



An Assessment of the Technical Infrastructure for Open Educational Resources

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Introduction

The purpose of this report is to offer an assessment of the current state and possible future directions for 'technical infrastructure' in support of the Open Educational Resources (OER) movement. It broadly addresses the following questions:

- To what extent and in what ways have William and Flora Hewlett Foundation investments to date contributed to OER technical infrastructure?
- What is the current state of OER technical infrastructure?
- What steps could the Hewlett Foundation take to improve the state of OER technical infrastructure?

Just as technology innovations are changing our expectations for educational institutions and teaching and learning writ large, so too are they influencing the course of the OER movement. Increased access to the internet and computing devices by individuals and schools have been instrumental to the growth and institutionalization of the OER movement – and technology tools have been and will remain the dominant means of OER distribution, editing, remix, and redistribution. Given that technology choices in working with OER – by publishers, educational institutions, and individual users – may amplify or mute its impact, it is important to understand the ways in which these choices either intentionally or unintentionally affect the adoption and effective use of OER and hence the ability of the Hewlett Foundation to execute upon its OER strategy. While the Hewlett Foundation has a history of engagement and direct investment in OER technology and technical infrastructure, it is clear that technology-related issues will play an increasingly important role in the future.

To what extent and in what ways have Hewlett Foundation investments to date contributed to OER technical infrastructure?

As part of the process of updating the OER strategy in 2015, the Redstone Strategy Group assembled a dataset of the Foundation's OER grantmaking to date and (then) future

commitments from 2010 through 2017. Under this contract, this dataset was re-analyzed to shed light on the recent history of technology-related investments by the Foundation. Over the 8 funding years covered by the Redstone Strategy Group analysis, a total of \$17.6 million was expected to be invested in grants whose primary purpose was to support “infrastructure” for the OER movement.¹ This represented roughly one-third of the Foundation’s total investments in the OER community over that time period. Per the Foundation’s OER strategy, infrastructure investments were intended to support a number of priorities important for the movement, including:

- To maintain and increase the usability of open licenses globally;
- For technology and technical infrastructure;
- For enhanced coordination within the OER community;
- For enhanced marketing and communication about OER;
- For general support of OER community ‘anchor institutions’; and,
- To build the research capacity of the OER field.

Infrastructure grantees from 2010 to 2017 included:

- Creative Commons
- Ontario College of Art & Design (OCAD)
- Open University
- MITE
- Open Education Consortium
- ISKME
- EdNovo (Gooru)
- Wikimedia Foundation
- OECD
- Open Universiteit Nederland

Of the grants made for infrastructure purposes, only about one-third were dedicated to technology or technical infrastructure. Grants to EdNovo (Gooru) and OCAD were made exclusively for these purposes. Grants made to Creative Commons, MITE, and the Open Education Consortium involved technology-related work, but were not exclusively made for that purpose. Grants to all other organizations funded to enhance OER infrastructure were for a number of other purposes, including general operating support, organizational capacity building, and to conduct specific projects or activities (mostly unrelated to technology).

It is important to note that technology-related grants made for infrastructure purposes were largely field-driven and not initiated as a component of a technology-related strategy by the Hewlett Foundation to scale OER adoption and use. These grants represent a relatively modest proportion of the OER portfolio, and at this point in time not every technology-related investment has yielded direct benefits to the wider OER community or movement (i.e., not all of the technology-related investments might be considered ‘infrastructure’ in terms of providing benefits to creators or users of OER unaffiliated with the grantee).

1 Coding of 2010-2017 OER grants by Redstone Strategy Group was exclusive by funding category. That is, grants coded as infrastructure were either coded as either 100 percent devoted to OER infrastructure activities or not at all. This may or may not accurately reflect all of the activities of grantees, although it should be strongly related.

What is the current state of OER technical infrastructure?

While there are no lack of ideas for investment in OER-related technology, members of the OER movement do not share a common view of the shared technology-related challenges they are facing – and there are real barriers to the notion of a long-term overarching ‘technology roadmap’ gaining traction.² This may not be surprising given that (a) leaders in the OER movement have built online tools and websites for different audiences with different goals and (b) traditional proprietary publishers and technology companies have continued to innovate (very) rapidly – partly in response to the OER movement’s successes – changing end user expectations about instructional materials adoption and use.

