

The FIGARO Project

Realising New Models in Scientific Communication

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Abstract. Due to a number of problems the traditional scientific journal has become an obstacle for efficient scientific communication. Several initiatives have been started to realise other ways of scientific publishing, using modern information technology. In several disciplines, however, a relatively large number of scientists still are reluctant to make use of completely new ways of publishing.

Two Dutch universities (Utrecht and Delft) and two German universities (Oldenburg and Hamburg) have taken the initiative to set up an infrastructure for academic e-publishing in Europe and to establish a network of content providers making use of this infrastructure. This project, called FIGARO, is a European extension of the Dutch Roquade project together with the German GAP project and is financially supported by the European Commission.

The FIGARO project has a number of remarkable aspects. Firstly, it offers a variety of possibilities, which together constitute an expeditious way for gradually changing the publication behaviour of scientists. It aims at creating an infrastructure that conglomerates the swiftness of publication which hitherto could only be realised by grey publishing, with quality judgement without the serious delay of the traditional review procedures.

Figaro offers a wide number of facilities to a broad audience, based on a common organisational and technical infrastructure.

Secondly, it creates a business model, which distinguishes between the back office (the infrastructure) at one side and a network of front offices (content providers and intermediates for content providers) at the other side. This business model not only guarantees continuous feed back from the users. It also allows content providers to stick to their own brand and brand name, instead of urging them to conform to a publisher's brand. In short, FIGARO is not a publisher in the traditional sense, but it enables scientists and organisations of scientists to become publishers themselves.

1 The breakdown of scientific communication

In order to make clear the historic perspective of academic publishing, we must go back more than 330 years. In 1665 the first issue of *Journal des Sçavans*, the first scientific magazine is published. A year later it is followed by a second journal, *Philosophical Transactions*. Both appear not in Latin but in the vernacular language, a quite unusual phenomenon during those days.

What were the reasons to start these endeavours?

A major factor was the rising number of researchers. Similarly important was the influence of Francis Bacon who had been successfully advocating the use of systematic and empirical scientific inquiry and who had emphasised the significance of exploring written sources. In order to stimulate the process of building on each other's findings as well as to avoid duplication of efforts scientists needed to be informed on the results achieved and collected by their colleagues. Bacon aimed at comprising library, laboratory and fieldwork.

Of course, there were books. But as a carrier for scientific information they had some disadvantages. Their main drawback – an aspect related to their volume – was their sluggishness, due to precious time lost in producing them. Books also featured a definite character. Therefore, they tended to be less suitable for discourses on detailed investigations, especially if the facility of additions comments and reply was useful.

It was these aspects that were of great significance to Bacon and his colleagues. Objections to the book as an inflexible medium for distributing concise, relevant information were first expressed by physicists, physicians and technicians. Increasing international contacts among scientists required a platform on which the results of their research could be revealed and discussed. What these scientists basically wanted was to trust their rather unstructured correspondence to a medium that was neither a book nor a letter.

The answer was the scientific journal. At first, the *Journal des Sçavans* was even a weekly magazine. The ensuing growth in various scientific periodicals was indicative for their need.

As such, this very need for communication among scholars has always been the very *raison d'être* of the scientific magazine. Editors were appointed to judge the quality of the contributions and their results. Due to differences in evaluations, a hierarchy was gradually emerging. Some editors proved to be more critical since they had decided to introduce stricter selection conditions. Thus, a number of journals were acquiring a comparatively better reputation.

Consequently, scientists started deriving their stature from the reputation of the journal to which they contributed. Increasingly, readers were becoming aware of the difference in quality. This difference even led to ascension of a ranking system. Finally, the ranking system resulted in playing a significant role in the evaluation of scientific papers and articles, a role that is now firmly established. So-called

quotation indexes are important tools in the evaluation of articles. These indexes refer to the quotation frequency of articles as well as to the reputation of the magazines in which the articles are cited. The composition of the indexes even evolved into a new discipline, bibliometry, in which these indexes constitute a basic element.

As a result, scientific journals have become a distinct factor in evaluating academic research programs. Oddly enough, the same people who favour the current scientific journal consider this factor as the main argument for continuing its existence. But do we really have any reason to be satisfied with its present form?

