

# The article of the future

## Artigo do futuro

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### Abstract

Technological advances and the Internet have contributed to the increased disclosure and updating of knowledge and science. Scientific papers are considered the best form of disclosure of information and have been undergoing many changes, not on their way of development, but on the structure of publication. The Future paper, a name for this new structure, uses hypermediatic resources, allowing a quick, easy and organized access to these items online. The exchange of information, comments and criticisms can be performed in real time, providing agility in science disclosure. The trend for the future of documents, both from professionals or enterprises, is the “cloud computing”, in which all documents will be developed and updated with the use of various equipments: computer, palm, netbook, ipad, without need to have the software installed on your computer, requiring only an Internet connection.

**Descriptors:** Education, distance. Internet. Publications. Selective dissemination of information. Online systems. Medical informatics.

### Resumo

Os avanços tecnológicos e a Internet contribuíram para o aumento da divulgação e atualização do conhecimento e da ciência. Os artigos científicos considerados a forma de divulgação dessas informações estão passando por várias modificações, não em sua forma de desenvolvimento, mas sim na estrutura de publicação. O artigo do Futuro, nome dado a essa nova estrutura, utiliza os recursos hipermediáticos, permitindo um acesso rápido, fácil e organizado destes artigos online. A troca de informações, comentários e críticas, pode ser feita em tempo real, proporcionando agilidade na divulgação da ciência. A tendência para o futuro dos documentos tanto de profissionais quanto das empresas, é o “cloud computing” – nuvem computacional, no qual todos os documentos poderão ser desenvolvidos e atualizados com a utilização de vários equipamentos: computador, palm, netbook, ipad, sem necessidade de possuir o programa instalado em seu computador, necessitando somente de conexão à Internet.

**Descritores:** Educação à distância. Internet. Publicações. Disseminação seletiva de informação. Sistemas em linha. Informática médica.

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## INTRODUCTION

The exchange of letters as a correspondence for professional update has been used for a long time. These cards have become a method of critical expression of restricted groups, which were increasing with time. The creation of the press allowed the publication of the latest scientific methods among intellectuals with possessions to acquire this knowledge [1].

With the technological breakthrough, the so-called scientific articles have been a great source of updating knowledge and dissemination of science, both in the academic and professional areas. The articles should be written clearly and follow rules according to the published area.

According to Castro [2], the evolution of communication networks has been facilitated by the scientific breakthrough of the Internet. The scientific production process became non-linear, with the participation of all concerned parts, by modifying the steps of both writing and validation.

According to Lyman and Varian [3], in 2002 92% of the new information was already stored in magnetic media, primarily in hard disk drives (hard disks), and only 0.01% was printed.

The first electronic journal with full text and graphics was the *Online Journal of Current Clinical Trials*, published in 1992 by OCLC - *Online Computer Library Center* in Ohio, USA. In Sweden, in 2006, there was 2160 open access electronic journals, published in DOAJ - *Directory of Open Access Journals* [4].

Newspapers and magazines online have characteristics of other media (radio, television, video, and multimedia); therefore, they are the predecessors of a new communication vehicle, where the main point is the information network. This network production and distribution are a revolution on the printed media, if we consider the velocity of dissemination and updating [5].

Manta [5] had already pointed out that the online edition should always exceed the printed version, emphasizing information and data that are missing, allowing parallel information and the search for research sites through links. All the resources found in the online publication have virtualized the information, making it unprecedented, thus causing the online media to have a quick access and updated communication vehicle.

Castells [6] points out that the Internet has influenced the social changes and created a company that produces and stores information in different spaces, which can be accessed by users geographically apart, thus facilitating the development of research and the elaboration of the paperwork.

To write and publish an article, besides its importance to each specialty, is much easier in comparison to the past,

since today, there are several resources and information available at any time, and various equipment, using a large network of computers. The aim of this paper is to discuss the types and means of publishing validated scientific information. The quality of publications should be warranted by "ad hoc" consultants and the editors responsible.

