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Edtech in Higher Education: Empirical Findings from the Project 'Universities and Unicorns: Building Digital Assets in the Higher Education Industry'

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Special report
April 2024

UKRI Economic and Social Research Council
UKRI Research England

Published by the Centre for Global Higher Education,
Department of Education, University of Oxford
15 Norham Gardens, Oxford, OX2 6PY
www.researchcghe.org

ISSN 2398-564X

The Centre for Global Higher Education (CGHE) is an international research centre focused on higher education and its future development. Our research aims to inform and improve higher education policy and practice.

CGHE is a research partnership of 10 UK and international universities, funded by the Economic and Social Research Council, with support from Research England. ESRC award number ES/T014768/1

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Abstract

Higher education (HE) is by now thoroughly digitalised. Universities use a variety of digital products and services to support their operations. The educational technology (EdTech) industry has been expanding in the past decade, while investors have become important actors in the field. This report offers findings from the ESRC-funded research project 'Universities and Unicorns: Building Digital Assets in the Higher Education Industry' (UU), which investigated new forms of value in digitalised HE as the sector engages with EdTech providers. The project was especially interested in digital user data and data operations. We followed three groups of actors: universities, EdTech start-up companies, and investors in EdTech. Understanding EdTech relationally, and bringing these groups together, allowed us to gain particular insights into the digitalisation of HE and its political economy. We aimed to trace the flow of ideas, strategies, and actions between these actors and to understand how and why the EdTech industry is developing as it is. Key findings indicate that EdTech in HE is less advanced than presented by the industry and policy discourse, all actors struggle to make user data valuable and useful, digitalisation and datafication mean more work and higher costs for universities, and legacy software and Big Tech seem to dominate the sector rather than the EdTech industry. Moreover, EdTech aims and practices require more transparency, participants wish for more democratic data governance, and EdTech should support rather than challenge universities. There are synergies and fundamental discrepancies between the discourses and imaginaries of EdTech on the one hand, and realities and practices on the other hand. Universities, EdTech companies, and investors in EdTech also share some aims, while at the same time, there are substantial differences between their goals.

Keywords: Higher Education, EdTech, Digitalisation, Datafication, Assetisation, Value, EdTech Companies, Investors.

Acknowledgement: The support of the Economic and Social Research Council (ESRC) is gratefully acknowledged [ES/T016299/1].

Acronyms

AI: artificial intelligence

API: application programming interface

AWS: Amazon Web Services

B2B: business-to-business (software targeting organisations, such as a virtual learning environment)

B2C: business-to-customer (software targeting individuals directly)

CRM: customer relationship management

EdTech: educational technology

HE: higher education

IaaS: Infrastructure-as-a-Service

IP: intellectual property

LMS: learning management system

LTV: lifetime value

MOOC: massive open online courses

OPM: online programme management

PaaS: Platform-as-a-Service

PE: private equity

ROE: return on education

ROI: return on investment

SaaS: Software-as-a-Service

SSO: single sign-on

TEL: technology-enchanced learning

VLE: virtual learning environment

VC: venture capital

Introduction

This report provides a descriptive empirical account of the findings from the ESRC-funded research project ‘Universities and Unicorns: building digital assets in the higher education industry’ (UU). The project was conducted between 1 January 2021 and 30 June 2023. It investigated new forms of value in digital and digitalised higher education (HE) as the sector engages with educational technology (EdTech) providers. The project was especially interested in digital user data and data operations. We followed three groups of actors: universities, EdTech start-up companies, and investors in EdTech.

Our study of universities focused on understanding their: digitalisation strategies and practices; digital ecosystems and collaborations with EdTech companies; attitudes towards and experiences with EdTech companies; user data operations and data outputs; and key challenges with digitalisation.

Our study of EdTech start-up companies focused on understanding: development of products and services; business models and strategies; how products are datafied and their data operations; how user data is made valuable; experiences and relations with universities; experiences and relations with investors; and challenges they are facing in their work and growth.

Our study of investors focused on understanding: their views of HE and the future of the sector; the role that EdTech should play in this future; their beliefs about the value of user data; their investment theses, strategies and activities; and their experiences and relations with the EdTech and HE sectors.

