

# CRITERIA FOR ANALYSIS OF THE STRUCTURE OF ELECTRONIC SCIENTIFIC JOURNALS

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This paper is the result of the Masters dissertation studying the role and history of scientific communication, especially the changes that have occurred after the appearance of electronic communication and computer networks. This study showed that hypertext systems are increasingly being used in the scientific and academic world in the production of electronic journals; this makes it possible for the user to rapidly access information in their area. However, these systems need to be improved to help the user during search and access to information. Both printed journals migrating to electronic media, and the exclusively electronic journals should present the current quality indicators. The attempt was made to discover whether characteristics related to printed journals are being maintained in their electronic counterparts. For this, a prototype model was developed to analyze the structure of electronic scientific journals; it composes 14 criteria expressing aspects of quality for these journals. It includes elements of Website Information Architecture and those already in place in printed scientific journals in order to ensure that basic functions – archiving and dissemination – are maintained in electronic publishing. Each criterion consists of variables, which measure the maintenance of these functions both in the migrating printed journals and the exclusively electronic ones. This prototype model was used to analyze *Ciência da Informação On-line* and *DataGramaZero – Revista de Ciência da Informação*. Results indicate that this model is able to find out if the basic functions of archiving and dissemination are being maintained in electronic journals. Therefore, its implementation is justified in electronic journals. The model can help librarians, authors, and users of electronic journals to identify quality journals, and assist editors in developing their projects. The material from the study may be included in the preservice and inservice education of Information Science professionals and to support editors of scientific journals.

**Keywords:** electronic scientific journal; quality criteria; analysis of structure of electronic journal; web site Information Architecture; Information Science.

## INTRODUCTION

Hypertext systems are frequently used in the academic and scientific world, in the production of electronic journals making it user access to information easier and more rapid. However, these systems should be improved to help users in their search for and access to information. In this sense, both printed journals migrating to electronic media and the exclusively electronic periodicals, should present the quality indicators that are currently considered by the academic community. They should also consider the elements of website information architecture.<sup>1</sup>

The fact that the publication is electronically published does not annul the criticisms that have been made internationally, also highlighted by Krzyzanowski and Ferreira<sup>2</sup>, calling attention to the large number of journals that do not have the quality criteria, therefore wasting efforts, published material, and funds, leading to a loss of prestige from scientific organizations and university institutions. It is well known that the lack of quality standards in scientific journals prejudices their being indexed in international bibliographies and indexes, which also use quality criteria.

To help ensure the quality of electronic journals, a prototype “Model for Analysis of the Structure of Electronic Scientific Journals” was developed. This consists of 14 criteria that express the quality aspects of these publications. It includes elements of website information architecture and quality elements already in use in printed scientific journals in

an attempt to ensure the maintenance of archiving and dissemination – the basic functions of a journal – in electronic publications.

For the prototype, a reference standard was developed to identify which quality criteria are kept, included, or excluded in electronic scientific journals, and which elements of information architecture should be used in its production. In addition to a review of literature, the following were analyzed: final reports of experiences that focus on the distribution of electronic journals; material available on the sites of national and international institutions which use periodic evaluation methods; studies about user needs in electronic journals.

## **THEORETICAL BASIS**

Since 1960, studies on scientific publication quality have shown the need to define measurable parameters and discuss the quality of the information in scientific and technical journals.<sup>2,3,4,5,6,7</sup> This has come from printed periodicals is relevant in the production and evaluation of electronic scientific journals.

In 1982, Braga and Oberhofer<sup>4</sup> presented a model to evaluate Brazilian scientific and technical journals. There were seven criteria in this new method (normalization; duration; periodicity; indexing; diffusion; collaboration and content division; authority) that attempt to show quality aspects and include measurable evaluation parameters. Each criterion had a number of variables with their respective scores. At the end of the process, a total score determined journal performance level category such as very good, good, average, or weak.

In 1991, Krzyzanowski et al.<sup>6</sup> continued a 1988 project evaluating Brazilian scientific journals, to improve and update the basic of nucleus of relevant titles from different knowledge areas. The methodology used in both studies analyzed the merit of journals by their peers using parameters predefined by the authors, including: quality of publication, nature of the publishing institution, scope, indexing, and tradition, regularity, and relative importance within the area. At the end of the study, the journals were classified into three relevant levels: high priority, important, and relatively important.

Castro et al.<sup>7</sup> studied Latin American periodicals indexed in Medlars Online and LILACS [Literatura Latino-Americana e do Caribe em Ciências da Saúde]. One of the objectives was to establish a model questionnaire to initially evaluate journals submitted for indexing in LILACS. The authors adopted a modified Braga and Oberhofer<sup>4</sup> model.

