Towards Multimodal Content Fruition in On-line Scientific Journals: The Case of DigitCult

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Abstract

On-line journals are becoming increasingly important and credited as scientific communication tools. The advantages of Web publishing, and in particular open-access peer-reviewed repositories, are remarkable in terms of availability, information retrieval, and potentially addressed audience. Quite surprisingly, some aspects typical of on-line publishing have never been fully explored and exploited: for example, the possibility of providing readers with multi-modal content (e.g., different file formats for text encoding, attached multimedia objects, etc.) non-traditional paths to navigate information and further investigate research themes (links to external content, video interviews with authors, multimedia insights, etc.), and the use of social networks and forums as spaces for debate among peers and with experts. DigitCult is an academic journal dealing with digital cultures, and – due to its multi-disciplinary and trans-disciplinary vocation – it has been conceived to achieve the mentioned goals. Consequently, a paradigm shift is required in the design of contents by authors, the rethinking of the editorial process, and the study of technical solutions aiming to adapt existing on-line publishing platforms to the new requirements. This paper will document the analysis, design and implementation efforts that led to the release of DigitCult, presenting – after the first year of publication – an insight about the technological and cultural innovations that DigitCult aimed to bring to the debate among scientific journals. Specifically, Section 1 will address the problem of technological affordances and editorial cultures, with particular reference to on-line scientific journals; Section 2 will propose a multi-layered reading environment aiming to enhance transmedia communication; finally, Section 3 will focus on the technical issues encountered to achieve this goal, discussing the limits of the OJS platform and proposing some workaround solutions.

Note: Section 1 – "Socio-technical Affordances and Editorial Cultures" was written by Tatiana Mazali; Section 2 – "A Multi-Layered Reading Environment to Enhance DigitCult's Transmedia Communication" was authored by Domenico Morreale; finally, Section 3 – "Augmented OJS: Technical Issues" was written by Luca A. Ludovico.

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Note to Readers

This work – published in Vol. 1 No 3, namely after the first year of activity of our journal – is an early contribution to the debate among traditional and on-line scientific journals focusing on technological and cultural innovations. We decided to publish an opening work which reflects the efforts of the first year of publication to face the crucial problems which DigitCult intends to deal with in the next issues.

Mario Ricciardi, Editor

1. Socio-technical Affordances and Editorial Cultures

In scientific scholarly communication, as in any other form of communication, the content and the container (the form) are co-dependent. From Marshal McLuhan's concept "the medium is the message" (McLuhan 1964) to the *domestication* paradigm applied in media studies (Hirsch, Morley, and Silverstone 1992; Silverstone 2006), we agree to see the socio-technical system that produces the different supports of knowledge dissemination (be it encyclopedias, books, printed journals or digital ones) as the result of the interaction between the technological affordances (paper, digital) and the public's tasks (*audiences*, users, community); an interaction that happens through methods of use and appropriation mechanisms in which the technologies, the content models/languages and the social and cultural contexts co-build each other.

In order to discuss about scientific publishing and dissemination in the world of university we need to analyze three closely related aspects: the publishing models consolidated in academic practice (formats that range from monographs to specialized journals), the evaluation models (that determine the publishing formats accepted by the academic community), and the technologies that allow to give form to these formats and languages.

The printed word technology (Ong 1982) certainly represents the "solid matter" that has most influenced the establishment of a series of publishing models in the world of scientific communication. If we take journals into consideration, innovation happens in relation to their contents, while their interfaces (that allow reading) and languages are still anchored to practices and cultures of the publishers and readers (mainly the academic communities) that have remained relatively stable until the early two thousands.

When paper came up against the digital world and the Net, the international big academic publishers began by offering digital equivalents of their analog catalogs. It is the so-called "copy-paste" model, from paper to digital support without any changes; the product remains the same, both in terms of content and of interface, if we consider that the display of a PDF is not so different from that of a printed page.

But, from the beginning of the new millennium up to the present day, several convergent phenomena have triggered important changes. The crisis of the scientific-academic publishing industry (Cope and Phillips 2014), included in the book publishing crisis tout court, has met and collided with a new cultural sensitivity, the *open access*, that runs parallel to the *open source* ethics in computer science. In addition, the renewal of the evaluation rules applied to academic careers has had a transforming impact on the traditional publishing practices of the scientific community.

