How to Find a Needle in a Haystack - Identifying Online Publications

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How to find a needle in a haystack - Identifying online publications

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1. Introduction

Postmodern society is characterized by information overload. The number of scientific publications alone has exploded since the end of the 20th century. The individual achievements of the scientist as an end in themselves are no longer the primary goal of modern science. The dissemination of scientific results is not only in the interest of the individual scientist and researcher but since the beginning of the early modern period this propagation has been demanded by society and society has increasingly funded these scientists. Their results are an integral part of social progress and require dissemination and publication.

1.1. How the history of publishing began

Oral and written communication, the exchange of ideas and findings was the first approach to publicizing scientific results. Early bilateral correspondence is the first testimony to scientific exchange long before an institutionalized form of scientific communication became a matter of course. With the foundation of scientific associations and organizations, such as the Royal Society in England and the academies, this exchange receive support, at least in the oral tradition, and soon became institutionalized in a written form. The first scientific journal was published in 1665 thus creating a forum that was suitable for the specific dissemination of the results of scientific research activities. Personal correspondence thus developed into an institutionalized scientific exchange. A pure gain in knowledge is by no means the end of added scientific value. Only a publication and the wide availability of new insights makes the findings of a “private scholar” into a result that is discussed in the scientific community (or a broader public), evaluated (possibly also revised) thus becoming accepted scientific knowledge: “Each endeavor will remain incomplete until its results have been communicated or reported”.

Another example also illustrates the necessity of scientific communication. In the 1930s in the Soviet Union, the Russian geneticist Lysenko propagated his preposterous theory of heredity which was intended to enable the USSR to breed plants and animals for all possible applications. Lysenko’s key position as the editor of the leading genetics journal in the Soviet Union enabled him for many years to reject contributions criticizing his theory and thus ensured that the entire Russian genetics community lagged 25 years behind developments in the rest of the world. Science therefore has to publish and the timely publication of findings is decisive for success. Not only did the number of scientists increase continuously in the 19th century but also the number of scientific journals. Since the beginning of the 18th century the number rose by a factor of 10 every 50 years.

Today the milestone of 150,000 different journal titles has been passed. In addition to the actual added value in the form of pure knowledge or applicable findings, it is the flow of knowledge, publishing and scientific
exchange that has become an indispensable part of the scientific process. A number of mechanisms and measures have thus emerged and become integrated into the process of scientific publication. The emergence of peer-reviewed journals as a quality control was an important step towards the high-quality publication of scientific findings.

In spite of the increase in scientific activities, the expansion of the individual disciplines and the explosive increase in scientific findings in the 20th century, this system retained its value until the sixties of the 20th century.

The arrival of digital media for the provision of scientific information in the mid eighties brought about a number of revolutionary changes. Digital information is no longer bound to place or time. It is available and usable everywhere and at all times. A whole number of useful (or superfluous) additional functions enable more specific and faster access to the desired content than could ever be offered by the corresponding printed versions. The processing of digital data, for example in dedicated reference databases, can be achieved with the same medium.

The establishment of electronic data processing fired scientists’ imagination at a very early stage. The possibility of computer-assisted exchange of information between academics was first used within the natural and engineering sciences. Conventional publication techniques needed more operations; they were labour-intensive, slow and expensive. It was therefore only a question of time before electronic data processing made inroads into the production, processing and distribution of scientific information. The traditional cooperation between authors, reviewers and publishers was to be controlled via compatible word processing systems and simplified via computer networks. As long ago as the seventies, there were already theoretical models for the application of these types of techniques and their early precursors. The concept of a “purely electronic publishing system” still regarded in the seventies as „admittedly revolutionary“ has long become reality today. The major priority was reducing the time lag between achieving the results and publishing them thus making them available to the specialist and general public.

1.2. Swifter, higher, farther?

It is the way in which scientists communicate with each other, and also the processing, supplying and utilizing of scientific findings that has been changed by the digital revolution. The consequences of digitization are also to be seen in a new cultural skill (computer literacy), in changing media competence and a fundamentally altered media perception and reception structure of the reader or the now so-called user. From the user’s or reader’s perspective, the characteristics of electronic information can be rapidly summarized. The information (especially in the STM sector) is subjected to a rapid ageing process so that the utility value of services is increased by the individualized search and utilization possibilities and the information value is enhanced by the inclusion of dynamic media.

Although for the scientist there is no general change in the process of obtaining scientific knowledge through the introduction of electronic publications, nevertheless there are a number of changes in the processes of disseminating and evaluation scientific findings.