Krzyzanowski and Ferreira<sup>2</sup>, after analyzing printed publications, developed a method to evaluate merit (content) and performance (form) of technical and scientific Brazilian publications in circulation. Merit evaluation followed three established procedures and form evaluation the Braga and Oberhofer model.<sup>4</sup>

On an international level, Garfield<sup>5</sup> emphasizes that qualitative and quantitative factors be observed during the journal selection process for the ISI database. Basically three types of information are analyzed, citation data, journal standards, and expert judgment. In relation to standards, the most important is periodicity but others are also considered: use of international editorial conventions; communicative journal titles; article titles; descriptive abstracts and key words with English translation; complete bibliographic data for all cited references; and complete address of authors. Peer review is another indicator of journal standard.

In a work about the ISI selection process, Testa<sup>8</sup> discussed evaluation of electronic journals in the database using the same quality indicators found in printed journals such as: editorial content; reputation of editorial board and authors; financial support; peer review; and internationality. Also, considering the specificity of the electronic medium, the author emphasizes the need for alterations and implementations in the evaluation process of this type of journal.

According to Testa<sup>9</sup>, the electronic version may speed up communication between editor and researchers, making supplementary editorial material available on the site.

In 1998, at an international Workshop was promoted by international organizations to identify practices and standards for scientific electronic publishing, addressing problems such as: what constitutes a publication, citation, the peer review process, full and open access versus intellectual property rights, privacy, integrity and authentication of material, and archiving.<sup>10</sup>

Tenopir and King<sup>11</sup>, addressing new publication models, highlighted that all links used in the structure of publication that allow a relation between the author and user or reader participate in the process of electronic transference of information. They also emphasize that this author/reader relationship is essential to knowledge dissemination, be it oral, written, or electronic. The authors summarize questions which must be answered those who are going to publish an electronic journal as shown below.

## FIGURE 1. DECISION ELEMENTS TO BE CONSIDERED IN PERIODICAL SYSTEMS.<sup>11</sup>

In the search for quality criteria that should be observed in electronic publication evaluation, ICAAP [International Consortium for the Advancement of Academic Publication] can be cited, adopting the following criteria for inclusion of a periodical in its databank: quality; presentation of full papers; low cost or free distribution.<sup>12</sup>

In Brazil, the SciELO Project<sup>13</sup> uses evaluation criteria for admission and permanence of titles in its electronic collection. A non-qualified periodical is automatically evaluated according the following indicators: scientific content; peer review; editorial board; periodicity; duration; frequency; abstract, keywords, and title in English; normalization.

Trzesniak<sup>14</sup> preliminary proposal of requirements for electronic publishing highlights the following items: the publication to be available in three secure servers at different locations; information about procedures used to preserve the published material; visualization of the bibliographic strip in all pages; mention of complete date and time of article acceptance; presence of links facilitating user navigation; and statistical control of article electronic access.

The development of the Internet and new information and communication technologies brought with them the need to identify and protect document content. For this, in addition to ISSN codes, CODEN, and bar codes, other identifiers appeared in the digital medium: DOI [Digital Object Identifier] and [Serial Item and Contribution Identifier]. DOI is used by editors, as it is a chain of characters that allows identification of intellectual property in the electronic medium. It is a unique and permanent identifier of specific content and a system that allows access to this digital content.<sup>15</sup>

The inclusion of errata or update information also requires attention in the electronic medium, in maintaining corresponding old articles.<sup>11</sup> The ease of immediate on-line text update or correction is one of the advantages available to electronic journals; the availability of the full article with updates does not occur in traditional journals, which present corrections in later issues.

Finally, electronic publication especially on the Internet, should consider the suitability of Information Architecture element application in electronic scientific journal page structure.

According to Rosenfeld and Morville<sup>1</sup>, Information Architecture consists of four basic elements: organization systems - ways of organizing information on websites; label systems – the way the reader denominates the content of information groups; navigation systems – navigation bars and site maps allowing the user to move around and leave the site; search systems - help the user to formulate queries that may result in relevant documents.

The authors emphasize that these four elements should be observed during website development. In this study the pages of an electronic scientific journal make up a website or simply site.

Straiato<sup>16</sup> presented a study on these four elements to analyze scientific-scholarly gateways. The author included additional elements such as information content<sup>17</sup>; site usability<sup>18,19</sup>; and some types of documents<sup>20</sup>.

