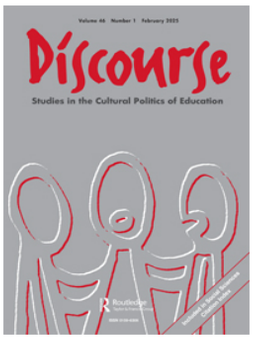

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ARTICLE COMMENTARY

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Digitalised higher education: key developments, questions, and concerns

Janja Komljenovic[a], Kean Birch [b], Sam Sellar [c], Annika Bergviken Rensfeldt [d], Joe Deville [e], Charlie Eaton[f], Lesley Gourlay [g], Morten Hansen [h], Niels Kerssens[i], Anne Kovalainen [j], Pier-Luc Nappert [k], Joe Noteboom[l], Lluis Parcerisa [m], Juan Pable Pardo-Guerra[n], Seppo Poutanen [j], Susan Robertson[o], David Tyfield[p] and Ben Williamson[a]

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ABSTRACT

Higher education is already profoundly digitalised. Students, academics, and university administrators routinely use digital technologies, many of which rely on data, including artificial intelligence. Universities aim to operate as data-powered organisations to support institutional efficiency and the personalisation of learning and student experience. These developments are occurring against the backdrop of university digital infrastructure moving to the cloud and the increasing role of 'Big Tech' in the sector. However, there are many unknowns about the aggregate impact of digitalisation on the sector, and hence, questions about potential risks and harms remain unanswered. Our approach in this collective piece is to reflect on particularly relevant and impactful dynamics of higher education digitalisation. We first identify assetisation as an emergent mode of governance linked to the digitalisation of HE, which brings new temporal, relational, and lock-in challenges for universities and their constituents. Second, we examine the macro-level structural transformation of higher education with the increasing role of Big Tech and Big EdTech. We conclude by discussing the consequences of the identified macro power dynamics.

KEYWORDS

Higher education; EdTech; digitalisation; assetisation; Big Tech

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Introduction

Higher education (HE) is already profoundly digitalised. Students and staff use digital technology routinely, including learning management systems (LMS), e-books, and many apps supporting teaching, learning, and research (Henderson, Selwyn, & Aston, 2017). University leaders are reorganising their institutions as data organisations that can benefit from data analytics and business intelligence (Drake & Walz, 2018). This reorganisation is being driven by the aims of institutional efficiency and personalisation of learning and other operations. Artificial intelligence (AI), and particularly generative AI, is already affecting teaching, learning, university management, and the sector more broadly (Williamson, 2024). These developments have implications for academic labour, working conditions, and professional autonomy (Ivancheva & Garvey, 2022), as well as for students and their learning. Some scholars have argued that it no longer makes sense to separate humans and non-humans, and we should conceptualise the use of these technologies in terms of the humandigital (Decuypere & Simons, 2014), teacher bots (Bayne, 2015), students as documents (Gourlay, 2023), and so on.

These developments are occurring against the backdrop of university digital infrastructure moving to the cloud and the increasing role of 'Big Tech' in HE (Fiebig et al., 2021), while at the same time, the EdTech industry is expanding with interest from venture capital (Hamilton, Daniels, Smith, & Eaton, 2024; Komljenovic, Birch, & Sellar, 2023). However, there are few empirical evaluations of the individual impact of these technologies, and even less of the aggregate impact of digital applications and platforms taken together. There are many unknowns and more questions than answers (Selwyn, Hillman, Bergviken Rensfeldt, & Perrotta, 2023), with critical scholars illuminating the risks and potential harms of technology and its data outputs (Selwyn, 2020).

Our approach in this collective piece is to take a step back and reflect on how HE as a sector is digitalising. We are interested in particularly relevant and impactful dynamics that provide the macro-level basis for the multitude of other effects and impacts at various scales. Thus, we identify macro-level structural and governance dynamics as key to understanding the overall digitalisation of HE as a global sector. We develop our reflection on (1) assetisation as an emergent mode of governance linked to the digitalisation of HE; and (2) the role of Big Tech and Big EdTech in building HE digital infrastructures. We address these because, firstly, digitalising HE is an ongoing dynamic, and we see that these two processes are becoming more impactful for the sector; and second, there are lots of unknowns needing attention from researchers, but even more so in policy, to address key concerns brought about by the concentrated power that assetisation and Big Tech enable. As a collective, we argue that more research on these processes is needed, and policy intervention is required to ensure that HE digitalises in socially beneficial and socially just ways.

