow some way for those other, even more innovative services to be added, and it must allow for technology change. The following approach has been chosen.

Each published article is primarily represented by two entities in the international computer network: the *original publication* and the *cover page*. The original publication is the file in e.g. postscript format which was submitted to the E-Press on the day of publication, and which must be kept on-line without changes. The cover page is a relatively small page in (presently) HTML format whose contents are allowed to change over time, but it must always satisfy three basic requirements:

1. It is stored at a fixed location – a fixed URL – in the Internet, and this URL then becomes *the official* way of referencing the article. The present article, for example, has the URL http://www.ep.liu.se/ea/apt/1996/001/, where ea stands for "electronic articles" and apt for "academic policies and trends" which is the name of the series where the present article is published.

2. It contains the basic bibliographic information about the article, such as the name(s) of the author(s), the title of the article, and so forth.

3. It contains a clickable link to the original publication, as well as sufficient information for verifying that the electronic document that is stored under that link is in fact the original.

   The cover page may also contain a miscellany of other information, but it must always be designed so that it is quite clear what is a link to the original publication, and what are links to other, related information.

Further down on the cover page, there is space for *additional publisher-provided information* and for *additional information from the author*. The publisher-provided information may include, in particular, alternative renderings of the document such as those using compaction techniques (e.g. gzip and binhex) and those where the original document has been translated to new formats (e.g. automatic transformation from postscript to PDF).

Additional information from the author may include indexing information, links to reviews of the current article, links to other articles which use the results presented there, links to the author's home page, and so on - this is left to the author. In particular, if the author wishes to put the source text (Latex, SGML) on-line then this is the way of doing so.

In any case, the cover page distinguishes very clearly what is the originally published information, what is the result of operations performed by the E-Press, and what is provided by the author. As a matter of policy, E-Press performed operations must be *reproducible by the reader*, that is, they must be the result of running a well-defined and publicly available program on the originally published file, without any additional input or interactive editing.

With this scheme, it becomes possible for an individual author, or a series editor, or for an organization such as a university department to provide add-on services and to reference them from the cover page. The E-Press will be cooperative in including links to such services in the cover pages, while being very restrictive with what services it provides itself.

The author is of course free to get someone to help him produce the author-provided information. We foresee, in fact, the emergence of one or more services (within the university or by outside suppliers) who support researchers both with editing their articles to the form where they can be accepted by the E-Press, and with the continued maintenance of author-provided information during the years after its publication. Each university department has a choice whether to provide this support itself, or to buy it from outside.

A major reason for this separation between the E-Press and the add-on services is that the latter do not need to be bound by the requirement of 25-year persistence. Add-on services may change over time, and the sponsoring departments or researchers may decide as time goes by which facilities they want to keep and which they want to phase out. This option is not available for the E-Press itself.

One might suggest, of course, that the E-Press organization could both perform the basic electronic publication service using central university money, and the add-on services on a subscriber basis. However, we believe that such an arrangement would be unflexible and likely to restrict competition. Instead, the E-Press should cooperate constructively with all the suppliers of add-on services without competing with any of them.

The proposed design using a cover page which is separate from the original publication has another advantage as well: it makes it possible for the E-Press to use an external service for the on-line storage of the original publications. The URL of the cover page is constructed using the name of the E-Press, but there is no similar requirement for the URL of the original publication. Also, it is only the *contents* of that original that must be kept unchanged; the *place where they are stored* may change. In particular, towards the latter part of the stipulated 25-year publication period, it may be advantageous to transfer the responsibility for storage of the original to a national electronic library if such an organization comes into existence.

4.3 Making electronic publications count legally

We have already discussed what it takes for an electronic article to have a chance to *be perceived* as a publication from the point of view of the researchers. This is where guaranteed persistence and availability is important. There is also a legal and formal aspect, which becomes important in the publication contracts between the E-Press and the authors, in the assignment of ISSN numbers, etc.

We then had to take into consideration that at the time of starting the E-Press operations (1996), and according to the current legal expertise applying to Swedish conditions, it was unclear to say the least whether a document which was only issued electronically via an Internet server were to count as having been published. With this in mind, the following policy was chosen. On the day of publication, a document that is being published by the E-Press must *both* be put on-line in the E-Press server in a secure fashion, *and* be produced in a certain number of paper copies. Some of these paper copies are submitted to Swedish university libraries, according to the rules that apply to everything that is printed and published here: one copy to each of a number of reference libraries. A small number of other copies are retained and offered for sale, but at a relatively high price.