'Publish or perish' is an adage that we are all familiar with. It is mirrored by the growth in the number of scientific papers. As a consequence of this growth, the existing publishing system is troubled by considerable problems.

1. Publishing is sluggish: it takes at least six months, sometimes up to a year and a half, before a submitted paper actually appears in print.
2. There is growing doubt about the system's reliability, particularly since reviewers may take advantage of their prior knowledge.
3. The system is becoming unaffordable because of vast price increases, which are often higher than the general price index. These rises lead to the cancelling of subscriptions, which in turn cause new increases, eventually evolving in almost monopoly-like situations held by the publishers.
4. Furthermore, we must be aware of the fact that, in addition to these price increases, universities have to pay for these publications more than once, since they also pay:
 - the salary of university staff members who write the articles and papers;
 - the salary of the reviewer who, at the request of the publisher, judges whether the articles are suitable for publication;
 - the publication's purchase price;
 - the archiving of the publications.

We can no longer deny it: the current scientific magazine can hardly be called a communication medium if we consider the amount of time between submission and publication of an article. Fortunately, scientists are also beginning to acknowledge this. They have started publishing their pre-prints on the Internet. In fact, their article's eventual publication in a magazine has become more of a formality, a procedure in which a quality certificate is assigned *afterwards*. Our conclusion must be therefore that the scientific journal in its conventional form can no longer play an essential role in the process of scientific communication. Moreover, this fact undermines its very *raison d'être*.

2 New initiatives in scholarly publishing

Currently, an author who wants to publish his article sees himself confronted with a dilemma. If he is after speedy publication, he has to seek refuge into so-called grey literature. On the other hand, if quality is more important he must address a traditional publisher, thereby accepting a lingering publication process. Modern information and communication technology can solve this dilemma.

There are a variety of initiatives within the academic community all over the world which try to innovate academic publishing with the help of modern technology.

These initiatives and projects can roughly be divided into three lines:

- Business to business.

The most important example of this line is co-publishing: helping existing publishing organisations or learned societies in making their paper journals also electronically available. This is the core business of HighWire, for instance.

- Archives.

Three kinds of archives can be distinguished:

- institutional archives: research institutions and universities archive the scientific output of their academics and make them accessible for the outside world (Savenije & Grygierczyk, 2000).
- subject-oriented archives: organisations or individuals set up a facility for scientists within one discipline to submit their publications which are then made accessible for everyone. The first of these archives was started by high-energy physicists, the Los Alamos arXiv (<http://arXiv.org>).
- personal archives: individual scientist archive their own publications and make them accessible through their personal homepage (Harnad, 2001). An overview of different archive initiatives can be found in Dekeyser & Van de Sompel (2001).

- Projects that stimulate new models for academic publishing without a role for traditional publishers. These initiatives mostly are concerned with new e-journals or the organisation of publication sites with peer review, prior to publication, or after the publication. The Roquade project is an example of a general initiative in this field. A more specific example is Electronic Transactions on Artificial Intelligence (ETAI) <http://www.ida.liu.se/ext/ep/ej/etai/>, published by the Linköping University Electronic Press.

In our opinion it is a good thing that different lines and strategies are pursued by different organisations. It is impossible to predict what the future of academic publishing will look like and it is rather short-sighted to declare a standard for what the future should look like. We should facilitate a new order in scientific

information processes and in this phase this implies that one should not be afraid of a certain degree of chaos.

However, many scientists seem to be a little squeamish when it comes to publishing their results. Naturally, this is partly understandable, because of the crucial role traditional journals play in quality assessment procedures. To a large extent, scientists derive their reputation from the journal's reputation. Nevertheless, their reservations toward alternatives cannot be completely explained by this aspect. As strange as it appears, scientists are reluctant to participate in innovative experiments, which in their eyes are risky. They tend to be more interested in projects that have a certain resemblance to the traditional publishing process, like an electronic version of a traditional journal.

Unsurprisingly, the traditional commercial publisher is not anxious to stimulate certain innovations that could change the established process of scientific communication. Traditionally, the publisher has been engaged in core activities like gathering, quality certification, registration and distribution. In the value chain spanning between information producer to information consumer, the publisher's added value is mainly in certification and distribution.

