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Against infrastructure: global approaches to digital scholarly editing.

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Consent form for *C21 Editions* interview participants

Thank you for participating in the *C21 Editions* research project. The purpose of this document is to explain to you how your article **Against infrastructure: global approaches to digital scholarly editing, c21 editions, Bloomsbury Publishing** with Raffaele Viglianti (University of Maryland) will be used, enabling you to make an informed choice.

C21 Editions is an international collaboration between University College Cork, the Digital Humanities Institute at the University of Sheffield, and the University of Glasgow. As you are aware, the project is seeking to explore and make a direct contribution to the future of digital scholarly editing and digital publishing. Part of that endeavour involved engaging with various experts and stakeholders, such as yourself.

If you have any queries about this research, you can contact James O'Sulliuvan at **james.osullivan@ucc.ie**

Best wishes

Ben Doyle

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Against infrastructure: global approaches to digital scholarly editing

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Abstract

Digital scholarly editions are one of the oldest forms of output of digital humanities research projects, and arguably one of the most prolific. Like all digital humanities projects that result in the creation of digital output—typically a website—digital editions are not immune to what Smithies *et al.* call the "digital entropy of software and digital infrastructure". This has a cost that grows with the complexity of the system needed to publish digital editions and this cost is often not only financial; it may also include the ability to access institutional or public infrastructure. The principles of minimal computing have informed new ways of undertaking digital humanities work, focused on use of open technologies and ownership of data and code. The latter in particular entails independence from institutional infrastructure and the network of surveillance that is a feature of many commercial platforms of the modern web.
This chapter discusses the current extent of minimal computing as an influence on digital editing, and which aspects of the concept have taken stronger root. Specifically, we will consider how, when applied to digital publishing, minimal computing principles intersect with a recent resurgence of static websites and related technologies. Deriving static sites from an end-of-life project is the clear choice when access to infrastructure becomes limited. What would it take to adopt them from the start to avoid infrastructural constraints? Through this discussion, the chapter articulates the need for a low-infrastructure future of the "global" digital edition.

Introduction

Digital scholarly editions are one of the oldest forms of output of digital humanities (DH) research projects, and arguably one of the most prolific (Pierazzo 2019). Like all DH projects that result in the creation of digital output—typically a website—digital editions are not immune to what Smithies *et al.* call the "digital entropy of software and digital infrastructure" (2019). While software and infrastructure are instrumental to the editorial work of a digital edition project during its entire lifecycle, this entropic process begins right after the *launch* of an edition's

website. In other words, as soon as a digital edition becomes available to its intended audience, the risk of it disappearing from the web grows, as funding and interest in keeping infrastructure available dwindles. A critical research approach to the infrastructure that keeps digital editions online is fundamental to the future of digital editing and publishing, but it is often a secondary matter for projects focused on the editorial work, scholarly significance, and the logistics of making the edition a reality.

The kind of publishing infrastructure needed by scholarly editions can vary greatly; many are somewhat experimental in nature, partly pushed by the need for achieving technical innovation in order to secure funding. Elena Pierazzo, adopting a fashion industry metaphor, calls these editions "*Haute Couture*" (Pierazzo 2019). They are characterized by experimentation and innovation, pushing at the boundaries of what scholarly editing can do as a research practice. At the opposite end of the spectrum, Pierazzo proposes a "*Prêt-à-Porter*" editorial model, whereby projects would rely on pre-existing tools and infrastructure to publish smaller scale editions, or editions that for a reason or another do not warrant (or cannot afford) to be digitally experimental. *Prêt-à-Porter* editions are not entirely achievable, given the lack of tools and infrastructure capable of fully supporting them. Nonetheless, Pierazzo argues that such an approach would renew emphasis on the text being edited by abstracting away most technical issues and by avoiding a race for digital innovation. Additionally, the tools and infrastructure required would make digital editions a more desirable publication for scholarly editors and would "consolidate the achievements of digital editing" (Pierazzo 2019). But who would be in charge of providing this kind of infrastructure? While funders have started requiring data management plans and maintenance plans, the problem of what happens to a funded digital edition after the conclusion of a project is inevitably outsourced to a different entity, such as a University IT department, a digital publishing house (few are willing to support digital scholarly editions) and commercial platforms[1], or national infrastructures.[2]

Infrastructure is inevitably cast in a supporting role, while the project, or the edition, is the focal point of scholarly work. This has led many to characterize infrastructure for DH projects as something that should "just work" and be as invisible as possible (del Rio Riande 2022) or even as something "diabolical [...] that performs a type of secret and silent" work (Verhoeven 2016). The reality, as both these scholars highlight, is that infrastructure is not only central to the

[1] Such as Gale, which has been offering services for digital publishing in DH (https://www.gale.com/intl/primary-sources/digital-scholar-lab), or *Rotunda* at the University of Virginia Press (https://www.upress.virginia.edu/rotunda/), or the Illinois Open Publishing Network (https://iopn.library.illinois.edu/).

[2] Like Huma-Num in France (https://documentation.huma-num.fr/humanum-es/), or all the national chapters of DARIAH in Europe or associated countries.

existence of DH projects, but it can be at the heart of “inventiveness and interpretive resourcefulness” (Verhoeven 2016). Nonetheless, projects and infrastructure remain separate concerns because of scope, goals, and the people involved likely belonging to separate teams. Digital scholarly editing—a creative process with a need for maintenance—must take into account from the start how infrastructure and those who maintain it will shape the project’s scope, reach, and long term existence on the web. Digital edition projects may want to consider how much infrastructure they really need, or if they need an infrastructure partnership at all. Rather than suggesting that infrastructure should “just work” and be “invisible”, this provocation questions whether infrastructure is needed at all, or, more realistically, how little infrastructure is in fact needed for digital editions. In other words, how much of a digital edition can be successfully published without the involvement of further parties dedicated specifically to its existence on the web?