There are three types of articles printed, electronic, and digital articles. Although the name seems to have the same meaning, there is a difference between electronic and digital: the first means a copy of the article printed, but stored in a type of media, CD or DVD. Whereas the digital article is one that is fully produced digital, written, read and published on the Internet. This is a "digital article," because it was produced, read and changed completely by the network, with on-line collaboration of the authors [7].

The search for information on a given topic is performed with the help of search engines - sites that are specialized in conducting surveys, such as Google, using keywords, which facilitates and speeds the search for the article you are looking for. The links are also options to find the information because they lead the reader to other articles compatible with the subject.

Due to the advanced technology, we can already refer to the "Article of the Future" in which all existing technological resources will be used mainly in computational terms, for the development and publication of scientific articles, in favor of science as well.

Elsevier [8], a major publishing house in terms of academic publications, and its subsidiary Cell Press presented in July 2009, two new prototypes for publication of scientific articles using the resources of graphical navigation, multimedia and differentiated structure. The navigation is much easier and faster, which enables the connection directly with the items.

The prototypes were presented in their beta version, and they are available on the Beta Cell website (<http://beta.cell.com/>). Visitors can analyze it and leave their comments. The structure and rules are the same as the context of a scientific paper existing rules, which are defined and used worldwide: Summary, Introduction, Results, Discussion, Experimental Procedures, Data, References, Supp. Info., Related Info., and Comments. What differentiates it from a conventional scientific paper is the way it is presented.

The first item is the "Summary", in this, besides the well-known abstract, presented graphically, it still has a few highlights of the article; a subject image and a podcast interview with the author - how to publish digital media files, which can be heard on the Internet, or even on the car radio, using specific programs. It also has the link "Paperflick" with an audio of authors talking about their work. These tools help supplementing the article.

At the top of the screen, just below the title, the names of the authors are shown, and in the front appears the link “see affiliation” in which all the research institutions to which the author is affiliated with are described.

The article described in “Introduction” is connected through a link - a clickable area - with the properly reference, directing the reader automatically to the complete reference cited, allowing flexibility in the search by author and paper. The outcomes are also shown in “Results” with the attachments of references, figures and graphs quoted. The images appear as thumbnails, and they can be enlarged for better visualization. Some words are underlined in the text with different colors. By positioning the mouse over them, a window with information about the theme and pictures is presented. Some of them are 2D. There is an option to view the article in full screen, reproducing a larger context and without “visual pollution”.

With a fast internet connection, you can see these images in high definition, which also facilitates the printing.

The option “Data” concentrates all figures, graphics and images used on the work. From a small image, positioning and clicking the mouse on the figure, the image appears larger in size, as well as the information concerning to this figure, besides the context quoted in the article. This part of the work also allows the “download” of each picture in higher resolution, to be stored in the reader’s

own computer. These resources facilitate the memorization and visualization of the article with interactivity and speed, allowing the reader to deepen his knowledge without wasting time in the searching of the respective images.

The tables used in the work are shown in the option “supp. Info”. All the supplementary information is on this page, with the description of type of file (Excel or PDF) and the download size.

References are in order and displayed in sequence. They are distributed on the screen attractively and easy to read. The citation of the article in Scopus.com is also shown in the reference, and other databases may be included.

Since 2010, the Cell Press Beta has been publishing several articles using this new structure. One of the latest publications, in May 2010, was the full article, “Transcriptional Control of Gene Expression by MicroRNAs” as can be seen in Figure 1.

These options are simply the full use of a technology already known at the websites, such as newspapers and magazines online. The news is that there is a part of the article available to the reader expose his/her comments or ideas related to the subject - the item “comments”. This is a critical point, used by Web 2.0, which follows a trend in which all the information can be inserted or commented by the user, allowing online communication between authors and readers [9].