In spite of electronic equipment, the reading habits of academics do not seem to have changed in the past 20 years. The dominant mode of publication is in journals especially in the scientific, technical and medical field (STM). Journal articles, whether printed or electronic, remain the most important source of information in the STM sector.

Although the number of scientific papers has increased enormously, so has the number of scientists. The number of papers per scientist has thus remained fairly constant. Also the number of articles read by an individual scientist has remained almost unchanged in the past 20 years.

Nevertheless, even in the 1960s and 1970s there were already scientists who recognized a journal crisis and criticized the traditional production of journals as a waste of paper, as too expensive and too slow. In 1978
an estimate was published according to which it would take 20 years before electronic journals would gain real acceptance. However, in 2001 one third of all scientific information read in the USA originated from electronic sources.

In addition to traditional journal publications, scientists and many PhD students are making increasing use of online publication since an advantage of online publishing in comparison to the print media is the faster, more direct and thus more up-to-date publication of documents. On the other hand, through online publication the documents are often available to interested parties faster and more easily. Publishers, especially those with a scientific emphasis, also make use of online publication in order to save considerable printing and marketing costs.

2. The need for identification

Dynamic documents on the internet do not only avert the danger of the one-sidedness of the print media by providing the digital optionality and permanent convertibility of information and constitution of scientific experience, but they also make it increasingly difficult to unambiguously identify and document the sources. Research libraries are responsible for the processing and provision of scientific information. The proliferation of electronic documents means that it is becoming increasingly more difficult to guarantee a unique and permanent identification (the precondition for unambiguous identification and ordering) as has been achieved for print media according to a uniform worldwide standard (ISBN, ISSN). If communication is essential for scientists ("Effective communication and dissemination of scientific information is therefore crucial") then the published material must be identifiable and searchable and capable of being archived. There is no question that libraries have proven their expertise with these tasks for thousands of years. The following sections will discuss which libraries can and should do this in future and how it should be done.

2.1. The mutability of the internet – A short-lived medium?

As information providers, libraries – especially research libraries – now use the opportunities of the internet with all its advantages and disadvantages for information searching and procurement (e-articles, online publications) as a complement to their library services and holdings. The term often used here of "online publications" means, in particular, scientific reports, articles or essays which can be found on the internet as full texts and are frequently referred to as electronic publications, web publications, electronic documents, e-articles or electronic resources.

If you are looking for an online publication and discover the associated internet address then you imagine you have already reached your goal. By no means! You don’t always arrive at the desired document and you may be in for an unpleasant surprise. "Error 404 – Site not found" or a completely different document appears... But what other chance is there of referring to electronic documents, citing and linking them?

The internet address is generally used due to a lack of alternatives. The address used to retrieve an internet page, the so-called uniform resource locator (URL for short), provides information about the current location of the document but locations (URLs) are not permanent and may change. Even if only a small part of the address changes digital information collections, libraries, citations and references “lose” their sources. The user then does not find the expected document but instead “Error 404 – Site not found”. If the electronic location of the document changes then all references to the document become unusable.

In order to make high-quality electronic documents usable in the long term, i.e. capable of being cited, referenced, linked and identified in a meaningful way, permanent addressing mechanisms are required. Persistent identifiers represent a solution to the problem of making online publications permanently usable.
2.2. The “digital ISBNs”

As the name already says, persistent identifiers are more than just addressing mechanisms. They are unique, permanent numbers that refer to an online publication making it identifiable and referencable. Furthermore, URLs say nothing about the authenticity of a document. Is it an original document or is it a copy? Since these persistent identifiers are only issued to publishers, institutions or libraries it is also ensured that they are original documents by the authors and scientists. On the other hand, a certain quality control of the online publications is performed by the mechanism for assigning these persistent identifiers via publishers, institutions or universities.

This regulated allocation and the uniqueness of the number means that persistent identifiers means are comparable to the ISBns (International Standard Book Numbers) and ISSNs (International Standard Serial Numbers) for print media. The “digital ISBNs” are also in a position to make online publications permanently identifiable irrespective of their current local address (URL). On the one hand, this is important for providers of online information, that is to say primarily publishers and increasingly also university libraries and their servers. On the other hand, the knowledge, use and further development of persistent identification and addressing mechanisms should be of interest to librarians as information brokers and also to other information professionals.