On a more practical note, infrastructure for publishing scholarly edition websites has a cost that grows with the complexity of the system needed and this cost doesn’t have to be exclusively financial; it may also include the ability to access institutional or public infrastructure and to which degree. In such a brittle environment, digital editions risk falling through the cracks. In describing how the King’s Digital Lab (KDL) managed over a hundred legacy projects (including digital editions), Smithies *et al.* explain that

> “not all projects should be maintained in perpetuity. Some are better conceived as short-term or even momentary interventions in the scholarly conversation, to be archived online for the historical record but not worth the intellectual, technical, and financial overhead of ongoing maintenance.” (Smithies *et al.* 2019)

This statement is an important reminder that those in charge of infrastructure are also determining, particularly in the long term, the scholarly worth of a project, whether it should remain online, and in what form.

Infrastructure for scholarly editions, today

The requirements for keeping a digital edition online after launch largely depend on the software used to build it. XML technologies are and have been particularly apt given the central role of the Text Encoding Initiative (TEI) XML format in the field. In order to support querying and transformation to HTML, TEI data is typically hosted in an XML database capable of supporting

and publishing a web application online. TEI Publisher (https://teipublisher.com/) is the quintessential example for this kind of setup: built on the open source XML database eXist, it offers a powerful and flexible web publishing environment for both developing and managing digital editions. The aforementioned KDL has, over the years, developed Kiln,[3] an in-house publishing solution for its numerous TEI projects. Many other digital editions opt to write their own custom code and web applications.[4] Once an edition is published, these various tools need infrastructure and maintenance to remain online. Often this burden falls among the responsibilities of technical partners of the digital editions, such as a DH lab or university library. KDL, for example, requires project partners to agree to a "Service Level Agreement" to determine how long and in what form a project will be hosted on their infrastructure (Smithies *et al.* 2019).

National and non-profit organizations may offer an alternative space for publication, particularly in the European Union (EU), where a number of initiatives have addressed EU requirements for Research Data Management (European Commission 2017). For example, Huma-Num, the French national infrastructure dedicated to Digital Humanities, hosts a number of digital editions.[5] The goals behind Huma-Num are to centralize research data to avoid dispersion and loss in the large volume of data created through research and to relieve the individual researcher, or even the research lab, from the responsibility of long-term preservation (Larrousse and Marchand 2019). TextGrid, in Germany, was one of the earliest Virtual Research Environment for the Humanities and still provides publication infrastructure for editions and their data.[6] Currently, it is part of the larger EU-backed research infrastructure projects CLARIN and DARIAH.[7] This level of support to public infrastructure applicable to digital editions is somewhat unique to the EU; access to its resources, however, is not guaranteed and the process for submission and acceptance is not entirely transparent.[8] Additionally, the goals of these

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[3] Kiln documentation: https://kiln.readthedocs.io/en/latest/.

[4] Many can be found in the comprehensive *Catalogue of Digital Editions* (https://dig-ed-cat.acdh.oeaw.ac.at/), which includes a brief "infrastructure" field for each cataloged edition (Franzini, Terras, and Mahony 2016).

[5] For example, the *Electronic Edition of the works of Jean-Joseph Rabearivelo:* https://rabearivelo.huma-num.fr/exist/apps/jjr/index.html. Many of the editions hosted on Huma-Num result from a partnership with the non-profit *e-editiones* spearheaded by the company eXist Solutions GmbH. Other projects like DiScholEd - Digital Scholarly Editions (https://dischole d.huma-num.fr/) are part of similar partnerships.

[6] https://textgrid.de/ and https://textgridrep.org/.

[7] DARIAH Teach offers tutorials in different languages about DSE: https://teach.dariah.eu/course/view.php?id=32

[8] For example the TextGrid home page states: "Would you like your own XML encoded files to be archived, made quotable and accessible through the TextGrid Repository? Then contact us: https://textgrid.de/en/kontakt/".

centralized systems do not always go hand in hand with what the academic community needs (van Zundert 2012).

The situation is more encouraging for research data repositories, where individual researchers and institutions are able to submit and preserve for the long term discrete research output. Digital editions, just like many research endeavors, create a number of research artifacts during their lifecycle, including articles, conference presentations, code, and TEI data. TEI's role as archival and interchange format is an advantage for the long-term preservation of digital editions that use it: TEI is designed to model[9] and encode both the text—e.g. from an extant source—and the scholarly intervention of editors during transcription and editing. This makes a TEI document itself an important record of the editorial work, even without a rich user-friendly front-end. Though, without a digital publication, the TEI is not quite the whole "edition". The complexities of TEI XML publishing have historically taken a central role in the creation of scholarly digital editions. Scholars have highlighted the interdependence between data and its processing (e.g. TEI and XSLT), arguing that code needed to achieve digital publication is as scholarly as the editorial model itself (Pierazzo 2011; Boot 2009; Clement 2011; Drucker and Svensson 2016)—though there are also arguments to the contrary (Turska, Cummings, and Rahtz 2016).

In many disciplines researchers are encouraged to deposit data in "domain" repositories, especially those that are FAIR-aligned, whenever possible.[10] A "domain" repository—or a repository that hosts data from a specific discipline—will usually host specific types of data and have expertise in curating and making them interoperable for that discipline. As a result, leading domain repositories help maintain data quality, provide a level of peer review, and help data meet community standards to enable interoperability and reusability. This is not the case for DH or digital edition projects, in which the decision related to the archiving of data in a repository does not rely on best practices or principles,[11] but depends on workflows (such as GitHub and

[9] To "model" here is intended as the scholarly act of turning cultural objects of investigation into computable data, as theorized by e.g. McCarty (2005) and Flanders and Jannidis (2015).

[10] FAIR stands for Findable, Accessible, Interoperable, and Reusable data. The FAIR Data Principles seek to promote maximum use of research data. In research libraries and repositories, the principles can be used as a framework for fostering and extending research data services. FORCE11 hosts a page on the FAIR Data Principles: https://force11.org/info/the-fair-data-principles/.