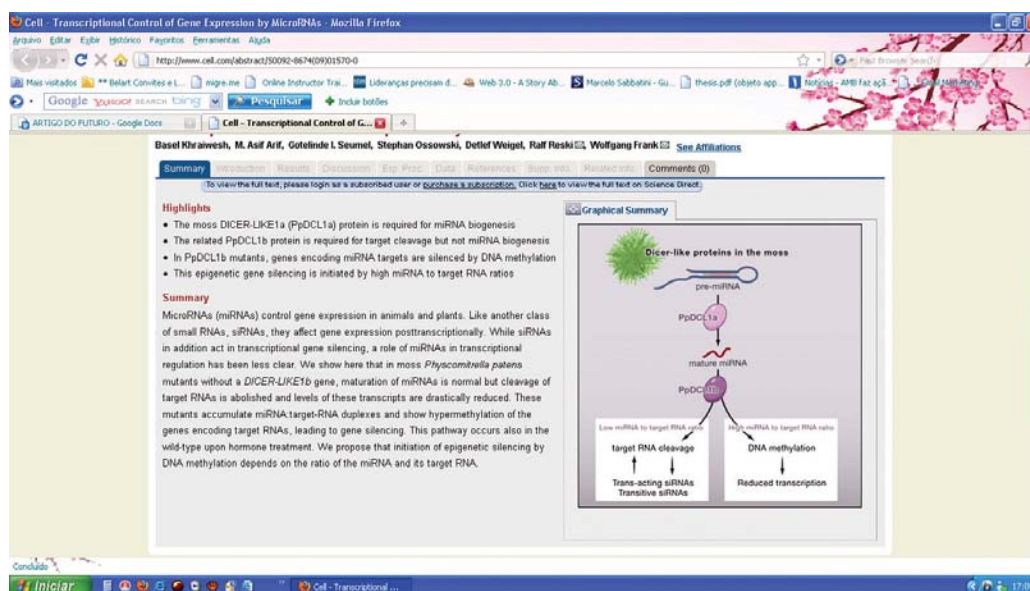


Fig.1 – The Cell website with an article published

All information available on the web, relevant and related to this article is cited and "linked" to the available article, so the reader can peer into the subject without the need to do another research on other web sites. The option to comment and add information makes the article more complete.

This new way of publishing shows how the Internet and technology are important and speed-up the process of information diffusion. According to Emilie Marcus, editor in chief of the Cell journal, the birth of the project of "Article of the Future" arose from the challenge of starting the structure from the scratch in a most effective way in order to present the contents of a traditional scientific paper in an online environment" [10].

In view of this new world of technological evolution, some important points to the user needs have been highlighted. The main one, and perhaps the easiest, is the knowledge of computer and Internet, which today is not a drawback anymore, since the majority of researchers and readers are using this outstanding equipment.

The English language is mandatory, once 80% of the more complete and updated publications are in English language. If the reader needs to be quickly and globally updated, he/she must know that language.

Another important issue to take into consideration is the quality of articles, since with this new technology it is possible for any user to access and enter information. Probably, it should be developed a new model of evaluation, such as the number of citations obtained and comments and assessment of articles posted as well but this is yet something to be considered.

There is great a concern about the plagiarism, once the easiness of searching information provided by the Internet became also an easy target for copies of existing articles. There are tools that aid to find these plagiarisms. We can quote the example of eTBLAST, a text similarity engine, which allows the detection of duplicate publications, including in the site itself a piece of the text in question and the system searches in well-known databases informing the plagiarism, if it is the case [11].

Fachin [12] presents a study to build an evaluation model for standardization of Brazilian scientific journals online. The results have shown a lack of norms and management patterns in online publications, which hamper the technical-scientific production.

The process of insertion of an existing article consists in the author to write the study resulting from his/her research and submit to the journal or publishing house for scientific publication. The journal, in turn, sends the article for approval, using the peer review process, in which other researchers in the same area will evaluate, question and approve or not the article submitted. This system of peer review is normally slow. The article is sent to the author for revision and correction as

many times as necessary. Upon approval, the article is also reviewed as to the technical-scientific language. When the article is completed and approved, it is then published. Depending on the editorial board, this process can take up to one year to final publication, without considering the layout of the article and the journal.