The convergence of these three factors explains the proliferation of journals published in Open Access (OA) mode. To ensure an open access to the scientific results of publicly-funded research, Italy has adopted its own specific law (Law 112/2013 of October 7th, 2013) in compliance with the corresponding European Directives, although some minor changes have been hotly debated. Critical voices have been raised against the "protectionist approach" in favor of the publishing houses, an example of which is the longer embargo period for articles and research works originally published in pay magazines (the open files can only appear 18-24 months afterwards, whereas EU directives speak of 6-12 months).

The so-called *green route* to OA (EU recommendation n. 4890 17/07/2012) has increased the number and types of readers that can be directly reached by scholars, and thus promotes a culture of transparency and sharing; at least potentially, this facilitates fruitful exchanges for the collective construction of knowledge.

The on-line inventory DOAJ (Directory of Open Access Journals), which lists high-quality open-access journals subjected to peer review – as is now required by the assessment standards also in our country – is a good indicator for understanding the extent of the phenomenon: in December 2016 there are 9,391 Journals spread over 128 countries (https://doaj.org).

Nevertheless, the format of digital publications tends to follow the model of paper magazines. On one hand, the Net makes scientific articles much more accessible but, on the other, the prevalence of the PDF format is still obvious, which is a clear sign of the printed model dominance and fixity.

If we look for the reasons behind what could be called a real resistance to change, we can identify several factors that determine this consolidation of cultural practices: on the production side, we have the publishing houses with their own business, organizational and professional models, plus the scholars and their recognition rules among peers and, finally, the research evaluation models; on the side of consumption, there are the reading models and the expectations of the public interested in academic publications.

The revision in our country of the mechanisms of research evaluation has been crucial in triggering a quantitative increase of publications, but also a further standardization of formats: today the international open access and peer review digital journal model, far from having fostered innovation in the production models and languages or in the scientific knowledge consumption styles, has created a "new" grammar, to which all (publishers and scholars) have to adapt. Innovation (the OA model, the possibility to fully exploit the potential of digitalization) is being "tamed" into something that may well become a new and static standard, a real *lock-in* process to quote Jaron Lanier's words (Lanier 2010): when a model or a tool become predominant in doing something (in this case, publishing in a way that is efficient and successful for one's academic career), it becomes more and more difficult to do that thing in a different way. A popular and prevalent model discourages innovation.

In view of this danger, we should consider the potential advantages of the Net and its digital world – mainly the multimedia and multi-modal nature of its language and devices – to improve the scientific publications that are affected by the problems signaled by Davies (2014): the slow pace of the workflow (reception, refereeing tasks, final editing) that can easily exceed a year from the moment of submission; the high access costs that explain the elitism of many journals regarded as most authoritative; and the absence of inclusive space open to young scholars.

The newly changed socio-technical environment, however, does not lack exceptions. There are journals that take advantage of the digital world and its specific expressive skills to transform the traditional publishing models in new ways, advocating for a multimedia setting in the composition of texts, or to manage the well-established formats in a different way (e.g. by allowing displaced communities to work collaboratively on remote publishing workflows). Only a large-scale deployment of new models will be able to propel really new practices and strategies, and therefore to create the conditions to overcome any *lock-in process* in the evaluation and publication of scientific research studies.

Innovation in academic publishing can be fostered on four levels: the instrumental level, by taking advantage of the different technological supports and their interconnections; the linguistic level, by overcoming the dominance of the words and the printing model; the cultural level, by accepting collaborative and interdisciplinary models in the academic assessment practices; and the economic level, by developing new models of sustainability.