[11] FORCE11 has been releasing Principles for scholarly objects (https://scholarlycommons.org/) or data citation (https://force11.org/info/joint-declaration-of-data-citation-principles-final/), but only the FAIR (and CARE) principles seem to have entered some basic discussions in the digital humanities community (Harrower 2020).

Zenodo)[12] or on the infrastructure chosen; for example, by adopting Huma-Num as infrastructure for publishing and Nakala[13] as a data repository.

While research data repositories are not a solution for keeping digital editions online, they are valuable and successful infrastructure for the preservation of digital editions as data. There are several data repositories that are already well established or are gaining ground, such as the aforementioned Zenodo, a general-purpose data research repository hosted by CERN and funded by the EU OpenAIRE project, which has become a popular and robust solution for storing and publishing research data, with even the option for assigning persistent identifiers, such as DOIs, to resources.[14] Another example is Humanities Commons, a successful non-profit model that works as a social network and a data repository for the humanities.[15] These repositories are successful in part because their usefulness is clear to their users who continue to submit to them in order to share and preserve their research data. Additionally their mission and required technology are fairly monolithic: the underlying systems are shared and robust (e.g. https://dspace.lyrasis.org/) and are built for the singularly defined purpose of long-term storage. Keeping digital editions online as *publications*, on the other hand, has a variety of needs besides storage to support elaborate front-end interfaces, search, and other services.

In this infrastructural landscape, digital edition projects are left with little solutions for the preservation of their publications; unless their edition (or editors) can sway capital and influence to afford private infrastructure or navigate the red tape of institutional and national infrastructure, access to open research data repositories seems to be the best solution, albeit unsatisfactory in its incompleteness.

Another way of gaining perspective on the requirements for keeping digital editions online, is to look at how older projects have remained online. Projects with substantial institutional involvement are maintained and remain online, such as the Rossetti Archive, started in 1993 at the University of Virginia (http://www.rossettiarchive.org/); the Internet Shakespeare Archive, started in 1996 at the University of Victoria (https://internetshakespeare.uvic.ca/), or Van Gogh's Letters, published in 2009 by the Huygens Instituut (https://vangoghletters.org/). What happens

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[12] There are some Best Practices for workflows via GitHub and Zenodo that allow researchers to connect code, data and their versions in a data repository, but mainly for Science, technology, engineering, and mathematics, such as these ones developed by a Geodynamics community: https://github.com/geodynamics/best_practices/blob/master/ZenodoBestPractices.md.

[13] Nakala's site: https://nakala.fr/.

[14] A Persistent Identifier (PID) is a long-lasting reference to a digital object (document, web page, etc.) that is globally unique, persistent, and resolvable. A digital object identifier (DOI) is a persistent identifier to uniquely identify documents and resources according to a standard and catalog maintained by the International DOI Foundation.

[15] This is achieved through Humanities Commons CORE: https://hcommons.org/core/.

to smaller scale projects, or those with less visibility? A common solution has been the creation of static websites derived from the original more complex websites. KDL has taken this approach, with the goal of “preserving functionally limited but usable “static” websites rather than complete systems” (Smithies *et al.* 2019). The Maryland Institute for Technology in the Humanities, with over 20 years of activity in DH, has taken the same approach to archiving legacy projects (Summers 2016), including digital editions (e.g. John Milton’s *A Maske* or *Comus*. Eds. Helen Hull, Meg Pearson, and Erin Sadlack https://archive.mith.umd.edu/comus/). Static sites are the natural choice for these archiving activities because they only require the absolute minimum from hosting infrastructure: a server to distribute documents at a given address. The sites themselves, once created, require no active maintenance and can be easily moved and transferred like any other collection of files. However, static sites cannot support features that would require an active server, such as large scale text search and user management; these features, therefore, are removed when projects are archived into static sites. Deriving static sites from an end-of-life project is the clear choice when access to infrastructure becomes limited. What would it take to adopt static sites from the start to avoid infrastructural constraints?

Minimal computing and the static site turn

The difficulty in accessing reliable infrastructure has been an issue for more than just editorial projects, but more generally for scholars who start approaching DH after having acquired, through formal and informal training, sufficient competence in the tools needed for their studies (Allés-Torrent and Riande 2020). Even more organized research groups may find themselves with limited access to their institution's infrastructure or encounter problems when using external services (del Rio Riande 2022). Minimal computing emerged in the United States as a reaction to the lack of access to institutional infrastructures, or their inadequacy to respond to the needs of DH projects and, in particular, those with a certain urgency in responding to current socio-cultural events (Gil and Ortega 2016).

In an interview with Cuban architect Ernesto Oroza, Alex Gil (2016) introduced the concept of *architecture of necessity* and applied it to DH projects and the infrastructure that supports them. Oroza had coined the concept of *architecture of necessity* to describe the expansion of the city of Havana, Cuba, which occurred spontaneously and in response to the immediate needs of its inhabitants; sometimes in contrast to government regulations and attempts to reorganize and regulate its development. According to Gil, this is largely comparable to the

development of DH research projects that have emerged and continue to emerge despite difficulties in obtaining funding and access to infrastructure. An important consequence of the lack of access to funding is the approach of humanities researchers to technical tools, such as basic web programming, "without the help we cannot get" (Gil and Ortega 2016). Here again, Gil draws on a concept by architect Oroza that describes the *moral modulor* as an individual who builds and learns to build out of necessity by focusing on what is useful and necessary; a moral scale perspective that, reworking Le Corbusier's proposals, is also purely physical.[16]

The concept of “necessity” is quite central to the minimal computing approach; as shown by a more formal definition of the approach in a recent retrospective:

