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HOW STANDARDS HELP IN THE DISCOVERABILITY OF A SCIENTIFIC JOURNAL

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How standards help in the discoverability of a scientific journal

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ABSTRACT: In Brazil, the amount of journals published "in-house" (without the help of a sizeable commercial publisher) is considerably high. Moreover, due to the lack of experience, it is expected that some of these journals might have low quality in their presentation, which may discourage the academic community from reading or citing it. This paper lists internationally adopted standards for the elaboration of a journal presentation. Besides the mandatory information, the study includes some additional ones to add value to the articles presentation, making the journal more appealing to the readers, and most important, completely machine-readable.

Keywords: Standardization; Identifiers; Metadata; Machine-readable.

INTRODUCTION

A journal's quality should not be related to its visual feature, especially in science, where the quality of the research, the editorial board's scholarly competence, and proper peer review process are what should matter. Nevertheless, adopting some built standards on the journal's presentation not only turns it appealing for the readers but also helps meet the operational requirements related to the search and compilation of the metadata. A well-organized journal 's article presentation with rich underlying metadata arrangement makes it easier to be collected by APIs (Application Programming Interface), which increases the probability of this research to be found, cited, and, above all, read.

In addition to the mandatory elements such as authors' names, affiliations, dates of the peer review process, reference list – to mention a few – it is possible to assign a better appearence to the journal's article by adopting some specific standards for scholarly publication without the demand for any financial investment or technical expertise.

Standardization is fundamental to guarantee that data follows a consistent pattern between distinct articles, ensuring the data functionality and interoperability with scholarly publishing information systems.[1]

METHODOLOGY

The methodology applied went through online collected information associated with scholarly publications. Besides benchmarking the most popular journals, it considers the criteria list created by several directories and index bases worldwise. Usually, these criteria requirements are applied to evaluate the journal. Later on, once the journal is accepted and becomes part of the directory/index base, it will guarantee that the quality is being maintained.

This research is restricted to open access journals/publishers, ensuring the possibility of locating the articles' PDF file to study its format, template/layout, and if it is fulfilling the index requirements.

Data were obtained from the following bases/directories:

- DOAJ (Directory of Open Access Journals): A community-curated online directory that indexes and provides access to high quality, open access, peer-reviewed journals. DOAJ covers more than 11,000 gold open access journals from 122 countries, in 74 languages, and over 300 subject areas.[2]
- SciELO Brazil (Scientific Electronic Library Online): An electronic library covering a selected collection of currently 295 Brazilian scientific journals. The Project envisages the developing a standard methodology for the preparation, storage, dissemination and evaluation of scientific literature in electronic format.[3]

- SpringerOpen: A portfolio of more than 200 peer-reviewed fully open access journals across all areas of science.[4]
- Scopus: A source-neutral abstract and citation database curated by independent subject matter experts. It currently indexes content from 24,600 active titles and 5,000 publishers with rigorously vetted and selected.[5]

These bases and directories mention requests for mandatory elements, and the cross of the information between all of them is highlighted in this study.

RESULTS AND DISCUSSION

The standards listed in this paper refer mainly to metadata but are not limited to it. On scientific publishing, the precise information incorporated on XML, for example, makes it machine-readable, and this rich underlying structure turns the paper more discoverable.

This study is divided into: Essential Metadata, Parts of an Article, and Running heads and Footline.

Essential Metadata

The most crucial metadata, according to international standards, are listed below. The correct use is indispensable to make articles machine-readable by various information systems, aiming its discoverability:

Title

The title is a significant part of an article that should be defined to engage the reader's attention at first sight. It should be informative, precise and reflect the work's aim. With the fewest possible words, it can't be too long to be read or too short to be descriptive; a mean of 10 to 15 substantive terms usually works fine.