The digital article - as we can denominate what is produced by this technology - is sent by e-mail and the reviewer can read and correct it in the Internet, or from your device connected to the network. The device can be a personal computer, notebook and even a cell phone. This process becomes faster and the article is published in the next issue of the journal. This time from submission to publication of the article is up to two months at the most; a time greatly reduced in comparison to print media [2].

### The Future

A breakthrough already used by companies, such as Google and IBM is attracting the attention of all companies. It is called "Cloud Computing" - a new way to organize and store information. It consists in sharing computational tools through the interconnection of systems, with a database available on the Web. It represents a new point of view of computer networks [13].

In this cloud computing, the access to major programs or personal files is done directly through the Internet, instead of data and tools being stored on the server or on your local machine [14].

Thus, this new system would reduce the cost with the Information Technology (IT) used in the companies, which now occupies 80% of the time of large organizations, according to Clifton Ashley, director of Google [15]. This structure is more than a computer network, it must have infrastructure for management, including functions that use the computers' resources, balance of work and a monitoring of the performance.

Several companies are investing in this new system. The first to adopt this technological trend was Google in 2002, with the creation of a text-editing software (Google Docs), spreadsheets, electronic presentations (Google Presentation), email and calendars, all developed for use on the Internet with no need to download the programs or to have them installed on the computer itself [15,16].

In Brazil, a specialized company in search engine systems, Katri, was first to develop this technology in 2002 under the name of IUGU applied in the search site for individuals and corporations, with a very marked difference in speed, if in comparison to other search processes [17].

The fact of using software without having to install them on the computers is the great advantage of this new system, because today, the major concern is to download or upload, i.e., send or receive files which you are not able to visualize, because you do not have the necessary

software installed on your computer. In most cases, you have to pay a high cost for it. This software can be used even without Internet access (offline), so in the next access, the data generated will be available online.

This work was carried out using the above feature of Google Docs. The authors participated online of the research and each one could add information to his/hers own computer, or device, using the Internet at their available time. Consequently, other collaborators could check the changes, authors could be connected simultaneously, and at each change was necessary to save the document, and after that, the other author can visualize.

According to Pires [18], the Article of the future is “born digital”, i.e., it is not designed to be read printed. The text is written taking into account the hypertextual and hypermediatic characteristics of electronic objects. The same author points out that only a written text using a desktop publishing software like Microsoft Word, is not necessarily a born digital text, because there is a need of an arrangement in order to facilitate the exchange of information between people or computers [18]. Authors should be aware that technology can and will help you improve and speed-up the process of scientific publication.

Another resource provided by that technology is the access to scientific paper, which becomes faster and updated. The reader has the facility to read the entire article, once many journals are providing free access - OPEN ACCESS, or by the authors’ personal sites as well. The opportunity to add information to the article through the comments that can be made online is also an improvement for the scientific community.

The publication of articles on the Internet is growing faster. Many journals are offering their articles initially online, due to the easiness of the layout. This increases the exposure of the article to criticisms and comments, in addition to speed-up the dissemination of knowledge.

The amount of equipment available for electronic access to the product increased as well. There are several devices on the market that connect to the Internet and use communication networks, besides the personal computer. A few years ago, the only way to read the article was through a printed journal. The beginning of the Internet provided the access through a computer, but technological evolution allowed this access in several ways and at any time. An interesting example and perhaps not yet widely known, although well diffused, is the podcast. An article or an audio recorded text can be heard on any MP3 device, allowing users to store this text in their MP3 players in the car and just listen to the information without the need to be still to read. It is also a nice resource for the visually impaired. This feature is present in the online version of this article.

The scientific journal has obtained a new form of research, but it does not rule out the print media, once we

still have many users who do not have the habit of do research through computers, unfortunately. The journals are sent to libraries, but many of these do not have access to the Internet, or just a few computers available for research. Several online journals do not allow access to the full article, normally only the abstract is published on the Internet.