> minimal computing is perhaps best understood as a heuristic comprising four questions to determine what is, in fact, necessary and sufficient when developing a digital humanities project under constraint: 1) “what do we need?”; 2) “what do we have”; 3) “what must we prioritize?”; and 4) “what are we willing to give up?” (Risam and Gil 2022)

The invitation to only adopt what is necessary to reach a research goal makes minimal computing applicable in multiple contexts and may thus serve as a common denominator for a more open and equitable DH: an approach that has the potential of being both globally accessible and locally adaptable. This adaptability is arguably brought forth through a conscious rejection of infrastructure:

> We need not wait for the affordances of infrastructure. In fact, I would argue that scholars adopting an infrastructure prematurely, or receiving a large grant for a project, might keep themselves from acquiring an intimate knowledge of the digital technologies they seek to employ and, by extension, from the means of producing their own digital humanities knowledge. (Gil 2016)

This is in line with wider movements to reject commercial and institutional infrastructure, such as re-evaluations of autonomous “self-hosting” for higher education infrastructure (Angeli *et al.* 2022) and similar discussions around the *Computing within Limits* annual workshop (https://computingwithinlimits.org/).[17] Some examples beyond DH and academia include the DIY

[16] The *modulor* is a system of mathematical measurements between man and nature developed in the 1940s by the Swiss architect Le Corbusier, in collaboration with André Wogenscky.

[17] In Latin America many open science or activist groups have standed against commercial software in Secondary and Higher Education. A good example are the projects Conectar-Igualdad in Argentina or

Book Scanner, a global community with chapters worldwide has “taken preservation in their own hands”.[18] Or the movement for “feminist servers” by the Tactical Tech NGO, which calls for a more autonomous infrastructure that is not controlled by the male-dominated tech industry that participates in unethical practices through data collection and surveillance for monetary gain (Tactical Tech 2017).[19]

Practical applications of minimal computing have relied on static sites as a way of affirming independence from institutional infrastructure. The static site generator Jekyll (https://jekyllrb.com/) has been particularly popular because the code hosting platform GitHub supports it as a free publishing solution. Alex Gil and others, for example, have worked on Jekyll-based alternatives to infrastructure-heavy DH solutions, such as Wax (https://github.com/minicomp/wax), a collection and exhibition builder meant to provide an alternative to Omeka (https://omeka.org/). The *Programming Historian*, furthermore, offers a successful example of minimal computing applied to digital publishing. It is a multilingual open-access, peer-reviewed scholarly journal of methodology for digital historians that moved from Wordpress (which requires a server-side installation and constant maintenance) to a Jekyll-based static site approach. Despite socio-technical challenges related to its growth into a multi-lingual publication, this approach has allowed the journal to flourish and avoid common technological pitfalls, including being bound by data models imposed by off-the-shelf systems (Lincoln *et al.* 2022).

The impact of minimal computing on scholarly digital editions, on the other hand, has been somewhat limited. The release of Ed, a Jekyll theme for digital editions (https://github.com/minicomp/ed) has resulted in a number of “minimal editions", ranging from student-led editions (Mini Lazarillo, https://minilazarillo.github.io/) to more scholarly editions (*Margaret Cavendish: Philosophical and Physical Opinions*, https://cavendish-ppo.ku.edu/).[20] Ed intentionally avoids support for TEI, in favor of simpler, more minimal, text encoding solutions such as markdown or HTML. This decision has likely kept Ed to the fringes of scholarly editing, given the prominence of TEI in the field because of its ability to encode both text and editorial

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Plan Ceibal in Uruguay, that foster the use of libre software in schools and the use of open educational resources. See Dussel (2020).

[18] DIY Book Scanner site: https://www.diybookscanner.org/en/index.html.

[19] This approach has had a number of practical applications in the Global South; most recently, a group in India has brought training and resources to rural parts of the country to empower women of the community to manage their own data and record storytelling activities. See https://thebastion.co.in/politics-and/tech/a-feminist-server-to-help-people-own-their-own-data/.

[20] In regards to student-led editions and minimal computing as a pedagogical instrument, the authors of this chapter have also taught a transnational (USA and Argentina) course on digital publishing with minimal computing, involving both undergraduate and graduate students (Viglianti *et al.* 2022).

process. Nonetheless, the advantages of static sites and the need for more independence from infrastructure highlighted by the minimal computing movement, has not gone unnoticed in TEI circles. Even preceding minimal computing, TEI Boilerplate (https://dcl.ils.indiana.edu/teibp/) provided a preliminary solution for displaying TEI documents directly in the browser by relying on CSS and browser-supported XSLT. TEI Boilerplate intended to bring the richness of TEI semantics closer to the final user, avoiding transformations to the less expressive HTML format (Walsh and Simpson 2013). The consequence of focusing on browser-supported technologies demonstrated that static websites are a viable TEI publishing solution for many editorial projects. The JavaScript library CETEIcean improved on this model by eliminating the need for XSLT transformation in the browser (where native support for this technology is at risk) and by providing an extension mechanism for adding interactivity to TEI elements via custom code functions called “behaviors" (Cayless and Viglianti 2018).

Examples of projects using CETEIcean include the Digital Latin Library (https://digitallatin.org/) and the new iteration of *Scholarly Editing: The Annual of the Association for Documentary Editing* (https://scholarlyediting.org/), which publishes small-scale digital editions with each issue. Inspired by minimal computing, the journal is open-access and uses static site technologies for longevity and sustainability. In Latin America, the HD Lab, the digital humanities laboratory at the Argentinian CONICET (*Consejo Nacional de Investigaciones Científicas y Técnicas*) has been creating minimal editions via a workflow built around Recogito, an open source semantic annotation software developed by Pelagios Network (https://github.com/pelagios/recogito2), incorporating TEI markup and rendering the edited texts in static sites built with Jekyll and GitHub pages.[21] This minimal, low-infrastructure approach was directly determined by the very limited funding and technological support granted to the lab. There are a few other digital edition projects relying on static sites, including the Jekyll and TEI based Shelley-Godwin Archive (http://shelleygodwinarchive.org/) (Viglianti 2018), but this approach remains marginal, partly because of the deeply rooted history of TEI in Java-based XML technologies and the infrastructure they require.