It is also recommended to use words to create a positive impression and stimulate reader interest. However, it is essential to avoid terms that can be unfamiliar to potential international readers.[6]

To avoid a wordy title, it is important not to include "Study of", "Investigations on", "Analysis of", or similar constructions; also, abbreviations, acronyms and jargons should not be allowed.[7]

Authorship

Every study has a researcher who idealizes it, defines its objectives, decides which material to be studied and which method to be employed. This researcher must be defined as the primary author, and his name must appear at first in the list of authors. As for the co-authors, the ones contributing to the research, the criteria may vary from each journal, such as the importance of their contribution or the alphabetical order.[8]

Once the authors are appropriately informed on the paper, the next essential step is to identify them properly. The best practice nowadays is to apply ORCID iDs (Open Research and Contributor ID) on the paper.

ORCID is a digital identifier for authors and contributors, it provides disambiguation, differentiating it from other researchers who may have the same name and surname, giving the authors an identifier that will free them of any concern regarding different forms of citation, misspelling and changes of maiden name/married name.

The journals should require every author to inform their ORCID ID, which is quick to register, free of charge and has international acceptance.

Besides guaranteeing worldwide visibility, it helps to connect and update publications by synchronizing data exchanges between trusted organizations (such as funding and development agencies, corporate systems, and publishers) – these updates work after authorization. The linking method is fast, reliable, and transparent, being no longer necessary to update activities in several databases and curriculums.[9]

An accurate way to display this data is by mentioning the author's name followed by the ORCID iD icon () and iD URI.[10]

Correspondence author

While submitting a paper for a journal, one of the authors needs to take charge for the manuscript process and direct communication with the journal and, later on, with the readers. This author is called the corresponding author. All communication concerning the paper is handled and sent to the corresponding author (since communicating with the journal's board, until reviewing the paper, submitting new versions and clarifying possible questions). This author is also responsible for the accuracy and completeness of the paper. For online publications, it is enough only to indicate the e-mail address of the author. No physical address is needed since the connection with the affiliation will also be indicated.[11]

An effective way of identifying the corresponding author in the paper is by adding an asterisk after his name.

To define who will be the corresponding author, it can be reasonable the one with the most knowledge of the paper and therefore more capable to answering questions about the research, or the senior researcher/academic, with considerable publishing knowledge and experience.[12]

Institutional affiliation

A good and straightforward way to present the institutional affiliation is to inform the institution to which each author is linked, in up to 3 instances and in descending order (e.g., University > Faculty > Department), followed by city, state/province and country.

To standardize and avoid problems with not finding that metadata or having a standard way to identify affiliations is highly recommended that journals adopt ROR (an open infrastructure for affiliations IDs). ROR is open and non-commercial. It focuses specifically on the affiliation piece and on how to connect research organizations to research outputs. It is a community-led project.

To picture an example, Maria Gould[13] found the same affiliation written in four different ways:

- UCLA School of Medicine
- Schoool of Medicine at UCLA
- UCLA David Geffen School of Medicine
- David Geffen School of Medicine, University of California, Los Angeles

This variation makes it hard to get a complete picture of all of the research outputs associated with a specific institution. The ROR ID for the David Geffen School of Medicine is: https://ror.org/00mjfew53. A standard and globally unique identifier is used instead of those four different variants of the name. The journal can use the ID to get a more complete and accurate picture of all of those outputs.

To implement the ROR in the journal's workflow it is suggested that the researcher selects affiliation at RORs list (https://ror.org/), after the journal checks for competing interests, the paper is published with the affiliation and the ROR ID deposited in Crossref metadata. It is essential to deposit the ROR ID in Crossref metadata but it is optional (even though it is preferable) to inform the ROR ID on the final PDF, in this last case, it is recommended to add the ROR icon ( ) to link the identifier to its institution.

Abstract

An abstract has to compile the central aspects of an entire paper. It has to be brief (about 200 words) and informative enough to help the readers decide if the paper is what they need to read.

To ensure that the abstract is well written, all the abstract topics have to be adequately filled:

- Background: why is this study relevant?
- Objective: what were the intentions of this study?
- Method: what was done to achieve the goals?

- Results: what were the main results?
- Conclusion: why were the results significant?