Our collective research and reflection is international, primarily situated in the Global North. Hence, our analysis sits in HE contexts with massified and well-resourced systems, many of which are subject to high international competition for students, research funding, and prestige. Our reflection in this article is conceptual in nature, albeit derived from our respective empirical and theoretical research programmes. Our discussion especially benefits from the findings from an Economic and Social Research Council (ESRC) funded project, *Universities and Unicorns* (UU), which investigated new forms of

value in the digitalised HE (Komljenovic, Hansen, Sellar, & Birch, 2024). This research introduced the conceptual framework of assetisation to explore how value is constructed through the digitalisation of HE.

In May 2023, we organised an interdisciplinary workshop at Lancaster University, UK, with leading scholars globally, as part of the UU project. Twenty-nine participants attended the workshop, and these participants came from Australia, Canada, Finland, Hong Kong, the Netherlands, Spain, Sweden, UK, and the USA. Their disciplinary backgrounds included geography, higher education studies, philosophy, political science, science and technology studies, media studies, and sociology. Participants' empirical research programmes were varied too, with participants studying different sectors, including higher education, media, science, biotechnology, sports industry, anthropocene, and more. All participants shared an interest in and research focus on critical studies of digitalisation, platformisation, and datafication of society and/or higher education policy and governance. Bringing together various disciplines, methodological and conceptual approaches, and expertise in analysing different sectors, offered room for sharing research insights, reflecting on the project findings, and advancing theoretical frameworks with explanatory power.

This commentary is one of the workshop's outcomes and is written as a collective reflection (Jandrić et al., 2023). After participating in the workshop discussions, a subset of participants decided to co-author this commentary. Thus, all co-authors of this article participated in the workshop and contributed to the intensive discussion at the event. After the workshop, each co-author wrote a short contribution responding to one of the three following questions:

- How has HE been digitalised?
- What are the effects?
- And where are we going in the future?

The debates at the workshop, together with the written short contributions after the event, were then synthesised by the three article organisers, the project Principal Investigator (Janja Komljenovic) and Co-Investigators (Kean Birch and Sam Sellar). The article organisers identified key themes based on the group material and drafted the article. All co-authors reviewed and commented on the draft before the article organisers finalised it.

Our article proceeds as follows. First, we discuss assetisation as a key change to HE governance in digitalising HE. We then discuss the centralisation of digital infrastructure around Big Tech and Big EdTech and how these actors intervene in teaching and learning, the administration of HE institutions, research management and academic publishing. We conclude by elaborating on our collective key concerns, calling for transparency, policy intervention, and reflection on how we teach and research in digitalised HE.

Assetisation: a new mode of governance for digital HE

We understand governance as 'all the processes of governing, whether undertaken by a government, market, or network' (Bevir, 2013, p. 1). Governance entails a range of institutional entities and diverse mechanisms for 'aligning economic, social, and personal

conduct with socio-political objectives' (Miller & Rose, 1990, p. 2). Specifically in HE, governance includes the coordination of HE activities such as 'funding, provision, ownership and regulation … carried out by the market, the community or the household as well as by the state' (Dale, 2005, p. 129). Over the past five decades, HE governance has undergone significant change and become multi-actor, multi-scalar, and multi-issue in nature (Chou, Jungblut, Ravinet, & Vukasovic, 2017). A notable dynamic has been the growing marketisation of HE, which paved the way for the emergence of the global education industry (Verger, Lubienski, & Steiner-Khamsi, 2016). At the same time, HE has been digitalising, often with proprietary technology, leading many to describe this development as a form of marketisation and commodification of HE.