Low-infrastructure futures of digital scholarly editions

The future of digital scholarly editions appears to be bound for web publishing with low-maintenance, low-infrastructure requirements. After a few decades of digital scholarly

[21] HD Lab’s site: https://hdlab.space/.

editing, it is clear that static site digital editions are more likely to remain online[22] and—as discussed above—those complex projects lucky enough to have technical partners willing to create archival exports end up as static sites as well, typically with reduced features compared to the original publications. The most high-profile digital edition projects, often based in the Global North, perhaps are and will continue to be the exception. This should be seen as both a challenge and an opportunity: focusing on low-infrastructure from the start may level the playing field for digital editions across the Global North and South, leading to more shared workflows, tools, and resources. Project longevity, moreover, can go from a planned outcome to something achievable from the start. The minimal computing movement has put pressure on the inequalities of DH project work and the unequal access to infrastructure for keeping digital publications online. The responses to the principles of minimal computing—together with parallel experimentation with browser-supported technology—has begun to demonstrate that static websites are a viable option for digital scholarly editions from the get-go, or at least as a *planned* end-of-life option for projects requiring complex infrastructure during their lifetime, such as user management, crowdsourcing, machine learning and other semi-automatic aids to the editorial process. Perhaps, minimal computing and “minimal editions” are more useful to digital scholarly editing as a provocation or set of guiding principles rather than as a methodology to which projects should subscribe wholesale. On many occasions, scientific concepts—and their statements—continue to be used despite the fact that their ability to describe and explain the world has diminished. Ulrich Beck considered that most concepts in sociology "are misleading to some extent" (Beck 2004) and proposed the term "zombie concepts" to describe categories that endure after their “death”.

This is perhaps evident from the many low or anti-infrastructure movements parallel to minimal computing, such as the above mentioned *Computing within Limits*, Tactical Tech’s feminist servers, DIY Book Scanner, and—with a stronger focus on longevity—the *Endings* project at the University of Victoria, British Columbia (https://endings.uvic.ca/). “Ending Your Digital Humanities Project from the Start” is the telling title of one of their conference presentations (Takeda 2018); the project has highlighted the fragility of web applications and has proposed principles to facilitate long term preservation. The *Endings Principles for Digital Longevity* (Endings Project 2022) include, among other strategies, the reduction of both software complexity and dependency on infrastructure. The principles, in fact, go beyond infrastructure and propose guiding principles for the entire lifecycle of a DH project. Though, for

[22] Such as *Frankenstein; or, the Modern Prometheus. The Pennsylvania Electronic Edition* from 1994 (Curran and Lynch 1994). See a representative page at http://knarf.english.upenn.edu/Colv1/f1101.html.

the purpose of this discussion, the most relevant principle proposed by the Endings project, is that the so called products of a project should be a static site that relies on “standards with support across all platforms, whose long-term viability is assured. [Their] choices are HTML5, JavaScript and CSS” (Endings Project 2022), which are web standards and the fundamental technologies of static websites.[23]

Targeting low-infrastructure requirements and static websites may not seem fitting for some editorial projects. It was not long ago when crowdsourcing seemed essential to the future and democratization of scholarly editing (Ridge 2014; Blickhan et al. 2019); other chapters in this book may be pointing to future research directions involving algorithmic approaches such as machine learning for collation, or cognitive computing techniques for the transcription and annotation of textual sources. It should be safe to assume that, in scholarly editing, these tools are meant to be part of a workflow that culminates in a digital publication. Institutional infrastructure may be needed in order to support these more complex—particularly in the algorithmic sense of the word—activities related to transcription, content creation, and annotation; digital publication, however, is best supported by low-infrastructure approaches.

The minimal computing heuristic is useful to help projects face the technical limitations of static websites, particularly the question: “what are we willing to give up?”. During the lifecycle of the project, but particularly once the editorial process is completed, what features are strictly necessary? User management and rich text and faceted search are problematic in a static site without having to rely on third party services that could incur a cost and would eventually become unavailable.[24] Search features, if not non-negotiable, are probably the hardest to forfeit given their central role to textual discovery by users-readers of a digital edition. There are many search solutions that work in the browser,[25] including at least one emerging from the XML and TEI technical sphere (Takeda and Holmes 2022). The main issue remains scalability, since search indexes, which can be sizable for larger editions, need to be downloaded by the end user. This may need strategic planning around both document and indexing structures in order to only distribute the smallest possible amount of data useful at a time. This kind of

[23] The principles also suggest keeping away from external JavaScript libraries, something that is arguably not as urgent when JavaScript tools and frameworks are increasingly proficient in targeting JavaScript known to be supported by the widest range of browsers. It is less clear, however, if JavaScript embedded in the page, as opposed to linked to external repositories, would be compliant to the *Endings* project principles.

[24] See how the Shelley-Godwin Archive (http://shelleygodwinarchive.org/), a static site with a server-side search system, ended up losing its search system to obsolescence and lack of funding to develop a client-side solution, at least at the time of writing.

[25] Lunr, as an example among many, is a popular system: https://lunrjs.com/.

consideration is another important reason for planning about static site delivery from the beginning of a project as opposed to an afterthought.

Ultimately, infrastructure is about the people that make it possible. Smithies et al. argue that “a failure of post-millennium digital humanities” is the lack of “permanent DH development teams”. If they were in place, they could “resolve most issues of sustainability and maintenance” (Smithies et al. 2019). Acknowledging the centrality of people and ethics in the conception of infrastructure is essential to direct attention to an aspect of DH scholarship that, as we have seen, can too easily be invisible or secondary. While this shift takes place and as the field of critical infrastructure studies takes root (Liu et al. 2018), it is essential to address the many gaps of DH infrastructure, particularly when considering the inequalities of global DH scholarship (Viglianti et al. 2022). The work needed is both one of repair, such as the efforts undergoing to migrate decaying editions into archivable static sites and data, and of direct intervention. Minimal computing and the longevity principles of the *Endings* project are examples of the technological and methodological strategies needed to work against the current state of DH infrastructure, particularly for projects that culminate in digital publication, such as digital scholarly editions.