After verifying if every aspect of the abstract is well informed, a final question could be: if the abstract was the only part of the study that could be accessed, are the amount of information presented enough? Does it describe the research well? If the answer is negative, then the abstract likely needs to be revised.[6]

As well as the Titles, the Abstracts also have some information that should be avoided. It should not have acronyms, jargons, any image, tables, use of the first person, lengthy background information or references to other literature.[7]

Keywords

Using a vocabulary thesaurus to ensure common words in the field and related areas, such as MeSH for biomedical index content, NASA Thesaurus for aerospace technology or even Google Scholar, facilitates the literature searches and the choice of proper keywords for the manuscript. It is also common for the journal to inform some preferred terms. The number of keywords may vary from each journal, but it is usually between 4 to 8 descriptors.

It is essential to choose wisely the keywords to avoid words that may lead to false matches (same word with different meanings). This metadata's right choice will increase the study's visibility due to the algorithm used by many search engines.[14]

Editorial Proccess Dates

When submitting the journal in a relevant index database, during the evaluation process, one of the verified qualifications is the efficient management of the reception, flow, evaluation of manuscripts and edition (copyediting and typesetting) of the approved articles.[1] This performance of the journal in bibliometric indicators also apprises its quality. The advised way of displaying this data is to inform the received and approval dates in a noticeable part of the paper, together with other metadata such as affiliations and correspondence contact.

Peer Review History

There are many different ways to peer review a paper, displaying on the final PDF version the information of the peer review process's history brings reliability to the journal since the reader can easily find this information on the own research. It could also be displayed together with the other essential metadata previously mentioned.

A step forward would be to inform the type of peer review and publish the review itself. It is possible to assign a DOI to the review at Crossref as supplemental metadata and then display the link in the own paper. This choice shows transparency and strengthens the validity of the work, and also gives credits to reviewers. It is also possible to indicate if the paper was submitted to a preprint base, by displaying the DOI of the preprint version and linking on the metadata (xml tag: isPrePrintOf).

According to PLoS,[15] signed and published reviews help contextualize research, giving readers the benefit of expert opinions that would otherwise remain hidden.

Section Editor

Publishing the name of the Section Editors at the manuscript is a form to appreciate this valuable work.[1] It is also common to name Section Editors as Associated Editors.

These professionals are researchers recognized in their field, and their names should be displayed followed by their ORCID iD.

Following this practice, the journal is, besides crediting the Section Editor's work, also aligning to open science and highlighting the researcher's capacity to manage the evaluation of the paper.

Types of Articles

Journals publish many different kinds of articles. The names used to label those often change among different fields.[16] Even though it may seem there are a vast number of types due to the considerable variation of names, most are one of the followings: Original Paper, Review Articles, Brief Communication and Case Reports. However, what might be called Original Research in one journal, might be an Original Article or Article in another publication, meaning that each type of scholarly article tends to have more than one name.[17]

This way, it is essential that the journal clarifies on their website the types of articles published, helping readers familiarize themselves with the different types.

Once it is defined by the journal, and since there is no orientation on standardizing this metadata, it is important to display this information in a prominent place, as the first page's header, in the final pdf version.

Digital Object Identifier (DOI) Display

The Digital Object Identifier (DOI) is the most crucial ID for scholarly publication.

There is no mandatory orientation, but since it is super important information, it is recommended to present the article's DOI on the first page and be noticeable. The header of the first page is a fitting location.

Also, there is one right way to display Crossref DOIs in a consistent way; it should follow these guidelines[18]:

- Be clickable (use its own DOI as a link, not the URL)
- Not be preceded by doi: or DOI:
- Always be displayed as a full URL link in the form https://doi.org/10.xxxx/xxxxx
- Not use dx in the domain name part of DOI links
- Use HTTPS (rather than HTTP).

Copyright and Licenses

Journals need to present the type of copyright under which work will be published[19]; for that, it is advised to rely on Creative Commons (CC) licenses.

CC licenses are worldwide adopted as an adequate legal solution to make explicit, promote and foment the reuse of a research results.[20] It offers six different copyright licenses, all free of charge and easy to use, creating a standard and straightforward way to give the readers permission to share and use the work.

The journal should identify which one of the six licenses is the best for its purpose. Once identified the license, it is possible to download the specific license logo and add it as a button on the PDF. This button should take the reader to the legal terms showing the conceived permissions.[21]

Crossmark

Crossmark is a Crossref service offering a standardized button that reveals the article's status, showing the reader if it has been thrown any corrections, retractions, updates, or actual current.