Understanding EdTech relationally, and bringing these groups together, allowed us to gain particular insights into the digitalisation of HE and its political economy. We aimed to trace the flow of ideas, strategies, and actions between these actors and to understand how and why the EdTech industry is developing as it is.

Our conceptual approach centred on rentiership and assetisation. The global economy is increasingly characterized by rentiership: the move from creating value via producing and selling commodities in the market to extracting value via controlling access to assets. In the digital economy, rentiership is often

exercised by controlling digital platforms and pursuing revenues associated with platforms, such as collecting and monetising digital data extracted via these platforms. Users became valuable through their engagement with the platform and are made visible through various user metrics[1]. Emerging work on assetisation in education argues that this is a productive way to understand the impact of the privatisation, financialisation, and digitalisation of public education[2]. However, the rise of assetisation does not mean that HE is no longer a public good or subject to commodification. Instead, it adds new complex forms of value creation and governance to the sector.

We should note that this research project was conducted before the release of ChatGPT into public use. Therefore, this report does not make reference to the turbulent discussions about generative AI and its potential usage and impacts in HE. Finally, we note that this report offers an empirical description of key themes and dynamics identified in our study. More in-depth and theorised analyses of project findings are being published in journal articles and book chapters, all of which are openly accessible. The Appendix includes a list of publications.

1. Overall takeaways

In this section, we briefly summarise key overall findings, which are analysed in more detail in academic publications, i.e. journal articles and book chapters (see Appendix). The following findings are relevant to our case studies and might be different in other contexts.

[1] Birch, K., Cochrane, D., & Ward, C. (2021). Data as asset? The measurement, governance, and valuation of digital personal data by Big Tech. Big Data & Society. https://doi.org/10.1177/20539517211017308

[2] For example, see: (1) Ideland, M., & Serder, M. (2022). Edu-business within the Triple Helix. Value production through assetization of educational research. Education Inquiry, 0(0), 1–16.; (2) Komljenovic, J. (2020). The future of value in digitalised higher education: Why data privacy should not be our biggest concern. Higher Education.; (3) Komljenovic, J. (2021). The rise of education rentiers: Digital platforms, digital data and rents. Learning, Media and Technology, 1–13. (4) Milyaeva, S., & Neyland, D. (2020). English Higher Education: From a Public Good to a Public Asset. In Assetization: Turning Things into Assets in Technoscientific Capitalism (pp. 261–285). Massachusetts Institute of Technology (MIT) Press. (5) Williamson, B., & Komljenovic, J. (2022). Investing in imagined digital futures: The techno-financial 'futuring' of edtech investors in higher education. Critical Studies in Education, 0(0), 1–16.

Takeaway #1: Big Tech and legacy software are prominent in digitalising higher education

Big Tech infrastructure and platforms, legacy software, and EdTech incumbents dominate university digital ecosystems. It is challenging for the EdTech start-up industry to enter HE markets. Digital products and services offered by new companies represent a small proportion of digitalisation work at universities. EdTech companies primarily target individuals as customers, enterprises for staff development and training, and lower levels of education (i.e. schooling rather than HE).

Takeaway #2: EdTech in HE is less advanced than imagined

There is a discrepancy between the promises of the EdTech industry regarding the quality and impact of digital products and services and the perception of university customers. Many university actors, as well as a few EdTech companies, argued that the current quality of EdTech products is generally low compared to other sectors.

Takeaway #3: Making user data valuable is difficult

Collecting, cleaning, sorting, processing, and analysing digital user data demands significant human, technological, and financial resources. It is difficult to make user data analysis useful and valuable, such that universities are willing to pay higher fees for data-driven products. Most EdTech companies that we analysed struggle with monetising user data. There is also less user data analysis currently in the sector than imagined by the EdTech industry in its public discourse. The omnipresent belief in the value of user data among all actors is disjunctive with the realities of data practices, which are mostly simple or non-existent. Most university users are sceptical about learning analytics.