Based upon work conducted as part of this focused assessment, there are four primary reasons for the current disjointed state of OER technical infrastructure:

- Members of the OER community bring different values and belief systems – some more pragmatic, others more idealistic – about the desired future of education, educational institutions, educator and student roles, and for-profit providers to the dialogue about OER technology needs.
- OER technology needs vary by audience and context—and the scope of interest of the movement and grantees is immense (PreK-lifelong learning, global). Yet, in many cases, the evolving technology needs and requirements of key OER audiences do not appear to be well understood.
- Members of the OER community have and desire different relationships with educational institutions and end users. For instance, some OER initiatives seek to extend the reach of their work into educational institutions by partnering with third parties to offer (sometimes proprietary) value-added services, such as technology platforms; data collection, feedback, and analytics; and sales/marketing. Others desire to manage the relationship with educational institutions, faculty, and/or students directly – with no intermediaries.
- As compared to proprietary educational publisher and technology companies competing with OER providers for educator adoption and buy-in, OER initiatives tend to be under-invested in key components of product development and marketing, including with respect to software development and other technology-related capacity.

Taken together, these issues may serve to moderate the interest of OER grantees (and members of the wider OER movement) to want to collaborate broadly on technology projects and initiatives.³ This is further compounded by the fact that there are few regularly structured

2 The *Open Education Tools Symposium*, hosted by Hypothes.is in January 2017—with the support of the Hewlett Foundation—for the express purpose of identifying the gaps and needs in OER technical infrastructure [found](#) that “even with the close focus on OER technical infrastructure, the conversations over the two-day event were wide ranging and often lingered on broader questions facing the OER movement: who exactly are we building for; is it really working?...no complete picture of the gaps in OER tooling became apparent during the symposium...”.

3 It is noteworthy that advocates for openly-licensed educational content do not uniformly share the same commitment to building and using openly-licensed software, or in participating in the open source software community. The reasons for this may relate to a lack of internal technology capacity and/or to sustainability/business model considerations.

opportunities for members of the OER community to engage in *extended and specific dialogue* about the shared technology challenges they are facing in growing the movement.

Nonetheless, there are recurring themes to technology investment ideas raised by members of the OER community. These themes include the desire for (a) better OER authoring and markup tools and metadata standards, including for assessments of learners, (b) automated feedback and analytics tools designed to save faculty time and work, (c) tools to manage the provenance and revision/adaptation of OER, (d) adaptation tools focused on localization (e.g., language translation), and (e) tools and standards to better manage the import/export of OER across file formats and platforms. The extent to which these solutions would make a significant difference in OER adoption and use, however, remains unclear – and design and implementation decisions required to make progress across any of these issues are value-laden and would require broad consensus (in some cases even beyond the OER community) to succeed.

In fact, some of the technology solutions advanced by the OER community as a way to address perceived user needs could be met – perhaps more directly and for less cost – via alternative approaches (some technology-based, some not) or via the help of third parties. For example, the development and adoption of comprehensive metadata standards for OER are often suggested as a solution for online ‘search and discovery.’ However, a targeted investment in basic search engine optimization (SEO) of OER repositories coupled with direct investments in online and offline advertising/marketing might prove to be a more cost effective way to raise user awareness of OER resources.

Alternatively, third party providers – like the for-profit [Knovation](#) in the U.S. K-12 context – have pivoted in recent years to fill a market need for OER (CC BY) curation, enhanced metadata markup, and automated import/export. While Knovation does not contribute to the development of OER per se (and hence might be considered as exploitative by some in the OER community), it does provide a value-added service that ultimately increases the use of OER by educators and students via their business relationship with educational publishers and technology companies.

While the current state of OER technology infrastructure may seem challenging to navigate, I believe there are concrete opportunities for the Foundation to build the capacity of the field to collaborate on new tools and services that would lead to the increased adoption and use of OER.

What steps could the Hewlett Foundation take to improve the state of OER technical infrastructure?

Without overly constraining new Foundation and OER program leadership as they transition into their roles, I believe there are a number of actions that could be taken over the coming months and years to improve the state of technical infrastructure in support of its OER strategy. I offer seven inter-related ideas below, roughly in order of their complexity and cost to implement:

1. **Foster continued dialogue about OER-related technology gaps and needs.** Venues are needed for shared technology implementation issues to be raised and discussed. Whether by supporting dedicated events (or tracks/sessions at events) focused on OER-related technology at OER community events, or encouraging OER community members to

collectively participate in general educational technology or open source software convenings, signaling that identifying and collaborating on shared technology needs and solutions is important for the growth of the OER field will help to clarify challenges and opportunities – and may lead to organic and beneficial collaborations.