The distribution of electronic documents is a process that is fairly similar to the library's function of providing access to information, especially if this task is combined with conservation and storage. In the past, the distribution of information was not considered a task of the library. It presupposed a marketing-orientated view, a requirement which libraries could only meet to limited extent. Moreover, it was thought of as an uncertain business, an aspect which subsidy providers tended to dislike. However, the distribution of information in digital form is regarded as a different matter. From a financial point of view, it is seen as a less hazardous operation because it makes use of an existing infrastructure, i.e. the academic community's electronic network.

As to quality certification, the peer review is provided by academics and organised by publishers. There is no reason why this process could not be organised by the academic community itself.

For the present we may therefore safely conclude that in future the publisher's added value may no longer be self-evident.

3 The FIGARO project: its philosophy and organisation

Two years ago the university libraries of Utrecht and Delft, joined forces with the library of the Royal Netherlands Academy of Arts and Sciences to change this situation. It was the starting point for the *Roquade* project (<http://www.roquade.nl>), one project upon which FIGARO is based (<http://www.figaro-europe.net>). The FIGARO project has been started recently and receives financial support from the European Commission (1,4 million euro).

The mission of FIGARO is to develop a network of publishing companies and universities to expand further into a digital e-publishing platform. To support this expansion, FIGARO provides all of its European participants a technical infrastructure and a network organisation strategy that facilitates the entire digital publishing process and allows these partners to benefit from each other's technological, organisational and scientific knowledge. FIGARO will investigate new business models for scholarly publishing and stimulate open access of the publications produced and distributed with its infrastructure.

FIGARO wishes to enable academic publishers to compete with the few dominating commercial players and to diminish their monopoly-like position, but do so without threatening the role of small and medium-sized enterprises (SMEs) as working partners. To accomplish this, FIGARO brings together non-profit academic publishing institutions and partner-SMEs.

FIGARO is distinguished by two aspects of electronic publishing support.

The first aspect is discipline-oriented. It emphasises the necessity of new publishing models that stimulate scientific communication, accelerate the exchange of research results and organise open discussions within knowledge domains. Researchers can place their papers on the website of their department or set-up electronic journals. Furthermore, they are provided with facilities for publication servers and new peer-review models.

The initiative for these activities, of course, comes directly from researchers within departments, from research institutes and learned societies. But in realising them they are supported by back-office processes and facilities, including the organisational and technological capacities.

The second aspect involves supporting institutional open archives. Its priorities are storing, conservation and providing access to the university's scientific output (e.g. its own publications). If every academic institution were to organise the scientific information it produces, this would result in a world-wide network of servers making full-text scientific information accessible on-line to everyone. The next step would be to order the information by subject within various knowledge domains.

The essential objective of these tasks is creating a digital archive that contains the scientific output of the university, as well as preserving this information and making it accessible to the academic community.

For both aspects of electronic publishing FIGARO provides a flexible infrastructure. The scientists and research institutions can use the type of publishing process they prefer: one that entirely meets their actual needs or the one that they are up to.

The reason for offering extensive as well as limited options is that many scientists are not yet ready to use fully new ways of publishing in order to make the issuing of their research results independent from the monopoly of commercial

publishers. These scholars are provided with an infrastructure that facilitates a gradual transition from traditional publishing to highly sophisticated models.

Similar to many scientists most editors who are interested in setting-up an electronic journal also want to start in a more or less traditional way mainly involving text and pictures. The concept of volumes and issues – typical of the paper journal – is maintained during the start-up phase and, as in the case of traditional paper journals, peer review takes place before publication.

In the case of traditional paper journals, peer reviewing takes place before publication. Gradually, a broad range of additions, modifications and alternatives is possible:

- the concept of separate issues will eventually become obsolete. Articles are published as soon as they are ready for publication;
- research data can be appended;
- communication and discussion facilities can be added;
- multimedia can be used to enrich the publication.

The second type is a publication site with peer reviewing. Its main feature is a series of pre- and post-publication peer reviewing processes. They are based on experience and knowledge gathered in traditional and digital academic publishing processes.