However, for several reasons, the digitalisation of the sector can be seen as more than yet another way of extending markets and commodification into HE. First, most activities in HE institutions are digitally mediated, and thus, digital technology has become structurally embedded in the fabric of the sector. Second, university technology procurement procedures, and contracts between HE institutions and technology providers, have become immensely important in setting the rights and obligations of the different parties, as well as end users of technology. However, these contractual arrangements are not transparent (Pistor, 2020). Finally, digital technologies and their component parts (such as digital platforms, user and personal data, software licences, user rights, and subscription fees) possess asset qualities (e.g. digital data as an asset) or support asset regimes (e.g. user consent as a basis for data collection) (Birch & Muniesa, 2020). Hence, a large part of HE digitalisation is subject to assetisation. There is a growing body of work analysing assetisation in HE (Hansen & Komljenovic, 2023; Ideland & Serder, 2023; Komljenovic, 2021, 2022; Milyaeva & Neyland, 2020; Williamson & Komljenovic, 2023) that already highlights how it impacts the sector, staff, and students. We build on this line of research and move to discuss assetisation in more detail, arguing that it marks a significant shift in governing societies and people's rights, including HE.

Assetisation

Assets come in various forms. Simply put, they can be understood as a resource for the asset owner or controller that brings long-term economic benefit. Assets are protected by legal arrangements, such as copyrights, intellectual property rights, and patents. There are also many things that have asset-like qualities even though they are formally not recognised as assets. Examples of assets in HE are content (e.g. course material), digital platforms (e.g. LMS), data products (e.g. algorithms), university brands, and more.

In our global economies and sectors, as well as in HE, an increasing number and variety of things and services are being turned into and managed as assets. Assetisation describes a societal transformation – the turning of things into assets – and a shift in the way societies understand and govern themselves and, especially, in this case, their societal resources (Birch, 2024; Birch & Muniesa, 2020). Thinking of HE as a societal resource can help us think through the implications of this transformation and what assetisation means for how we collectively organise the HE sector. Of critical importance here are three dimensions of assetisation that are worth spelling out in more detail: first, the particular temporalities of assets; second, the relationalities of assets; and third, the path dependency implications of assets.

Assets are defined by their temporalities, insofar as a set of future expectations helps to determine an asset's value and valuation; for example, an asset's yield, often spread out over a specific number of years, is used to define its value through various valuation practices, such as discounted cash flow (Birch, 2017; Doganova & Muniesa, 2015; Muniesa, 2012; Tellmann, 2020). An asset is not only constructed as a temporal expectation, representing a series of actual and potential revenue streams; it is also, and necessarily so, governed as such. If we accept that markets are instituted in a Polanyian fashion (Polanyi, 1957), then we have to understand how those revenue streams are constituted, especially by examining the deployment of specific techno-economic mechanisms that can smooth out the lumpiness or bumpiness of cash flows over time and space (Leyshon & Thrift, 2007; Miller & Rose, 1990). As Pistor (2019) emphasises, asset holders get granted a privilege that has value because that privilege is 'durable', and it is only durable because a political-economic entity, like the state, underpins that entitlement now and in the future. For example, if learning content (e.g. an e-textbook) can be protected by intellectual property rights, the owner of these rights can expect future economic benefits from legal control of that content as an asset.

There is then a 'durational' temporality to the construction and governance of an asset (Tellmann, 2020), which entails the enforcement of particular techno-economic configurations to ensure that said asset, especially its entitlements, is enforced throughout its lifespan. To continue with our example, the author, the reader, and the publisher of an e-textbook remain in an assetised relationship over a period of time set by law: the reader can access the content legally by paying a license fee to the publisher, but cannot make copies to distribute the content. This applies to all assets, such as platform products and services. Such durational claims were not previously explicitly considered part of HE governance, which has significant implications for HE. As educational objects (such as course content, platforms, and analytics) are assetised, they become tied into a set of entitlements benefitting asset owners, but, at the same time lock-in societies to the particular interests of these asset owners and the expectations of their investors (Dreyfuss & Frankel, 2015; Williamson & Komljenovic, 2023). We are thus confronted with governance through assetisation, which is defined by proliferation of multiple 'external' and private claims and dispersal of power relations (of this particular kind), and hence by declining transparency and democratic oversight.

