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Toward a Critical Approach for OER: A Case Study in Removing the 'Big Five' from OER Creation

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Abstract

This paper examines the role of proprietary software in the production of open educational resources (OER). Using a single case study, the paper explores the implications of removing proprietary software from an OER project, with the aim of examining how complicated such a process is and whether removing such software meaningfully advances a critical approach to OER. The analysis reveals that software from the Big Five technology companies (Apple, Alphabet/Google, Amazon, Facebook and Microsoft) are deeply embedded in OER production and distribution, and that complete elimination of software or services from these companies is not feasible. The paper concludes by positing that simply rejecting Big Five technology introduces too many challenges to be justified on a pragmatic basis; however, it encourages OER creators to remain critical in their use of technology and continue to try to advance a critical approach to OER.

Keywords: open source software, proprietary software, critical approaches to open educational resources, critical theory

Introduction

"The enemy is proprietary software," wrote Richard Stallman (2002), a key figure in the early days of the free software movement. Wayner (2000) echoes this view, arguing that copyright, licensing, and patent laws gave a level of control to the software companies that was unmatched by any other industry. The disdain for proprietary software on the part of free software advocates like Stallman (2002), Stallman and Papatheodorou (2012) and Wayner (2000), stemmed from the unprecedented power it gave companies over both developers and end users alike.

Critical literature has identified a number of problematic power imbalances in Open Educational Resources (OER) development - from concerns over the use of free labour and the failure to address academic precarity (Almeida, 2017; Crissinger, 2015), to arguments that open educational resources serve as a form of academic neocolonialism (Almeida, 2017; Amiel, 2012; Rhoads, Berdan & Toven-Lindsey, 2013; Weiland, 2015). However, reservations over the use of proprietary software specifically, and reliance on 'big technology' (including Apple, Alphabet/Google, Amazon, Facebook and Microsoft—hereafter referred to as the 'Big Five') are often less starkly and morally framed as Stallman's approach.

In an effort to expand the critical literature on OER, the following case study aims to problematize the role of Big Five technology in OER production. Drawing on critical approaches to technology and Stallman and Wayner's moral arguments against proprietary software, the paper addresses two important questions - what are the implications of removing Big Five technology and software from OER production, and does eliminating Big Five technology meaningfully advance a critical approach to OER?

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The paper addresses these questions beginning with a review of the literature on OER and proprietary software, and then examining some of the theoretical literature on critical perspectives of technology. Using a case study of the University of Alberta's (2019) *Opening Up Copyright* instructional module series, the paper proceeds to analyze how Big Five technology, particularly Microsoft, Google and Amazon, embeds itself in OER production and the challenges in relying on open source alternatives. The paper concludes by suggesting that simply avoiding Big Five technology does little to advance a critical approach to OER, and offers several alternatives.

Literature Review

Literature on OER often emphasizes the natural connection between open resources and open source software; however, many scholars also suggest that preferences for open software be tempered by considerations around usability. Hilton III, Wiley, Stein and Johnson's (2010) ALMS (Access to editing tools, Level of Expertise required to revise or remix, Meaningfully editable, and Source-file access) framework for OER notes that both proprietary and open software can be used for OER creation, though more importantly they emphasize that the adaptability of the resource is diminished if there is a significant training/learning curve required for end-users to edit materials. Specifically, they suggest OER creators "choose the simplest tool possible" (Hilton III et al., 2010, p. 41), rather than privilege open source tools. Expanding on the ALMS framework, Wiley (n.d.) in his "Open Content Definition," emphasizes four important points about open design and technology (access to editing tools, level of expertise required, meaningfully editable, and self-sourced), but does not advocate for an outright rejection of proprietary technology. Abeywardena (2012) calls for more free and open source software to support OER development, but similarly does not advocate for a complete elimination of the use of proprietary software in OER. In related work Abeywardena, Choy and Raviraja (2012) applied a desirability measurement for OER and found resources relying on proprietary software are lower ranked than those using open software, but they too do not call for outright avoidance of proprietary software in OER. The ALMS framework's recommendation for prioritizing simplicity over open is also reflected in the framework proposed by Christiansen and McNally (2018) and McNally and Christiansen (2019), which notes that open file formats increase openness; however, McNally and Christiansen (2019) caution that file format is only one of eight factors influencing openness and that maximizing openness is not always ideal.