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Against infrastructure: global approaches to digital scholarly editing (proposal)

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Abstract

Digital scholarly editions (DSEs) are one of the oldest forms of output of digital humanities research projects and are associated with heavy infrastructure requirements and a certain brittleness (Smithies 2019). This has a cost that grows with the complexity of the system needed and this cost doesn't have to be financial, it may also include the ability to access institutional or public infrastructure.

Reducing dependency on infrastructure is motivated by tangible needs. "Digital scholarly editions are expensive to make and to maintain" (Pierazzo 2019); as such, long term web hosting and preservation along with access to servers pose a significant obstacle for not-so-well-funded scholars who are not able to apply for specific DH grants. Overall, DSEs require substantial infrastructure and advanced technical skills, but also, at a global scale, diverse needs, capacities, priorities, languages, and academic traditions may require different features from DSEs.

This perspective in favor of reducing dependency on infrastructure couples with a refocus of digital humanities scholarship from a European and North American center to a wider global lens. The work of the ADHO Global Outlook : Digital Humanities working group on Minimal Computing urges us to reckon with digital humanities output crafted under varying constraints imposed by lack of resources or power (Gil & Ortega 2016). The principles of minimal computing have informed new ways of undertaking digital humanities work, focused on use of open technologies and ownership of data and code. The latter in particular entails independence from institutional infrastructure and the network of surveillance that is a feature of many commercial platforms of the modern web.

This chapter will explore the concept of "minimal computing [...] as localizable space" (Gil & Ortega 2016), focusing on low-infrastructure and the "architecture of necessity" (Oroza 2022) as a common ground for a global practice in digital scholarly editing. We will discuss the current extent of minimal computing as an influence on digital editing, and which aspects of the concept have taken stronger root (from textual recovery, to "no markup" approaches, to shifting complexities in software architecture). Part of this discussion will interrogate whether minimal computing is the right term for a global digital editorial practice or if it is a "zombie concept", based on Ulrich Beck's terminology for scientific concepts that continue to be used despite the fact that their ability to describe and explain the world has been clearly diminished (Beck 2004).

We will ground our discussion through the analysis of practical applications of minimal computing to editorial practice. Specifically, we will consider how, when applied to digital publishing, minimal computing principles intersect with a recent resurgence of static websites. These consist of simple files on disk (HTML, CSS, JavaScript, images, video) that do not require server-side infrastructure to access and can simply be viewed as-is in a web browser. We will analyze examples of “minimal” digital editions and existing resources for their creation to articulate the need for a low-infrastructure future of the “global” digital edition.

Sandbox / Trash bin

Introduction

- What + why
    - Smithies
        - It repeatedly invites discussion – perhaps acknowledge this and present this piece in a similar manner? These are not solutions, but another addition to this ongoing discussion, though perhaps one that is both more provocative and inclusive of realities that go beyond the UK, US, and Europe.
        - “Digital entropy” as alternative term to just “longevity”
        - “The problems exist in continental Europe but are less pronounced because of longer-term commitments to infrastructure development and better alignment to STEM-based initiatives that are actively exploring ways to improve Research Data Management (RDM) infrastructure and processes [European Commission 2017] [Rosenthalter et al. 2015].”
        - “If there is a failure of post-millennium digital humanities, it could well be related to this human aspect, rather than anything overtly technical: setting aside all other considerations, permanent DH development teams will resolve most issues of sustainability and maintenance.”
            - Good, but this really implies that ongoing maintenance is inevitable and forever – how does this scale, really?
        - “a conception of infrastructure that moves beyond material technical necessities, templates, and process documents (as essential as they are), towards one that acknowledges the centrality of people, funding, ethics, technology strategy, software engineering method, and data management to the long-term health of our research infrastructures.”
        - Re KDL practices: “A range of archival products (static sites, removal of front-end, data migration, graceful shutdown, visualisation etc.) are now considered at the initial requirements gathering phase of projects, for implementation when funding ends.“
        - “t not all projects should be maintained in perpetuity. Some are better conceived as short-term or even momentary interventions in the scholarly conversation, to be archived online for the historical record but not worth

the intellectual, technical, and financial overhead of ongoing maintenance." – THIS IS HOW DSEs ARE OFTEN SEEN IN DH, TBH
        - "The process has made us keenly aware of gaps in contemporary funding models, which would ideally incentivise projects to manage their future according to similarly transparent and flexible models, but instead incentivise researchers to produce "orphan" projects with uncertain futures."
    - What do we mean by infrastructure? Which infrastructure are we against? I think we mean publishing infrastructure: what keeps our dses alive?
        - https://criticalinfrastructure.hcommons.org/session-description/
        - "This idea that infrastructure itself is diabolical persists in many contemporary imaginings. For some, the measure of "best practice" infrastructure is that it be as boring or invisible as possible." – Deb Verhoeven 2016
        - Del rio: "For this reason, infrastructures are usually defined as invisible to humans, who hardly notice their presence when they break or disappear"
        - "open or decentralized knowledge infrastructures (Shorish and Chan, "Cocreating Open Infrastructure")"
        - "Left to their own devices, citizens have designed huge nets, 16 meters high by 4 meters wide, that disfigure the landscape and cause the limeña or thick fog to condense. The drops of water captured in the fog-catching net (atrapanieblas) descend by gravity into a system of pipes that collects them in a cistern. Thanks to this device, citizens obtain about 16 liters of water per day for free, generating and building their own modest yet complex infrastructures." – great minimal computing example
        - "It is clear that the needs of today's diverse scholarly communities are not being met by the existing largely uncoordinated scholarly infrastructure, which is dominated by vendor products that take ownership of the scholarly process and data. (Robinson, "Schmidt Futures") " https://investinopen.org/catalog/