2.3. Persistent identifiers – What are persistent identifiers and what can they really do?

The rising number of online publications, the problems associated with the variability and the resulting instability of the uniform resource locator (URL), the limited citability of the URLs and the lack of authenticity of online publications make it a matter of necessity in the digital age to use persistent and unique identification, addressing and referencing procedures. Persistent identifiers (PIs) are such unique and permanent “names” for online publications that have the task of making online publications identifiable and addressable irrespective of their current local address (URL). PIs therefore enable permanent identification and referencability and provide a certain measure of authenticity due to their controlled allocation.

The two best known examples of PI systems are the Uniform Resource Name (URN) from the non-commercial sector and the Digital Object Identifier (DOI) from the commercial publishing sector. Persistent identifier systems all function in a similar manner and are constructed on similar principles. For each PI system there are standards for the structure and syntax of the PIs and they are allocated by a registration agency. There is a cooperatively managed, central administration for each system which lays down the basic sequences and resolving mechanism in order to move from the PI to a valid URL so that the permanent addressing and referencing can function.

Since the basic idea is a strict separation between the identification of the publication by a unique string of characters and the location reference, PIs are given as identifiers instead of URLs and are only subsequently resolved into the associated URL via an intermediate resolving mechanism.

3. URN – Free access to free information

Apart from the commercial Digital Object Identifier (DOI), the Uniform Resource Name (URN) is the best known persistent identifier system with a general approach.

The Uniform Resource Name has been in existence since 1992 and is the persistent identifier standard for the Internet Engineering Task Force (IETF) 13. The standard was designed with the aim of keeping the cost of the provision and use of URNs as low as possible – comparable to existing namespaces such as URLs.
3.1. URN application possibilities – For whom?

URNs are not just applicable for online publications but in general for electronic resources that need to be permanently identifiable independently of their location. URNs are thus used, for example, for forms in an e-government project in Switzerland. However, there is still a need for identification, especially in the online publication sector, comparable to that of ISBNs and ISSN for the print media. This is why the majority of applications are found in the online publication sector. Probably the greatest field of application for URNs originated at the initiative of the national libraries, who were interested in the collection and persistent identification of web publications. In 1999 it was laid down within the framework of the CDNL (Conference of Directors of National Libraries) that all participating national libraries should manage and accordingly introduce the URNs they allocate under the “NBN” (National Bibliography Number) namespace. The Library of Congress in Washington is responsible for administering the URN system.

In Germany, the German National Library in Frankfurt am Main administers the “de” namespace of the NBN. It considers itself responsible for coordinating the allocation procedure, administering the resolving mechanism and ensuring permanence of the URNs by the long-term archiving of the associated documents.

3.2. URN implementation in Germany

In Germany, URN implementation first started in mid 2001, initially only for online university publications, especially electronic PhD theses. It should be noted that online university publications are not simply collected like other publications in the university libraries, but rather that online publications are actually published by the university libraries so that in this field the university libraries function as publishers. Like all publications in print media, the publications are sent to the German Library by the publishers or in this case the university libraries. In the project on URN implementation, the procedure for registering online university publications was expanded by the addition of the URN in order to keep the extra effort for the university libraries participating in the project as small as possible. The registered URNs are included in the catalogue as part of the entry and can thus be searched in the catalogue.

After the good start to URN implementation for the university publications (1030 URNs allocated by mid July 2002 / approx. 3000 by the end of 2002), at the beginning of 2003 it became possible to allocate URNs to institutions other than university libraries such as for research establishments, small university publishers in the process of establishing themselves etc. with high-quality publications (e.g. research reports). Online publications are also becoming more popular in this environment due to high printing costs and the good opportunities for further distribution.

Thus, for example, the Central Library of Research Centre Jülich takes over the function of a publisher, advising authors and then, when the publication is ready, allocating the URNs, notifying the German Library, placing the document on a server and sending a reference copy to be archived at the German Library. Online publications are then advertised by the publisher together with its other publications so that those interested can easily access the online publication via its URN. Furthermore, the publication can also be searched in the catalogue of the German Library in addition to other library catalogues.

3.3. Structure – What does a URN actually look like?

The general approach is taken from the IETF and is based on a hierarchical structure of subareas. A URN basically consists of: urn:nid-niss, but it can also have the following appearance: urn:nid:snid:snid-niss. “urn” characterizes the numerical region, “nid” stands for Namespace Identifier which may consist of several subnamespaces (“snid”-Subnamespace Identifier) and finally the “niss”, Namespace Specific String, which identifies the actual document.
The national libraries have registered the URN namespace “National Bibliography Number“ (nbn) for their initiative. In order to ensure that the numbers of the individual national libraries do not overlap and remain unique, the national libraries have decided to use another subnamespace as a country code. For Germany this is “de”.