One of the most significant benefits to OER is their accessibility for use. The UNESCO definition of OER specifies adaptability as a key factor (2002, p. 24). In spite of this, existing work suggests that most OER material is created on a context-specific, as-needed basis, without downstream reuse in mind (Richter & Veith, 2014). Hilton III et al. (2010) emphasize the importance of the ability to "unlock" OER for adaptation and evolution. The authors provide a number of recommendations to OER creators, advocating that source files should be provided in open formats that content reusers and remixers can edit with a wide range of free or low-cost software programs. Most OER content must be customized before it can be applied in a new context (Dichev & Dicheva, 2012), yet Wiley, Bliss and McEwen (2014) note that little empirical evidence exists for the revision and remixing of OER materials. The accentuation of practical considerations such as usability and accessibility of OER appear to mitigate against concerns around the use of proprietary software.

While usability, reusability and accessibility are three important elements emphasized in the literature on OER technology, a fourth important consideration is the sustainability of OER. One heavily discussed element of OER sustainability has been the range of business models that can be used to support production (Dholakia, King, & Baraniuk, 2006; Downes, 2007; Wiley, 2007a;

Koohang & Harman, 2007; Lane, 2008; de Langen, 2011, 2013; de Langen & Bitter-Rijkema, 2012). While a complete review of business model literature is beyond the scope of this paper, two important considerations arise in of the connection between OER sustainability and business models. First, several authors suggest that OER production processes be made efficient as a means of controlling costs for production and maintenance (Downes, 2007; Schuwer, Wilson, van Valkenberg, & Lane, 2010; Schuwer, Lane, Counotte-Potman, & Wilson, 2011; Nikoi & Armellini, 2012; Annand, 2015). While controlling costs through efficient production processes underscores an important element of OER design, the literature on whether costs can be best minimized by relying on proprietary software (emphasizing ease of use and lower production costs) versus free or open source (which may have higher creation costs for creators and modification costs for downstream users) is underdeveloped. A second key element of sustainability discussed by Downes (2007), Koohang and Harman (2007) and Stuurman, van Eekelen and Heeren (2012) is ensuring successful OER by developing a community of practice or community of users. Thus, OER creators must consider the software tools used for production in addition to the tools required to foster and sustain user communities.

Finally, there exists a crucial body of literature problematizing several key aspects of OER. Bayne, Knox and Ross (2015) highlight that the lack of critical understanding around the term 'open' leads to a lack of consideration about what closures are implied through the uncritical championing of openness. This concern is reflected by several authors who have highlighted the lack of consensus about what 'open' actually entails (Farrow, 2017; Knox, 2013a; Pomerantz & Peek, 2016). In examining open educational technologies, including OER, Selwyn (2013) argues that social relations around open production processes are under-scrutinized, and posits that open technologies in education reflect a view of the dominant individualized, neoliberal capitalist ideology. Similarly, Almeida (2017) and Falconer, Littlejohn, McGill and Beetham (2016) note the underlying neoliberal aspects of OER. Although OER literature underproblematizes the role of proprietary technology, and in particular the role of technology and services from technological giants (who have become the world's largest corporations by market capitalization), there exists a rich and extensive literature on approaches to technology that can illuminate the importance of critically examining how social and power relations are bound into and obscured by technology.

