

Enhanced publications: a study of the platform Public Library of Science (PLOS)

Enhanced publications: um estudo da plataforma Public Library of Science (PLOS)

Edilaine Avila¹, Cláudia Regina Ziliotto Bomfá²

¹ Federal University of Santa Maria (UFSM), Santa Maria, RS, Brazil. ORCID: <https://orcid.org/0000-0002-2561-1858>

² Federal University of Santa Maria (UFSM), Santa Maria, RS, Brazil. ORCID: <https://orcid.org/0000-0001-9398-3146>

Mail to/Autor para correspondência/Correo a: Edilaine Avila, edilaineavila@gmail.com

Submitted/Recibido: September 28, 2020; Approved/Aceptado: December 14, 2020



Copyright © 2021 Avila & Bomfá. All journal content (including directions, editorial policy and templates) is under a Creative Commons license Attribution 4.0 International. By being published by this journal, articles are free to use in educational, research and non commercial environments, with mandatory attribution of authorship. To further information check <http://revistas.ufpr.br/atoz/about/submissions#copyrightNotice>.

Abstract

Introduction: It identifies and presents what enhanced publications resources can be used by digital scientific journals. It presents the Public Library of Science (PLOS) as an analysis object, based on the following guiding question: which characteristics identify a scientific publication as an *enhanced publication*, and where these particularities are used by scientific journals? **Method:** Qualitative research, at the exploratory level, that, with a survey, culminated in a content analysis of the data found. **Conclusion:** The characteristics of an *enhanced publication* have been defined, and it has been demonstrated how PLOS works with these resources to increase its visibility.

Keywords: Communication; e-Science; Editorial Production; Enhanced Publications; Visibility.

Resumo

Introdução: Identifica e apresenta quais recursos das *enhanced publications* podem ser utilizados pelos periódicos científicos digitais. Apresenta, como objeto de análise, a Public Library of Science (PLOS), a partir da seguinte questão norteadora: quais características identificam uma publicação científica como uma *enhanced publication* e como essas particularidades são utilizadas pelos periódicos científicos? **Método:** Pesquisa de natureza qualitativa, em nível exploratório que, com um levantamento, culminou em uma análise de conteúdo dos dados encontrados. **Conclusão:** As características de uma *enhanced publication* foram definidas, além de ter sido demonstrado como a PLOS trabalha esses recursos com o intuito de ampliar sua visibilidade.

Palavras-chave: Comunicação; e-Science; Produção Editorial; Enhanced Publications; Visibilidade.

INTRODUCTION

Since their appearance, still, in the 17th century, scientific journals have played a central role in the context of Scientific Communication, as they are considered “the main formal channel for the dissemination of Science” (Valerio, 2005, as quoted in Ambinder, 2012, p. 40). However, with the evolution of technologies, mainly with the emergence of the internet, the scientific community has been observing the need for new models for publications that present greater interactivity and accompany the changes that the digital environment has brought to communicational relations.

In this sense, Information and Communication Technologies (ICTs) and open science movements (open file, access, data, and science) have imposed changes in the way of disseminating research results, requiring computerized resources. Valerio (2006) lists these resources as providing links, new communication channels, search engines, software, data maps, among others. As a way of meeting the needs of the scientific community in the face of the changes mentioned above, the so-called *enhanced publications*, defined by Gomes (2014, p. 200), appear as “a publication enriched by three categories of information: research data; extra materials; and post-publication data.” *Enhanced publications* emerge as an evolution of the studies on repositories made by Woutersen-Windhouwer, Brandsma, Hogenaar, and Hoogerwerf (2009), with progress in the concepts later.

Thus, *enhanced publication*, also known as expanded publication, can represent “a collection of objects and diverse mutual relations, thus surpassing the ‘unilateral’ characteristic consistent with the so-called ‘traditional’ publications” (Gomes, 2014, p. 200). Therefore, one of its main characteristics is its ability to facilitate access to research sources, promoting the crossing of information hitherto isolated in its production universes. In this way, the platform Public Library of Science (PLOS) can be considered an *enhanced publication* since it offers resources from expanded publications. So much so that Woutersen-Windhouwer and Brandsma (2009) reveal that PLOS meets the three main characteristics of *enhanced publications*, such as research data, extra materials, and post-publication comments. PLOS was founded in 2001 as an open-access non-profit organization with a

mission to accelerate progress in Science and Medicine, leading to a transformation in the communication of scientific research¹.

Thus, this article presents the research results carried out in *PLOS*, whose objective is to identify and present which resources from *enhanced publications* are used by this platform. Besides, the aim is also to contribute to the discussion on this type of publication, offering input for evaluations of other initiatives and describing the resources available by *PLOS*.

THEORETICAL FRAMEWORK

One of the main characteristics of network communication is the production of many to many, which is understood from multiple actors producing innumerable messages for a vast group of recipients. In this context, the communication's classic flow is no longer established, where the message was produced from one to one or from one to many. Currently, there is a range of content streams happening, at the same time, with fast encoding and decoding.

With this, the culture of network collaboration grows exponentially, where the content production is stimulated between virtual communities or social networks, for which members gather around common affinities to share information. These collaborative environments were expanded from web 2.0, differentiated by sites or applications with low development costs. In this case, the content emerges from the bottom of the relationship between the participants, combining content from more than one platform to produce an integrated experience (Spyer, 2007).