Assets are also defined by their relationalities. The techno-economic configuration of something as an asset entails knowledge claims that are both relational and situated, and these claims engender performative effects (Birch, 2024). For example, a claim that the value of an asset (e.g. educational data) is rising faster than other assets (e.g. educational content) implies that investors will invest in it over other assets. Such valuation practices are based on specific knowledge claims (e.g. cost of capital calculations, discounting) yet they also reflect a collective and relational achievement (Muniesa et al., 2017). As the historian Jonathan Levy (2017) illustrates, there was a rethinking of assets and their values at the end of the nineteenth Century as investors and others began to understand asset values as 'discounted against a uniform market interest rate' (Levy, 2017, p. 498). Here, the increasing standardisation of valuation judgements against a naturalised market rate was relationally constituted. An asset's value – and how it ends up being governed – is necessarily constituted by its relation to a range of other political-economic objects, claims, and entities, especially to other assets and

expectations about long-term interest rates, which form the basis for discounting (Muniesa et al., 2017).

Governance through assetisation, therefore, entails extending and reinforcing a societal understanding of how to manage and value societal resources, and it entrenches an increasingly influential (if not dominant) understanding of what collectively matters. For HE, this can have significant impacts. Notably, as HE institutions manage a number of key societal and organisational resources, they are relationally driven to reframe their activities and resources in financial terms that valorise monetary value over other considerations (e.g. educational or research objectives), and whether they wish to or not, this has become a matter of expectations on competent management of their day-to-day operations. As a result, financial logics end up shaping the comparison between different social objectives.

Finally, the commonality in current forms of digital assetisation across sectors is a tendency towards lock-in, which refers to the ways asset controllers (e.g. a platform company) make it hard for users to quit their services, using various strategies (Hackfort, Marquis, & Bronson, 2024). In HE, the most common lock-in strategies are technological, legal, and economic. By technological lock-in, we mean that it would be technologically complex and costly to switch providers, such as when a digital platform is integrated into a university digital ecosystem, or when a university migrates its digital infrastructure to a public cloud, such as that of Amazon's AWS or Microsoft's Azure (Birch, Cochrane, & Ward, 2021). By legal lock-in, we mean that universities may sign long-term contracts that make it legally challenging to replace providers. And by economic lock-ins, we mean that the costs of switching would be too high to do so in practice. For example, subscriptions to large platforms, such as Learning Management Systems, cost several hundred thousand pounds annually for a large university, while for cross-services, such as the Microsoft suite, this cost can be in the millions; and the migration to the cloud takes several years and costs tens of millions of dollars (Komljenovic, Sellar, & Birch, 2024). These lock-in strategies benefit asset controllers such as platform companies, as they collect fees for access to their platform assets as well as collecting user data that they can further assetise and use as resources. Consequently, the implications of assetisation for HE institutions and their constituents are important to note and address.

Implications of assetisation

Governance through assetisation entails a problematic perspective in which financial value and metrics (e.g. return on investment) may take precedence over other evaluation metrics and measures (e.g. educational or pedagogical relevance). This, in turn, engenders a specific prioritisation of technological assets and 'fixes', which is commonly observable across end-user applications as products are 'strategised, developed, and designed to become something that the user 'cannot do without,' not because it is addictive, but because it is made indispensable to the distributed action universe of the behavioural problem that it addresses' (Doyuran, 2024, p. 1). In HE, technology is framed as a solution to problems for the sector, while HE is presented as broken and in need of urgent change (Williamson & Komljenovic, 2023). EdTech firms' solutions are increasingly framed in ways that compel HE institutions repeat business, rather than a one-off transaction, precisely via integrating digital services into teaching, learning, administration, and other university

practices in an effort to embed these services in HE institutions. For example, Hansen and Komljenovic (2023) show how automating decisions in learning situations serves to embed new technologies and practices. HE institutions and companies might even find ways to co-construct user data as a mutual asset from which they can both develop products and services they can use or embed in their respective practices (Komljenovic, Sellar, Birch, & Hansen, 2024).