Takeaway #4: User data analytics in HE are not well-developed

EdTech companies attempt to make their digital products valuable by incorporating user data analytics into their core products. However, currently, these analytics are simple and remain at the level of basic descriptive feedback loops for the user. Nevertheless, there is a clear trend in which EdTech companies are continuing their attempts to construct new metrics, scores, and

analytics to monetise data, with efforts to convince customers of the value of these analytics.

Takeaway #5: Datafication in HE happens at universities

Universities are in the driving seat of their institutional datafication. Universities are establishing data warehouses, and many aim to collect all user data produced by external digital platforms in order to organise and analyse it for pedagogical and business purposes. However, universities currently lack the capacity to analyse, interpret and act on data. Universities need to establish frameworks for action based on data and acquire the requisite personnel and skills to do so. Universities should ensure that data outputs (e.g. analytics, metrics, scores) are truly representative of what is measured and build confidence in their communities regarding data-driven decision-making.

Takeaway #6: Digitalisation and datafication create work and costs for universities

Digitalisation and EdTech promise to bring efficiency and cost savings for universities, but in reality, university actors feel that digitalisation and data operations create more work and higher costs. In addition, new staff profiles and skills are needed, including data scientists, vendor managers, cloud engineers, as well as more learning technologists.

Takeaway #7: Good EdTech does not challenge core university values and practices

University actors find technology useful in general and are interested in technological innovation in relation to their work. However, there are two instances where university actors are sceptical towards EdTech. First, when companies' business models are exploitative and extractive. Second, when digital products interfere with the university's core values and practices, such as by challenging professional judgement or academic freedom. Intentions to automate the teaching process or provide behavioural nudges are often received with scepticism. Most university actors feel that user data collection should be limited, and data outputs, including analytics, should be restricted and carefully evaluated.

Takeaway #8: The aims of EdTech require greater clarity

The key aims of EdTech are understood to be personalisation, automation, enhanced student engagement, and greater institutional efficiency. However, there are discrepancies between university, EdTech, and investor actors in terms of how they understand these objectives and, consequently, how they will be achieved. Each of these aims needs clarification, including recognising the plurality of dimensions to each objective.

Takeaway #9: Future imaginaries of tech companies and universities

The future imaginaries of HE and EdTech are constructed by the EdTech industry and policy actors. There are discrepancies between investors, EdTech companies, and universities in relation to what EdTech should do and how it should shape the future of HE. Universities should drive these discussions and determine their futures and the role of technology in creating these futures.

Takeaway #10: Democratic data governance

Universities should do more to inform students and staff about the digital products and services they routinely use. Universities should also continuously provide transparent information to students and staff about user data collected from them and what is being done with this data within their universities and externally. Students and staff should have the choice to participate or not in user data collection and processing. Students and staff should be included in the governance of EdTech and user data at their institutions.

Takeaway #11: There is a plurality of assetisation processes in EdTech

EdTech companies establish a variety of processes to control and charge for access to their assets. These include mediating content, organising and mediating teaching interventions, and digitalising and mediating credentials. Typical moats that EdTech companies build are lock-in, network effects, and integration of products into everyday individual practices.

Section 1: Universities

2. Universities

UK universities are each at different stages of developing their digital ecosystems and are utilising diverse strategies and resources to digitalise and datafy their institutions. University digital ecosystems consist of a number of different digital infrastructures, platforms, and software. Some elements of university digital ecosystems may be internally developed (i.e. by the university alone and/or using open-source software), while others must be procured. Some digital ecosystems may be located and run privately (e.g. private cloud infrastructure situated on campus servers) or using public cloud infrastructure (e.g. Microsoft Azure). Some elements may be in the form of downloaded software, while others are provided as software-as-a-service (SaaS). This variety of digital technologies makes the techno-economic construction of universities as datafied organizations a complex task.

In this section, we analyse UK universities' digitalisation, platformisation, and datafication strategies and practices.

2.1 Dataset

The dataset for university analyses consists of: eight case studies (four based on document analysis, and four based on interviews and document analysis) and six focus groups.

From July 2021 to June 2023, we interviewed a range of staff working in UK universities. We interviewed senior university leaders, academic staff responsible for digital innovation in teaching and learning, IT managers, procurement staff, and vendor managers. The interviews have focused on: changes to the HE sector driven by digitalisation; the development and implementation of digital strategy; relationships between universities and EdTech companies (including procurement and contracts); and a range of issues associated with the collection, management and use of digital data.