    DSEs MORE SPECIFICALLY
    - Pierazzo 2019
    - Encoding (data?) Vs publishing. Encoding as "hidden practice"
        - "In their exceptional account of classification systems, Geoffrey C. Bowker and Susan Leigh Starr demonstrate how the power of information and data (and the institutions that administer them) rests on the invisibility of their structuring and categorization.21 Bringing these otherwise unquestioned definitions of data up to the surface offers the possibility for change." - DV
    - Epistemiologies of building https://dhdebates.gc.cuny.edu/read/untitled-88c11800-9446-469b-a3be-3fdb36bfbd1e/section/c733786e-5787-454e-8f12-e1b7a85cac72

- Infrastructure(s) for DSEs as interactive publications (and as datasets)

- Today's infrastructure; infrastructure for scholarly editions, today
    - KDL: https://kdl.kcl.ac.uk/how-we-work/why-work-us/
        - "KDL's rates provide an affordable and self contained solution for long term hosting of any website and database content. Our infrastructure is robust and responsive, with multiple redundancy layers ensuring maximum uptime and availability. All our servers are monitored for performance issues and are backed up nightly.
          Completed projects are routinely audited to assess security and performance risks and our infrastructure is maintained to make sure any pressing concerns are addressed quickly with minimal interruption to service levels.
          If the output is an online resource and either KDL hosting is not required or the resource has reached end-of-life, KDL will discuss available archiving options with the project partners during the requirements gathering phase. Such options might include, for example, generating a static site"
            - For sure, not everyone can do this. For DSEs, static sites may be more appropriate throughout the whole life cycle and not just at the end.
    - (humanum lit? Ask philippe, Richard?)
        - https://hal.archives-ouvertes.fr/hal-02153016/document
        - "the risk of data loss is increasing. Another difficulty is to provide full access to this flood of data to users often located in distant areas. These problems can no longer be addressed individually by researchers or even at a laboratory level: it is therefore necessary to use a technical infrastructure with specific skills to provide stable preservation services. "
    - Dariah lit? (Gimena knows?)
        - TextGrid?
    - Nakala (data in the humanities)
        - Institutional repositories; their role; Zenodo, Humanities Commons (check OpenITI deposits), DRUM, https://data.kdl.kcl.ac.uk/dataset…
    - ~~[Does Dixit provide infrastructure? More for training not publishing/hosting]~~
    - **Beware of falling into historical deep dive**
    - Project Bamboo? - cautionary tale
        - https://academic.oup.com/dsh/article-abstract/29/3/326/2938127
    - [Spain: virtual environment for editing (also didn't work)]
- Use the word _anxiety_ when speaking of infrastructure and longevity

Minimal computing and static site turn

- Intro
    - Gil + Ortega, intro DHQ, other DHQ?
    - extent of minimal computing as an influence on digital editing, and which aspects of the concept have taken stronger root (from textual recovery, to "no markup" approaches, to shifting complexities in software architecture).

- “independence from institutional infrastructure and the network of surveillance that is a feature of many *commercial platforms of the modern web*.” <- more on this point?
- Focus on localizable space (Gil + ortega, find quote and look for more lit?)
    - Towards minicomp and common ground – but is it the right terminology? Or just a starting point? Beware of posing minicomp as panacea
    - Del Rio: “decentralized model of regional online portals, such as SciELO (https://scielo.org/en/), RedALyC (https://www.redalyc.org/), and LaReferencia (http://www.lareferencia .info/es/); and (2) the most unequal region in the world, according to the World Economic Forum on Latin America” – “seeks to develop local literacies and infrastructures differently in different countries.”
    - “How can we develop a DH curriculum in a region defined by social inequality, obsolescent infrastructures, and a lack of adaptation to technological advances?”
    - “but the global DH scenario seems to us so unequal that we can hardly relate to the scale, interests, and tools that, for instance, a project founded by the National Endowment for the Humanities or the European Union can command.” – just relate this to the claims made by Smithies (“just throw more people at it”)
- Evidence
    - Influence of minicomp on DSEs as something still in progress – who else besides us is doing this?
        - Look through Gimenas’ lab
        - Texas? Something about chicanos
        - Susanna (mini lazarillo)
        - Find other Ed based editions (dare I ask Alex?) Cavendish
        - Shelley-Godwin Archive (static site) Viglianti 2018 Viglianti, Raffaele. “Using Static Sites Technology for Increased Access: The Case of the Shelley-Godwin Archive.” The Design for Diversity Learning Toolkit, 2018. https://des4div.library.northeastern.edu/shelley-godwin-archive/.
        - Scholarly Editing (journal)
    - TEI Boilerplate
    -

Low-infrastructure futures of digital scholarly editions

- Endings project discussed here, but is parallel to minicomp, I think?
- future(s) because the KDL archival approach is likely to keep happening – long term DSEs will _at best_ be low-infrastructure, losing bits on the way
- Low-tech is only in relation to infrastructure, it’s more about front-end than low-tech. Careful here. But it’s also an opportunity to remind readers that front-end technologies are vastly more powerful than they used to be and can cover a lot of the typical scenarios for DSEs.
- Scholarly Commons https://force11.org/fsci/post/principles/
- Minicomp is a zombie concept (Beck)
- Abandoning infrastructure at publication point is a must
    - Past archival efforts as evidence (Munoz / Summers)

