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The Importance of Single Source Publishing in Scientific Publishing

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Academic publishing currently raises several issues, such as the production of multiple artifacts from a single source. The expression "single source publishing" refers to generating several formats from a single source. A single document can be used to produce various formats, without having to switch from one process to another, whether it is a PDF format for printing, an XML export for a digital platform, or a digital version in HTML format. This editorial challenge brings up both theoretical and technical questions, such as the legitimization of content, the evolution of publishing practices, and the creation of adequate tools. At the intersection of media studies, publishing studies, and literature, the concepts of hybridity (McLuhan, 1968), hybridization (Ludovico, 2012), or editorialization (Vitali-Rosati, 2016) allow us to question the principles of this editorial design.

Actuellement, les publications académiques soulèvent plusieurs questions, telles que la production d'artefacts multiples à partir d'une source unique. L'expression « publication à source unique » fait référence à la production de plusieurs formats à partir d'une seule source. Un même document peut être utilisé pour produire différents formats, sans devoir passer d'un processus à l'autre, qu'il s'agisse d'un format PDF pour l'impression, d'un export XML pour une plateforme numérique, ou d'une version numérique au format HTML. Ce défi éditorial soulève des questions à la fois théoriques et techniques, telles que la légitimation des contenus, l'évolution des pratiques éditoriales et la création d'outils adéquats. Au croisement des études médiatiques, des études éditoriales et de la littérature, les concepts d'hybridité (McLuhan, 1968), d'hybridation (Ludovico, 2012) ou d'éditorialisation (Vitali-Rosati, 2016) permettent d'interroger les principes de cette conception éditoriale.

This article is the result of a collective work that started with the creation of a poster with Margot Mellet (Université de Montréal) and Marcello Vitali-Rosati (Université de Montréal) in the context of the DH Unbound 2022 conference (Fauchié, Mellet, and Vitali-Rosati 2022).

Current academic publishing practices raise several issues, such as content diffusion on different platforms, accessibility with Open Access, and sustainable archiving challenges. Another issue, the production of the reading documents, did catch our attention as it expresses a singular question, which we aim to answer: how to organize multiplicity and interoperability in the life of a document? Today, academic publishers have to generate several formats of their articles, journal issues, and books according to the needs of different distribution platforms (in addition to a printed version when it exists). Hence, the publishing academic workflow has to produce many different artifacts (for instance, XML, HTML, or PDF). How can we do so without over-complexifying the task of authors, editors, and publishers? The expression single source publishing refers to the generation of several formats from a single source, and it is a possible answer to our question. With single source publishing, a single file or set of files can be used to produce various formats without having to switch from one process to another, whether it is a PDF format for printing, an XML export for a digital platform, or a digital version in HTML format. This editorial challenge brings up both theoretical and technical issues, such as the legitimization of content, the evolution of publishing practices, and the creation of adequate tools. The answer to such questions exceeds pragmatic and practical concerns, especially when considering the editorial and publication chains. At the intersection of media studies, publishing studies, and literary studies, the concepts of hybridity (McLuhan [1965] 1994), hybridization (Ludovico and Cramer 2012), and editorialization (Vitali-Rosati 2016) allow us to question the principles of this editorial design. With this conceptual framework, we may take a theoretical step back to study the technical principles that make single source publishing possible.

In parallel to these conceptual concerns, the implementation of single source publishing also represents a major challenge for publishers and distributors of scientific publications. However, the benefits are many: creation of a common space for all those involved in the publishing chain; clarification of actions on content; merging of needs between the various output formats; mutualization of efforts for the various exports to be produced (PDF, HTML/web, XML, EPUB, etc.); and the simplification of archiving and maintaining by having that single source. Setting up publishing chains with single source publishing is complex: several initiatives have been trying to meet this challenge since the early days of computing. Software that implements the principles of single source publishing does exist, but in the present article, we focus on *chains*, which are

based on a combination of different computer programs or softwares. In the Revue2.0 project, led by the Canada Research Chair in Digital Textualities, several journals have experimented single source publishing with the semantic text editor *Stylo* (Stylo 2023), which is one technical solution among others. The Revue2.0 project is a case study for both the concrete implementation of single source publishing and the study of theoretical questions related to that subject. This article is an opportunity to address the interrelation, interactions, and considerations between theoretical and practical issues.

What is single source publishing?