Theoretical Foundations

While the literature does express concerns over the reliance on proprietary software in OER projects, and there are calls for "critical" approaches to OER/open education, there is a need for further consideration of the political economy of technology in OER production. The earliest work in a critical political economy of technology can be traced to Marx and later the Frankfurt School (Feenberg, 2002). Feenberg (1995, 2002) posits technology is inherently biased toward preserving hegemony, and that the more technology is used the stronger its hegemonic power. This assertion aligns with Winner (1986), who referred to technologies as a means of building or reinforcing order and advocated a more in-depth examination of technology's impact on the distribution of power and authority. More importantly, and in alignment with Stallman's observations, Feenberg (2009) suggests that technology is a *source* of power. It follows that the use of technology in an educational context is deeply political, and the impact of technology selection is worthy of examination. Mercado (1998) warned of institutional dependencies created by the adoption of rapidly-advancing information technologies in libraries and related institutions, and the free-market approach to technology noted by Winner (1986). Large platform providers have been very successful in establishing themselves in the educational technology market (Barwise & Watkins, 2018) leading to significant reliance on

integrated platforms for education. For example, recent data shows that more than half of the United States' primary and secondary school students use Google's education suite in the classroom (Singer, 2017). As noted by Arthur (1990), these integrated platforms create feedback mechanisms that may disadvantage more efficient technologies, reinforcing the incumbent choice through vendor lock-in and path dependence. Although a critical approach may not entail an outright rejection of technology, careful consideration is necessary to determine how technology can improve rather than simply maintain existing social relations (Dyer-Witherford, 1999).

Many of the software platforms used for educational content authoring—from Microsoft Office products to Google collaboration suites—support file formats that can be used for open interchange, but unique application features still rely on the use of proprietary file formats that are not readily interpreted by competitive products. Transformation of content from proprietary to open formats typically results in the loss of application-specific features and, in some cases, the corruption of content. Moreover, ongoing media concentration efforts have now blurred the line between content and creation and distribution (Noam, 2009). The prevalent tools used to create educational material, the file formats used to store created content, and the platforms used for "free" content distribution construct and reinforce a reliant relationship with commercial products that contradict the "four R's" of OER as articulated by Wiley (2007b): reuse, redistribution, revision, and remixing ["retain" was later added as the fifth "R" (Wiley, (n.d.)]. It is therefore worth examining if a fully-open approach to OER authoring and distribution, using free and open-source software (FOSS) tools and open file formats, can foster the creation of effective and engaging open educational content.

While focusing on the role of proprietary tools and Big Five technology companies in OER production is arguably reductive, it does serve as a useful starting point for considering what a critical approach to technology in OER may look like. Selwyn and Facer (2013) urge critical researchers to question who benefits from educational technology, arguing "the political economy approach encourages an interest in the ways in which structures and processes of power are embedded within digital technology" (p. 13). Knox (2013b) has criticized the tendency of technological neutrality in OER literature, suggesting that such discourse masks the impact of technology. It has been suggested that the corporate power of the Big Five makes them more akin to governments with respect to the degree of control they have over society (Manjoo & Gross, 2017; Taplin, 2017). Given their dominance it is unsurprising that there are growing calls to reduce dependence on usage of the services provided by the Big Five (Akinyemi, 2019; Taplin, 2017), and there are recent, anecdotal experiments of individuals attempting to forgo any use of the Big Five's technologies or services (Oberhaus, 2018; Hill, 2019). Drawing inspiration from these individuals' attempts, and in an effort to advance a critical approach to technology in OER, we present a case study of examining the impact of removing Big Five technology from an OER project.