Displaying this information turns the journal more reliable, as readers will know they can use and cite the research with confidence.

It is essential to highlight that there is nothing harmful or wrong about updating scientific research or adding corrections. However, if it is done, the reader has to know about this retraction or errata and, since each journal would have its own guideline to publish a correction/update, Crossmark comes to solve this situation offering a standardization for this, making it very convenient to find in only one button a place to access information. Crossmark is free of charge for both journals and readers.

The journal has to place the Crossmark button close to the article's title and commit to informing Crossref if there is an update such as a correction or retraction. It is crucial to apply the Crossmark button to all current content, not just content that has updates, to show readers that you are participating in Crossmark and check your content for updates through the button.[22]

Parts of an Article

IMRAD Structure

The IMRaD (Introduction-Methods-Results-and-Discussion) refers to the standard structure of the body of scientific writing (after the Title and Abstract).[23]

By answering the main questions for each topic, the researcher can realize if the manuscript is communicating well:

- Introduction: Why did you do it in the first place?
  This part should provide background information of your work, explicating what problem was studied.
- Methods: How did you do it exactly?
  This section should provide in detail the methodology used to conduct the research; the details should be so accurate that the reader has to be able to replicate the experiment.
- Results: What did you find?
  Without interpreting or discussing the results, the researcher should simply state, in a logical order, what was found in the study. Data should not be repeated among the text, tables and figures.
- Discussion: What does it mean after all?
  Moreover, in this part, the article should present what the results mean.

IMRaD does not always represent current research activities; technological advances may influence publishing and editing. However, for now, IMRaD still rules, and modifications will continue.[24]

According to Meadows,[25] the IMRaD structure facilitates modular reading because readers usually do not read linearly but browse in each part of the manuscript, looking for specific information, which is usually found in pre-established areas of the paper.

Funding

As Cochran[26] explained in the Scholarly Kitchen blog, Funder Registry (Fundref) was born to tie research dollars to research articles efficiently. It guarantees that funding data is not just mentioned in an article's acknowledgments but that there are standardized controls of this information built into an article's metadata.

Fundref is a standard taxonomy of more than 15,000 funding body names and growing.[27] This information should be presented on the PDF of the article and informed while registering the DOI (deposit should include funder names, funder IDs, and associated grant numbers).[28] Each funding organization has its persistent ID, and it can be found at the Crossref website.

Besides the researchers aiding their agreement with funders' requirements for acknowledgments, another benefit of this transparency is that the funders can also track outcomes of studies granted. Also, the readers can read the article in the context of knowing who financed it.

Acknowledgment Section

The acknowledgment is a section of a paper that should be added to the end of the paper, usually following the Conclusion section. It intends to appreciate all of the people who assisted with the research but did not qualify as an author).[29]

It is up to the author(s) what they feel should be acknowledged.[29] However, in scientific papers, contributions not explicitly related to your research, including personal guidance as family and friends, should not be cited. The authors should acknowledge anyone who provided academic assistance, technical help, or special equipment or materials.[29] The International Committee of Medical Journal Editors (ICMJE)[30] defines various functions that deserve acknowledgment: "acquisition of funding; general supervision of a research group or general administrative support; and writing assistance, technical editing, language editing, and proofreading."

Crucially to state that this section should be as succinct as possible, written in the first person, and the reason why the person is being cited should be specified. It might seem that this section is trivial; nevertheless, it establishes an indispensable means to ensure that all the support for the paper can be transparently and adequately declared. By acknowledging all the help received with the research, the researcher is demonstrating integrity.[31]

Authors' Contribution

The ghost, gift or bought authorship is a regular debate in scholarly communication. Most journals require the author to make a contribution declaration, some in a structured method, and some in free-text form. To normalize this data and help to solve this problem, in 2014, was established the Contributor Roles Taxonomy (CRediT).[32] It has been broadly adopted and aims to guarantee that all the authors are recognized by their actual participation.