As Limone puts it (2014), the ongoing changes in academic production revolve around three key concepts: design, collaboration and access.
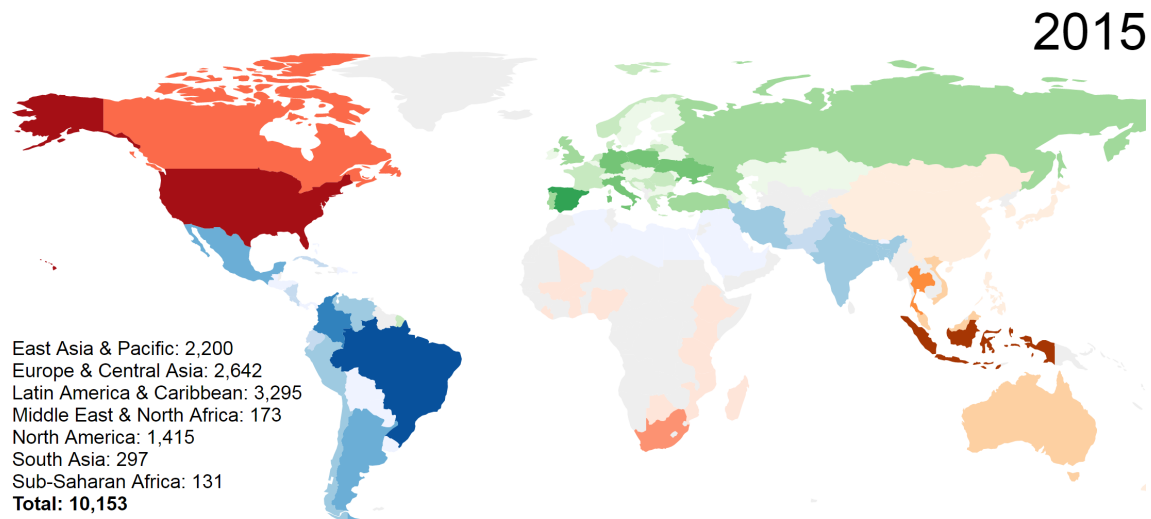
Design has to do with the writing models and the creative approach to the scientific publishing languages. Innovation in the product design requires "the production of interactive and three-dimensional texts, animated presentations, video-documentaries. This type of product exploits the Web's potential certainly better than a magazine, but has not yet been considered a scientifically ratable item" (Limone 2014).[1]

Collaboration is the result of processes supported by the technologies that allow access and sharing. The assessment academic standards should reward collaboration instead of focusing, as they do nowadays, on the competitive individuality that struggles on the very thin limits between scientific disciplines.

Access, lastly, can trigger new models, such as the so-called "Megajournals, a fairly recent

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[1]   Translated by the author.

2015

East Asia & Pacific: 2,200
Europe & Central Asia: 2,642
Latin America & Caribbean: 3,295
Middle East & North Africa: 173
North America: 1,415
South Asia: 297
Sub-Saharan Africa: 131
Total: 10,153

Figure 1. Location of journals using Open Journal Systems in 2015 – Source: https://pkp.sfu.ca/ojs/ojs -usage/ojs-map/

phenomenon that corresponds to open access, multidisciplinary journals; their editorial criteria to select scientific papers are different from those of paid-subscription journals".[2] More open access models can support the enlargement of publics, pulling the ability of researchers to make cultural transfers beyond the circle of peers (Attanasio 2011).

DigitCult journal was created with the aim to give an answer to some of the challenges presented here. It was decided to use the OJS platform for digital publishing because it allows, potentially, to work on all three levels mentioned above.

OJS was founded in 2001 and is developed by PKP (Public Knowledge Project). It is now the tool of a growing number of university and research institutions. It allows to edit and publish open access and peer review journals, and offers an open source platform that can thus be used independently of publishing companies. The platform's choice to be inclusive can even be seen in the fact that it has been translated into 30 different languages, although the most used one is English. In 2015, according to the latest figures provided by PKP, 10,123 journals were using OJS, all over the world, North and South, and with a rather good presence in developing countries (see Figure 1).

2. A Multi-Layered Reading Environment to Enhance DigitCult's Transmedia Communication

DigitCult adopts a transmedia (Jenkins 2006; Scolari 2009; Davidson 2010) communication strategy in order to promote an additive comprehension process of the scientific content that is present in the papers. This comprehension process involves two complementary paths: the integration of videos, images and text in the dissemination process and the extension of the discussion process and the creation of conversations through media (Manovich 2013) about the topics of the essays on social networks.