Accordingly, each national library can freely allocate further subspacenames for the individual university libraries, publishers or institutions. In Germany, for example, depending on the library association a URN for university libraries looks like this: urn:nbn:de:hebis:30-000000759.

For institutions that are not university libraries but rather, for example, publishers in the research sector such as Research Centre Jülich, the URN looks like this: urn:nbn:de:0001-00081.

In Sweden or Finland, for instance, URNs look like this: urn:nbn:se:uu:diva-3344 or urn:nbn:fi-fe975025.

What is common to all URNs after the different SNIDs is the end of the URN separated by a hyphen, the NISS, which is the specific string that characterizes the document. Depending on the country, the last digit may be different and in the same way as for ISBNs it may be a check digit.

3.4. The way from the identifier to the document

The beginning of the second chapter dealt with the problem of unstable URLs and it was mentioned that the persistent identifier was not only useful for identification but also for permanent addressing, often called resolving of the PI. Unfortunately, URNs, and this also applies to all PIs, cannot simply be entered into the address line of the browser in order to reach the document since the PI cannot be interpreted by the browser and automatically converted.

In order to reach the document itself use still has to be made of the existing URL standard. To this end, a so called resolving address is used onto which the persistent identifier can be attached, in our case a URN.
In theory this appears as follows: http://<resolver-address>/PI and in practical terms it looks like this: http://nbn-resolving.de/urn/resolver.pl?urn=urn:nbn:de:0001-00081. All PI systems function on a similar principle. The persistent identifier, in this case our URN, is entered into a database in which – in addition to other metadata – the currently valid location is also stored. These URLs are checked regularly and updated in the case of changes. If the resolving URL is entered, the database is interrogated and the user is guided to the current location. In our example the URN is: urn:nbn:de:0001-00081, the resolving URL: http://nbn-resolving.de/urn/resolver.pl?urn=urn:nbn:de:0001-00081 and the valid location: http://www.fz-juelich.de/zb/datapool/page/439/00081_Linz.pdf.

It should be noted that there is no uniform resolving mechanism for all PI systems since the various systems originate from different projects and only the principle of resolution is similar. But even within some PI systems that are designed to be very free, such as URNs, various resolution mechanisms with different resolver addresses have emerged. In this way, each national library, even in the NBN field, has different resolving addresses etc., which complicates the resolution of URNs.

3.5. Citation by means of URNs

Since uniform resolving mechanisms have not yet been technically realized, there are certain recommendations for the referencing/citation of a URN. In media where an online publication is cited by means of a URN, but which cannot be highlighted as a link, such as in print media, the URN should be given in square brackets after the resolving URL, e.g. urn:nbn:de:0001-00081 [http://nbn-resolving.de/urn/resolver.pl?urn=urn:nbn:de:0001-00081], so that the user who does not know the resolving URLs can nevertheless gain permanent access to the document. On the internet, it is recommended that the URN should be directly linked to the resolving URL as a hyperlink since in this way it is possible to click directly on the URN. However, there is no harm in using both paths especially in documents that can be downloaded and also linked on the internet. There is thus still a need for action within the individual PI systems and also in the higher-level systems.

Particularly for URNs it is desirable that more standardization, further technical development of PI services and higher-level retrieval possibilities should be established.  

4. DOI – The commercial path to persistent identification and transaction

Let us now turn to the counterpart of the URN: the best known commercial PI system – the Digital Object Identifier, DOI for short. The trade in digital content, such as articles in e-journals, arising in the mid nineties led publishers to see the need for uniquely identifying digital content for trade and transactions and to provide associated information such as authorship, rights, version of the documents. A DOI initiative came into being in 1996 emanating from the American Association of Publishers, which in 1998 then led to the establishment of the International DOI Foundation (IDF).
4.1. DOI application possibilities – For whom?

This genesis shows that DOIs are used as identifiers for digital content intended for commercial use. At the moment this is particularly the case for articles in e-journals, but it can also be applied for other online publications, e-learning products up to and including images and music. All DOI applications are based on the following objectives: linking customers and content providers irrespective of location and facilitating e-commerce, identifying and protecting intellectual property, and creating a basis for an automated management of copyright and licensing rights. At the same time, DOIs create the technical and organizational boundary conditions permitting these digital content to be managed and the content provider linked to the customer. This creates the possibility of developing and automating services on the basis of DOIs for electronic resources that have limited accessibility due to copyright, licences or other commercial reasons.

