Imagine, the world without the journals.

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Last few years we are witnessing the rapid growth of on-line services, social networking, internet forums, wikis, blogs, "Second Life" world etc. and birth of new technologies such as e-paper. The internet access is as common as TV or telephone. One stumbles upon "e-" terms almost everywhere (e-book, e-mail, e-bank, e-library). Would it be possible to wake up some day and find oneself in the world without paper journals or without journals at all? How can the Open Access movement affect the traditional printed materials? Are we currently experiencing the revolution akin to the Gutenberg's invention of movable type printing press? This presentation would show how could the scientists' collaboration look like in the future, in a virtual world, and answer the question - is there still need for scientific journals in their traditional form? Could they be replaced by new media? What tools are available right now, what will be in a near future for creating "Journal 2.0"

Academic journal in traditional meaning is a peer-reviewed periodical in which scholarship relating to a particular academic discipline is published [1]. Most journals contain scientific publications with a very specific thematic scope. The editorial board and peer reviewers of scientific journals ensure the conformity publication with the journal issue. As a result, scientific journals serve as order publications in terms of themes. Until the latest rapid growth of internet services, the results of research in the particular field could be observed and examined based on several titles of journals devoted to a specific area of science. Researchers were often limited to reading a few selected scientific journals.

The increase the number of journals has caused the need to create bibliographic databases which can collecting information on various publications in scientific journals. Originally, the database was issued in printed form, but since the spread of computer systems, the electronic database replaced the paper versions. First they were available from local PC and with the growth of the Internet database available on-line became the only source of bibliographic information.

The growing popularity of the Internet and the increasing use of web search engines and electronic databases have begun to change the behavior of users. Search by journal title has been replaced by search by keywords. Using search engines lead to discover new magazines, extending the space of exploration. This changes the approach to the search process. Users are looking for specific pieces of information, article rather than journal issue, book chapter rather than entire book, single song than album, picture, table, chart rather than article. This trend is evident not only in relation to publications and journals.

Search engines and bibliographic databases provide more results, so that information found in one publication can be easily confront with other sources. Furthermore according to the report by OCLC [2], users no longer pay attention to the format of publication based on the content and it does not matter whether this is an electronic document, printed one or audio or video file.

Change in user behavior is accompanied by a change in presentation layer. Most journals in addition to the printed version offer an internet access to the articles. Some offer the ability to buy individual articles without having to subscribe to the entire journal.

However, the use of electronic media and the Internet to distribute magazines does not change the general rules of publishing. The article to be published shall be peer-reviewed and get the acceptance of the editorial board of the magazine. This model has limitations due to historical circumstances. The publication does not always get a favorable opinion of the editorial board and reviewers, despite its substantive value. The author has to look for the journal, which will accept his publication, and not always he manages to publish in the highly-rated scientific journal.

The old idea of free exchange of knowledge between researchers, in association with the modern media and Internet, has resulted in the concept of Open Access.

The important events for the Open Access Movement was the conferences in Budapest in December 2001 (Budapest Open Access Initiative signed in February 2002 [3]), in Bethesda in July 2003 (Bethesda Statement on Open Access Publishing [4]) and in Berlin in October (The Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities [5]).

Those three conferences defined Open Access as a free availability on the public Internet, permitting any users to read, download, copy, distribute, print, search or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited [6].

The idea of Open Access meets with strong support among academics and researchers. More than 34,000 scientists signed an open letter to the publishers against the policy of reducing the possibility of sharing their own work in the public domain [7].

The main factor of Open Access movement is significantly increased access to scientific publications. Publications distributed under the Open Access license are more easily available to the scientific community, but also become widely available outside academic circles.

Articles become accessible to not only those involved professionally with the subject of such publications, but also to the people involved in other areas. The prevalence of access to the publication increases the number of citations. Recent studies [8] show the level of the increase on average by 57% (65% ignoring self-citations) and in the case of sociology publications as much as 88% (103%).

The other study [9] estimates that the provision in the publication Open Access results in an increase in the number of citations from 50 to even 250% depending on the field when compared with articles in toll access. Despite this significant increase only 15% of researchers use out of the Open Access.

Habits of the scientific and librarian community are barrier for the moment. However these restrictions will disappear, with the change in behavior of Internet users. The younger Internet users are familiar with the widespread use of digital content, efficient use of a variety of searching tools. Movement from printed material to digital will increase.