In this context, for Bardi and Manghi (2014, p. 1), *enhanced publications* are “digital publications that consist of a mandatory narrative part (the research carried out description) plus ‘related’ parts, such as data, other publications, images, tables, workflows, devices.” The *enhanced publications* are, therefore, intended to make data processing possible, to ensure that information is easily searchable in the web environment (Degkwitz, 2016).

Sales, Sayão, and Souza (2013) state that, in 2007, the **Digital Repository Infrastructure Vision for European Research - II (DRIVER-II)**, a European digital repository, published a report on digital objects, in which it defined the term *enhanced publication* or expanded publication as: “composite digital objects that combine ² e-prints with one or more data resources, one or more metadata records, or any combination of these” (Sales et al., 2013, p. 5).

Woutersen-Windhower and Brandsma (2009) propose that the concept of *enhanced publication* is related to the improvement of research information, with the use of extra materials, post-publication data, databases, among others, which present a link between objects. “In this definition, an object can be part of an article, a data set, an image, a film, a comment, a module, or a link to information in a database” (Woutersen-Windhower & Brandsma, 2009, p. 31, our translation).

Bardi and Manghi (2014) establish two models of *enhanced publications* (Figure 1). In this case, it is observed that the narrative part is represented by the scientific article, and the complementary part is designed from the slides presented at a conference, the presentation video, and the related data spreadsheet, for example. The two publications have an equivalent structure for the supplementary material but differ like the mandatory narrative: a single PDF file versus a structured text, such as abstract, sections, figures, tables, among others.

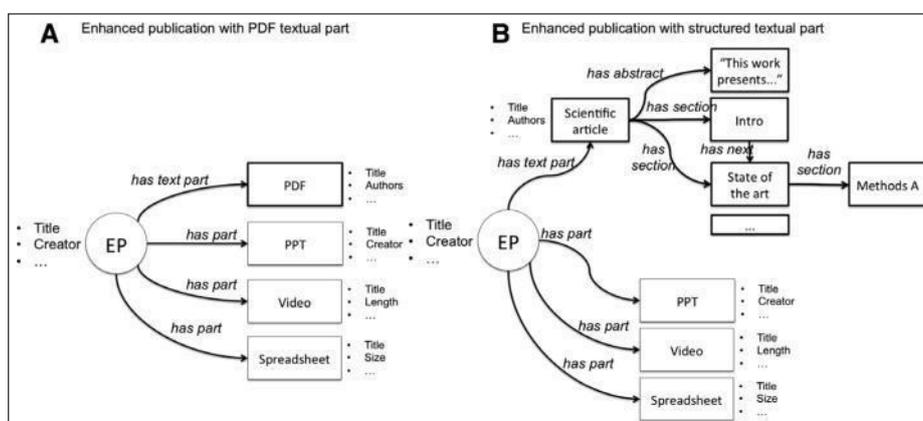


Figure 1. Examples of *enhanced publication* structures

Source: Bardi and Manghi (2014, p. 244).

¹Retrieved from <https://plos.org/about/> (November 13, 2020).

²E-prints are “electronic textual resources that express an original academic work, intended to be read by human beings, which presents some academic claims and that generally contains an interpretation or analysis of certain primary data” (Verhaar, 2007 as cited in Sales et al., 2013, p. 5).

It is also understood, according to Bardi and Manghi (2014), that the first model is generally used in a digital library configuration, where the PDF article's traditional management must be enriched with supplementary material. The second is more appropriate for information systems that allow an article's an interconnected reading experience, for example. Besides, the authors present a classification of the features of the *enhanced publication* data model (Figure 2).

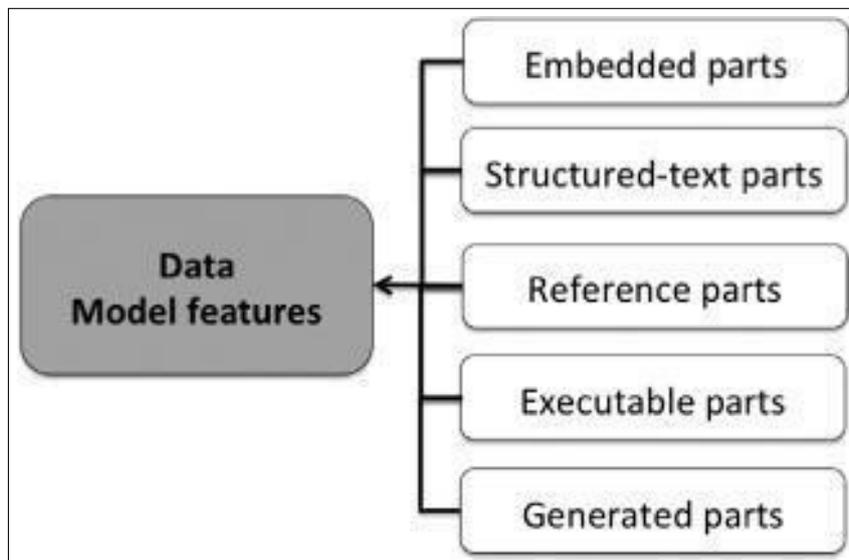


Figure 2. *enhanced publication* data model features.

Source: Bardi and Manghi (2014, p. 245).