Digitalisation has also had profound effects far from the front stage of HE – classrooms, laboratories, and lecture halls are increasingly transformed through information technologies. In addition to its impact in these spaces, digitalisation also reached the back office of most HE institutions, directly reshaping their core financial operations in the direction of assetisation. In the past, financial systems in most organisations were a tapestry of different systems developed with little coordination, each attending to the demands of different organisational units. These financial systems implied that account managers in individual units often had some discretion to work around the constraints of each system. This provided some flexibility to units, who could work around the system creatively to respond to the needs of their members. In the last decade, however, large information technology vendors – such as Oracle and Salesforce – started to market integrated platforms to HE institutions, presenting these as one-stop solutions to budgeting and account management problems. Substituting different and disparate devices and techniques, these new platforms effectively reduce the agency of frontline staff while reinforcing the view of students and enrolments as revenue streams. In making connections between enrolments and financial health constantly measurable, trackable, and auditable, these systems have reinforced notions of the campus as a service provider and individual units as competitors in a marketplace for student attention.

Sector-wide implications of these dynamics include developing omnipresent technology dependencies within HE. These dependencies are created by outsourcing capacity development and future planning to private actors, further hollowing out the public HE sector. This impacts what students learn and how they learn, what academic research looks like and how it is conducted, and, more fundamentally, which actors have the authority to make decisions. This authority is not given by the state (in the form of university status) but claimed through techno-power (in the form of technological capability). These implications will be hard to roll back so long as technology is seen as a necessity for the modern university and the private sector is seen as the only credible actor for developing and supporting these technologies because – under current conditions – technology development is capacity development.

Infrastructuralisation and platformisation: vertical and horizontal scaling

The second key development in digitalised HE is the increasing concentration of control over digital infrastructure, including the expansion of Big Tech in university digital ecosystems. In short, if the first issue highlights the changing power relations constitutive of contemporary HE, with regard to its increasing dependence on the assetised logics of technological solutions, the second issue highlights how the purveyors and owners of those technological solutions are themselves increasingly powerful actors, especially by employing assetisation as a governance mechanism. HE institutions use a variety of

digital products and services, including legacy software (e.g. student database software that has not changed very much over time and which provides a stable base for the niche service), EdTech incumbents (e.g. educational companies that have been present for decades and are evolving into data and analytics companies), and a variety of novel platforms supporting various activities. However, HE institutions also use products and services provided by Big Tech (e.g. Microsoft 365) and increasingly Big Tech cloud infrastructure (Fiebig et al., 2021). Big Tech is thus expanding in HE globally, including in the Global South, (for South America, see Observatório Educação Vigiada, 2024). The impact of this Big Tech expansion remains to be documented and thoroughly examined.

Big platformisation in higher education

The twinned dynamics of infrastructuralisation and platformisation (Helmond, 2015) are currently reshaping HE, operating as driving forces and embedding individual HE institutions ever deeper into the expansive global economic and technological ecosystems of Big Tech platform companies (Kerssens & van Dijck, 2023). In recent years, the platformisation of education – understood as 'the transformation of educational content, activities, and processes to become part of a (corporate) platform ecosystem, including its economies, (data) infrastructures and technical architectures' (Kerssens & van Dijck, 2023) – has been best illustrated by the promotion of Microsoft Teams for Education (MTfE) as central to the digital learning environments of HE institutions across countries. The (re)positioning of MTfE as a digital 'home base' for students and teachers represents the latest episode in an ongoing digitalisation process through which online learning environments in public education are integrated with the interoperable ecosystems of hardware, software, and infrastructural services provided by platform companies.

Big Tech provides cloud services for other platforms and offers 'as-a-service' infrastructure models (e.g. Software-as-a-Service, STorage-as-a-Service, IDentity-as-a-Service). Amazon Web Services (AWS) has been a significant player in these domains. Other platform providers build their software using this cloud infrastructure. An example is the new generation of LMSs that benefit from plugins, 'as-a-service' models, and other interoperable extensions. For example, an empirical analysis traced data server traffic provided by Instructure (Canvas) within a Swedish university's LMS before and during the COVID-19 pandemic (Cone et al., 2022, pp. 856–858). The analysis identified AWS as a central node; however, the traffic went to other unexpected actors as Instructure had set up 'Open Apps' store, allowing third-party integrations and extensions. At the same time, it allowed Instructure to extract data to improve its service provision (Cone et al., 2022). Together, these digital services and activities highlight intensive market and social activity for profiting from platform and data assets by not only Big Tech (Birch et al., 2021), but also Big EdTech, i.e. 'natively education-focused companies that have built their business fortunes *through* education itself, rather than technology companies translating their business interests and enterprise systems *into* education', such as Instructure (Williamson, 2022, p. 158).