The adequate structuring of navigation, search, labeling, organization, information content, document types, and site usability systems, allow the reader/user to rapidly find the desired information. These are important as the reader/user can access articles faster in electronic media.

## METHODOLOGY

This study was characterized as an analytical descriptive research based on document analysis, to develop a prototype “Model for analysis of the structure of electronic scientific journals” and apply it in the analysis of two Brazilian electronic journals from the area of Information Science.

The prototype was based on: Braga and Oberhofer<sup>4</sup>; McKnight<sup>21</sup>; TULIP<sup>22</sup>; Krzyzanowski and Ferreira<sup>2</sup>; AAAS/UNESCO/ICSU<sup>10</sup>; Rosenfeld and Morville<sup>1</sup>; Testa<sup>8,9</sup>; Tenopir and King<sup>11</sup>; IBICT<sup>23</sup>; King and Tenopir<sup>27</sup>; Martín<sup>15</sup>; Trzesniak<sup>14</sup>; ICAAP<sup>12</sup>; Straiato<sup>16</sup>; JSTOR<sup>24</sup>.

The journals chosen show full papers on the Internet at no cost. The first *CIONline* [Ciência da Informação On-line] available at <http://www.ibict.br> also has a printed version; the second, *DataGramZero – Revista de Ciência da Informação*, available at <http://www.dgz.org.br>, is only in electronic version. The choice of these two journals allowed a better comparative study of their electronic structure. All issues of both selected journals

available on the Internet until Dec 2001 were analyzed. The following steps were used in the analysis process:

- electronic access to journal address;
- location of the main page from the first electronically published issue;
- description and analysis of main page and other navigation pages;
- identification of labels and description of the related contents;
- identification of architecture elements in all navigation pages
- link testing;
- representation of the journal's navigation system.

The resulting data were discussed in light of the reference standards.

## RESULTS AND DISCUSSION

### DEVELOPMENT OF THE PROTOTYPE "MODEL FOR ANALYSIS OF THE STRUCTURE OF ELECTRONIC SCIENTIFIC JOURNALS"

The Braga and Oberhofer<sup>4</sup> model used to evaluate traditional technical and scientific Brazilian journals was fundamental to the development of this model, as it addressed the following elements: normalization, duration, periodicity, indexing, diffusion, collaboration, and authority. These criteria reflect quality aspects of journals and consider the applicability, peculiar characteristics of national journals, and validate quality judgment of archiving and dissemination - the basic function of periodic publications.

The Krzyzanowski and Ferreira<sup>2</sup> model (based on Braga and Oberhofer<sup>4</sup>) was used for the variables within each of the above criteria. These variables are divided into six criteria: normalization (of the complete journal, issue, and articles); duration; periodicity, indexing, diffusion; collaboration; and content division.

Based on these models and aiming to attain the specific objectives of this study, the prototype model was developed incorporating criteria and variables that complement the existing ones and reflect quality aspects pertinent to Internet based electronic scientific journals. The elements of this model are described below.

### NORMALIZATION

#### **Adapted variables:**

- ISSN: included on the initial page, other navigation pages, and print files. <sup>23</sup>
- DOI: included in the digital publication.<sup>15</sup>
- Address: complete with e-mail and URL.
- Instructions to authors: complete with indications of guideline and examples for citation of electronic references and links; formats and text and image electronic file size; font and software standardization; delivery by e-mail and ftp. Project approval documentation by CEP and/or CONEP [Research Ethics Committee]<sup>25,26</sup>
- Bibliographic Strip: included on all pages as per Trzesniak<sup>14</sup>.
- Pagination: included without pagination.

#### **Included variables:**

- Storage, distribution and access support: includes topics indicated by AAAS/UNESCO/ICSU<sup>10</sup>; Tenopir and King<sup>11</sup>; Trzesniak<sup>14</sup>, ICAAP<sup>12</sup>; JSTOR<sup>24</sup>.
- Errata: included to rapidly communicate to the reader any alteration to articles already on the Internet.<sup>11</sup>
- Date and/or time (mandatory): included according to Trzesniak<sup>14</sup>: complete date and time of article acceptance; date of article published on electronic media.
- References and electronic addresses: related to the existence of links as per TULIP project<sup>22</sup>, Testa<sup>8,9</sup>, Tenopir and King<sup>11</sup>, Trzesniak<sup>14</sup>.
- Presentation Quality: related to texts and images as per the TULIP project final report<sup>22</sup>.