Integrated parts are those that use files as complementary materials. Presentation slides, appendices to the article, data used description, high-resolution images, tables that cannot be fully inserted in the digital publication due to page limits, among others, for example. The structured text parts are constituted through an editorial structure that provides for textual subcomponents. In this case, the data models precisely define the relationships between the subparts and include metadata (chapter, section, table) to support the advanced features of visualization and reading Bardi and Manghi (2014).

Considering the limitations imposed on the integrated parts, the reference parts use URLs for external objects, which have links to remote search results, such as data sets, citations, websites, presentations, and other material in addition to the main content. In turn, the executable parts use software that enables the experiment reproduction, allowing the comparison of results found with those presented in the article, thus validating the research results. Finally, the generated parts contain references that link to external databases, creating dynamic tables that are constantly updated Bardi and Manghi (2014).

It should be noted that the emergence of expanded publications was driven by the realization that the publication considered traditional was limited to the attempt to incorporate the results of the entire scientific research process (Verhaar, 2008, as quoted in Sales, 2014). In these conditions, an *enhanced publication* has the mission of adding the most extensive number of resources and/or elements that can expand the connections made by researchers, with the ultimate goal of disseminating Science quickly and efficiently.

In this way, “an expanded publication is a new form of publication where the traditional form (a report, an article, a book) is enriched with additional information” (Mucheroni, Silva, & Paletta, 2015, p. 3). Therefore, it is essential to consider that, for the improved publication to fulfill its function, complementary materials must be stored in proper places. Sales (2014) points out that thematic repositories, national and international, must use persistent identifiers to efficiently preserve and disseminate this type of content.

Still, according to Arraiza, Gonçalez, and Vidotti (2019, p. 16), an expanded publication is “in the context of digital publication as a way of publishing research data together with a textual publication, adding value to the final product and showing the processes that led to the achievement of the results presented.” Given this, the authors consider that this type of publication can be taken as a composite object, with certain particularities that draw a framework for scientific papers and journals.

Besides, it is understood that the excellent contribution of *enhanced publication* to the universe of scientific knowledge lies in improving the reading experience through the web, with the expanded publication responsible for promoting numerous relationships between these publications and the set universal search data. Most of the studied authors welcome the advances brought by the improved publications, although they consider that its use is still below its potential.

METHODOLOGY

This article presents the qualitative research results at an exploratory level that, through a survey, culminated in a content analysis of the data found. At first, scientific journals carried out exploratory research that scored better according to the JCR³ database. However, after searching the best-rated magazines and publisher's websites, it was possible to notice that they did not have a significant number of characteristics that define an *enhanced publication*.

For the study object, the model (Figure 2) proposed by Bardi and Manghi (2014, p. 245, our translation) was used as a criterion, where the *enhanced publications* are “digital publications that consist in a mandatory narrative part (the research description) and more 'related' parts, such as data sets, other publications, images, tables, workflows, devices.” According to the authors, *enhanced publications* are composed of two parts: the first, mandatory, related to textual narration; and the second, optional, characterized by a set of subparts interconnected by semantic relations.

Besides, the arguments of Woutersen-Windhouwer and Brandsma (2009) were considered, who state that the best-known example of *enhanced publication* is the *PLOS ONE*, an international peer-reviewed and open access online newspaper, which publishes papers with the addition of online notes, comments, and ratings. From here, the object of study of this research is the platform Public Library of Science (PLOS)⁴ that, after the survey, presented itself as the set of scientific journals that best illustrates the specificities of a publication magnified. We sought to verify and show the *PLOS* structure to demonstrate how the characteristics and functionalities of *enhanced publications* are used by this platform that involves a newspaper, six scientific journals, and four additional content types.

Based on the survey⁵ carried out on the portal *PLOS*, it was possible to perceive that the scientific journals present the same resources, being the website of each of them developed from a standard structure. Thus, scientific journals are considered conventional structures: *PLOS Biology*, *PLOS Medicine*, *PLOS Computational Biology*, *PLOS Genetics*, *PLOS Neglected Tropical Diseases*, and *PLOS Pathogens*. On the other hand, the newspaper *PLOS ONE* individual characteristic and the extra contents are evaluated: *PLOS Collections*, *PLOS Currents*, *PLOS Blogs*, and *PLOS Research News*.

Based on the definition of which features identify a publication as an *enhanced publication* and, considering the entire universe of characteristics of communication on the web, the editorial products range on the internet, and the possibilities that ICTs have brought to scientific communication, Chart 1 gathers the analysis categories used in the present study.

³The *InCites Journal Citation Reports* (JCR) statistical database, of the publisher *Clarivate Analytics*, is a resource that allows you to evaluate and compare scientific publications using citation data extracted from academic and technical journals and their impact on the community scientific. Retrieved from jcr.clarivate.com (November 13, 2020).

⁴Retrieved from <https://plos.org/> (2020, November 13).

⁵It should be noted that the initial data collection took place in 2017, since this research results from a Course Completion Work. For this article, some information has been updated to better contextualize the results.