The economic logic of Big Tech and Big EdTech companies funnels data flows generated across the ecosystem into proprietary assets. They create data enclaves through the collection and aggregation of digital data, creating valuable data assets that other companies have to pay to access (e.g. for product development) (Birch, 2023). HE institutions

are attractive customers of such services as part of an increasingly data-intensive sector dealing with large amounts of data, including sensitive data.

MtfE's central position in digitalised HE institutions, as well as Big EdTech running on AWS, illustrate how platformisation drives infrastructuralisation, turning global platforms into digital infrastructures essential for HE institutions' daily routines and operations. Big Tech companies provide material and social digital infrastructures such as workspaces, embedded learning apps, machine learning capabilities, analytics, and other cloud-based services that shape classroom user interactions, making HE institutions increasingly dependent on platform companies. The socio-technical design of Big Tech ecosystems and the political-economic strategies of these companies, grounded in the logic of assetisation, redistribute organisational power over education. This is a major cause of concern worldwide for the autonomy of HE, including institutional and academic freedom to design, organise and control digital learning environments and their capacity to control user-generated data flows (Kerssens & van Dijck, 2022).

Another key concern relates to transparency and accountability. Platforms, such as LMSs, are embedded in, and built on, Big Tech cloud infrastructure. These service integrations play an important part in the provision and accessibility of education. However, these are operated with little public transparency. This raises concerns about whether such ecosystems still serve the democratic mission that HE has delivered traditionally, who gets to aggregate and monetise user data, and the impact of platform features based on data operations replacing the teacher as the main asset for the HE sector. A key emerging issue is whether these developments will lead to data flows, extraction, and processing being prioritised over teachers' control and protection of their professional decisions and autonomy to serve students (Teräs, Suoranta, Teräs, & Curcher, 2020). There is already evidence in education that teachers are pressed to prioritise work with data and support proprietary platforms in building educational assets that platform companies control (Selwyn, 2021). We argue that these techno-economic-legal infrastructures should offer more transparency and accountability to a diverse range of HE stakeholders, including students as end-users.

The platformisation of student experience

From the perspective of end users, Big Tech's connectivity with the broader digital ecosystem paves the way for wider technology use. The adoption of EdTech platforms by HE institutions is not the only, or even primary, way in which students' experiences are affected by societal processes of platformisation. Students' everyday lives are increasingly mediated by datafied platforms that affect how they relate to each other and their HE institutions. They generate new intimacies, require new literacies, and raise the possibility of new kinds of publics (Burgess, Albury, McCosker, & Wilken, 2022). As well as using a range of platforms in their academic work to cross curricular boundaries and supplement the formal teaching they receive (Araos Moya & Damşa, 2023), students increasingly depend on platforms, such as Deliveroo, as both consumers and workers in ways that highlight the relationship between the financialisation of HE and the platform economy (Gregory, 2022).

Students also increasingly rely on the 'cooperative affordances' (Bonini et al., 2023) of social media and messaging platforms, such as WhatsApp and WeChat, to navigate the

complexities of mass HE and student life, relying on each other (and private platforms) for essential information, support, and friendship. Along with new possibilities of connection, these everyday processes of platformisation generate new divisions amid the internationalisation of universities. For example, at Western universities with a significant proportion of students from China (e.g. in the UK), the geopolitical divide between US- and China-based platform ecosystems (Van Dijck, Poell, & de Waal, 2018) presents new challenges to the student community and belonging, with many students remaining embedded in the 'transnational Chinese platform economy' (Yu, 2022) inaccessible to many of their peers. Thus, attention to the lived experiences of students reveals how processes of digitalisation and platformisation stretch far beyond the confines of universities' own digital infrastructure. Future research must account for the many ways in which HE is connected with global platform economies.