The Case Study

To examine the impact of disembedding the Big Five technology companies from OER work, we have chosen to focus on a case study of an OER project the authors are involved in creating: the University of Alberta's Opening Up Copyright (OUC) instructional module series (University of Alberta, 2019). Each module is a six- to ten-minute YouTube video on a specific topic, supplemented by interactive pop-ups and quizzes in H5P's free, open-source HTML5 format. The underlying files used to generate the MP4 videos uploaded to YouTube are created in PowerPoint, and Google Docs is used to prepare scripts for narration in the videos. Users can download the PowerPoint slides or transcripts in Google Docs to adapt the modules for their own institutions, but the raw audio of the narration is not made available. The content of the videos and underlying slides is a mix of original

text, quotations (most commonly from the Canadian *Copyright Act* and academic sources), and visual content that is often sourced from open content sites such as Wikimedia Commons, and some original images. The OUC project is also supported through a series of open Google Docs that allow anyone to provide input on the module series. Though all of the modules are made freely available under a Creative Commons Attribution 4.0 licence, their production relies on use of tools and platforms provided by Google and Microsoft, with more-limited and indirect connections to Apple and Amazon.

While single case studies are not uncommon in the OER literature (for example: van der Merwe, 2013; Oliver, 2015; Wang & Wang, 2017; Alpi, Cross, Raschke, & Sullivan, 2017), relying on a single case is not without limitations (George & Bennet, 2004; Yin, 2016). Although the proximity to the work by the authors is a source of bias (Flyvberg, 2004), such closeness facilitates a more intimate understanding of the technology and processes involved in the creation of the materials that is necessary for the analysis that follows. Case studies, such as this one, are particularly well-suited for the study of individual programs or initiatives (Leedy & Ormrod, 2005). Single case studies are not well suited for testing hypotheses but are useful for providing deep understanding and generating hypotheses to be tested in future work (Gerring, 2007). Case studies in education (both single and multiple) are particularly valuable for examining educational innovations (Merriam, 1988). Merriam (1998) further argues that the value of the case study lies in its focus on processes, context and meaning rather than outcomes. This approach is reflected by the analysis, which illuminates the depth of integration of Big Five technology rather than contrasting the quality of OER produced by proprietary versus open software. Yin (2016) specifically notes the value of single case studies in contexts where researchers have access to unique information sources. As the creators, we are well situated to provide insights into the decision making process around technology use for the development of OER. Our bias is hopefully tempered by a willingness to be critical about our use of this technology.

Since work on the OUC project has been ongoing since 2017 and there is existing material to work with, the emphasis here is on removing reliance on functionality and features provided by software and systems from the Big Five. Another approach, not examined in this case, would be to reboot the project with an emphasis on selecting collaboration, development, publishing and dissemination tools that do not rely on Microsoft, Google, Apple, Amazon, or Facebook platforms.

Removing Microsoft

As implicated by the description of Opening Up Copyright, two products are immediately implicated: the generation of slides using Microsoft's PowerPoint, and the use of Google Docs for collaboration, transcripts and solicitation of external contributions. Removing PowerPoint is straight forward enough, since it can simply be replaced with OpenOffice Impress, but even the simple process of converting existing PowerPoints into Impress creates problems. While the majority of graphics and timing for slide effects do transfer, there is considerable loss in the overall quality of the slides, with some images rendering in a completely unrecognizable manner.

Use of OpenOffice Impress also presents a learning curve. At the project outset, the choice to use PowerPoint was guided by the fact that, despite being proprietary, it is a commonly-used and well-understood tool. Furthermore, the only means of exporting Impress' rendered slides to video involves creating an Adobe Flash (.swf) file, a format that Adobe plans to phase out by 2020 (Adobe, 2017), and whose proprietary nature has been long-criticized for its poor accessibility and vendor-dependence (Meyer, 2008; Nielsen, 2000). The Impress Video Converter extension does remedy the .swf problem to a degree by allowing the creation of AVI files (Apache, 2019).

While PowerPoint has been a primary technology used in OUC, its removal is certainly not untenable. Creating modules in Impress would result in some degree of limitations around visual effects and impose a learning curve (both on the project team developing the modules and on adaptors) but is not an insurmountable problem on its own.