The sample for the university case studies consists of 243 documents collected from eight universities and 14 in-depth interviews across four universities. Three distinctive university types are represented in the sample:

- 2 Russell Group universities

- 1 Old university
- 5 New universities

Each of the universities in our sample is distinctive in relation to (a) their digital strategy and (b) their level of maturity in relation to the digitalisation of their operations. In terms of the four universities in which we also conducted interviews, at one end of the spectrum is a university that has fully integrated its operations with a range of public cloud providers and is using digital strategy to drive innovation through its broader institutional strategy. At the other end of the spectrum is a university that is only beginning to develop a deeper understanding of its data assets, and it has not yet embarked on establishing public cloud infrastructures to support its data operations.

At the time of the interviews, two of the universities were in the process of developing new digital strategies. In both cases, interviewees explained that this strategic renewal had been driven by the experience of pivoting online during the Covid pandemic. University digital strategy has tended to be embedded across a range of strategic documents relating to information technology, teaching and learning or library services, and efforts were underway in these universities to develop a more explicit and coherent approach. One university had a very clear digital strategy that was driving its broader institutional strategy and this university had a more well-developed and nuanced approach in relation to its digital operations. All four universities are clearly at different stages of consolidating their use of multiple digital platforms and apps, ensuring interoperability between systems and developing coherent approaches to data management and use. This work was consistently described as building digital ecosystems.

Across all four universities, there was recognition that the growth of EdTech, accelerated by the pandemic, was having a significant impact on the higher education (HE) sector and HE practices. At the same time, the current impact of EdTech is limited by the speed with which universities adopt new technology, and the lack of quality EdTech products that deliver on their disruptive claims. At the same time, university staff also described the emergent state of this sector, arguing that there are a lot of opportunities for EdTech companies because, so far, no one is doing a ‘good job’ at developing EdTech. This was

not an argument against the potential benefit of specific platforms or applications, but rather a comment on the fact that many of the key promises of EdTech are yet to be delivered. Interviewees also recognised that academic staff involved in teaching delivery often have reservations about EdTech-driven change.

We conducted six focus groups between December 2022 and January 2023, with 19 participants from 17 universities.

2.2 Key themes

We highlight five key themes from our analysis of digitalisation in UK universities. The first key theme is **data processes and data struggles**. The universities we studied aim to become data-driven organisations and feel that this is expected of them. Universities' digital ecosystems include data collected on or from students, which they have collected for a long time (e.g. personal information such as date of birth or home address; information on qualifications; information on enrolled courses, attendance, grades; etc.), as well as on or from staff. These ecosystems also include digital *user data*, which is data produced and collected as students and staff engage with various digital platforms (such as a Virtual Learning Environment or the Microsoft 365 suite). User data is diverse (e.g. posted content, click-through behaviour, or metadata); and only a subset of user data is personal information protected by privacy regulations such as GDPR. All universities are at different stages of establishing institutional data warehouses to store and connect these data.

Data on students and staff is collected, organised, analysed, displayed, and used at universities for different purposes in relation to two broad aims. First, data are used to support the student experience and the learning process. Second, data are used to support institutional efficiency and business processes. However, there are numerous struggles over data practices. The most common struggle concerns the mismatch between data collection, on the one hand, and interpreting and acting on data, on the other. Participants felt universities lacked competence, structures, and opportunities to interpret and act on data outputs. There is a notable discrepancy between (1) omnipresent belief in the value of data and (2) the actual value of data practices, which participants feel are often lacking usefulness and impact. Linked to this

discrepancy is contestation over whether or not various data outputs accurately represent phenomena of interest. For example, some participants believe that a single student engagement score is representative of how immersed students are in their studies, while others perceive such a score to be meaningless.

There is also a tension between (1) practices of collecting and storing large amounts of user data and (2) the risks that this creates. In particular, participants highlighted surveillance as a significant risk and threat to the experience of students and staff. Some participants called for more democratic forms of decision-making in relation to technology and user data practices.