AUTHORS	FEATURE	TYPES AND RESOURCES	DESCRIPTION
Palacios (1999-2004); Bardoel and Deuze (2001); Mielniczuk (2005); Terra (2006); Canavilhas (2014)	Hypertextuality	Non-linearity	Content fragmentation; information organized in an inverted pyramid format.
		Connective and disjunctive link	Conjunctive: same browser window with different content. Disjunctive: when opening a smaller window or another browser window.
		Internal and external	Internal: refers to lexis within the website itself. External: directs to lexis external to the website.
		Editorial, service and advertising link	Editorial: belongs to the informational content of the website. Services: directs you to services offered by the website. Advertising: refers to the advertising of advertising companies.
Bardoel and Deuze (2001); Palacios (1999-2004); Canavilhas (2014)	Multimediality	Text and photo	Text: contextualization and documentation element. Photography: illustration element.
		Graphic, iconography and static illustration	Signs that illustrate and guide the reader concerning the content.
		Video and digital animation	Video: moving images. Digital animation: computer-generated images and illustrations with motion effects.
		Oral speech	Captured speeches, voice off, and subtitles.
		Music and sound effects	Multimedia pieces that use audio.
		Style sheets, presentations, and the research textual descriptions (tables, sections, etc.)	Elements used to summarize or illustrate the contents.
		Vibration	Warning signs are widely used on mobile devices.
Palacios (2004-2014); Bardoel and Deuze (2001); Terra (2006); Canavilhas (2014); Valle (2016)	Interactivity	Selective	Access options, such as menu and search engines.
		Communicative	Interaction between subjects, such as comments and forums.

Palacios (2004-2014); Terra (2006); Canavilhas (2014)	Instantaneity	Real-Time	Breaking news, immediate updates, and short notes.
		Continuous update	Provision of new information in real-time.
Palacios (2004-2014); Canavilhas (2014).	Memory	Database	Set of information that can be archived, indexed, and retrieved by certain technical procedures.
		Search engines	Systems that allow information to be located in databases.
Palacios (2004-2014); Bardoel and Deuze (2001); Canavilhas (2014).	Customization	Content customization	Personalization according to the user's interests.
		Answer	Ability to adapt web pages to different devices.
		Change based on time of day	The content adapts according to the user's time and needs.
		No significant interaction	It presents the content in new ways, according to the user's comments.
		Decision help	It offers mechanisms that help the user to visualize the consequences of their actions.
		Calibration and algorithms	It allows the user to view recent data whenever it is available.
		Adaptable to change	Pre-disposition for modifications, essential to the innovation of personalization systems.
Terra (2006); Canavilhas (2014)	Ubiquity	Mobile device	Allows access to information interactively, in real-time, and from anywhere.
		Consumer generated media	Users express their opinions and replicate them on their social networks.

Table 1. Analysis categories of *enhanced publications*.

The results and discussions of the analysis of this research are presented below.

FINDINGS AND DISCUSSION

Based on the definition of what characteristics identify a publication as an *enhanced publication* and considering the survey carried out in the digital library of *PLOS* journals, it presents some resources that are useful to an expanded scientific publication, analyzing how the particularities, made available on the web, are appropriated by the platform. Concerning the characteristic of **hypertextuality**, we noticed that the main advantage established for scientific communication is that navigation is non-linear (Terra, 2006). The user *PLOS* can build the access paths to the available content by himself, which allows the user to search for information according to his areas of interest in a very interconnected and dynamic way.

As for navigation resources, the links presented as solutions that improve the user experience in the search for information were analyzed. In this way, in *PLOS*, the articles of scientific journals show a kind of side menu, with the organization of the content in such a way that the reader can advance or return to the texts, without necessarily performing a linear reading, which is evidenced by through conjunctive links (Mielniczuk, 2005). At the same time, an upper menu allows the user to access a series of data that includes: the text of the article; information about the author (s); metrics, such as the number of views and citations; the comments; and related content that was published in other media (Figure 3).

Figure 3. Examples of conjunctive links (*PLOS Medicine*).

Source: <http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1002396> (2020, December 10).

Regarding the disjunctive links (Mielniczuk, 2005), it was found that the figures found throughout an article, for example, can be viewed through thumbnails in the body of the text or, if the reader prefers to click on the image, expanded to full screen. In this case, it is possible to access some commands such as zoom, previous/next, all images and download in PPT, PNG, and TIFF formats. Another facility found is that, when closing this window, the reader returns to the text, continuing with its reading. Besides, just below the title of the article, where the name(s) of the author(s) is mentioned, it is possible to open a pop-up with an e-mail address, work affiliations, and link to the ORCID profile.

About the coverage universe (Mielniczuk, 2005), internal links are observed on the pages dedicated to authors, for example, where it is possible to verify links that redirect the researcher to the journal's editorial criteria. External links found in articles within scientific journals redirect the researcher to content outside the portal *PLOS*. In this case, the reader migrates to the Creative Commons website and sites where the works cited in the references are hosted, such as PubMed/NCBI and Google Scholar. About the type of information, it is possible to observe the presence of editorial links in most of the texts of the magazines *PLOS* since this is the differential of scientific publications.

Concerning the **multimedia feature** Bardoel and Deuze (2001); Canavilhas (2014); Palacios (1999, 2004), in the case of *PLOS*, it is clear that the text comprises most of the content on the portal, the articles being presented traditionally in the structure of textual information. To complement the text, the authors use a photograph to illustrate or even legitimize the addressed topic context. In the Science dissemination case, photography becomes a differential for the research and processes dissemination occurring inside laboratories Salaverría (2014). It is also necessary to highlight the graphics, whose use, according to Salaverría (2014), is more and more common due to its evident capacity to elucidate and summarize information. In the Science dissemination case, the graph is one of the key elements for understanding the research results, being one of the most used resources to demonstrate data collected and tabulated by the researchers in their studies, as illustrated in Figure 4, which represents a graph taken from one article in *PLOS Genetics*.