With this arrangement, it is unquestionable that the electronic document has been *published*. Each published document belongs to one of our series, which of course has an ISSN number, and at this point it is unclear whether one such series can contain both paper documents and electronic documents, provided that the latter count as being published at all which we do not know. Our common-sense solution to this somewhat ridiculous enigma has been to only obtain one ISSN number (rather than two parallel ones), and to put it into the file which is both put on-line and used for printing the paper issue.

A marginal comment may be in place here with respect to ISBN, ISRN, and other systems for identification of individual works. Our point of view is that the URL of the electronic document is necessary information for the reader who wishes to access the document and, given the administrative conventions that have been described here, that it **is** a unique identifier for the document. It therefore seems completely unnecessary to create another, parallel system for identification of such documents. Possibly, one could obtain a certain savings by allowing a URL of the present form, such as

http://www.ep.liu.se/ea/apt/1996/001/

to be replaced by the (say) ISEN

ep.liu.se/ea-apt-1996-001

where the notational savings would be noticable but it does not make an enormous difference.

With this framework, it follows that if an article is first published in the Linköping University Electronic Press and later on in a scientific journal or a conference proceedings, then the latter *republishes* the article. Conversely, if the E-Press puts a paper on-line using its publication procedure, then the E-Press *republishes* the previously published paper. Although in a legal sense it appears to still be the paper publication that really counts, the E-Press will not accept to publish any work unless it also has a formal right to put and keep the work on-line. Similarly, the E-Press will not agree to any republication of works published by it where the right of the E-Press to keep the work on-line could be restricted. This is the way we accomodate electronic publishing in the contemporary, somewhat uncertain and possibly changing formal framework.

4.4 A detailed publication agreement with authors

The question of the publication agreement between the author and the E-Press may at first sight seem to be a simple one: the author allows the E-Press to put the article on-line, and the E-Press commits to keep it there for the agreed period, which usually is 25 years.

It turns out, however, that things are a bit more tricky than that. For the reasons stated above, persistence is of outmost importance to the E-Press: if the public (the scientific public, in this case) can not count on published articles staying on-line, then the E-Press publications become more or less unreferenceable.

Consider now the following scenario: A researcher has previously published an article in a journal with small circulation, and is distressed because his colleagues don't seem to notice it. He therefore brings the article to the E-Press, gets it published, and later on the journal files a complaint on the grounds that the author had previously transferred the copyright for the article to them. They therefore request that the E-Press shall remove the article from the net.

In another scenario, a researcher has published some new work using the E-Press, and then submitted it and gotten it accepted for a journal. She signs the journal's standard publication agreement, which transfers all copyright to the publisher of that journal. Again, the journal might request that the E-Press shall remove the article from the net.

It is clear that the E-Press wishes to completely avoid getting into any of those situations, or at least to reduce them to an absolute minimum. It has therefore been considered necessary to construct a fairly detailed form for the publication agreement between the publisher and the authors, and to obtain the help of legal expertise for the construction of that standard agreement.

4.5 Graphical appearance

One of the points of discussion in the preparations for the E-Press has been to what extent the E-Press should regulate the graphical appearance of E-Press published materials. Do we wish to impose a standardized "look and feel" like most conventional publishers do, or should we leave this to the authors or the series editors?

In the present startup phase, we chose to impose one standardized appearance using a Latex style file which is obligatory for all contributions in the initial period. After that, the question of graphical appearance will be discussed with the various interested parties, and possibly we will organize a competition for the best graphical style(s). We take the view that it is easier to relax an initial, strict regime than to bring in order afterwards.

5 Departmental reports and author-provided on-line documents

The practices of printing departmental technical reports ("pre-publication") and of accepting that authors put their papers on-line via their own home pages have evolved over many years in the scientific community, and have sometimes been at odds with a strict application of copyright laws and copyright agreements. Our university has been concerned about some aspects of this development, which was also one of the reasons for the creation of the E-Press.

In the coming years, we will have to face the questions of what to do with departmental reports, and what to do with the author-provided on-line papers. Will they all be replaced by publication via the university E-Press? This question must of course be addressed in cooperation with the various faculties and departments. We do not foresee any rapid change in the system of technical reports, although those departments who prefer to use the E-Press extensively may well find it worthwhile to order additional supplies of the paper version of the electronic issue instead of making their own tech-reports.