Another struggle we identified concerned the potential of learning analytics, with enthusiasm amongst some tempered by scepticism about the EdTech sector's promises concerning what is currently possible. Most participants felt that learning analytics do not deliver on what is promised, despite the persistent push towards rolling out learning analytics.

Participants also described user data flows as another area of struggle. Universities increasingly see the value in ensuring all user data is returned to a university data warehouse. However, this is a recent development, and universities have reported that this is still a challenge in their relations with Tech vendors. Moreover, Tech providers that do enable user data to flow back to the university may not provide these data in an easily readable format that universities can easily manage and analyse.

The second key theme is **the value of EdTech, which is still in question**. University digital ecosystems primarily consist of Big Tech infrastructure and platforms, legacy software, and products and services provided by EdTech incumbents. Despite burgeoning investment, edTech start-ups and emerging companies currently represent a small part of universities' digital ecosystems. Moreover, there is a division in the EdTech sector between large established companies with access to procurement frameworks and small start-ups that confront challenges in partnering with universities. The procurement process, and EdTech incumbents being structurally integrated into university ecosystems, can be understood as a form of lock-out for start-ups.

Universities have different views on and attitudes towards the EdTech industry and the value of their digital products and services. The value of digital platforms and EdTech depends on alignment with diverse institutional strategies. Universities are keen to engage with emerging EdTech products and services, but prefer to experiment with new products and services in low-risk pilots and applications.

The third theme is **increased cost and changing business models** of technology vendors. Our participants noted that the subscription fees of particular products have increased substantially since the Covid pandemic, which has been made possible due to captive markets. Costs for universities are also increasing as they deploy more digital products and software, to support the migration of their infrastructure to public clouds, and increase storage for rising volumes of data (e.g. recordings of all lectures).

Our participants also reported on changes in procurement and contracting practices as private sector models gained influence in HE, again accelerated by the Covid pandemic. There is a shift from perpetual licences towards subscription models and more standardised contracts that favour suppliers, particularly in relation to data use. Participants noted that providers are also changing their terms and conditions and are less willing to negotiate.

The fourth theme is **new demands for universities** in terms of labour and skills**.** Our participants reported substantial increases in workload generated by the datafication of their universities and increased digitalisation. New role profiles and skills are needed, and new jobs must be created: for example, cloud engineers and developers to support technological changes; data scientists and statisticians to support data processing and actionable analytics; vendor managers to support new legal and operational requirements; learning technologists to support new learning approaches, and so on.

There is an interesting paradox between (1) EdTech industry promises of savings and efficiency through digitalisation and datafication, and (2) participant accounts of rising costs and new demands, including increased workload and the need to recruit new staff to support these developments.

The final theme is what we refer to as **'good versus bad' EdTech**. The products and services provided by EdTech companies are generally appreciated in the sector, especially when they offer clear benefits in terms of supporting or enhancing core activities. For example, video calls enable meetings across borders, which participants value.

However, challenges and tensions appeared in two cases, giving rise to perceptions of 'bad' EdTech. First, when participants felt that business models were exploitative and built on monetising user data without consultation or fair treatment of those who produce, own and/or control data (e.g. when companies collect and enclos user data, process and integrate it into products, did not provide access to universities, and charge high fees). Second, challenges appeared when participants felt that the promises and intentions, or practices and operations, of products and services, challenge the sector's remit, values, and/or educational practices (e.g. digital products intended to replace human teachers with bots, or when there is a lack of confidence in the validity of metrics). Consequently, the perceived value of EdTech is highest when it provides functionality with limited or no enclosure of user data and minimal emphasis on metrics and analytics integrated into products.

'Good' EdTech is understood as enabling interoperability and integration into university digital ecosystems. Indeed, some participants argued that EdTech only adds value when it is integrated into the university's ecosystems. Integration of platforms and digital products is a key objective for universities to enable positive user experiences for their students and staff, to enable benefit from data collection and analysis, and to increase the functionality of their systems.