Disembedding Google from the Module Production Process

Removing Alphabet/Google's impact on the project produces more intractable problems, especially since Google products are implicated heavily in both the production of the modules and in project communication. Google, more than any other software provider, is heavily incorporated into OUC because the University of Alberta has an institutional subscription and reliance on Google Apps Education Edition. Stemming from the University's use of Google services, OUC has also relied on Google Drive and Google Docs for both internal coordination and facilitating external participation in the project. On the internal side, the Opening Up Copyright team uses Google Drive for document management and Google Docs for script creation. Replacements for Google Drive include open source document management providers such as LogicalDOC CE or OpenKM and web-based multiple-author systems like MediaWiki or GitHub. To facilitate synchronous editing of documents for internal collaboration Google Docs could be replaced with open source alternatives such as Etherpad or OnlyOffice.

While open alternatives could easily handle the requirement for text-based collaboration, Etherpad does not allow the inclusion of images in collaborative documents, a feature sometimes used in Google Docs by the project team. OnlyOffice presents a considerably more complicated option. While OnlyOffice provides features comparable to Google Docs, without the image limitation of Etherpad, it presents another challenge in relation to eliminating the Big Five from OER production - the web based version relies on Amazon Web Services (Ascensio System SIA, 2019a). A downloadable version of OnlyOffice exists and collaboration on the OnlyOffice cloud requires a paid subscription; however, educational institutions may qualify for a free cloud based version. Still, this comes with its own limitations including the requirement of a website banner and promotion of OnlyOffice on social media networks (Ascensio System SIA, 2019b). Given OUC has not used social media (whose tools are also dominated by the Big Five), it isn't clear whether OnlyOffice is a viable alternative. Thus, to effectively remove Google Docs and Drive as a means for collaboration involves either forgoing functionality or jumping through several additional hoops.

A much more significant barrier to Google's replacement can be seen in OUC's current use of YouTube for video hosting, and as a foundation for adding interactive features to videos. YouTube allows simple and direct mechanisms for integrating timed text pop-ups, interactive links, and quiz questions built on the open H5P architecture. The use of H5P-based features contributes to the project's ability to foster engagement, so ideally we would aim to remove reliance on YouTube without compromising our ability to benefit from the H5P platform. Currently, H5P can only support externally-hosted videos when a direct video link is provided. YouTube provides this feature natively, but alternative platforms such as Vimeo require a paid account to accomplish the same task. The easiest alternative to YouTube would be local hosting of video files, but this introduces significant challenges for considerations of file storage. Given that the project aims to create upwards of 50 video modules, with the file sizes for some videos approaching 1GB, the shift to locally-stored video files could result in significantly-increased project costs for storage and network bandwidth.

The other added benefit of YouTube's use for the project is its facilitation of content discovery. Even with the introduction of additional techniques for search engine optimization, locally-hosted

video files and alternate video hosting platforms would result in decreased discoverability of project content.

OUC also uses Google's advanced search function to locate open content. The new Creative Commons search engine (currently only capable of image searches) holds promise, and the project could rely on other open repositories such as Wikimedia Commons or Pixabay, but the loss of Google as a general-purpose content search tool presents the project with a slight handicap.

Dislodging Google from Project Communication

Google's influence on the OUC project eclipses the production process because it also significantly impacts the project's internal and external communication. OUC relies on Gmail based communication for collaboration, which stems from the University of Alberta's institutional use of the Google suite of services. Although independent mail providers such as Tutanota and ProtonMail are viable alternatives, switching emails would require all the creators to take on secondary email address and do all project communication outside of their primary, Gmail based, university email addresses. As with the removal of PowerPoint, such an approach is not ideal, but nor is it infeasible.

A core value of OUC's current incarnation is external collaboration and feedback from colleagues and peers. This is currently done by providing public access to a series of "Community Pages" based in Google Docs. Each instructional module has its own Community Page that encourages contributions to the project by providing feedback. The project solicits a wide range of input from the broader community including story ideas for scripts, creating learning objectives or test questions, or highlighting useful resources related to the module content. As with internal collaboration these could be replaced with open alternatives; however, the same limitations apply. The most reasonable alternative for this functionality might be to forego simultaneous collaboration software all together, and just direct contributors to an online forum.