With respect to on-line articles, on the other hand, we expect a more rapid change. For those articles where there exist copyright agreements with external publishers, we wish to become more strict than before, and we now have a viable alternative to offer. For articles which are not offered to external publishers, we will emphasize to our researchers that it is in their own interest to publish the article in the E-Press instead of putting it out to the world without the protection of having it officially published.

6 Unbundling the functions of contemporary scientific journals

A frequent objection to the approach described above has been: "If unrefereed publication becomes widespread, then what happens to quality? Who will have time to read all the garbage that will get published?"

Our answer to that is that the system of anonymous peer-review that dominates scientific publication today (especially in science, engineering and medicine) is already in serious trouble. There are two basic problems:

- The system assumes that the quality control of research articles can be performed without rewards to those who do it: since reviewers are anonymous, their efforts can not be acknowledged or, for that matter, criticized. Consequently, reviewing is often slow and/or sloppy, at least in some disciplines . Stories of downright errors circulate. It is not surprising that there are errors in a human activity, but it is disconcerting that it is so difficult for an author to get correction after such an error.

- The system assumes a basic level of trust and fair play. Articles are presumed to be "unpublished" while they are in the reviewing process, which means that they do not exist as referenceable items. At the same time, they are made available to a number of people who are often in direct competition for the same results. This works fine if everyone is honest, and able and willing to say "I do not share your approach, but it is defensible in its own right so I recommend publication." That assumption is not always satisfied.

The principle that articles should be "not previously published" while they are in the reviewing stage made good sense fifty years ago, when articles were submitted to journals in typewritten form, and the printing of the journal article was *the method* of making its contents public. At present, most journals (and quality conferences; in the sequel we will only say "journals" but the same applies for quality conferences) retain the same formula. They do this although the appearance of offset printing for departmental technical reports and for proceedings of informal workshops and, more recently, the use of electronic distribution over the Internet have made the expression "not previously published" lose its original meaning.

Journals have met the development of tech-reports and workshops by allowing for "previous publication with limited circulation" or "limited availability". However, one can not seriously claim that that applies for on-line electronic distribution: if something is on the net and is available for anyone, anywhere simply by a few mouse clicks, then certainly it can not be said to have "limited availability".

6.1 The functions of journal publication

In order to understand this issue, we propose to identify the functions that journal publication plays. They are:

1. A way of bringing results to the reader. This is the original and nominal function.

2. A reviewing mechanism which performs quality control of scientific work. This provides feedback to the authors and evalu-

ations that are used in the academic promotion process and by research sponsoring agencies.

3. A selection mechanism whereby readers of the journal obtain a flow of relevant articles worth reading, and are protected from being drenched by large numbers of articles that they consider to be merely a nuisance.

4. Conversely, from the point of view of the author, the journal serves as a promotion tool, if this commercial-sounding word is permitted. The author wants his or her article to be *read*, and being published in a journal is one way of achieving this.

We propose that *it is high time to unbundle these four functions*, and we shall discuss the separation of functions 1 vs. 2, 1+2 vs. 3, and 1+2 vs. 4 in turn.

6.2 Separating publication from reviewing

The separation of reviewing and publication is obtained if reviewing happens *after* an article has been published, and preferably by *public* review where the identity of the reviewer is known. This makes it possible for reviewing to become a respectable and rewarded academic activity; it also provides an automatic check so that incorrect reviewing can be challenged.

The electronic medium can be used to support open reviewing, namely by arranging that each published article is linked to a list of reviews of that article, or reviews of a set of articles where the present one is included.

In practice, a combination of public reviewing and confidential reviewing might be the best: an initial period of public availability and public review debate is followed by a confidential follow-up review made by two or three anonymous reviewers. Then a "reviewing board" (the counterpart of an editorial board or program committee) considers all the resulting reviews, and decides whether the article should be promoted to "recommended" status. Such promotion would occur on the same quality criteria as are presently applied for being "accepted for publication".

6.3 Separating selection from journal-style publication

The present journal system is not particularly perfect as a selection mechanism. A given researcher has to monitor a number of different journals, and in each journal only a small proportion of the articles are directly relevant for him or her. This happens because each journal must have a certain volume, which forces it to have a certain breadth. But these parameters are the result of the paper-based distribution of the journals. In an electronic medium, it would make more sense to perform the selection function by offering the reader well focused reading lists, each covering a topic which is much more specialized than a journal can be, but attempting to be complete and exhaustive within its niche.

A journal can not be complete and exhaustive within its niche, since the same article does not normally appear in several journals. However, this again is a consequence of the paper-based distribution. Electronic reading lists which merely contain *references* to articles that have already been published by their author can certainly have overlapping contents. The Linköping E-Press as described above is then an exampel of how the author can arrange the publication of her article.