The goal is to use an editorial plan that foresees the orchestration of multiple language styles, media (text, videos, images, animations), communication strategies and platforms (content management systems, media-centered social networks such as YouTube, people-centered social networks such as Facebook and Twitter) so as to encourage the understanding of the scientific content in the journal even by a non-specialized audience, in order to have a dissemination service characterized by *public understanding of science and technology*. The report "The public understanding of science" was published in 1985 by the Royal Society and is a document of fundamental importance for the European development of this movement. As the report underlines

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[2]   Translated by the author.
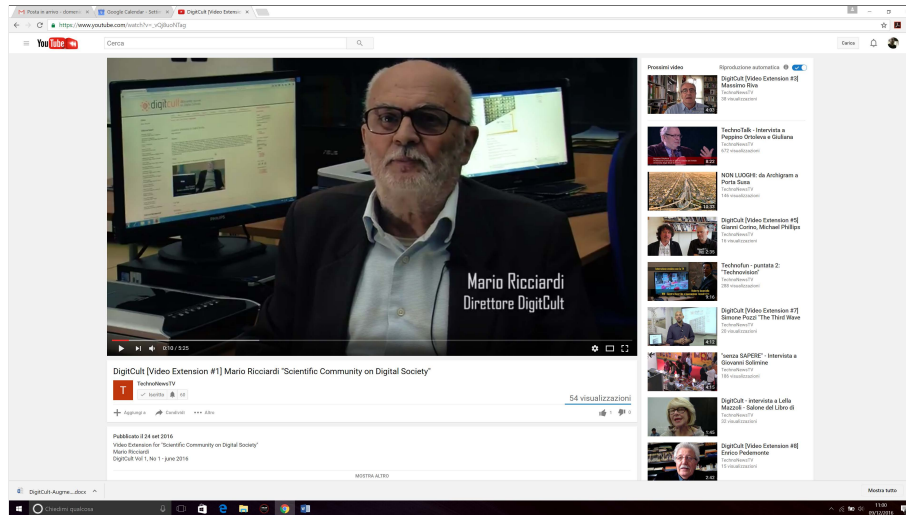
Figure 2. The first video extension developed for the essay "Scientific Community on Digital Society" by Mario Ricciardi published on DigitCult Vol. 1 Iss. 1 (2016) – URL: https://youtu.be/_vQj8uoNTag

a better understanding of science can be a significant promotion factor for the well-being of a nation, raising the quality of both public and private decisions and enriching a person's life (Irwin 1995).

The editorial plan is aimed at creating a multi-layered reading environment where each different text-node (the article, the video extension, the posts on social networks) adds an original perspective on the topics and on the issues.

The orchestration and coordination of the various texts created around each essay published follow a transmedia approach. This means that they make sure that each media content involved in the project is complementary to the others, with a low level of redundancy and a language that is suitable for its own platform. This favors a process of additive comprehension of the themes.

> "A transmedia story unfolds across multiple media platforms, with each new text making a distinctive and valuable contribution to the whole. In the ideal form of transmedia storytelling, each medium does what it does best [. . .]" (Jenkins 2006)

When applied to the DigitCult multi-layered model, the approach is divided into three main levels: the essay, which represents the main content, uses a scientific language and academic publishing rules. It is presented in its linear form on the corresponding page of the Open Journal System platform; the video extension on YouTube, which represents the video extension of the essay, and uses a more popular language. On the one hand it is aimed at encouraging the reading of the essay and on the other hand at extending its contents by proposing discussion topics and further studies designed to encourage the creation of on-line conversations; the posts on social networks, particularly the Facebook page and Twitter profile of DigitCult, represent the favorite space of interaction for the community of authors and readers.

According to the popular classification of cross-media projects proposed by Gary Hayes in 2006, which is based on a scale from high to low redundancy between the contents of the various assets which are part of the project (Hayes 2006), the DigitCult multi-layered model ranks among the transmedia *bridge*, in which each medium is linked to the others through references (the bridge), and each asset has a different perspective on the content of the communication, although there is a main media content, the tent-pole (in this case the essay), around which the transmedia architecture is structured. In DigitCult, the page of the Open Journal Systems platform which hosts the essay, also includes links to audiovisual content, called Video extensions, uploaded on YouTube.