Single source publishing (sometimes written *single-source publishing*) is both a method and a principle; it is the use of a single file or set of files to produce many finished written artifacts in a variety of formats. For instance, one file in a markup language and a folder containing pictures and diagrams could be used as the single source, and a series of instructions (a software or a script) could produce a PDF file for printing, another for an online archive, an HTML page for a website, an XML for digital platforms, and an e-book in the EPUB format. Any modification to the source file would then ripple into every publishing format, saving time and energy for the publishers. However, the setting up of single source publishing requires some time and technical knowledge, an issue more and more obsolete since free and open-source tools are now common and well documented. Single source publishing is at its core a technical principle that describes an array of digital publishing technologies (Blanc and Haute 2018).

A brief definition

Mainly, single source publishing proposes to produce multiple outputs from one, single source. As we already said, with this approach, it's possible to produce a PDF format for printing, an XML export for a digital platform, or a digital version in HTML format, from *one* source file. Single source publishing requires a highly flexible source, which usually consists of a set of texts, some metadata and bibliographical data, and some images or other media. Some students or researchers already use the principles of single source publishing; however, it is long and tedious with a classic text processor, which lacks flexibility; it is complex and just a little more flexible with LaTeX, and it is both expensive and difficult with XML. Since the beginning of the 2000s, a few alternatives emerged based on (1) lightweight markup languages, (2) structured bibliographies, and (3) open–source convertors; our case study (*Stylo*) uses Markdown, BibTex, and Pandoc. Markdown is a markup language used in blogging, README files, Jupyter/R Notebooks, and forums; it is easy to learn and to read for both humans and machines. BibTex is a reference management software that structures references and produces bibliographies according to a given style (such as MLA, APA,

Chicago, etc.). Pandoc—known as the Swiss Army knife of publishing (Dominici 2014)—is a powerful alternative for producing academic artifacts from one single source. This library allows the user to convert files from one format to another, allowing for one source to be converted into one of many possible outputs. In this section, we explore what it means and what implications it has for scientific publishing.

Dealing with reality: Academic publishing constraints

Scientific publishing has several requirements since the articles, journals, chapters, and books are complex editorial artifacts. The first group of specifications is the paratextual elements (Genette 2002):

- · critical material: footnotes, citations, bibliographies, figures, inserts
- metadata: data about data, like title, subtitle, authors, standard identifiers (ORCID, Wikidata, etc.)
- bibliographic data: structured references

Furthermore, scholarly research and publishing require texts to have a semantic structure, both to enrich its content (especially in XML) and to insure an efficient digital diffusion (structured data is paramount to archiving and retrieving texts in large databases).

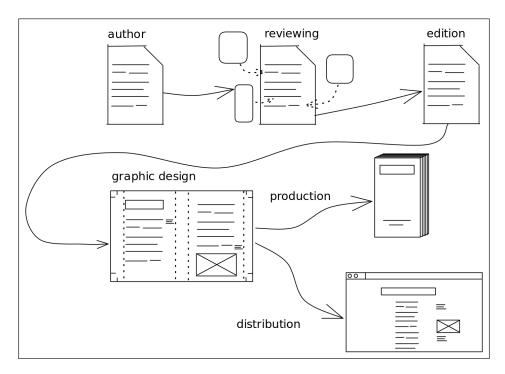


Figure 1: The academic publishing workflow.

The second group of complexities is the academic workflow (Figure 1), or more precisely, the path of the text through the stages of submission, peer reviews, corrections, and publication. The authors, the editors, the publishers, and the distributors all require specific file formats through its circulation and validation, and even in a given format, multiple files are used by different contributors without a way to merge them. In the humanities, where the pressure to publish is significant ("publish or perish" [Auerbach 2006]), the actual process of publication is quite slow and cumbersome; this conflicting injunction is painful to both authors and editors. These paratextual elements are restrictive and should shape both the ideation and implementation of the editing process.