6.4 Separating promotion from journal-style publication

According to the textbook, a researcher is supposed to do his or her research, write an article, get it published, and that is all. Once it has appeared in a journal or a conference, the rest of the world is supposed to take notice of it, read it, use its results, and (most important of all for the author) reference the results so that his score in the Citation Index is maximized.

Unfortunately, the world does not behave that way, or more precisely: the world *sometimes* behaves that way, but not at all always. In particular, European researchers are often distressed to observe that their American colleagues fail to cite relevant references from European research groups and/or in European journals. Although there are certainly cases where this criticism is motivated, maybe we should also turn the question to ourselves: have we done enough to promote our results?

The word "promote" is intentionally provocative, but the idea should be clear: As long as "publishing" is taken to mean "making publicly available", it is pointless to publish something without also doing something active to bring it to the attention of the intended readers. In the naive publication theory, the inherited prestige of a journal and the current advertising of its publishing company is all the promotion that is needed, and the author doesn't have to worry.

We have to realize that this is not enough. The author *has to* worry about the promotion of his or her results. This may be done by correspondence or by travelling; it may be done individually or on the basis of the whole research group; but *it can not be properly done by the publisher.*

6.5 Strategies for performing the unbundled journal functions

The policy of the Linköping University E-Press ties in with the unbundling perspective that has now been described: the mission of the E-Press is to perform the publication function in the limited sense, and to assume that reviewing, selection, and promotion are done by other means. We are convinced that new ways are developing for all the other three functions, but this is only beginning to happen.

The separation of reviewing and publication is occurring through the emergence of electronic journals. Provided that the chief editor and the editorial board of an electronic journal considers the reviewing to be its major job, and the chore of putting articles on-line to be a practical duty, they should have no objection against reviewing an article that has already obtained unrefereed electronic publication. Conversely, we are beginning to see entities which only undertake reviewing and abstain entirely from publication. This may be the best way to go in the future.

In this context, there are also some technical problems having to do with the revision of an article which may be the result of reviewing. This will call for having several versions of an article on-line: the original article which defines the date of first publication of the research result, and revised versions which are the ones one would normally recommend a reader to use. It can not be difficult to define a practical system for managing such a sequence of two or three versions of the same article and the same result.

The separation of publication + reviewing from selection is obtained by the emergence of *electronic colloquia*, such as the recently started "Electronic Colloquium on Spatial and Temporal Reasoning" (http://vir.liu.se/brs/) which is another one of our initiatives. An electronic colloquium provides its users up-to-date information about recent research results in a precise and fairly narrow niche of research.

The separation of publication + reviewing from promotion, finally, is a topic which depends very much on the character and the culture of each particular research field, even more than in the cases of the reviewing and selection functions. It is difficult to say something general about the issue of promotion. However, this ties in with the E-Press policy of leaving add-on services to the authors and to third parties. Each author or group of authors may think about their own promotion strategies, and if these include computational support to readers or would-be readers, the E-Press cover page of the article can be amended with links to that facility.

7 Conclusion

The emergence of electronic publication is bound to bring very big changes to the world of research. There will be changes in how research results are disseminated and received, but because of the crucial role of publication in research, there is also likely to be repercussions on how the quality control of scientific work is organized, how credit for research work is assigned, by what criteria researchers are selected for promotion, and on the researchers' own methods of identifying what to read in an ever-increasing flow of research reports.

The formation of Linköping University Electronic Press happens at the time when these changes are just beginning to happen. The chosen policies of our E-Press are fairly noncommittal exactly because they limit the operations of the E-Press to publication in a very concrete and direct sense: putting articles on-line in a way that guarantees the integrity and undisturbed availability of the document over a long period of time. Even this involves a number of non-trivial issues, as we have shown in this article, but the chosen policy allows great freedom with respect to how other issues are handled: the add-on services, the reviewing and quality control of research results, and the selection and promotion of research articles.

In combination with this flexibility, we are very firm about a few basic tenets. We claim with emphasis that what the E-Press does is to *publish* the scientific articles and other documents that it puts on-line. We also believe that the most important use of the E-Press is to *publish rapidly*, that is, to allow researchers to bring their articles to published status more rapidly than by other means. The principle of *unreviewed publication* is chosen exactly in order to minimize publication delays. In a world where rapid information exchange is very important, and where the Internet itself allows information to be transmitted instantly, we believe that these basic principles are sound and, in fact, necessary.