Finally, our participants felt that universities are mainly responding to external dynamics, such as policy demands, public expectations, and EdTech and tech industry strategies. In their view, universities should be central in discussions about the future of the HE sector and the role of technology in shaping this future. In other words, universities should develop their own vision for the digitalisation of HE's futures.

2.3 Data

In this section, we discuss university datafication practices. We explore the value of data, learning and business analytics, data operations, and the business models of EdTech companies in relation to user data, data policies, and universities as datafied organisations.

2.3.1 Dimensions of data extraction

Digital technologies and platforms collect user data from university students and staff during teaching, learning, and related practices. User data comes in different forms and can be categorised as:

- Content produced by staff and students (e.g. discussion forum posts on VLE, student assignments submitted to plagiarism detection software, lecture recordings submitted to university digital asset repositories, etc.).
- Data provided by staff and students or their universities (e.g. information on enrollments, grades, etc.)
- Click data (e.g. which platform sites were visited, which e-books were accessed, for how long, etc.)
- Metadata (e.g. IP address, machine number)

As we discuss below in the section on start-up companies, the most common way in which EdTech start-ups aim to build the value of their products is to integrate data analytics into their products. For example, they would not only offer e-reading platforms but also provide analytics on reading patterns. Common approaches include integrating various analytics loops in the service for end users and providing dashboards with various analytics for university administrators. However, this can be challenging for universities, which increasingly prefer to receive user data back into their own data lakes, enabling data integration and processing for their analytical needs.

Our participants spoke about EdTech companies (incumbents and start-ups) taking university data (student and staff platform users), processing and displaying it back to universities, but charging for this service. Our participants felt that this was an exploitative model, since universities own and produce the

data and helped build these digital products through their data and platform users. Participants observed that a common approach employed by start-ups is to create a digital product, use university data to develop it, and charge for access later. Deferring cost and pricing to the future is a common practice in the technology industry, as we elaborate in more detail in the section on EdTech companies.

However, our participants also spoke about companies' different approaches to sharing student and staff data they collect. At one extreme, some companies extract and enclose the data without providing any access to universities. They also do not send user data back to the university. The most common example we were given was that of a well-known plagiarism detection platform. At the other extreme are companies that automatically return user data back to the university, enabling data to be easily integrated into university systems and providing detailed analytics dashboards. In between are platforms that allow user data to be downloaded by universities, but in time-limited batches (e.g. six months of data at a time) and in a format that may be hard to manage and analyse. An example we were given was a popular VLE company.

Therefore, (1) how companies collect and process user data and integrate analytics into their product, and (2) whether they provide data access to universities, crucially shaped participants' perceptions of the usefulness of products, and the fairness and legitimacy of business models. For example, a focus group participant stated:

> *"We hate people taking our data and then trying to sell it back to us. So on the data, that is a really important sort of criteria for us when we're purchasing, in having access to our data and that data, where is that data going as well because we're also advising researchers on their data. So we have to have an ethical open stance on that." (G2P2).*

Focus group participants explained that EdTech companies are beginning to realise the power of data analytics, especially when integrating different services. This goes beyond individual companies processing data and offering analytical insights back to universities for a fee. Rather, companies are moving to consolidate the value of data analytics. Participants commented on

acquisitions of particular companies happening because of the acquiring company's motivation to access accumulated user data. One participant highlighted the potential threat to HE by EdTech accumulating data from the sector and using it for innovation:

> *"[W]e're not keeping track of where that may be going and how it will be used as an aggregate back at us. I think we're, we know, it's important for us to know more about how our students are behaving and all those kinds of things. How data will build platforms in competitive solutions, and then tie us into things, is something that I'm not sure we have captured. I've been talking to a number of companies recently around adaptive learning platforms and all those types of things; and … are we beginning to outsource what Higher Education is? And that's one of those things that-, we just need to have those conversations, we need to go into these things with our eyes open." (G1P2).*

Participants spoke about universities being data controllers, but at the same time, they must allow companies to process data in order to receive the service. In other words, data processing has become integrated into the very functioning of EdTech's digital products. One participant spoke about how universities have to cede data to receive the benefits of analysis.