Martin Orth [19] states that only in rare cases, the traditional media will be eliminated; the Internet is a platform with all the contents. The reproducing apparatus will exist, such as books, but may be differentiated, not eliminated.

Most of the publications of scientific articles on-line offer the same article in PDF - Portable Document File, a practical file format that occupies less space for visualizing the article, following the layout pattern of the printed journal. This format is widely used also for the dissemination of electronic books, derived from the well-known word in English, E-book. E-books are complete books that can be read from electronic equipment such as computers, cell phones and PDA - Personal Digital Assistants, a computer of great computational power, but with reduced size. The advantage of PDA over the printed book is the portability. The e-books can be recorded into CDs, DVDs and flash drives [20].

The technological trend is that we can increasingly interact with other authors reciprocally, using various electronic devices, such as computer, television, cell phone and iPod, accessing and exchanging information anywhere and at anytime. That’s what Web 2.0 promises. There is considerable interest in disseminating information through complete scientific articles available on the Internet without the need to make a subscription or payment. This is called Open Access - open access to knowledge.

PLoS - Public Library of Science - an organization of scientists and physicians committed to developing a source of free medical and scientific literature, is an example of a company with free access. Founded in 2000, PLoS provides full articles without the need of prior subscription. The articles published in PLoS, in English language, are freely accessible to the public. PLoS requires as a condition for the free access the appropriate citation of the study, in the terms due to the law [21].

The publication of scientific articles with features technologically updated is now real. Some journals are already taking part of this virtual world, posting videos with the subject of the article being fully detailed. An example in Brazil is BJCVS – the Brazilian Journal of Cardiovascular Surgery, organ of the Brazilian Society of Cardiovascular Surgery (BSCVS), which published its first article with insertion of a video explaining the technique used in the present published article. The article “Total cavopulmonary connection with extracardiac conduit without cardiopulmonary bypass” was published in the July, 2008 issue number 23.3 of the journal. Members of the

BSCVS received together with the printed magazine, a DVD with the technique used. On the journal website, both the full article and video are available [22].

The first Brazilian scientific journal that adopted the video version, designated SEER, was the Online Brazilian Journal of Nursing (OBJN). In 2004, the OBJN published the video version of its editorial section [23].

The scientific article is an exchange of information and incitement to knowledge. The doctor keeps up-to-date and discloses his/her research to other scientists of the same or from a different area. The continuing medical education, known in Brazil as EMC, is widely spread among these professionals. It is considered an educational level, allowing the physician to revalidate his/her title of specialist obtained through their professional organizations.

This kind of continuing education is being widely used throughout the Internet. It has been known as Distance Medical Education (EMaD). In it, the user performs the tests at the desired time and location. In 2009, the system of continuing medical education online was used for the first time in Brazil, by the BJCVS in the cardiovascular area [24]. The first scientific paper using this new form of education - "The Importance of troponin I in the diagnosis of myocardial infarction in the postoperative coronary artery bypass surgery" - has a link for questions to be answered on the site, with an interactive system, demonstrating both the correct and incorrect answers, and making room for reading the article. All the journal issues offer several articles with this questionnaire. By taking the test, the associated is allowed to get points to obtain and renew his/her Title of Specialist, besides getting a certificate.

The technology allows you to produce a paper like this, fully using the collaborative space of the Internet, available on the new storage format, the digital cloud. This is an innovative way to create an article by typing it directly online, interacting with other co-workers and making the research more complete and updated. It is noteworthy that the article submission has also become a fast and practical process, and completely online. The author sends his/her work directly via e-mail, or by its own system. Most journals accept streaming media, i.e., the article can be sent at any time, allowing greater flexibility in the process of evaluation and reviewing. The article should have been formatted in agreement to the requirements of each magazine.