4.2. Managing DOIs – Administration and registration

The International DOI Foundation (IDF) is the governing organization that supervises the development of DOIs and issues licences for the allocation of DOIs to so-called registration agencies. This is comparable to the URNs of the national libraries (NBN field) where the Library of Congress takes over the central administration but the individual national libraries allocate the URNs. The difference is, however, that DOIs are a fee-paying PI system since they were developed for commercial applications. It should be mentioned that the DOI Foundation is a non-profit organization and merely recoups its costs by membership fees, the sale of DOI prefixes and the allocation of DOI numbers and in exchange provides a uniform technical and organizational framework with the DOI. The DOIs themselves are allocated by registration agencies, who have been licensed by the IDF. There are currently seven different agencies that in part have different priorities with depend on geographical location or subject matter in allocating DOIs. In addition, the agencies lay down the metadata standards and operate the databases for metadata administration. Each DOI is also supplied with metadata (author, title, size, current location, access rights etc.). The metadata can be modified (change of ownership rights, new location etc.) but the DOI is permanently associated with the document. The registration agencies also charge fees whether for the allocation of DOI prefixes (product identification), individual DOIs (per document) or DOI retrieval.

4.3. DOI structure – What is a DOI composed of?

A DOI is standardized and always consists of a prefix and a suffix. The first part of the prefix always begins with “10”, which identifies the “DOI” namespace. Then comes a dot followed by a usually four-figure number for the issuing institution (e.g. publisher, corporate entity, product line), to which this number is allocated by a registration agency. The second part starts after the slash. This suffix is the unique identifier for the respective content, irrespective of the size, file type or form (book, article, image etc.) and can be freely composed by the institution itself (publisher, corporate entity etc.), it must be unequivocal and it must not repeat itself. In theory, a DOI may appear as follows: prefix/suffix, and in practice: 10.1016/S0168-1656(02)00137-2, thus: 10.1007/s00468-002-0161-y or thus: 10.1045/march99-bunker.

4.4. From the DOI to the document

As in the case of the URNs, the resolution is also performed via the existing standard URL which can be interpreted by browsers. A database is queried via the permanent resolving URL, which guides the user to the current URL. In contrast to the URNs, there is a superordinate resolving mechanism for all DOIs with an uniform resolver address for all DOIs regardless of which registration agency in which country has issued them. The resolving service of the International DOI Foundation (IDF) is always accessed at: http://dx.doi.org/<DOI> and if you have access authorization (e.g. have subscribed to the e-journal) you will arrive at the document and if you do not have authorization you may still obtain information on the
In order, for example, to locate an electronic article, you no longer need the journal title, ISSN, volume, page, author etc., the DOI – possibly with the resolver URL – would be sufficient! Nevertheless, such data should be given when citing the article, at least as additional information for the reader. Since the DOIs are resolved by a uniform resolving service in citing the article it is no longer so important to give the resolver address as it is for URNs. Although it does no harm, especially for readers who do not often use DOIs. The DOI thus represents a technically self-contained system for identifying and managing resources while the technical approach for URN is basically open.

4.5. DOI goes Europe, too

Whereas several European national libraries use URNs for the identification of and permanent access to online publications, DOIs are currently only applied by a few very big European publishers, especially in the scientific journal sector. In order to make DOIs affordable for small and medium-sized publishers and also usable for other electronic content, a project was launched in July 2002 known as mEDRA (Multilingual European DOI Registration Agency). The project is being implemented within the framework of the eContent programme of the European Commission, which regards it as particularly worthy of support. The project will take 24 months and is due to run until June 2004. mEDRA has already been entered as a registration agency with IDF and has already issued its first DOIs as part of the project. Five partner organizations are involved from the publishing world or publisher’s associations in four countries: Italy, Spain, France, and Germany. The group is coordinated by the Italian publishers’ association. Before initiating the project, a survey was made of the publishers’ demands on a future DOI agency. Some of the requirements (linking mechanisms, catalogue, coverage of the whole of Europe) will in the medium to long term lead to additional services and opportunities in addition to the mere allocation of DOIs, depending on how much acceptance the project and the future agency receive, which will in turn undoubtedly also depend on whether DOIs become affordable for small and medium-sized publishers.