Universities also need to collect informed consent from users, including from students once they enrol at the university and from staff when they are employed. Therefore, staff and students do not give consent for their data to be used and processed by specific platforms and for specific purposes every time they use a digital product. They give overall consent once, and universities make decisions on digital technology and user data based on the legitimate interest clause. Students and staff cannot opt out of using particular digital products or having their data collected and analysed. Some participants felt that universities do not do enough to inform students and staff about what data is collected from them and what happens with the data.

Some participants also mentioned system analytics, which they share and discuss with vendors for adjusting and managing the delivery of digital products. System analytics is not considered to be the same as user data analytics.

2.3.2 Analytics

Learning analytics

A small number of participants valued learning analytics and believed it could support teaching and learning processes. However, the majority of participants spoke about learning analytics with scepticism. They stated that the promises of learning analytics have not been delivered, and many had not seen good examples with actionable outcomes.

Learning analytics is a complex category comprising different kinds (e.g. descriptive, predictive), different activities (e.g. student relationship management, student journeys) and, different aims (e.g. informative, intervention), and it was a concern for many participants. For example, one participant expressed concern that the learning analytics may display metrics based on incorrect data. This might be as simple as predicting all courses have a set start and end time, and consequently, such misconceptions can lead to flawed metrics relating to progress percentages during the course. This example indicates a tension between the use of digital technologies to generate numerical calculations and the realities of a messy social life with many exceptions and dynamics that cannot be made tangible within the parameters and classifications employed by these technologies.

Another concern was that learning analytics are not relevant for all universities in the same way. Hence, beyond the risk that analytics will not present true measures of the phenomena that universities are interested in, the assumption that all universities and students need metrics in relation to the same phenomenon is also problematic.

A major concern was that learning analytics do not capture offline actions (e.g. when students read a book or download PDFs to their tablets and read them outside a platform). Hence, students might read and be very active in their studies, but this is not recognised in the available learning analytics. Consequently, learning analytics are commonly perceived as being unreliable, especially in highly consequential activities, such as assessment.

Universities have different views on how best to utilise learning analytics data to drive interactions with students. On the one hand, some participants

described how they do not want their students to use these analytics to compare themselves with others in their groups. This was perceived as demotivating and encouraging unhelpful comparison and competition, potentially increasing student stress. These participants did not want technology companies to automatically roll out analytics features in core products such as a VLE. Other participants described how they provide analytics to students to enable comparisons with others in their group or plan to do so. These participants felt that it was motivating for students. These opposing views indicate a lack of consensus in the sector regarding the uses and benefits of learning analytics.

Participants explained that learning analytics are often promoted as a means to support student wellness (i.e. identifying struggling students), monitor the usage of different technologies and resources (e.g. supporting efficiency in paying for licences and subscriptions), and provide course-level analytics (e.g. supporting academics with managing their courses and resources). Indeed, all participants agreed that the key value proposition of learning analytics is that these can be used to identify struggling students for early support. However, they disagreed on whether this value can be delivered. Some participants stated that tutors already know which students are struggling, which can be identified and managed without the need for learning analytics.

Focus group participants highlighted fundamental discrepancies between (1) the basic premises of learning analytics and (2) the values and practices of staff at universities. In the public discourse, this may be represented as academics and universities being averse to technology or the change that digital technologies are promoted as enabling. A minority of participants did suggest that academics are not interested in new technologies and approaches in general. However, the majority of participants described genuine tensions that should be addressed. These participants observed that teaching is about personal relationships. Technology is only part of the student experience, and much of the student and university experience is not mediated or captured by digital technologies.

For example, many universities are considering or have already introduced metrics to gauge student progress. These metrics often culminate in a single

student engagement score. However, some participants described this is a misleading measure that does not reveal much about actual student progress. Formative assessment was identified as a better way to support and monitor students. One focus group participant explained:

> *"[O]ne reason why I find all this stuff very superfluous is that built into the whole process of teaching and learning, we have engagement metrics already. It's called formative assessment, and it's called assessment. So at these different points, especially when you have formative assessments throughout the year or even a kind of like, modular assessment, or bit by bit assessment, anything apart from an end-of-year exam, you're getting that feedback constantly about how students are doing, how they're engaged, how much they're learning. And that just comes, that's part of the job, and the lecturers are all intimately aware of that. So it's actually pointless having a little number or having some kind of graph showing you, oh watch out for this student because you can see it in their work already. It's kind of just doubling up something which is already there." (G3P2)*

We return to this discussion on the tensions with metrics and measures in the sub-section 'Universities as data organisations'.