Infrastructural scaling of academic publishing

Platformisation is affecting not only the teaching, learning, and management of HE institutions, as discussed thus far, but also academic publishing. Universities and academics become actors in the horizontal and vertical scaling of digital infrastructures for knowledge dissemination. Academic publishing is a major global industry undergoing reconfiguration. For example, Elsevier was once a small Dutch publishing house founded in the late nineteenth Century and is now part of RELX, a global conglomerate, reflecting Elsevier's 'transformation' from a publisher into a 'technology, content and analytics-driven business' (Elsevier, 2024). Other brands in the RELX suite include ResearchFish, SciVal, Pure, Scopus, Digital Commons, and Plum Analytics, each a major platform provider of research-related services. Their assembly under a single corporate structure is largely the result of a sequence of company acquisitions, which allows charging fees for universities to access insights related to research and publishing by their staff. Such practice of charging universities for access to 'insights' driven from data mining the products of academic labour is criticised as a 'moral indignity' involving 'siphoning taxpayer, tuition and endowment dollars to access our own behaviour' (Pooley, 2022). Elsevier is one example, but other publishing brands like Sage, Springer Nature, Taylor and Francis, and John Wiley & Sons are each involved in similar practices.

The commercialisation of scholarly publishing is the subject of considerable debate and critique. However, less attention has been paid to the increasing interest in Open Access publishing by commercial actors. Open Access publishing is here defined simply as academic work available to read without barriers or paywalls. More particularly, commercial publishers have shown considerable interest in buying up the infrastructures of Open Access publishing, which is a particular form of the digitalisation of knowledge creation and dissemination in HE. Examples from the past three years include Taylor and Francis' purchase of F1000 (Taylor & Francis, 2020), De Gruyter's purchase of Ubiquity (Ubiquity, 2022), the Emerald Group's purchase by the Cambridge Information Group (Emerald Publishing, 2022), and Wiley's purchase of both Knowledge Unlatched (Wiley, 2021a) and Hindawi (Wiley, 2021b). Often, the precise figures involved are not made public. An exception, however, is in the case of Hindawi, where the purchase price was $298 million, which is well above the average sum of $90 million paid for company acquisitions in 2021 (IMAA, 2024). These enclosures of open-access publishing significantly

affect the sector, academic labour and societies at large. Organising academic publishing via the market potentially contradicts policy objectives to make the results of research open and publicly accessible. Moreover, we must ask whose assets are the research outputs produced by academics, often through public subsidisation and who controls them.

However, the digitalisation of academic publishing also offers examples of counter-movement and resistance in relation to the processes we have outlined in this article. An important counter-movement in recent academic publishing has been an increasing move by scholars and university presses to establish their own independent and Open Access publishing initiatives to collectivise. This collectivisation is intended to provide mutual forms of support (see, for example, the ScholarLed group and the recently launched Open Institutional Publishing Association) and to enable the design and deployment of independent infrastructures. Examples include Thoth, which is a non-profit software platform enabling Open Access publishers to better manage their book metadata, and the Open Book Collective, which delivers new revenue streams for independent and non-profit publishers. At the very least, such initiatives provide concrete examples of members of the scholarly community not just arguing for alternative futures for digitally mediated HE, but actively creating them.

Key concerns and next steps

Digital technology brings many opportunities and challenges to HE that researchers are already addressing. In this article, we have reflected on macro-level structural and governance developments that are likely to have the most significant and fundamental effects on the sector and HE institutions and, consequently, on students, staff and other stakeholders. These macro-level dynamics are continuously in development and have not appeared suddenly. Subject to incremental progression over many years (Noble, 1998; Robins & Webster, 2002; Williamson, Komljenovic, & Gulson, 2024), these technological, social, economic, cultural and legal processes have profoundly restructured HE globally.

The temporal aspect of assetisation lays out long-term claims by asset owners (e.g. platform companies) concerning access and use of their assets, and compensation for such access and use, enforced by legal arrangements. The relational aspect of assetisation allows for socio-economic dynamic that configures present actions in new ways. Various forms of lock-in make it hard, if not impossible, for HE institutions to change technological providers. Together, temporal, relational, and lock-in dimensions of assetisation are now reconfiguring student and staff interactions, their individual and collective rights, the possibilities they have in their educational and working environments, and their personal freedoms. Moreover, they are rearranging research governance and knowledge dissemination. For the sector overall, assetisation impacts its economic and educational resilience as HE institutions find themselves locked into layered digital ecosystems and faced with ever-rising costs. It also impacts pedagogic resilience as analytical and automated services become embedded in teaching, learning, research and management. We see a progressive shifting of expertise away from academics and professional staff towards 'efficient and personalised' teaching, learning, and administrative operations. These shifts are embedding techno-dependencies across the sector.