The video extensions represent the second layer of the DigitCult's transmedia strategy. They are short videos lasting 4/5 minutes maximum uploaded on YouTube and published on the DigitCult page from which you can download the pdf of the essay they refer to. The video extensions represent a multimedia content which is complementary to the essay. In the video extension the authors of the essay ask the audience to deal with their contribution and highlight

the main themes, inspiring and encouraging the discussion which will be later developed on DigitCult's social channels. The goals of the video extension are to match the technique with the scientific discourse in terms of support and as a language style, and to encourage a dialogue about specific issues. The video extension is an integral part of the essay and is connected to it, therefore the extension is intended as media *expansion and dialogue* (thanks to the possibility to use channels which make you experience the themes of the essays in on-line discussions). The Video extensions are structured in three parts:

- Overview: the introduction which provides a summary of the theme and the purpose of the essay;

- Relevant Topics: the central part which explores the key themes of the essay;

- Open Issues: the third part meant to encourage dialogue and discussion, suggesting some open issues, on which analysis and research can be focused.

The video extensions, created by the editors of DigitCult in collaboration with the author of the essay, have a basic style which ensures an efficient production process. The video includes some animations showing phrases extracted from the essay that accompany and emphasize some moments of the video speech. For each video extension the author is asked to select and indicate by email some phrases and key words from his essay that will be turned into animations and included in the video as cultural activators (Jenkins 2006) for each one of the three parts of the video (Overview, Relevant Topics and Open Issues). These phrases and keywords will encourage the user to do a decoding and interpretation process, also through dialogues and exchange of information with other on-line users, therefore favouring the social use of content.

Social networks represent therefore the third layer of the transmedia DigitCult model. A common feature of the different types of social networks can be identified in the possibility for the users to influence the shape of the social network and on the ways in which the content is distributed. Users can help define their newsfeed on Facebook and Twitter, affecting the algorithm that determines the visibility and circulation of content through their choices and their actions. User actions consist of upload of original content, cataloguing of existing content via hashtags or tags, addition of comments and answers, reworking and redistribution of existing content. These actions leave traces on the content to which they are associated, increasing the amount of data and metadata of the content itself, and generating what Manovich defined as *conversations through media*, of which the video extensions want to represent an enabling factor.

> "We see new kinds of communication where content, opinion, and conversation often can't be clearly separated. Blogs is a good example of this: lots of blog entries are comments by a blog writer about an item that s/he copied from another source. Or, think about forums or comments below a web site entry where an original post may generate a long discussion which after goes into new and original directions, with the original item long forgotten. Often 'content', 'news' or 'media' become tokens used to initiate or maintain a conversation" (Manovich 2013).

Therefore the goal of including video extensions of DigitCult on social channels is to trigger a conversational process that contains tokens in the videos that are able to gather a network of grouped content through the sharing of pages, boards and tweets, that represent interpretations and stimuli for derived content.

Through the multi-layered structure of DigitCult's reading environment, a double dynamic is therefore activated. This dynamic is favored by the *bridges* between the three environments (editorial content management system, media-centered social networks and people-centered social networks) and between the three types of content (digital essay, video extension and conversations through media on social networks). The first part of this double dynamic is centripetal, that starts from the promotion of the individual essay on social networks, through the video extensions, and finishes with the essay on the Open Journal System's publishing platform, intercepting a non-specialised audience and providing opportunities to acquire the skills needed to understand the content of the scientific essay (with the goal of combining efficiency in the divulgation and scientific rigor). The second part, a centrifugal component, starts from the digital essay on the Open Journal System and finishes with *conversations through media* on social networks, which extend the dialogue between authors and readers and between the authors

themselves, in a form that ensures a persistent link between media content, the essay, and the totality of comments, data, and metadata created by users.

3. Augmented OJS: Technical Issues

The choice of OJS as the journal management and publishing system for DigitCult was driven by a number of aspects, including its free and open source features, its adoption by a huge number of other open-access initiatives, the customization options offered by its back-office interface, and the huge community of users and developers who are regularly exchanging opinions and technical advices on OJS discussion forum.