A brief history of single source publishing

The expression appeared with the first graphical user interfaces: the same file could be viewed on the screen and be produced as a printed artifact. Single source publishing has seen more projects with the development of XML, which allows the developer community to manage only one source for multiple artifacts—including multilingual support. In digital humanities it is especially the XML-TEI that is used for digital publishing and the encoding of textual information. The Text Encoding Initiative (TEI) is a consortium that developed (starting in 1987), promotes, and maintains a set of XML elements, attributes, and entities to represent textual artifacts in digital form. Extensible Markup Language (XML) format is used to store data in a structured, hierarchical way; TEI is thus a scheme that specifies how XML is used in the case of written documents. The widespread adoption of TEI in the description (or representation) of textual artifacts and data means that information produced by one institution or individual can be used by others, and documents can be used and parsed regardless of who encoded them. The extensibility of XML and the ongoing maintaining of TEI mean that any information in a written document can be represented for ease of use, as the XML format is easier to reference, share, and search than physical documents or pictures. XML-TEI makes it possible to produce texts in several formats like HTML or PDF from a unique source and instructions (a software or library such as Pandoc) that manage the outputs.

An earlier example of single source publishing is One Document Does it all (or ODD). Its principle is to write the documentation for an XML (or TEI) schema, the encoding rules, and the customization details all in the same file (Viglianti 2019). More fundamentally, it is about writing code and documentation in a single process, and it is the origin of the word processors: the developers started to write their documentation behind the code—with a typewriter—before the creation of the first word processor, Electric Pencil (Kirschenbaum 2016, 100).

Single source publishing is still an important issue that warrants continuous development, mainly because of the tediousness of the publishing process and of financial constraints: the current process is time consuming and requires a certain expertise.

What does it imply?

In this section, we present different approaches to single source publishing from a pragmatic perspective (implementation and practicalities). To explain the theoretical principles of the single source publishing approach, one has to explore the pragmatic implementations and implications. There are different ways to use this approach.

Single source publishing implementation

Since single source publishing is a series of principles rather than a specific tool, it can have many different implementations, the simplest of which being to separate the source, the templates, and the conversion instructions. The *source* is the content, usually a text with semantic and basic layout information, metadata, and medias. The *templates* model each final output, for example, the arrangement of information as diverse as the title, the metadata, or the body of the text. Furthermore, the templates explicify the behaviours of certain data according to the output format: titles might not be displayed the same way on a printable PDF and an archival copy. A template would also hold instructions of very precise layout information, such as how to display an alt caption for the figures on the HTML version of an article. The *conversion instructions* are necessary to assign the appropriate templates depending on the outputs. So, if the source is a semantic document, the template can rearrange the elements (textual and paratextual) from a source into an artifact (HTML, XML, or PDF).

As previously mentioned, textual data is rarely made up of only text, like XML-TEI, which is usually used to represent an actual, physical, written document. This scheme focuses on what the document looks like, but there are other formats, markup languages, and schemes that encode semantic rather than visual information. For instance, conceptual markup structures and labels part of the text with categories such as subtitle, section, citation, and external references. When a presentational markup might only "understand" that a word should be in italics, TEI might have added information in its attribute that expresses why the word is italicized (for instance, it might be a foreign word, a book title, or the author decided to emphasize it).

We made **Figure 2** to show a complete workflow with four main operations:

- 1. the writing, production, and collecting of documents, such as texts, medias, or data
- 2. the conversion of these documents, notably from one markup format to another markup format, and the reorganization of the files
- 3. transformation, resulting in the production of artifacts or output formats, such as PDF, HTML, or XML
- 4. publication of the artifacts

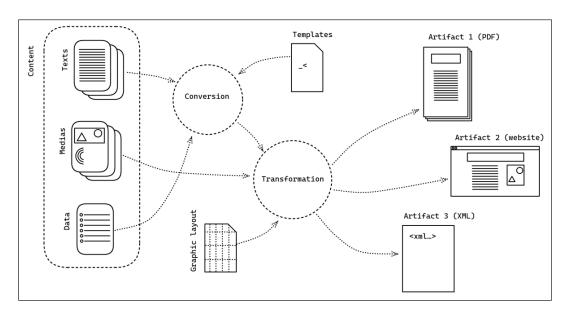


Figure 2: Schema of a single source publishing process with the conversion and transformation steps.

This diagram (Figure 2) shows that templates model the text (differently for each output format) in a new format that includes textual content and metadata. This file is then translated with a "graphic layout" that gives information on the disposition that elements should take on a page, and on the geometry of the page itself. These transformations are not only aesthetic, they represent important editorial decisions about how to render a page in a way that conveys both semantic and graphical information.