### PERIODICITY

**Included variable:** continuous flow publication.

### DIFFUSION

**Adapted criteria:**

- Number of accesses to the issue and number of accesses and/or downloads of the article: statistical control as per Trzesniak<sup>14</sup>.
- Direct mailing: as per McKnight<sup>21</sup>, and King and Tenopir<sup>27</sup>.
- Granularity: ways of accessing the document: article; title; issue or volume; and partial document as per Tenopir and King<sup>11</sup>.

Duration, indexing, collaboration, content division, and authority were not altered.

In addition, seven criteria directly related to website architectural elements were included in the model as per Rosenfeld and Morville<sup>1</sup> and Straioto<sup>16</sup>: organization system; navigation system; label system; search system; information content; site usability; and document types. These criteria and their variables are responsible for the quality of the electronic site structure and are directly related to user/reader information retrieval and access. The complete model can be seen below.

**Model for analysis of the structure of electronic scientific journals<sup>28</sup>**

Title \_\_\_\_\_  
 Institution \_\_\_\_\_  
 Volume(s) \_\_\_\_\_ N<sup>o</sup>s. \_\_\_\_\_ Year \_\_\_\_\_ State \_\_\_\_\_ Funding Agency \_\_\_\_\_

## **1 NORMALIZATION**

### **1.1 *The complete Journal***

#### 1.1.1 ISSN and/or DOI

- exists - yes or no
- DOI (related to issue, to article)
- ISSN of printed journal
- ISSN of online journal
- included (main page, other navigation pages, print files)

#### 1.1.2 Address

- complete (e-mail, URL)
- incomplete

#### 1.1.3 Instructions to authors

- exists - yes or no
- complete (including model of bibliographic references and electronic citations /web references)
- peer review system and method
- instructions and examples for references (printed and electronic)
- instructions and examples for electronic citations /web references
- formats and size of electronic files (text and graphics)
- standard fonts and software
- paper submission (postal mail, e-mail, and ftp)
- approval by Research Ethics Committee CEP and/or CONEP

#### 1.1.4 Storage, distribution, and access

- distribution and access: (paper, DVD, CD-ROM, Magnetic tape, Internet)
- storage and access structure: server including mirror

### **1.2 *Issue***

#### 1.2.1 Abstract

- in original language
- bilingual

#### 1.2.2 Bibliographic strip

- exists - yes or no
- included on main page, other navigation pages, print files

#### 1.2.3 Bibliographic references

- normalization (ISO, ABNT, others)

#### 1.2.4 Errata

- exists - yes or no (with date of inclusion)

### **1.3 *Articles***

#### 1.3.1 Author affiliation

- complete (phone, fax, and e-mail)
- incomplete

#### 1.3.2 Abstract (mandatory)

- only in language of article
- only in different language to article
- two or more languages

#### 1.3.3 Descriptors or Keywords

- included in all articles
- not included

#### 1.3.4 Date and/or time (mandatory)

- article receipt and/or acceptance
- article available online
- information update and revisions

### 1.3.5 Pagination

- sequential in the issue
- no page numbers

### 1.3.6 References and electronic addresses

- exists - yes or no
- links

### 1.3.7 Quality of presentation

- visualization
- printing

## 2 DURATION

- survival indicator

## 3 PERIODICITY

- published on time according to stated frequency (number of issues per year)
- not published according to stated frequency (late)
- continuous flow publication

## 4 INDEXING

- inclusion in indexing and abstracting services, periodical directories , specialized databases, or CD-ROM

## 5 DIFFUSION

- number of times the issue is accessed/ journal usage
- number of times the article is accessed or downloaded
- direct mail delivery (article, title, issue or volume, and partial document)

## 6 COLLABORATION AND CONTENT DIVISION

- exists - yes or no

## 7 AUTHORITY

- existence of editorial board

## 8 ORGANIZATION SYSTEM

- schemes
- structures

## 9 NAVIGATION SYSTEM

- hierarchic
- global
- local
- *ad hoc*

## 10 LABEL SYSTEM

- word
- icon

## 11 SEARCH SYSTEM

- known-item searching
- existence searching
- exploratory searching
- comprehensive searching

## 12 INFORMATION CONTENT

- objectivity
- navigability
- visibility

## 13 SITE USABILITY

- friendly interface
- navigability
- functionality
- help (support)
- feedback

## 14 DOCUMENT TYPES

- text (HTML, SGML, PDF, others)
  - images (static and/or animated)
  - sound (MP3, MIDI, WAV)
- 

This prototype was first used to analyze two national Science and Information journals, distributed free on the Internet - *CIOOnline* and *DataGramaZero*. It was possible to ascertain which quality criteria are being maintained during this transition period and which variables are necessary for archiving and dissemination maintenance in e-journals.