In summary, while some of the dependence on Google is reflective of an institutional decision to rely on Google products, a complete disembedding of the Google platform requires new approaches for many facets of the project. Barriers to Google's removal are complex enough that a "reboot" approach, relying on an entirely-different set of open source collaboration platforms, may be less problematic.

Untangling Apple, Amazon and Facebook from Opening Up Copyright

Although the project is most immediately impacted by Google and Microsoft, removing the Big Five also involves some consideration of the role of Apple, Amazon and Facebook. The first of these warrants more discussion than the other two, but there are implications for all three.

Apple's presence in the project is most visible with the use of MacBook hardware and MacOS software tools. The most notable aspect of this entanglement is in post-production, which employs built-in MacOS tools to transform PowerPoint slides into high-quality video files. Though neither the computers nor the software is essential to OUC workflow and could be displaced, removing Apple introduces new challenges if one also wants to exclude reliance on Microsoft software. Simply put, to avoid both Apple and Microsoft, OUC would be compelled to use Linux-based operating systems on generic computing hardware. Although this could be done, it would impose switching costs by, minimally, forcing most members of the project team to familiarize themselves with a new operating system. On the upside the decision to use Linux-based computers for content creation would not create any new dependencies for students, or for downstream adaptation of content from the project.

At first glance, avoiding Amazon and Facebook might seem relatively straight forward. As an OER project, Amazon's large online retail presence is not directly implicated (though in the spirit of full disclosure, at the outset of OUC a microphone for recording narration was purchased through Amazon), and Facebook has not been used as a social media platform to promote the project. However, truly cutting out Amazon is more challenging than first envisioned because it means cutting out all websites that use their AWS (Amazon Web Services) infrastructure. Eliminating sites that rely on AWS involves not using about 30% of *all sites on the Internet* (Digg, 2018). With the inclusion of Google's and Microsoft's cloud services, the total grows to 54% (Preimesberger, 2018). As with removing Google as a search tool, cutting off access to any sites hosted on AWS or Microsoft Azure architecture creates barriers: Flickr, for example, has recently moved all of their services to the AWS platform. A committed and thorough removal of Amazon's tools and services, then, would handicap the project by foreclosing the use of significant open content providers. Furthermore, eliminating sites supported by AWS (and similar cloud services from Microsoft and Google) would introduce a new painstaking step of determining the cloud service provider for any website connected to the project. This tedious analysis could be overcome by predetermining list of open content providers that don't rely on Big Five web services and relying on content located at those sites.

The Entangled Nature of Big Five Technology and Internet Services

The implications of removing AWS (or other Big Five) hosted sites raises one final consideration related to the more-hidden and ubiquitous ways these platforms are embedded in online interactions. If the goal is to truly remove any and all presence of Big Five technology, then every aspect of a website's technology—from email hosting providers and content delivery networks, to JavaScript and code libraries, to the locations of freely-available online fonts and graphics used in website design—must also be considered. Sites such as Built With (https://builtwith.com) can provide this information with a reasonable level of detail, and they reveal just how embedded the Big Five technology companies are. For example, according to Built With (2019a, 2019b), Wikimedia relies on Google Apps for Business for email hosting and makes use of the Apple Mobile Web Clips Icon, and the Creative Commons site uses an array of Google products including Google Analytics, Google Website Optimizer, and Google Font API.