This figure contains other information. As we already said, the templates are the modelling of the text according to the final outputs. It is both the distribution of data (text and metadata) and the construction of the artifacts. The "graphic layout" is the visual translation of the templating, like the disposition on the page or the typographical choices. It is not just about aesthetic details, but important decisions about how informations are rendered on a page (printed or HTML).

Different formats: Ins and outs

In choosing an input format, many popular writing tools were considered, but commercial non-standard formats were quickly discarded as the likes of .doc/.docx do not allow the production of richly structured content. On the subject of structuration, XML is a good solution; however, it is complex, not intuitive, and there are not enough customizable tools to write and edit in this format. Despite this fact, a few approaches, based on both single source publishing and XML, like Métopes (Vincent 2020), are effective, although they require some expertise and have a steep learning curve. Lightweight and understandable markup languages, like Markdown or AsciiDoc, are an interesting intermediate solution; for instance, they were used in the Getty experiment with Quire (Fauchié 2020) for museum catalogues.

Raw digital textual data is rarely only made up of words (the .txt format being an exception). There are three different types of information normally found in a file containing text: presentational, procedural, and descriptive markup. The first type is usually hidden to the user; presentational markup is buried in the textual file and gives geometrical instructions to a software (such as Page, Words, or LibreOffice) that are not meant to be seen, nor informative for users. Procedural markup is information on how a text should be read or parsed by a computer and is usually legible by a human (a good example being the markup this text is emphased and more precisely or graphically in italic in HTML). Finally, descriptive markup gives semantic information on the content of a text, for instance, by tagging titles and sections, or by giving attributes to procedural and presentational markup to explain it.

In *contrario* to input where many decisions can still be made, scientific publishing requires specific output formats: PDF, HTML, and various XML with specific schemas—like JATS (Journal Article Tag Suite, an XML schema for scientific publishing) or TEI. The question is to understand the requirements of output formats to design efficient templates: for example, the XML formats necessitate more metadata than a PDF with specific markups, which can be shared with nothing else than a file name.

Benefits of single source publishing

As previously mentioned, the emergence of single source publishing has economic origins: if a workflow can be set up around one single source and can produce three or four different formats, it represents a huge savings. It is what we call a multimodal approach: one source but multiple artifacts/formats. With one source, there is no need to manage multiple versions, like the .doc version for the writing and editing step, the .xml version for the digital distribution step, and the .indd version for the printing step (INDD format is for the Adobe InDesign software). In theory, single

source publishing is a horizontal workflow since all actors of the publishing chain can participate at the same time—for example, editors (and in some rare cases, authors) on the source, publishers on the metadata, designers on the templates, and editorial engineers on the tool chain. So, editors, publishers, designers, and digital distributors can work simultaneously on the different stages of the publishing chain without having to wait for the previous steps to be completed. This process can support continuous and iterative work; building a publishing chain can be an iterative method.

Issues involved in the single source publishing principles

The actual and practical implementation of single source publishing raises several questions that go beyond technical issues. The technical workflows and the creation of digital publishing tools concern the editorial management as a whole from the legitimization of content to the evolution of publishing practices.

Legitimization of content

A horizontal publishing chain makes it harder to legitimize its content: where do we situate the validation, structure, and design of the documents, and how do we deal with the de-structuration of the classic chain? With single source publishing, legitimization is no longer a centralized issue: few different people with different levels of technical skills can modify the content until the final steps of the publishing workflow. However, since they are in control of the templates and publishing software, editors and publishers have final say in the layout without having to burden authors and reviewers with the responsibility to adopt or maintain a particular style. This also opens new possibilities for the publishing of new formats or the republishing of older texts with updated formats or layouts.

Evolution of publishing practices

Single source publishing is possible only if the editorial teams drop the use of commercial word processing (or at least learn not to depend on them). It is necessary that these teams integrate more tech in their staff, or even better, that publishers need to acquire the technical skills to manage or create publishing chains. A positive (or utopian) situation would be the creation of custom publishing chains by publishers by assembling free or open-source programs/software.