2. **Set expectations of OER grantees with respect to baseline technology policies and practices via modifications to the Hewlett grantee application and reporting requirements.** It is important to begin to set baseline expectations with respect to grantee technology policies and practices. Over time, these expectations could grow to be more specific and directive, but I would argue that one could generate a set of high-level expectations that seem likely to be aligned to Hewlett’s aims, the OER community’s values, and best practices in educational technology. These might include some combination of any or all of the following:
 - The requirement for open intellectual property licensing, including as described in Terms of Service;
 - The encouragement of open licensing with respect to any software developed with grant funds;
 - The encouragement to use (or be compatible with) existing technical standards for content metadata and data exchange;
 - The discouraging of access restrictions to OER, such as those that require account creation or that limit downloads/exports of resources;
 - Encouraging the availability of OER for download/export in multiple file formats, including in open formats and formats accessible to individuals with disabilities; and,
 - Ensuring that OER community websites offer basic HTTPS encryption.

3. **Offer resources and support to grantees to begin to meet some of the baseline expectations that will be enshrined in the Hewlett Foundation grantee application.** Depending on the Foundation’s interest, this support could be more or less comprehensive and involved:
 - For instance, one could imagine developing a model ‘social contract’ that OER providers could post for their users that would delineate how the services they provide differ from proprietary services.⁴ Another approach could recommend model language for Terms of Service that could be adopted by grantees.
 - Educational materials could be provided to grantees with respect to existing technical standards for content metadata and data exchange – with encouragement to engage in the bodies that maintain those standards.
 - Support could be provided to grantees willing to deploy the FLOE accessibility tools on their site.
 - The Foundation could promote or even help customize software tools to aid with the easy import/export of files of different types (such as is enabled by the open source tool [Pandoc](#)).

4 This approach has been used in the open source software community. See, for instance: https://en.wikipedia.org/wiki/Debian_Social_Contract and

- More concretely and more urgently, OER grantees could be offered support in upgrading the security of their websites (from HTTP to HTTPS) in advance of this year’s deadline to begin signaling to users the lack of trust they should have in sites that do not offer encrypted connections.⁵
4. **The Hewlett Foundation could purchase/commission market research on OER audiences key to the Hewlett strategy with respect to their technology-related expectations and needs and summarize it for grantee use.** Firms such as Tyton Partners are well-positioned to give an institutional point of view (e.g., of the postsecondary market), especially vis-a-vis the evolving roles of proprietary educational publishers and technology companies. However, it may be useful to consider market research targeted to classes of individuals – such as first generation college students or community college faculty – and not institutions per se. The technological needs of the intended beneficiaries of OER may be different than those of the institutions they serve (e.g., low-income students may be more reliant on mobile phones to access OER than their institutions presume). Shedding light on the needs of these priority target audiences may also help to drive an equity focus in OER grantee work.
 5. **In an effort to bring more funders to the table and technology capacity to the community, the Hewlett Foundation could co-host ‘hackathons’ or other joint networking events with grantees of other foundations.** Events could have several foci. For example, they could be designed to help grantees of other Foundations (such as the Bill and Melinda Gates Foundation or the Chan Zuckerberg Initiative) focused on bringing technology innovations to schools to incorporate OER as part of their offerings. VCs (like the New Schools Venture Fund or Charter School Growth Fund) that fund personalized learning startups and schools also may be interested in having some or all of their portfolio participate. Another avenue would be to partner with a group like the Susan and Michael Dell Foundation, which is focused on improving and promulgating interoperability standards in education, to help OER grantees better address interoperability issues in their tools and platforms. A number of the most promising projects could be jointly funded out of these hackathons/events, although there is every reason to expect that the cross-pollination of ideas would produce many secondary benefits.
 6. **The Hewlett Foundation could launch an OER Technology Fellowship Program.** Modeled on analogues run by the [Ford](#) and [Mozilla](#) Foundations, Hewlett OER Technology fellows could play a variety of internal and external facing roles, including supporting OER program technology capacity (such as in making investment decisions and tracking notable developments in the field), helping to represent the OER community on technology standards bodies, and helping grantees to collectively build and refine shared technological solutions. A rotating fellowship will help avoid groupthink in making technology decisions on behalf of the community and can help ensure that a diversity of perspectives are explicitly included in the community’s work.

5 See, e.g., <https://security.googleblog.com/2017/04/next-steps-toward-more-connection.html>

7. **Providing quarterly (or regular, periodic) funding for small, focused technology projects proposed by consortia of grantees who collectively agree to work together to solve specific OER-related technology issues and to license their solutions as open source.** A regular funding stream available to current grantees who commit to working together on common challenges could be beneficial to the OER field. In general, this represents a bias toward small, agile, and decentralized technology investments versus large technology platforms and standards, which are inherently expensive and risky. Such a regular funding stream could be managed by the Foundation, by OER Technology Fellows, or by a neutral third-party (non-profit) dedicated to being a neutral arbitrator of priority setting and fund distribution.