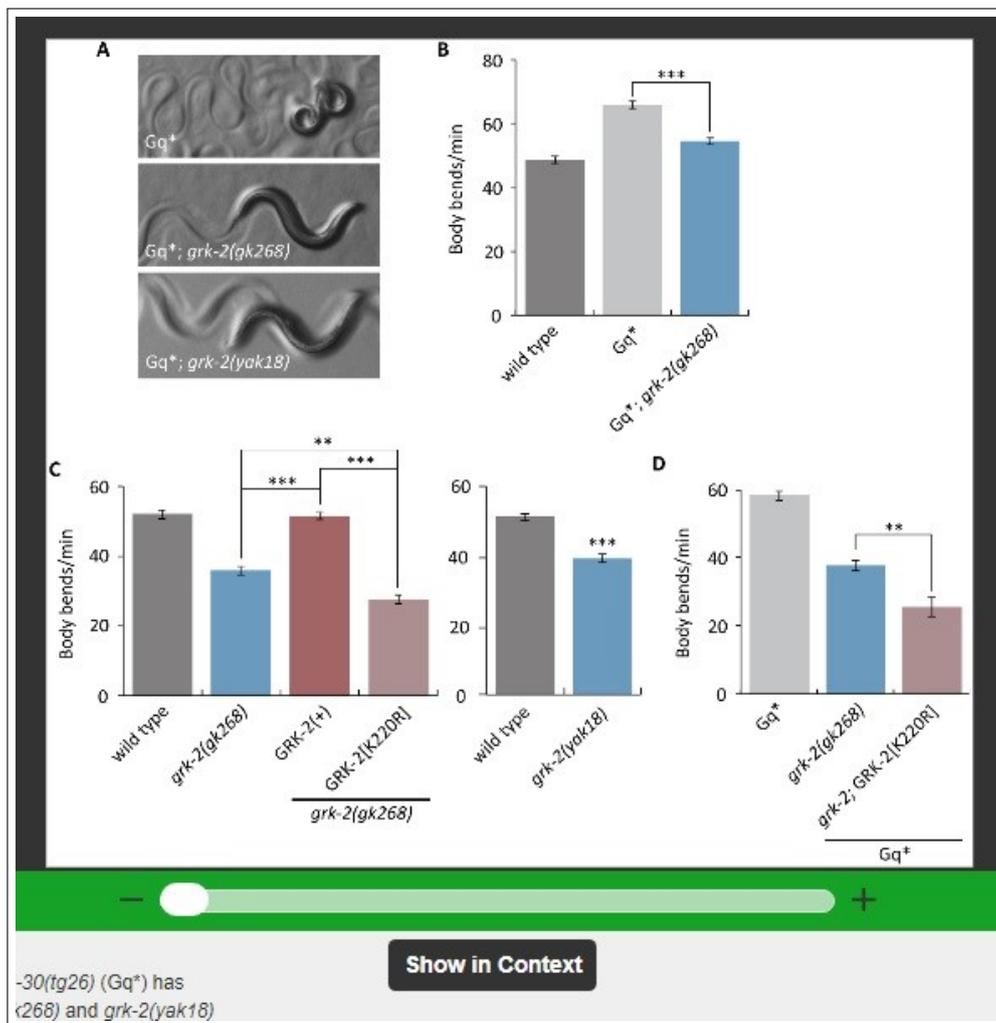


Figure 4. Chart example (PLOS Genetics).

Source: <http://journals.plos.org/plosgenetics/article?id=10.1371/journal.pgen.1007032> (2020, December 10).

Likewise, videos appear as an outstanding resource in scientific knowledge dissemination. In the case of *PLOS*, the videos are originally published on a YouTube channel, to be inserted later on the website's text body. Among the system's principal advantages is the fact that YouTube organizes the videos in chronological order, and publishers can create thematic lists within the channel that facilitates the information recovery. Another feature employed by *PLOS* is digital animation. In this case, we can use, for example, an article where the author used a high-resolution 3D image technique, which allowed scientists to identify two new species of ants, whose unique spines inspired researchers to name them dragons, based on the Game of Thrones series. Thus, the visibility indicator is in the content exploration using resources that expand the visualization possibilities, such as 3D media. It is clear, therefore, the potential of multimedia and convergence resources since scientists are using them as reference media products that, at first, were not related to the subject studied.

It is also worth mentioning the use of oral discourse. One of the blogs hosted on *PLOS Blogs* is *PLOScast*, which features interviews in the podcast's format with opinion leaders on academic editorial development, the academic future, and the scientist's experiences. The audio files are organized into episodes and were originally published on SoundCloud, whose link was incorporated into the blog. About sound resources, some effects are worked on in the videos themselves, as in the case of an audiovisual, where a bat is filmed tracking a moving insect, and the sounds heard are reproduced by a bat detector, which allows the animal's vocalizations are audible to human ears.