Subsequently, the traditional process of peer reviewing is transformed into several new types preserving the traditional advantages as much as possible. In this variant it is possible to achieve speed without omitting the time-consuming peer review process by delaying peer reviews until after publication. This variant also offers the possibility of experimenting with different forms of quality assessment, e.g. an open and public (not anonymous) peer-review discussion.

The third type consists of pre-print and re-print open archive service. There are two functions that are particularly useful from the authors' point of view in this respect:

- Long-term preservation, including guarantees for permanent accessibility, readability, integrity and authenticity (with respect to the transition from one medium and/or format to another).
- Broadening of the readership by making the publications traceable via various Internet channels. Here, advanced methods of archiving and indexing play a crucial role, as do the options for self-ordering and ordering in knowledge domains. The use of the publications is further promoted by employing usual library tools in modernised form (such as user-friendly and accurate search engines, alerting and filtering systems and well-organised presentation of the publications on the web) and by being compliant with the Open Archives Initiative.

3.1 Objectives

FIGARO has three overall strategic objectives :

1. Realise technical innovation in the fields of **collaborative document modelling** and the development and implementation of a **www-based shared workflow model**.
2. Realise business process innovation through the establishment of a **collaborative business model for e-publishing** within a virtual community of academic institutions and SME's.
3. The actual **building of a networked organisation and production platform** based on the results of the aforementioned innovations. This networked organisation also constitutes an **effective distribution channel for emerging technologies and new standards** in this field.

4 The Business Model of FIGARO

FIGARO has adopted a collaborative business model for e-publishing within a virtual community of academic institutions and SMEs. This approach builds synergies that are currently not realised by independent academic e-publishing institutions and at the same time preserves each institution's identity and brand.

The model consists of Back Office (BO) facilities distinct from, but shared by co-operating Front Office (FO) institutions (i. e. the actual publishing instances). This model ensures that FIGARO's 'brand' remains in the background, representing the quality of the e-publishing facilitator not the quality of the published content itself. It also ensures that the network organisation of front offices can grow, as it is attractive for publishers to retain their own brand during the facilitation process to digital publishing.

The *back office* consists of the technical infrastructure: soft- and hardware, as well as maintenance, expansion, upgrading and innovation. The back office is managed by a co-ordinator with the help of a specialist team recruited from the consortium libraries.

The users of these facilities are autonomous publishing initiatives and projects. However, they do not make a direct use of these technical facilities, but do so with the support of the front offices of FIGARO.

The *front offices* are franchise holders of the *FIGARO* brand. These front offices can also use the FIGARO facilities (for example Delft University Press) or support other organisations who want to make use of the facilities. The consortium members form front offices themselves, but other front offices may also be recruited.

The front offices are co-ordinated by a central contact point of *FIGARO* which also directs new clients to the front offices.

The support given by the front offices can vary depending on the organisation's or project's request for support. This support can cover all technical facilities, as well as project management for setting-up new publications and implementing the project results. However, it can also be limited to a simple helpdesk function.

On the basis of their experiences, the front offices play an important role in the feedback and evaluation of the tools that are offered by *FIGARO*.

The co-ordinating front office also controls the fulfilment by the front offices of a number of constraints that are necessary conditions for the franchise of the *FIGARO* brand. Among these constraints are:

- requirements concerning the quality (control) of the publication's content;
- requirements as to the quality of support given by the front office;
- principles concerning cost calculation for using the infrastructure and the front office services;
- the way the *FIGARO* brand is mentioned in the publications.

Co-ordinating the exchange of information, experiences and feedback is the task of the co-ordinating front office. The front offices collaboration could be seen as a network organisation.

The *FIGARO* project is managed by a steering group, which consists of the co-ordinator and the primary contract partners, plus a general project manager.

Participants

Co-ordination :

Utrecht University (NL)

Primary contract partners :

Delft University of Technology (NL)

University of Hamburg (D)

Carl von Ossietzky University Oldenburg (D)

Daidalos bv IT in Publishing (NL)

Universita degli Studi di Firenze (I)

Libraries (USA)

Assistant contract partners :

Delft Cluster Foundation (NL)

LEMMA B.V. publishers (NL)

Katholieke Universiteit Leuven (B)

Lunds University (SV)

SPARC: Association of Research Wydawnictwo DiG sc. (PL)

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