For present students or pupils use of on-line sources is common practice. An example might be the widespread use of on-line editions of daily press. It can be assumed with a high degree of probability that these habits are moving in the future on the periodicals and academic publications.

The popularity of Open Access is also affected by economic factors related to the "Serials Crisis" (the growing costs of subscription) and "Big Deal" (an online aggregation of journals that publishers offer as a package). Libraries had to spent more money to purchase a similar package of magazines or reduce the number of subscribed titles. For example an MIT since 1986 has increased more than three time their expenses associated with the subscription of journals [10]. In addition, it was found that combining journals into packages forces libraries to buy subscriptions to titles that are not used [10, 11]. Hence, there is a trend in libraries to shift from buying large volumes of periodicals. More and more often libraries prefer to purchase a few dozen the most valuable titles from the best publishers than the hundreds of

magazines sold in packages. This helps to keep spending on subscriptions to their current level but it limits availability for publication in lower-rated journals.

So what would happen with the journals less famous then Nature or Lancet? If they would not be sold in bulk, they would not sell at all. For those journals the only way to survive is to go open, to take the Gold route to OA. That means that journals should change their business model and charge for publication, not for subscription, or try to find subsidy from the hosting institution, university, sponsors or advertisements. The cost of publication (article processing charge) is forwarded to the author or research unit. Not all OA journals charges for the publication. In more than half of the cases publication in these journals is free. In 2007 only 47% of journals [12] collected fees from authors to cover the cost of peerreview, edition and maintain the magazine. Gold OA is currently quite popular solution, when over 4100 journals are indexed in DOAJ. The Open Access journals market is growing quickly, but it still represents only approximately 15% of the referred journals.

On the other hand we have Green OA, the open repositories. A repository can be created and maintained by universities, scientific associations or any other institution, including commercial publishers. It can provide publications by various criteria. Most repositories are collecting the work of the institutions employees or publications devoted to specific fields of knowledge. The main difference between open journal and open repository is that repository does not organize the publications in volumes or yearbooks.

It can be asked: How to reach the particular publication? Citation the journal publication refers to the year, volume, issue, and pages, but what about publication existing only in repository? First idea is to present document's URL. But e-publication can be relocated into another location, the address of the repository can be changed or the file can be moved to another directory. The best solution for this problem is to use unique identifier for the publication. This identifier would refer to the information about current localization of the file. That system already exists. It is called DOI, Digital Object Identifier. The DOI[®] System's main role is identifying content objects in the digital environment [13]. It is used to provide current information, including where the objects (or information about them) can be found on the Internet. Information about object (especially about its location) may change but DOI cannot. One of the DOI System's main components is Handle System (HDL) [14]. The HDL System is a technology specification for assigning, managing and resolving persistent identifiers for digital objects and other resources on the Internet. HDL System's main aim is to store identifiers of arbitrary resources, known as handles, and resolve those handles into the information necessary to locate, access, contact and authenticate, or otherwise make use of the resources. This information can be changed as needed to reflect the current state of the identified resource without changing its identifier, thus allowing the name of the item to persist over changes of location and other related state information.

Using the "DOI" for the e-version of the publication is the solution for the "missing links" problem with quotation. Many of the e-journals already use DOI (or handles) as an article identifier, among with traditional volume, number and pages reference. In many cases the publishers of such journals ask to use the DOI for the quotation. The growing popularity of digital objects and Internet makes obsolete accessing the e-publication using the traditional volume and page numbers.

The most common way to reach the publication is the bibliographic database and scientific search engine, like PubMed, Scirus, Google Scholar or other. But to make the publication fully available, the search engines should not only index the metadata (using the OAI-PHM protocol) but also they should reach the content. If the article would be published as a searchable HTML, it would be accessible by standard search crawlers and indexed in Google or Yahoo. Modern search engines can index some PDF files, but not all. Documents created as a set of scanned pictures cannot be reached by Google crawlers.

Most of digital publications are published in PDF format, which resembles the paper issue. That is a great advantage when you want to print the publication, but that page format do not fit the networked area, and makes publications hardly usable on palmtops, netbooks, and completely useless on small mobile devices.

That leads to conclusion that all publications should have its HTML and PDF version, one for web browsers and search engines and the other for printing. Both formats have been known for years, and both have disadvantages. So maybe it is the time of the new file format based on XML, like Open Document Format, which would be searchable by standard search engines at full text level, and also would look "nice" in printing, without all the HTML documents problems [15].