As it regards the graphical interface of the journal, by entering the administration area it is possible to load user-defined texts and images, in order to customize e.g. the header through the journal's logo or to assign a cover to the current issue. It is possible to further exploit the possibilities for interface customization by uploading a user-defined CSS[3] file, thus giving the desired look to pages in terms of font family, size and weight, background and foreground colors, link styling, and much more.

A more challenging aspect concerns the customization of the original structure of journal pages. From this point of view, the availability of built-in as well as user-defined plugins can help. For instance, the information about DigitCult's editor, scientific committee, editorial board and publisher presented in the left column of the homepage was realized through a block plug-in defined by the webmaster and implemented in HTML language. After adding this user-defined component to the list of available plug-ins, it was possible to load it both in the homepage and in the *Board* area of the *About* section.

Another section that required special care due to the transdisciplinary characteristics of the journal was the release of multiple templates, covering not only word-processor's common formats such as Microsoft Word (DOC) and its open counterpart OpenDocument (ODF), widely used in the digital editing of texts, but also LATEX, which is – more properly – a document preparation system. When authoring a LATEXdocument, the writer uses plain text as opposed to formatted text, as in WYSIWYG word processors like Microsoft Word; such a plain-text document contains markup information to define the general structure of a document, to stylize text throughout a document, to manage image and table layout, and to add citations and cross-references. The production of a formatted output document, typically in PDF or DVI format, requires to compile the source file. A LATEXtemplate was included since this approach is widely used in academia for the communication and publication of scientific documents in many fields, including mathematics, physics, computer science, statistics, and engineering.

In conclusion, OJS proved to be a framework flexible and customizable enough to natively manage the most common requirements of personalization concerning text and graphic content, as well as to slightly alter the original structure of Web pages. Nevertheless, some additional needs were required by the scientific committee and editorial board members of DigitCult. In the following we will describe some emerging issues and the workarounds implemented to solve them.

3.1 Extending Articles' Summary

A first point considered unsatisfactory regards the paper landing page, namely the content that a reader views by clicking a link to a specific article from the issue summary. The default information offered to the reader is rather poor: it would be reasonable to expect on the one hand the opening of the PDF version of the paper, or on the other hand a page rich in catalog information, additional content, links to related materials, etc. Conversely, the default settings restrict the page layout to abstract, keywords, and a link to the PDF file. An interesting area is reserved to the external back-references automatically retrieved by the platform; unfortunately these links, after their detection, should be evaluated and enabled case by case by the author of the work, which often results in a blank section.

Such a default setup, according to DigitCult scientific and editorial board members, makes

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[3] CSS stands for Cascading Style Sheets, which is a simple mechanism for adding style (e.g., fonts, colors, spacing) to Web documents.
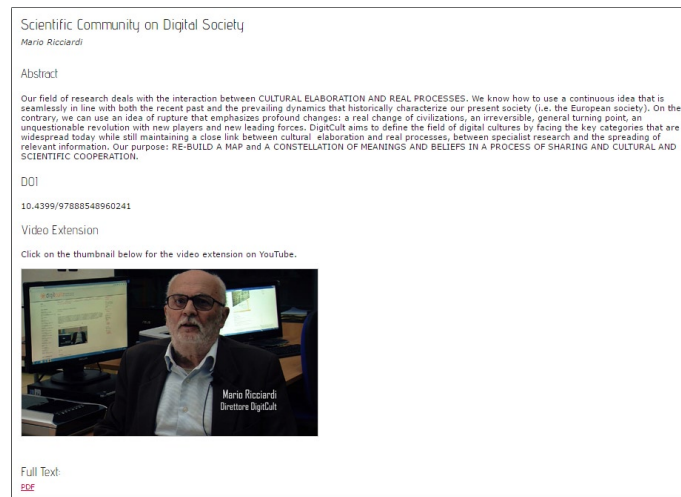
Figure 3. Customized summary including a video extension.

this page an annoying waste of time before getting to the actual paper content. Please note that the front page of the PDF document contains most of the information presented here. Instead of merely jumping this intermediate page to proceed directly to the PDF, we looked for ways to make its content more interesting. A trivial idea was to embed additional catalog information, not present in the original layout, such as the DOI[4] assigned to each paper. But the true advancement is to provide the reader with brand new sections, such as suggested Web sites, video extensions, and links to discussions on the social networks.