5. The End

Returning to our starting point: We cannot know whether the use of electronic media in science and libraries will, as predicted by McLuhan, once again break up the “monolinearity of writing and constriction into individual disciplines” and like a “many-headed hydra” will change scientific communication into a network of ideas or whether electronic publishing mean nothing but the impossibility of making a selection and a lack of permanent provision as asserted by Klostermann. The mere fact that electronic media and electronic publishing have already become reality forces libraries, research and teaching establishments to make a meaningful, intelligent and forward-looking decision concerning appropriate possibilities for permanent and unique identification.

In comparison to 1997, persistent identifiers have led to great progress in the field of the identification of online publications and their approach for permanent availability. The practice of allocating PIs by institutions such as publishers and libraries ensures a certain degree of quality and authenticity for online publications. Nevertheless, further developments are still necessary as well as greater dissemination and above all a standardization of PI systems, both for URNs and for DOIs. In order to make sure that we do not have to look for publications on the internet like the proverbial needle in the haystack, but that they can be found even in such an enormous haystack by means of persistent identifiers, a part should be played by librarians and information professionals in encouraging their wider dissemination, further development and standardization.


4 Garvey, W. D., loc. cit.


6 Page, John R. U.: loc. cit. p.18


8 Whether the time factor is really of major significance seems to be doubtful in view of the time lapse of on average thirteen years that it takes for scientific findings to enter into the awareness of the general public. This time aspect is undoubtedly often overrated.


11 Ebel, H. F., Bliefert, C., Russey, W. loc. cit. p.57


13 http://www.ietf.org - RFC 2141


15 In other countries, for example Finland, Norway or Sweden, the respective national libraries have taken over the allocation and resolution of the URNs.

16 http://www.ietf.org - RFC 2141

17 http://www.ietf.org - RFC 3188

18 In Germany, a project is currently underway, EPICUR (Enhancement of Persistent Identifier Services - Comprehensive Method for Unequivocal Resource Identification), which is concerned with the further development, dissemination and interlinkage of PI systems. - http://www.persistent-identifier.de/?link=335

19 http://www.doi.org

20 The best known registry agency for allocating DOIs for articles in scientific journals and related areas is „CrossRef“. - http://www.crossref.org

21 DOIs for e-learning products can be registered with the registry agency „Learning Objects Network“ - http://www.learningobjectsnetwork.com

22 Applications for DOIs for the digital content of books, images and music can be made with the „Content Directions“ registry agency. - http://www.contentdirections.com

23 More information information on the IDF can be found at http://www.doi.org/handbook_2000/governance.html.

24 The technical development goes back to the „handle system“ of the Corporation for National Research Initiatives (CNRI). - http://www.cnri.reston.va.us or http://www.handle.net


26 http://www.doi.org/idf-member-list.html

27 The DOI structure has been registered as ANSI/NISO Z39.84 2000 Standard. More information can be

28 In contrast, even within the URNs of the individual national libraries different resolving services are required to resolve the URNs. In Germany, for example:
http://nbn-resolving.de/urn/resolver.pl?urn=<urn>
whereas in Sweden: http://urn.kb.se/resolve?urn=<urn>

29 E.g.: http://dx.doi.org/10.1000/186; http://dx.doi.org/10.1016/S0168-1656(02)00137-2; http://dx.doi.org/10.1045/march99-bunker

Furthermore, individual DOIs can be resolved by entering them directly in a field on the DOI website (http://www.doi.org). According to the technical approach employed by the „handle system“ of CNRI (see above) DOIs can also be resolved via a small program without entering the resolver address.

30 Since this is a commercial PI system with content accessible on a fee-paying basis the resolution depends on the legal situation with property rights. The protection of electronic content was one of the reasons for establishing a DOI initiative.


32 http://www.medra.org

33 The Italian partners are, on the one hand, the Italian publishers' association, Associazione Italiana Editori (AIE) - http://www.aie.it, and, on the other hand, CINECA, a university consortium consisting of 15 Italian universities and the Italian nation research council (CNR) - http://www.cineca.it/indexe.html.

34 The Spanish partner is Editrain S.L. The aim of the company with headquarters in Madrid is to provide training courses for the book industry as well as information and online services.


36 Germany is represented in the project by Marketing- und Verlagsservice des Buchhandels GmbH (MVB), a subsidiary of the umbrella German Book Trade Association. - http://www.mvb-online.de