About **interactivity** Rost (2014), the magazines *PLOS* organize the contact forms in a side menu that the user can access, amongst others: name and e-mail of the editor and offices *PLOS*. In this way, the institution's visibility, which promotes the journal and its managers, increased. Besides, concerning selective interactivity, at the end of the page, there is a survey form where the reader gives feedback regarding the reason that led him to access the site. It is also necessary to consider guidelines and information for authors as selective interactivity. The *PLOS* system allows the researcher access to three types of content: 1) submissions: submissions guidelines; 2) politics: research involving human beings and animals, copyright, ethical publications, etc.; and 3) the manuscript review and publication: with editorial clarifications and guidelines, and peer-review process.

Regarding communicative interactivity (Rost, 2014), the icons for social networks and forms of sharing stand out. The *PLOS* features, at the bottom of its home page, three icons that direct the user to their pages on *Twitter*, on *Facebook*, and *LinkedIn*. Individually, the newspaper *PLOS ONE* and the other six scientific journals *PLOS* have on their homepage five icons of "Fale Conosco" (Contact Us). These provide access to the following information: receive alerts by e-mail; RSS document; *Twitter* (individual profile of each journal); *Facebook* (*PLOS*); and *PLOS Blogs*.

When accessing a specific article, the reader can share the content by clicking on the icon on the right side of the page with the following networks: *Reddit*, *Google +*, *StumbleUpon*, *Facebook*, *LinkedIn*, *CiteUlike*, *Mendeley*, *PubChase*, *Twitter*, and E-mail. It is necessary to highlight that the user can download the PDF file (citation or XML) and print (the *EzPrintis* resource also available). It is worth mentioning that, in this case, the visibility indicator is related to the fact that the scientific community expands its research through the use of social media, aiming to get closer to the reader.

About **instantaneity** (Palacios, 2004), observing the principle of continuous updating, *PLOS* keeps the numbers of the metrics of the articles updated. When accessing articles, the reader can check, in icons organized on the right side, the number of downloads, citations, views, and shares of this text. This information is updated automatically by the website system (Figure 5) and collaborates to promote the research and the article's visibility.

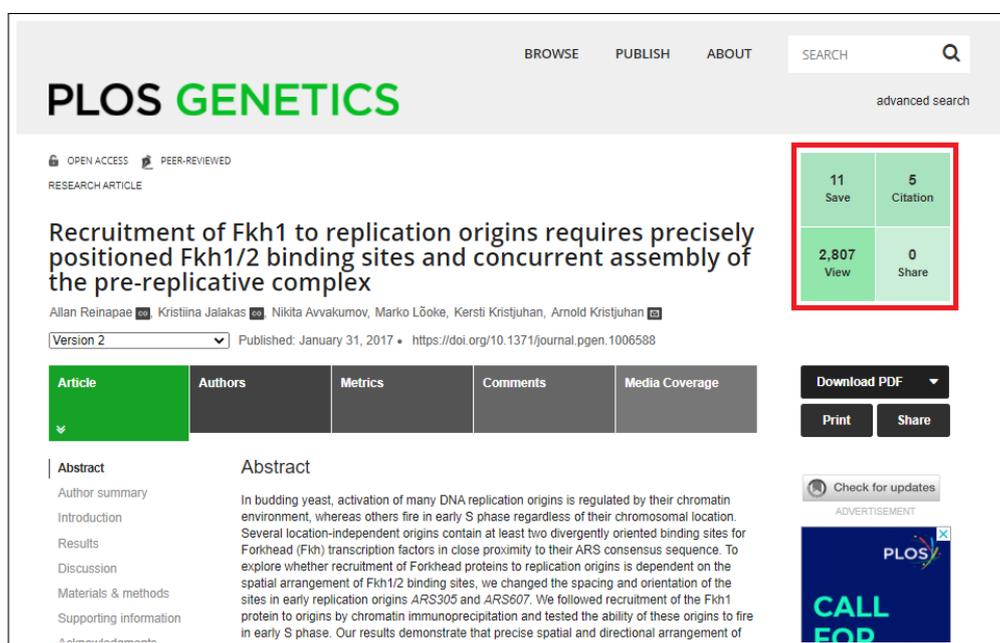


Figure 5. Example of article metrics (*PLOS Genetics*).

Source: <http://journals.plos.org/plosgenetics/article?id=10.1371/journal.pgen.1006588> (2020, December 10).

About memory Palacios (2004), it is necessary to highlight the functioning and the importance of search engines on scientific communication sites. *PLOS* is considered a portal since it brings together several pages of different content and services, and at the same time, related. On each page, it is possible to notice that the publishers work the search engines to adapt the content to the user's reach, enabling search recovery and visibility.

Thus, concerning the newspaper *PLOS ONE*, it is possible to notice that, through the menu Browse, the reader can search the collection, which has 243,312 articles (on December 10, 2020). For this, there is a filter divided into eleven areas and, when selecting the field, the user can still follow his search through a new list with sub-areas, which vary in number depending on which they are linked. In the *PLOS Scientific* journals case, the search engines for consulting the collection include the publication years where the reader can access monthly copies through a timeline according to the example in Figure 6.