CRediT is high-level taxonomy, human-and machine-readable, including 14 roles, each author must have at least one contribution, assuring equity and fairness concerning the task of contributors. The 14 roles are: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing –original draft and Writing – review & editing.[32] Important to state that not all roles need to be covered.

It supports proper identification of each role and decreases the over-acknowledgment of those authors who have not contributed much to the research but helped with funding acquisition or supervision, designating them the proper roles.[33]

Data Availability Statement

The Data Availability Statement (DAS) is a relevant section for a more open research landscape and should be encouraged and expected by journals. Readers and algorithms use DAS to find the data that the article claims to use, to verify or manage the data for further analysis.[34]

At DAS, authors may declare that:

- Data will be available upon request.
  This alternative is more useful than no data, but still not the best practice since this request might face some troubles such as an invalid email address.
- Data are not openly available.
  If this is the case, the author should pronounce the circumstances and justify why it is not openly available.
- Not applicable.
  If no data are underlying the article, it also has to be asserted.
- The data is available in a repository.
  This choice is the most reliable and expected one. Repositories make data simpler to deal with. The authors have to declare the data output along with its location, usually a DOI:

e.g.: The data is available in [repository name] at [doi/url], [reference number].

The reference number is due to the need to provide a citation of the data in the article's reference list:

Example of in the reference list: [dataset]Authors; Year; Dataset title; Data repository or archive; Version (if any); (DOI)[35]

- All the data generated or analyzed is in the current study.
  It is an option but not the most desirable one, since the reader would have to read the paper accurately and find out what the data are. It is preferable to be explicit about each piece of data the article presented.

To help to identify registered and certified data repositories to the subject area, authors can rely on re3data.org or fairsharing.org[35].

Reference list

The presentation of a reference list by the end of an article is a standard and necessary practice in scholarship writing. Even though there are diverse standardizing styles (such as APA, Vancouver, ABNT, to mention a few), the journal must determine the one that fits the area adequately. Regardless of the determination of the journal, some basic rules should follow:

- References should be accessible and reusable. For this, the authors have to be able to provide the most complete and accurate data about the referenced literature and standardize it according to the journal's style.
- The references should be well balanced, current and relevant[28]. If there are contradictory outputs on a topic, it is fundamental to cite studies with both outcomes. It is recommended not to cite references that are older than ten years. However, it has to be the first discovery or mention when referencing a study, even if it is ten years older. At last, the referenced studies have to be entirely related to the article.
- It is mandatory to display the DOI of every reference in the list if they have it; this is crucial to creating a cross of research references, turning the article more discoverable.
- The reference list is essential metadata that should be registered when validating the article's DOI.

Running Heads and Footline

The article's running heads are the headings that appear across the tops of pages. The article's name often appears on the left-hand pages and the authors' names on the right-hand pages. The title can be a short title, and the authors' names can be displayed as preferable; there is no rule or condition for this information.[36] The running heads serves to guide readers toggling between multiple papers of an online journal.[37]

The article's footline is the information that appears across pages below the text; it should carry the title of the journal, the volume, issue numbers or e-location (depending on the type of publication), pages and year.

CONCLUSION

The proposals presented must be seen in the context of scientific publication developments, resulting in the presentation of articles with rich metadata, attractive structure, standardized, pleasant reading, and, most importantly, using patterns that make the study machine-readable.

Following these suggestions, the article will have higher discoverability, more straightforward read, interoperable with other researches and, hopefully, re-usable in further studies.

Some examples of journals that apply entirely or partly these recommendations can be found in numerous databases. See the following shortlist; without the purpose of classifying, simply to picture the scenario painted throw this article:

Advances in Rheumatology: https://doi.org/10.1186/s42358-020-00157-1

PLoS GENETICS: https://doi.org/10.1371/journal.pgen.1008871

Academic Emergency Medicine: https://doi.org/10.1111/acem.14144

Nature Cell Biology: https://doi.org/10.1038/s41556-020-00625-2

Journal of Aerospace Technology and Management: https://doi.org/10.1590/jatm.v13.1202

BRAGANTIA: https://doi.org/10.1590/1678-4499.20200176

The Lancet Global Healthy: https://doi.org/10.1016/S2214-109X(21)00005-X

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