Creation of adequate tools

Since the 1980s, the scientific community uses mainly one unique numerical writing paradigm for both writing and editing: different generations of word processors

WYSIWYG (What You See Is What You Get) like Microsoft Word, LibreOffice Writer, or Google Docs. Proprietary software (and copycats of proprietary software like LibreOffice Writer for Microsoft Word and Scribus for Adobe InDesign) maintains a confusion between the structure of the contents and the graphic rendering. The academic community needs tools that correspond to its constraints, and that means the conscious encoding of semantic (rather than visual) information. Many communities already work in this paradigm of WYSIWYM (What You See Is What You Mean): Manifold, PubPub, Coko, Métopes, Quire, Stylo, etc. Groups and initiatives such as Métopes (Université de Caen), Editoria (Coko Foundation [Hyde 2021]), Quire (The Getty), or Stylo (Canada Research Chair on Digital Textualities and Huma-Num) are implementations of the single source publishing principles.

Concepts

Some interesting concepts are intertwined with single source publishing; here is an overview of three of them. We have chosen these because they give a new perspective on the single source publishing principles.

Hybridity

The hybrid or the meeting of two media is a moment of truth and revelation from which new form is born. For the parallel between two media holds us on the frontiers between forms that snap us out of the Narcissus-narcosis. The moment of the meeting of media is a moment of freedom and release from the ordinary trance and numbness imposed by them on our senses. (McLuhan [1965] 1994, 55)

In *Understanding Media*, Marshall McLuhan developed the concept of *hybridization* or *hybridity* (McLuhan [1965] 1994, 48–55). According to McLuhan, the hybridization of media produces new media, as media have a generative effect on each other. In the case of single source publishing, we should ask the question of the effect and influence of multiple artifacts on their single source and vice versa. It can be assumed that taking into account an additional output format (whatever it may be) will affect the way the source is structured and managed in the publishing process. It is what we can call a hybridity of the elements, with a fluent content modelling through complex templates.

The role of the templates is to translate a semantic construction into an editorial pattern, in determining how to distribute the information through specific instructions in a meaningful way. Hence, in our case, the hybridity is possible through the work done on templates (how the outputs are shaped).

Hybridization

In other words, this book [Martin Fuchs and Peter Bichsel's book Written Images] is a comprehensive example of post-digital print, through a combination of several elements: print as a limited-edition object; networked crowdfunding; computer-processed information; hybridisation of print and digital—all in one single medium, a traditional book. (Ludovico and Cramer 2012, 156)

Written Images was a book subject to a crowdfunding campaign from which several artifacts such as a website, printed books, and printed postcards were produced. From Alessandro Ludovico, the hybridization of forms and formats is a phenomenon that can be observed in the first digital experiments, like electronic literature available online or the first augmented e-books. Electronic literature explored the possibilities of writing and publishing literature in new forms (Rettberg 2014). It is about producing literature that can seemingly only exist on digital supports like computers, since it uses hyperlinks, interconnected texts, or multimedia, such as texts, images, videos, and interactions in the same document. Augmented e-books appeared mostly through technologies such as the iPad around 2010. An augmented or enhanced e-book (James and De Kock 2013) is a special form of digital book that incorporate digital elements and tools that could not be included in a traditional paper publication. Augmented e-books make use of hyperlinks (both within and outside the browsed documents), create popup windows, play videos and sounds, might include interactive or live graphs, and even change according to user interaction (either through individual choices or according to a community's practice).

In *Post–Digital Print*, Alessandro Ludovico analyzes several examples of hybrid publishing initiatives, where few artifacts derived from the same content complement each other. Electronic versions of books, journals, magazines, or articles came in to complete already existing forms: printed and digital artifacts become hybrid. Even if the source is unique, it is possible to conceive different scenarios depending on the output format; for example, a specific block of text can be displayed differently depending on the artifact. This can be considered as an anticipation or as an investment in order not to waste time on adjustments that would concern artifacts that would no longer have any link between them. Paper publishers already experiment with different versions for a given printed book with the same content inside: from the cheap and affordable paperback to the luxurious, embossed, limited edition hardcovers. It is also not uncommon to find that the digital version lacks some content that would not be well rendered in the EPUB format, or better quality/more pictures in an electronic version where colour printing is too expensive. Hence, single source publishing implements Ludovico's concept of hybridization: rather than editing several source versions to get

the corresponding artifacts, it is possible to create a unique source and use templates as scenarios for generating different artifacts in both their form and content. Hybridization is more coherent and powerful when all of the content of a given project is in the same place, generating different forms and version from the same source.