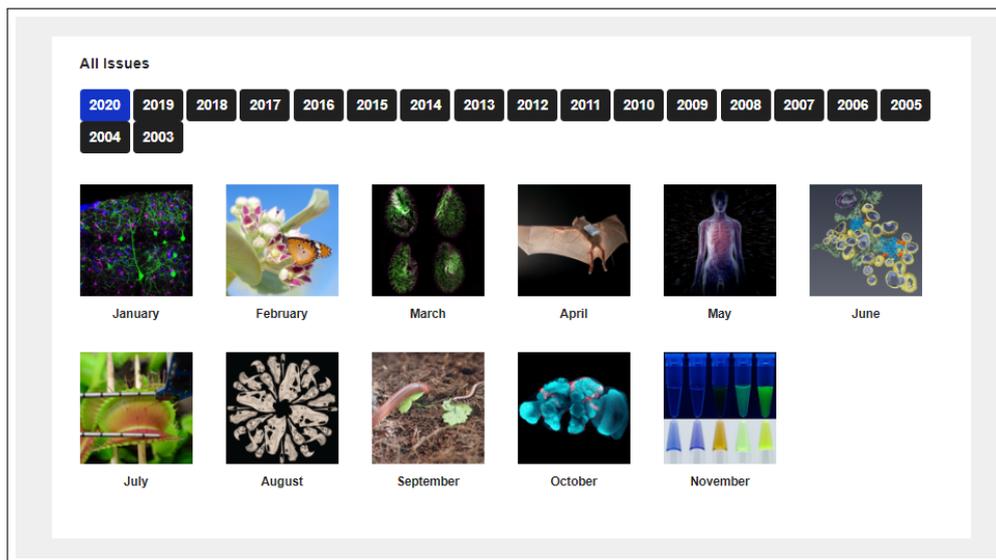


Figure 6. Consultation to the scientific journal collection *PLOS Biology*.
 Source: <http://journals.plos.org/plosbiology/volume> (2020, December 10).

Still, concerning memory, it is necessary to realize that, by making available its collection organized by year, for example, *PLOS* is preserving the memory of scientific research in the areas in which it is dedicated, through the formation of an extensive online database. Likewise, this feature makes it easy to retrieve information and, at the same time, share data.

Regarding **personalization** Bardoel and Deuze (2001); Canavilhas (2014); Palacios (1999, 2004), there were no customizable aesthetic elements in the website's general structure. This feature may be available to users who have login and password registered. However, considering the access to approachable content, registering to receive information by e-mail, for example, can be a form of personalization. Likewise, the search engines allow the user to trace their reading path according to their interests, personalizing their navigation along with the pages.

Finally, about **ubiquity** Canavilhas (2014); Terra (2006), the *PLOS* and its scientific journals and auxiliary content websites were also designed to adapt to the device interface furniture. The great advantage of these adjustments resides in the better visualization of the contents and the menu systems, facilitating the user's access to the information. Thus, the research visibility is more effortless through the layout's use and adaptation to mobile devices.

From this analysis, it is clear that web development's vast contribution to scientific communication lies in the resources provided for the results and advances in research dissemination, making scientific journals vehicles with great potential to increase Science visibility. The current diagnosis concludes that the *enhanced publication* characteristics do not create many opportunities for scientific communication's treatment and dissemination. The watchword, in this case, is adequacy, since the researcher/editor needs to be up to date about the resources offered on the internet, aware of the potential created by analyzes, and surrounded by trained professionals who can support the practices adopted by the journal in the research dissemination.

CONSIDERATIONS

The research results exposed in this article allowed us to identify and present which *enhanced publication* features the *PLOS* platform uses to increase scientific publication's visibility. In the same way, it was possible to verify how scientific journals can use these *enhanced publications* particularities from the example of *PLOS* and its multiple pages of Science content. Although in a modest and isolated way in the scenario of scientific communication on the web, *PLOS* becomes a model to be followed, presenting several expanded publications resources in a very didactic way. However, we understand that other modifications can be applied to enhance the visibility results.

Besides, the results of this analysis propose a kind of path for other editors of scientific communication to understand the process of creating an expanded publication and develop their models based on the types and resources presented here. Thus, this work's contribution is to show the researcher/editor the possibilities of using the *enhanced publication's* competent resources.

Also, we discovered that **hypertextuality** and **multimediality** go together to produce an expanded quality publication, as the text added to multimedia elements adds value to the improved scientific journals. The reader

participation, through interactivity provided, becomes a differential for scientific communication because it enhances the visibility of the publications through information sharing between peers.

It is noteworthy that it is necessary to implement *enhanced publications* resources for the rise of scientific communication since these characteristics expand and intensify the visibility of scientific publications and those involved in the creating and producing a journal process, all of which they must be engaged in this construction. Likewise, working with these resources improves the credibility of publications, helping to legitimize scientific journals. For this reason, we hope that this research can open discussions about the principles and use of publications expanded in Brazilian magazines.