Big Tech is the primary driver of HE's platformisation and infrastructuralisation. Allowing connectivity with other platforms and enabling data flows, Big Tech provides the foundational technology for HE's digital operations. At the same time, Big Tech is able to assetise its infrastructure and data flows with scaling of its service, its high numbers of users, and its control of operations on its infrastructure and platforms. Big EdTech is increasingly benefitting from the common good by scaling horizontally and vertically across the sector. Here we do not mean only privatisation of the HE infrastructure and collection of subscription fees, but also user data as a common good. Building data enclaves (Birch, 2023) gives Big Tech and Big EdTech new power over the fabric of educational technology as well as what kind of innovation is occurring in the sector, what features are released in digital products, how students learn and how teachers teach, and so on. Seen this way, Big Tech and Big EdTech could also be understood as closing down possibilities for educational innovation.

While the digitalisation of HE is not new, assetisation and infrastrucuralisation allow for new large-scale consolidation of specific operations. A significant part of that is large-scale data production and aggregation, leading to uncertainties concerning data ownership and control, as well as emerging risks in protecting public sector data assets. Platformisation coupled with assetisation also externalises responsibility over HE and limits the space for politicising the sector, i.e. leading democratic debates over political questions concerning what HE should be and how it should be run.

Moreover, the stakes here are potentially high – not just for the longstanding humanistic and critical public missions of universities, nor even just for universities themselves as institutions, but also for society more generally. Opening out the perspective onto the broader landscape of societal challenges and demands upon universities in the mid-twenty-first century, regarding their crucial (but still largely unactualised) contribution to societal transformation as we face unprecedented ecological crisis (Fazey et al., 2021; Maxwell, 2021), shows that significant institutional innovation is crucial for the medium-term flourishing – and, for many individual universities, survival – of HE. Specifically, participatory institutional and/or methodological-conceptual innovation is needed, cultivating a reassertion and redefinition of the university's primary commitment to the public good.

This is already a massive challenge, not least given longstanding and deeply entrenched conceptions within the modern university itself that privilege a specific model of 'good' science and HE as the collation and dissemination (respectively) of arm's length objective facts, and hence an intrinsic wariness regarding more situated, diverse and 'second-order' ways of knowing. In principle, digitalisation and the construction of a global 'epistemic web' (Renn, 2020) is potentially a huge advance in the infrastructural affordances for such transformation. By increasingly locking in specific ways of researching and teaching that, if anything, are even less open than at present to these kinds of epistemic and institutional innovation, however, digitalisation of HE in its currently dominant model threatens the exact opposite outcome. In short, the dynamics of digitalisation outlined here may render numerous universities around the world increasingly unfit for purpose and – crucially – may, in turn, catalyse their rapid and unprecedented abandonment by prospective students and staff.

The possibilities of resistance are limited, but we see glimmers of possibility. The material and structural techno-economic processes we have discussed here are hard to

challenge without changes in the digital economy more broadly. Therefore, the HE sector must be part of broader debates about how digital technology, especially Big Tech and the user data it assetises, should be governed and monitored. HE institutions must collectively organise their own discussions and then, as a sector, participate in the overall societal stakeholder elaboration of a new governance model for digital technologies. Some options are suggested in the policy recommendations published by some of the co-authors of this article, including that stakeholders explore the possibility of establishing a sectorial data trust and an oversight body for EdTech. Other suggestions include enabling selective and collective user consent within HE institutions (Komljenovic, Williamson, Eynon, & Davies, 2023), and even more fundamental programmes of redefinition of science and HE as per a 'science for the Anthropocene' not just of or about the Anthropocene (Tyfield, 2022). More transparency in relation to how multi-layered technology infrastructure works and opportunities for users to impact their operations individually and collectively are also needed.

We have reached a moment of increased push-back against the power of Big Tech and Big EdTech that goes beyond discursive tech-lash or individual consumer choice. Collective actions to find new forms and types of alternative possibilities are getting established, such as new forms of open-source publishing. These speak to the question of how we can use assetisation to work for the greater public good. We encourage stakeholders to pursue and support such new initiatives.

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