The deep presence of the Big Five presents a two-fold problem for the OUC project if any use of the Big Five were to be avoided. In terms of developing the modules, it would require the project to effectively create all of its own images, avoiding platforms and tools provided by the Big Five; it would also likely circumscribe the ability of the project to make use of existing, effective, openly licensed imagery. Dissemination would be hindered by the requirement that OUC's output and distribution should eschew any hosting provider that relies on the Big Five's cloud-based service platforms. Most importantly, however, avoidance of the Big Five would undermine the spirit of Opening Up Copyright. Rather than using and combining existing open content to make more effective OER, a wholesale avoidance of the influence of Google, Amazon, Apple, Microsoft, and Facebook would introduce an ideological rejection of all content in any way touched by the Big Five, suffocating the larger objective of creating and providing effective, accessible and reusable educational content on Canadian copyright.

Discussion and Conclusion

As indicated by the above conceptual experiment, removing the Big Five from OER production and distribution produces a series of challenges. Many of these challenges are surmountable through

simple changes, but others present more significant degrees of complication. In the aggregate, taking all the steps to untangle the Big Five from an existing OER project results in a series of impractical decisions and extreme switching costs that push up against the limits of reasonableness. A newly-conceived OER project, aiming to avoid the use of Big Five technologies from the outset, would not fare much better. A series of smaller decisions, such as using Open Office and OnlyOffice, could effectively remove the majority of the Big Five's presence in an online OER project. However, an absolute rejection of the Big Five (including any web-based technology relying on their cloud services frameworks) would significantly stifle the project. Rejecting any website that makes even incidental use of Big Five technology represents a theoretical breaking point at which complete removal seems unfeasible.

Some of the challenges outlined in this case study may be more specific to the nature of OUC's outputs. Creating online instructional videos is different than creating an open textbook, and accordingly it is possible that other OER projects would face fewer barriers than the project studied here. In much the same way Oberhaus (2018) and Hill (2019) found that it is possible but highly challenging to remove the Big Five from one's personal life, disentangling Apple, Amazon, Alphabet/Google, Facebook and Microsoft completely from an OER project can be done: it is just painful. Recognizing that online instructional videos are only one form of OER, we suggest that future work be done to examine whether Big Five technology is more or less prominent in specific types of learning materials and OER production processes.

Given the complications of disembedding the Big Five from OER work, it is worth questioning whether or not such an approach is even useful. From a purely pragmatic perspective, it is not. While proponents of free and open source software have marshalled both practical and moral arguments against proprietary software, the only argument for complete removal of the Big Five from OER work appears to be a moral argument of what ought to be.

The revelation of the case example is that OER creators are responsible for critically reflecting on their use of technology, and its possible impact on education, rather than ideologically reject 'big technology.' OER creators should be concerned about the potential exploitation of free labour and the role such resources play in furthering academic neocolonialism, but arguably the removing the Big Five does not, in itself, meaningfully advance a critical approach to OER. A critical approach to OER must explicate the social relations and power imbalances embedded in OER design, development, dissemination, and engagement and not only make content available but do so in a manner that is easily adaptable by a variety of users. With specific reference to the project in question, as of the time of writing, the authors are aware of multiple institutions linking to the instructional modules, thus demonstrating the usefulness of the materials to other institutions; however, there is no evidence of the modules being adapted by other institutions. The lack of adaptations of the instructional modules likely stems from the challenges of altering video, including the time (and thus cost) of re-recording narration, even as the underlying materials to create the videos (the PowerPoint slides and transcripts) are made openly available.

Given that simply avoiding Big Five technology or attempting to use only open source software, at whatever cost to reusability and accessibility, does little to further a critical approach to OER, what alternatives exist? In addition to further exploration and scholarship on issues of precarity, neocolonialism and neoliberalism in OER, scholars could return to the rich conceptual tool bag provided by a range of critical perspectives (not only Marxian and more traditional schools of critical theory but also feminist, Indigenous and other approaches). To advance a critical approach to OER future work could explore the role of OER in alienation, reification, and counter hegemonic struggle, among others. While sufficient pragmatic arguments exist for tolerating Microsoft, Google, Amazon and others in the aim of advancing open education, OER creators who choose to use such

technologies must accept that their usage contributes to the creation and further embeddedness of these technological giants' platforms.

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