Based on the above prototype development theory, the following observations can be made related to the selected journals.

The *CIOOnline*, in general, maintains the periodic functions, as it is an electronic version. In this respect, peer review is highlighted to ensure content quality; it does not present problems related to archiving and dissemination as it maintains storage and access in printed media and on two servers, IBICT and SciELO. However, in the early years of electronic publishing, there is an absence or partial absence of the quality criteria present in printed media, such as pagination, absence of part of the text, article title incompatibility, and changes in some article captions that will compromise future information retrieval. But, the introduction of some elements of Information Architecture can be seen on its site, such as e-mail link to author, and local and global navigation systems. There will be a period of change until better interactivity with user/reader is achieved, however its important to highlight that this is the first step, and that the migration of articles to electronic media may improve dissemination of scientific information.

*DataGramaZero*, despite being exclusively electronic it attempts to preserve periodical functions. Maintenance of peer review is emphasized and the use of two URL's to access information on servers which insures archiving and dissemination. However, storage in the digital medium still requires attention; in the long-term the volume of information will be much higher with the need for constant studies on storage, retrieval, and access. When the journal was first published, receipt and approval dates, quality criteria that ensure copyright, were not present. Descriptors are included from 2001 onwards; that is a criterion that already existed in traditional journals. There is no pagination; this is justified by document type [HTML]. But being electronic "from birth" it has higher user interactivity, allowing access to other sites in search of further information or other scientific articles, a characteristic of hypermedia systems. It has a navigation system that becomes tiresome as it always directs the user to the main page of the selected issue, making him always have to go through navigation pages with little information; this may compromise site usability. This journal will probably go through changes to improve interactivity with its user/reader.

In brief and based on the Model, the following recommendations apply to:

### *CIOOnline:*

- use the final version of the electronic file corresponding to the peer approved paper and published in the printed version;
- check link construction and always keep updated, allowing retrieval the corresponding content;
- keep all information presented in the original content;
- observe information presentation quality on screen and in print;
- develop a search system allowing fast information retrieval and access.

### *DataGramaZero:*

- check link construction and always keep updated, allowing retrieval the corresponding content;
- observe information presentation quality on screen and in print;
- check link construction to remote sites, ensuring good screen area for viewing, using a fixed frame at the side of the screen;
- develop a search system allowing fast information retrieval and access.

## CONCLUSION

This study rediscovered the history of scientific communication and scientific journals that over the last few centuries have become the main medium for research dissemination. During this time, criteria were

introduced to ensure the quality of journals and articles, showing that there was concern to maintain the basic functions of scientific journals - archiving and dissemination.

The use of new information and communication technologies has brought about changes in scientific communication and in the format and distribution of journals; this started in the electronic medium and allows faster dissemination of information and offers advantages over printed media.

This study contributes to scientific knowledge in Information Science focusing on the development of the prototype "Model for the analysis of the structure of electronic scientific journals". The model took criteria and variables from the printed medium and adapted them to the electronic medium; it indicated elements that represent the specific quality criteria of electronic media described by website information architecture to be considered in e-journal development and acquisition.

The following are the conclusions from this study:

In the development of electronic scientific journals, the inter/multidisciplinary work of specialized teams should be prioritized and include the following structural elements: editorial, text and bibliographic normalization, formatting, editing, and textual and visual programming for the digital medium, using the available technological resources selected by the team. This is endorsed by the author's experience, who since 1994 has been responsible for editing an electronic journal indexed in national and international database services.

The "Model for the analysis of the Structure of Electronic Scientific Journals" can be used to analyze printed journals migrating to electronic media and also exclusively electronic journals. It allows verification of whether the basic functions of archiving and dissemination are being maintained in e-journals. In this way, it may help editors and technical personnel to develop e-journal projects. The attention given to all these elements may ensure journal presentation quality and consequently allow them to be indexed in national and international database services.

This model, by presenting quality criteria directly related to electronic media, where evolution is extremely fast, has to be periodically reviewed and modified so that it remains up-to-date and relevant.

Further studies are required to attribute scores to the criteria and variables in the model so that it may help funding agencies analyze the performance (form) and scientific merit of e-journals.

This study can help authors choose quality e-journals assuring authorship credibility and work visibility; give support to e-journal users in relation to quality identification and use; help information science professionals, especially librarians dealing with periodical acquisition and reference; and demand that the scientific e-journal present the quality criteria of the printed journal.

The material obtained can be included in preservice and inservice education of Information Science professionals and give support to editors of electronic scientific journals.

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