The near future will belong to semantic web and new generation of search engines. To be prepared for the change the XML format should become more common and replace old HTML and PDF. The XML document allows to extract semantic information and modularizing content. The semantic tools for analysis of the research paper will help authors or automated services to extract the proper metadata from the document. That analysis will facilitate the automated interlinking to external resources which leads to improved navigation for readers and the better indexing by semantic search engines [16].

Another problem with a printed paper model article, typical for journals, is when the authors do some extra work or have new findings. Author needs to write another paper, instead of update or extend the current one [17]. The e-publication can be updated anytime. Even more, all the versions can be kept alongside to show history of changes.

The next step for the e-journals is to change the publishing style. If the journal exists only in the Internet environment, each publication with its own DOI number can be treated as a stand-alone object. The article can be placed in institutional repository or on a web page, but not necessarily on e-journal. As stated before, reader does not search for the entire journal, but he is interested only in particular publication. The edition and publishing process on the Internet differs form of the preparation of the printed version. Each publication can be put online any time. The editors do not have to collect the proper set of materials to complete the volume, so the journal does not have to be published on a regular schedule. Each article can be published separately. The information about each update can be distributed whether by email, separate webpage listing, or RSS feed [15]. Considering the ability of self-archiving so popular in Green OA repositories the editing process might be reduced to administration of web services. That makes e-journal rather a repository.

The part of on-line scientific journals discussed the most is the peer-reviewing. Many disadvantages of the system was pointed, such as subjectivity, bias, abuse, detecting defects, fraud misconduct and maybe the most common complaint about peer-review - the long delay associated with the review process [17]. There is a strong conviction that within few years some changes to peer-review system should appear supported by post-publication commentary [19]. Many different options to change the refereeing in networked era are proposed, like open peer review, commentary or community reviews based on reader's opinions or based by usage or citation statistics. That leads to the ideas of Web 2.0. Some social networking elements can be easily transformed to e-publications. The easiest part is to implement tagging, comment and ranks as a part of the publications. In case of scholar paper, collaboratively created tags may provide a keyword list describing the article, often more precisely than added by author. Another approach is to use soft review – software solutions based on metadata collected by online reference managers (such as tags, annotations, bookmarks) [20].

But do we really need the peer review? The voices against traditional peer-reviewing are getting stronger. In common opinion peer-review is to ensuring that the article passes certain standards of scientific quality and integrity [21].

According to the article of Jefferson at al. [22] there is little evidence that peer review improves the quality of published biomedical research. The practice of peer review is based on faith in its effects, rather than on facts. The use of peer review is usually assumed to raise the quality of the end-product (i.e. the journal or scientific meeting) and to provide a mechanism for a rational, fair and objective decision-making. However, these assumptions have rarely been tested. On the other hand: "Most of the high quality materials on the Web are not peer-reviewed and much of the peer-reviewed literature is of dubious quality" [23]. Peer-review is devoted to printed journals. The system base on the editors choice of reviewers in many cases has to give an answer to a question "Does this publication fit to a journal X, is it enough novel and interesting to satisfy the readers?" [24].

So could the open commentary replace the peer-review? Is it possible to build the review system on the Wiki idea? Could we trust the "wisdom of crowd"?

Technically it is possible, but I think that mentally scientists are not ready for this, yet. We have to wait till the MySpace generation grows up. Today teenagers raised in networked environment and they would much easier accommodate the web style publications. Users accustomed to the known mechanisms of social networking and Web 2.0 are changing their behavior. They give up the experts guidance and more trust community. That moment is coming rapidly, one of the latest addition (March 2009) to arXiv is Facebook's application which allows Facebook's users to comment their own and people's arXiv articles and to show a dynamically updated list of arXiv articles they have written on their "profile" [25].

Maybe we need next Linus Thorvalds, Bill Gates or Larry Page and Sergey Brin to create some revolutionary ideas for indexing, searching, reviewing and ranking publications, or maybe existing solution would be enough, some only needs to put them together. Who knows, maybe the future projects like "Liquid Publications" [26] will take place of the current journalism?

There are nonetheless objective reasons to believe that we are witnessing an essential change in the way information is accessed, the way it is communicated to and from the general public, and among research professionals - fundamental methodological changes that will lead to a terrain 10-20 years from now more different than it was 10-20 years ago than in any comparable time period [15]

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