Editorialization

Editorialization is the set of dynamics that produce and structure digital space. These dynamics can be understood as the interactions of individual and collective actions within a particular digital environment. (Vitali-Rosati 2016, 8)

According to Marcello Vitali-Rosati, editorialization is an evolution of the concept of edition in a contemporary context by taking into account the digital. Editorialization expresses the idea that actions like writing or reading are shaped by the tools and support (platform) we use. The adaptation of publishing chains to produce different artifacts is one such way of understanding and constructing this space. Single source publishing is one expression of editorialization, where all work converges in a horizontal structure in order to produce textual artifacts. The modelling of our space depends on the way we design and build these processes: methods, tools, free/open-source software, technical approaches, etc. Single source publishing implies a remodelling of text within many scenarios, a task that mirrors the shaping of digital and real spaces.

Academic single source publishing in practice: The example of Revue2.0

How can we ensure that tomorrow's knowledge is based on a plurality of worldviews, languages and cultures? How can we ensure that this knowledge is not oriented by commercial interests, and that it retains a public and collective dimension? (Fauchié et al. 2020)

Revue2.0 project was led by the Canada Research Chair on Digital Textualities from 2018 to 2021 (Revue2.0 2022). Revue2.0's (in French *revue* means "journal") goals were to investigate how academic journals build knowledge and to show the richness of variety in academic publishing practices. Experimentations were conducted with a dozen journals in the humanities, such as open peer reviews, automatic analysis of a corpus of journals in the humanities, and single source publishing. *Stylo*, the semantic text editor for academic writing and editing, was created in this context (Vitali–Rosati et al. 2020). Several journals have experimented with single source publishing and *Stylo*, with which it is possible to produce simultaneously many different versions from one set of files: the source. From a set of text (Markdown), metadata (YAML), bibliographic data (BibTex), and media (jpg, png, etc.), scientific journals can produce the following formats: HTML for their website, PDF for their own distribution and aggregators, and

XML formats for digital distributors. *Stylo* also supports the production of e-books with the EPUB format, as well as LaTeX, DOCX (as some publications still require this format for submissions), and ODT. A research report is available on the Revue2.0 website (Fauchié 2021); it gathers the editorial experiences of three journals.

Stylo is a tool designed to transform the digital workflow of scholarly journals in humanities and social sciences (Vitali-Rosati et al. 2020). As a WYSIWYM (What You See Is What You Mean) semantic text editor for the humanities, it aims to improve the academic publishing chain with specific export setups.

Revue2.0 (and its use of *Stylo*) is an example of the technical and human implementation of the theoretical principles of single source publishing. This project was only made possible with a clear understanding of single source publishing issues and an appreciable dose of skilled labour and determination. Each journal found explicit solutions for their publishing requirements and helped to improve the methods, the tools, and the documentations. Revue2.0's conclusions can be found in the aforementioned reports, articles, and books, and in Nicolas Sauret's thesis (Sauret 2020).

Conclusion: Inspirations from different domains

Single source publishing is a series of principles and different ways of implementations. Single source publishing involves technical issues (technological choices), political issues (potentially more horizontal human organizations), and theoretical issues (like hybridity, hybridization, and editorialization). The projects cited in the present article were academic in nature, but some other creative initiatives also make use of single source publishing. Abrüpt Template is an editor project from the Swiss publisher Abrüpt: from a Markdown marked-up source it is possible to generate both a paginate version (a PDF format for print) and digital version (HTML and e-book with EPUB) (Abrüpt 2021). Pandoc-SSP is another workflow based on Pandoc; it is created by Arthur Perret (Perret 2023). The *fabrique* is a minimalist workflow based on a static site generator (Hugo) and a JavaScript library to paginate web pages (Fauchié 2022); the fabrique is created by one of the authors of this article: it is a workflow influenced by web technologies. In addition to their variety and originality, these projects use the low-tech or minimal computing approach (Risam and Gil 2022); they have in common that they limit the use of complicated technologies. In conclusion, it is possible to build efficient, human readable, and sustainable publishing workflows, even though academic publishing has complex requirements.

This article was made with Vim, Markdown, YAML, Pandoc, and Git. The poster from which it is derived is available in different versions (Fauchié, Mellet, and Vitali-Rosati 2022).

Competing interests

The authors have the following competing interests to declare: Antoine Fauchié and Yann Audin are involved in the development of the software *Stylo*, and Antoine Fauchié is the creator of the workflow *la fabrique*.

Contributions

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Authorship is alphabetical after the drafting author and principal technical lead. Author contributions, described using the CASRAI CredIT typology, are as follows:

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