Two examples can be extracted from DigitCult Vol. 1 No 1. The Web interface of the customized summaries of papers (Ricciardi 2016) and (Haus 2016) is shown in Figure 3 and 4 respectively. It is worth noting that, with respect to the default structure, the former summary presents a section for the video extension, whereas the latter includes a list of essential Web references and additional video content.

From a technical point of view, these additional parts – whose meaning and importance have been discussed above – are hard-coded in the abstract of each paper and formatted through ad hoc HTML tags. OJS limits the range of HTML elements that can be displayed in the journal's pages. Such a list can be read by accessing the Site Administration area of the platform, and modified acting on the configuration file named `config.inc.php`. The allowed elements include basic tags for structure and layout, such as `<p>`, `<ul>`, `<ol>`, `<img>`, `<em>`, `<i>`, `<strong>`, `<b>`, etc.; but this list intentionally leaves heading tags `<h1>` to `<h6>` out, probably not to allow page customizations that would profoundly change its structure. Rather than forcing this setting, an easy workaround to enter headings in user-defined sections (e.g. the extended summary) is to confer a heading-like style to one of the allowed tags through the CSS. Needless to say, this will affect the look of such a tag throughout the interface, but some tags are unlikely to use – e.g. `<cite>` – and therefore they can be "recycled" to simulate headings.

3.2. Back Issues on the Homepage

The publishing policies of DigitCult include always-open submissions and publishing on a rolling base. Consequently, papers are expected to be available on line as soon as the copy-editing process ends. Due to an editorial choice, DigitCult presents the current issue's cover and summary in the homepage, which makes two conflicting goals emerge: on the one hand giving visibility to the last published issue, on the other hand offering the reader new contributions as soon as they are accepted for publication in the next issue.

Such a problem is partially solved by the time constraints of the publishing process. In fact, the end of the review phase and the consequent copy editing phase is often close to the release date of the new issue, even for those papers sent well ahead of the deadline. Therefore, the overlap between the old and the new works is quite limited.

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4   DOI stands for Digital Object Identifier, a persistent interoperable identifier in use on digital networks.

Figure 4. Customized summary including additional Web references and video content.

Figure 5. Cover thumbnails for quick and easy access to back issues from the homepage.

In order to minimize overlaps and maximize visibility, we come up with the following solution. About 15 days before the official publishing date, the new issue's articles begin appearing on the homepage, thus sending the earlier works to the archive. The visibility of the previous issue, which officially is still the current one, is guaranteed by a mechanism based on cover thumbnails shown on top of the homepage. These clickable images keep trace of the latest issues, pointing to the corresponding archive entries and giving them high visibility and prompt accessibility. An example is provided in Figure 5.

From a technical point of view, also this addition is based on the workaround explained above: the description of the journal – originally customizable in content but not in structure – is enriched and suitably formatted through ad hoc HTML tags, and currently includes also latest issues' thumbnails.

3.3. Two-way Integrations with External Resources

Since hyperlinks can be easily embedded in any user-defined text area of the interface, outlinks from OJS are trivial to implement. If the targeted material in turn can provide backlinks to OJS pages, then a two-way mechanism can be implemented, and this feature can greatly extend the capabilities of the platform.

An example is provided by the integration between OJS on one side, and media-sharing environments – such as YouTube and Vimeo – as well as social networks – such as Facebook and Twitter – on the other. The former approach lets readers enjoy alternative versions of the paper, insights and additional material, usually prepared by the authors themselves. Content can be commented by viewers, but in general terms this kind of tools is not intended for debate. The latter option allows the creation of open discussions on each specific paper, thus enabling a closer interaction among authors and readers.

In both cases, the information flow can proceed in two opposite directions, and this feature makes DigitCult an original example of transmedia experiment, not only in its content but also in its form.

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