REFERENCES

- Ambinder, D. M. (2012). *Artigos científicos digitais na web: novas experiências para apresentação, acesso e leitura* (Dissertação de mestrado, Departamento de Ciência da Informação, Universidade Federal Fluminense Niterói, Niterói, RJ, Brasil). Retrieved from <https://app.uff.br/riuff/handle/1/352>
- Arraiza, P. M., Gonzalez, P. R. V. A., & Vidotti, S. A. B. G. (2019). Recomendações para a integração de publicações ampliadas em repositórios digitais confiáveis. *Encontros Bibli: revista eletrônica de biblioteconomia e ciência da informação*, 24(55), 1–23. doi: <https://doi.org/10.5007/1518-2924.2019.e58556>
- Bardi, A., & Manghi, P. (2014). Publicações aprimoradas: modelos de dados e sistemas de informação. *LIBER Quarterly*, 23(4), 240–273. doi: <http://doi.org/10.18352/lq.8445>
- Bardoel, J., & Deuze, M. (2001). Network journalism: Converging competences of media professionals and professionalism. *Australian Journalism Review*, 23(2), 91–103. doi: <http://doi.org/10.18352/lq.8445>
- Canavilhas, J. (2014). Hipertextualidade: novas arquiteturas noticiosas. In *Webjornalismo: 7 características que marcam a diferença* (pp. 3–24). Covilhã: Livros Labcom.
- Degkwitz, A. (2016). Enhanced publications resp. future publications. In *Proceedings of the unica scholarly communication seminar*. Suíça, Lausanne. Retrieved from <https://goo.gl/VMQKYy>
- Gomes, C. M. (2014). *Comunicação científica: Cartografia e desdobramentos* (Tese de Doutorado, Escola de Comunicação e Artes, Universidade de São Paulo, São Paulo, Brasil). Retrieved from <https://bdpi.usp.br/item/002321102>
- Mielniczuk, L. (2005). O link como recurso da narrativa jornalística hipertextual. In *Anais do congresso brasileiro de ciências da comunicação*. Rio de Janeiro, RJ, Brasil. Retrieved from <http://www.portcom.intercom.org.br/pdfs/160318299140382081603311405193211973269.pdf>
- Mucheroni, M. L., Silva, F. J. M., & Paletta, C. F. (2015). Entre a publicação ampliada e a multimodalidade. In *Anais do encontro nacional de pesquisa em ciência da informação*. João Pessoa, PB, Brasil. Retrieved from <http://repositorios.questoesemrede.uff.br/repositorios/handle/123456789/2968>
- Palacios, M. (1999). *O que há de (realmente) novo no jornalismo online? conferência proferida por ocasião do concurso público para professor titular na facom/ufba*. Salvador, Bahia.
- Palacios, M. (2004). Jornalismo online, informação e memória: apontamentos para debate. *Revista PJ:BR*, 4. Retrieved from <https://goo.gl/qstWc8>
- Palacios, M. (2014). Memória: jornalismo, memória e história na era digital. In *Webjornalismo: 7 características que marcam a diferença* (pp. 89–110). Covilhã: Livros Labcom.
- Rost, A. (2014). Interatividade: definições, estudos e tendências. In *Webjornalismo: 7 características que marcam a diferença* (pp. 55–88). Covilhã: Livros Labcom.
- Salaverría, R. (2014). Multimedialidade: informar para cinco sentidos. In *Webjornalismo: 7 características que marcam a diferença* (pp. 25–51). Covilhã: Livros Labcom.
- Sales, L. F. (2014). *Integração semântica de publicações científicas e dados de pesquisa: proposta de modelo de publicação ampliada para a área de ciências nucleares* (Tese de Doutorado, Instituto Brasileiro de Informação em Ciência e Tecnologia, Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brasil). Retrieved from <https://ridi.ibict.br/bitstream/123456789/874/1/LUANA%20SALES%20D.pdf>
- Sales, L. F., Sayão, L. F., & Souza, R. F. (2013). Publicações ampliadas: um novo modelo de publicação acadêmica para o ambiente de e-science. In *Anais do encontro nacional de pesquisa em ciência da informação*. Florianópolis, SC, Brasil. Retrieved from <https://ridi.ibict.br/handle/123456789/454>
- Spyer, J. (2007). *Conectado: o que a internet fez com você e o que você pode fazer com ela*. Rio de Janeiro: Jorge Zahar.
- Terra, C. F. (2006). *Comunicação corporativa digital: o futuro das relações públicas na rede* (Dissertação de mestrado, Escola de Comunicação e Artes, Universidade de São Paulo, São Paulo, Brasil). Retrieved from <https://goo.gl/U3fkZZ>
- Valerio, P. M. (2006). Periódicos científicos eletrônicos brasileiros: ampliando visibilidade e acesso. In *Anais do encontro nacional de pesquisa em ciência da informação*. Marília, SP, Brasil. Retrieved from <https://goo.gl/kdn26B>
- Valle, T. O. F. D. (2016). *Cocriação de valor como estratégia de comunicação na sociedade em rede: estudo do programa cocriando natura* (Dissertação de mestrado, Centro de Ciências Sociais, Universidade Federal de Santa Maria, Santa Maria, RS, Brasil). Retrieved from <https://repositorio.ufsm.br/handle/1/6373>
- Woutersen-Windhouwer, S., & Brandsma, R. (2009). Enhanced publications, state of the art. In *Enhanced publications: linking publications and research data in digital repositories*. Amsterdam: Amsterdam University Press.
- Woutersen-Windhouwer, S., Brandsma, R., Hogenaar, A., & Hoogerwerf, M. (2009). *Enhanced publications: linking publications and research data in digital repositories*. Amsterdam: Amsterdam University Press.

How to cite this article (APA):

Avila, E. & Bomfá, C. R. Z. (2021). . *AtoZ: novas práticas em informação e conhecimento*, 10(1), 129–140. Retrieved from: <http://dx.doi.org/10.5380/atoz.v10i1.76846>