- Creation shouldn't shy away from infrastructure when necessary, but always ask "what do we need"
    - "Shifting complexities" – reliance on commercial 3rd party services like GitHub, Netlify, Amazon, "the cloud" beyond storage (find articles in the software engineer blogosphere? Doesn't have to be academic to make the point) https://computingwithinlimits.org/2022/papers/limits22-final-Angeli.pdf
    - Tools adopted for the creation of DSEs should be as complex as required; as simple as user management (remind of rush to crowdsourcing not too long ago – and connect that to micro-services and human labor: "Amazon Mechanical Turk") gesture towards new directions in machine learning / AI, OCR, HWR
- "Against infrastructure" is about dissemination.
    - **repair, care, and maintenance (KDL people centric infrastructure)** is still the way to go, but as DSEs editors / content creators how can we facilitate this process, in other words how can we make it easier to care for / take care of our editions?
        - "Against infrastructure" is about care.
        - "Rather than settle for the widely held belief that infrastructure is just a means to an end, I am interested in how we address the social or relational aspects of infrastructure" - DV
    - ~~Ability to deposit editions in open access repositories as static sites (they're just files)~~
        - ~~Data repositories (Text Grid)~~
        - ~~Editions' websites AS data are also depositable~~
    - Disengage from infrastructure at the moment of publication. BUT, **relying on FOSS and static-site "first"**, other low tech (such as…?) provides an opportunity to share instruments (and knowledge on how to use those instruments) more globally.
        - Chapter in spanish (citable?)

Digital Editing & Publishing in the Twenty-First Century
https://www.c21editions.org/call-for-chapters/

~500 words

Ideas from our previous works

- There is no unique way of doing a digital edition
- They say Open Science is the future. UNESCO recommendation 2022: https://en.unesco.org/science-sustainable-future/open-science/recommendation
- If editing is "without doubt one of the oldest scholarly activities within the Humanities" (Pierazzo, 2016), DSEs are at the core of DH (Earhart, 2012) and while not all textual scholars might rely on the same definition, they recognize their features and uses (Sahle, 2016). Free open standards such as the ones developed by the Text Encoding Initiative (TEI), but also XML (eXtensible Markup Language) technologies such as XSLT (eXtensible Stylesheet Language Transformations) and XQuery, and dedicated software

have characterized the digital editing field; the scholarly editions themselves, however, haven't always been successful in being open products of research. Bodard and Garcés (2009) posed this issue when they claimed that, analogous to the Open Source Software movement, DSEs—called by them OSCE or "Open Source Critical Editions"—should be licensed for reuse, including all sources, data, methods and software. It is common practice to make TEI data publicly available, for example, but the debate on how DSEs need to be structured to be truly open is still ongoing and best practices are yet to be established.

- DH critical literature hasn't focused much on the benefits of Open Science for enabling collaborative, scalable, and long lasting global research. For example, digital scholarly editing and digital scholarly editions (DSEs) are not always perceived as open.
- Indeed, "[d]igital scholarly editions are expensive to make and to maintain" (Pierazzo, 2019): as such, long term web hosting and preservation and access to servers pose a significant obstacle for not-so-well-funded scholars who are not able to apply for specific DH grants. Overall, DSEs require substantial infrastructure and advanced technical skills, but also, at a global scale, diverse needs, capacities, priorities, languages, and academic traditions may require different features from DSEs.
    - "While there are a few examples of digital editions architected in this minimal, low-infrastructure approach (with tools like Ed., or by pre-generating HTML content from TEI like the TEI Guidelines), there is significant research and prototyping work that remains to be done to effectively apply minimal computing technologies to digital editions. This project will provide a model to counter the established belief that "[d]igital scholarly editions are expensive [...] to maintain" (Pierazzo 2019) and pursue the potential to integrate a greater level of interactivity into minimal computing applications without requiring greater dependence on expensive web infrastructure"
- How can, therefore, one of the crown jewels of DH (Pierazzo, 2016) become global? From our perspective, it can do so by establishing its own "digital commons".
- Raff developments as digital commons :) (as proposal that improves Ed for editions)
- Is Minimal Computing the right word or is it just a zombie concept?: On many occasions, scientific concepts -and their statements- continue to be used despite the fact that their ability to describe and explain the world has been clearly diminished. Ulrich Beck considered that most concepts in sociology "are misleading to some extent" (2004: 145) and proposed the category of "zombie concepts" to define categories that endure after their "death".
- Intentionally adopt low-infrastructure tools for the publication of digital editions by relying on free and open source software and by building a website with minimal hosting and infrastructure requirements. This is motivated by ideas spearheaded by Global Outlook : Digital Humanities, a special interest group of the Alliance of Digital Humanities Organizations. Their work on minimal computing urges us to reckon with digital humanities work done under varying constraints imposed by lack of resources or power (Gil & Ortega 2016). The principles of minimal computing have informed new ways of undertaking digital humanities work, focused on use of open technologies and ownership of data and code. The latter in particular entails independence from institutional

infrastructure and the network of surveillance that is a feature of many commercial platforms of the modern web.
- “Learning how to produce, disseminate, and preserve digital scholarship [scholarly editions] ourselves, *without the help we can’t get* [...] minimal computing [...] as localizable space” (Gil & Ortega 2016)
- The Endings project highlights the fragility of web applications and proposes principles to facilitate long term preservation through reducing complexity and dependency on infrastructure (and more) The project, in fact, goes beyond infrastructure and proposes guiding principles for the entire lifecycle of a DH project. In particular, they state that the so called “products” of a project should be a static site that relies on “standards with support across all platforms, whose long-term viability is assured. [Their] choices are HTML5, JavaScript and CSS.”
- The chapter will explore how minimal computing principles are being applied to textual scholarship, ranging from efforts of textual “recovery”, particularly in North America and

Title ideas (where is the focus?)

Minimal computing and digital scholarly editions
(main focus: how the term/methodology applies and what needs to adjustment/change; dh commons)

Low-infrastructure digital editions
Against infrastructure: global approaches to digital scholarly editing
(main focus: longevity and access to infrastructure in the global north / south)

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