The peer review system, as quoted in this article, is the process of submitting manuscripts to researchers from the same area for evaluation, which is currently held by e-mail. The evaluator depends on the time available to access the e-mail and respond to other reviewers, who also have their own schedule to access the Internet. If a mobile device is not available, it will take longer to send the answer. The idea is that you can use this new trend of "cloud computing"

in which reviewers can evaluate each item while providing agility in reviewing and publication of the article.

According to Seringhaus and Gerstein [25], the peer review will be carried out by multi-levels, community comments, and notes. The research results will be made individually to the users' profile. This entire large information network will be linked, connected, and

## CONCLUSION

Scientific articles with state-of-the-art technology resources are already available. Most of them can count on multimediatic tools that include submission to journals and the Continuing Medical Education process with the professional certification and the recognition of the title by his/her professional society, as exemplified in the case of BJCVS. The trend is the increased availability and access to resources with Web 2.0.

There is a movement toward the open access - unrestricted access to scientific publications, but we still cannot claim that it is a worldwide trend. Initiatives such as PLoS are important sources to disseminate scientific knowledge of quality.

This is an irreversible process, gathering of knowledge and science, whose tool should be well-known and safely used with technological precaution and scientific rigor, in order to contribute to the process of scientific knowledge dissemination.

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## GLOSSARY

**Hard Drive** – Also known as HD (derived from hard disk drive), is part of the computer where data is stored. The hard drive is a non-volatile memory, i.e., the information is not lost when the computer is shut down. It is considered the primary means of data storage.

**Download** - It is the transference of data from a remote computer to a local computer: the opposite of upload.

**E-book** – It is a digital book (an electronic Book) - It is a book in digital format that can be read in electronic equipment such as computers, PDAs or even cell phones that support this feature. The most common formats of e-books are the PDF and HTML.

**Links** – It is a word, text, image or expression that allows immediate access to another part of the same or another document or website, simply by pointing and clicking with the mouse. In a hypertext, a link in the form of word or phrase, is underlined and written in different color from that used for the rest of the text. Clicking on the link, the user is taken to another page or part of the same page.

**Media** – The term media had been created to describe the function, the professional area, the media work, or the act of planning, developing, thinking and practicing the media in advertising agencies. It is used for communication media and also in computer storage media such as CD, floppy, and DVD.

**MP3** – It was one of the first types of audio compression with loss of quality almost imperceptible to the human ear.

**Off-line** – It is a term for the person, computer or document which are not available for immediate access, in real time. Instant messenger means to be ready for immediate transmission of data, either through spoken or written means. In the context of another information system, means to be in full operation, according to the tasks that network or system. It represents the unavailability of user access to the network or communications system.

**Open Access** – It is a condensed form to refer to open access to knowledge. Open Access means free availability on the Internet for scientific literature, allowing any user to search, view, download, print, copy, and distribute the full text of articles and other sources of scientific information.

**PDF** – Abbreviation for Portable Document Format – Portable File Format is a file format developed by Adobe Systems to represent documents independently of the application, hardware, and operating system used to create them. A PDF file can describe documents containing text, graphics, and images in a format regardless the device and

resolution. It is widely used by journals for publication online. You need a program installed on your computer, called a pdf reader to view the file.

**PDA - Personal digital assistants (PDAs ou handheld)** are a reduced-size computer (about A6), which has a large computational capacity, fulfilling the functions of an agenda and basic office computer systems with the possibility of interconnection with a personal

**Podcast** – The name given to the digital audio file, usually in MP3 or AAC (the latter may contain images and links), published by podcasting on the Internet. It can also refer to the number of episodes of a program as to how it is distributed. The word is a conjunction of iPod or “Personal On Demand” and broadcast (radio or television). The video podcast is called “videocast” often in MP4 file format.

**Websites** - It is a set of pages, i.e., hypertext, usually accessible by the HTTP protocol on the Internet. The World Wide Web is composed of a set of all existing public web sites. The pages on a web site are organized from a basic URL, where the main page is hosted, and usually stay in the same directory from the server.