Some universities are trying to extend and deepen their use of learning analytics. For example, one university extracts data on students from a VLE for its tracking system, which is proprietary and very expensive. Despite being costly, significant work from university developers is still required to process data. Consequently, the university is considering moving to Microsoft's Power BI to improve the process. However, our findings indicate that at most universities, learning analytics are not currently implemented substantively. Rather, learning analytics are promoted and utilised by a small number of advocates rather than across entire institutions. The most common use by institutions is in relation to specific issues. For example, if there is a problem with a student, staff may use various analytics to inform action rather than systematically monitoring all students all the time.

Some participants stated that EdTech companies, including learning analytics providers, do not do research to evaluate the predictive analytic capacity of their products. They were frustrated with this because they felt that these companies had partnered with their universities for a number of years and had sufficient data to evaluate the quality of the predictions made. However, universities were left to manage their own evaluations of digital platforms and their impact.

Business analytics

The universities in our study use Microsoft BI to run their business analytics. In addition, some participants noted other external providers who conduct AI-driven analytics on specific university datasets to generate insights and feed results back into their systems. To maintain confidentiality, we cannot elaborate on concrete examples. Some participants described how business analytics could be used to manage staff performance, sometimes in punitive ways, which signalled different motivations, rationales, and practices that universities have for utilising business analytics to manage their workforce.

2.3.3 Other data operations and artificial intelligence

Some universities in our study used data to personalise the student experience, and it is important to acknowledge the diverse approaches to personalisation that are being pursued. Personalisation includes displaying a student's individual classes and timetables (instead of generic timetables) when logging into a VLE. This might include locations of classrooms and display of classrooms on campus maps that can be integrated into apps. Student-facing apps allow information displays in a chosen colour scheme or text size. This is similar to EdTech companies talking about personalisation that we describe below (e.g. where e-reading platforms enable font, colour, size, etc. to be adjusted to the individual). Often, the personalisation that technology enables in HE is not personalisation of learning per se, but rather individualised displays of information and other content.

A small number of participants spoke about adaptive learning, which appears more prominent in the lower levels of education. Participants were also sceptical in relation to adaptive learning, questioning the impact on universities

(e.g. does this result in universities outsourcing their core operations) and highlighting an absence of good quality products currently in the market.

Automation is another aspiration for the sector in relation to user data processing. However, the question of what should be automated yields diverse answers, ranging from administrative tasks to communicating with students (e.g. automatic sending of emails when students do not access resources). For example, some informants talked about automated emailing, which failed and was consequently abandoned, while others spoke about the same practice working well at their university. A small number of participants spoke about automating more critical and complex processes, such as assessment. This again points to the diverse motivations and experiences of different universities, and the fact that one size fits all technological solutions will not work across the sector. Scaling of such services without allowing for these differences is unlikely to be successful.

Our participants also spoke about how AI has been used for non-teaching purposes for some time in the sector, including for cyber security and internal support chatbots. At the same time, AI is increasingly spreading in various technologies used in HE. For example, infrastructures and platforms are now integrating generative AI into their products and services, such as the Microsoft Suite, Salesforce CRM, and Canvas VLE. Our participants generally spoke positively about AI, including generative AI. Their approach was to accept this new technology and learn how to use it productively.

2.3.4 Policies and governance

Universities and the vendors they engage with must follow relevant legislation, including data privacy regulations (GDPR). Universities also have internal policies governing digital technology and data. However, our participants felt that many current policies are obsolete in relation to new trends, such as advanced analytics and facial recognition, and require updating. They also felt that universities are responsible for better informing students and staff regarding the data collected from them and the implications of data processing and usage.

In relation to generative AI and AI processes, one participant noted significant debate about the impact on and adjustment of HE practices (e.g. teaching and assessment) and the absence of discussion about who owns these technologies and future monetisation models. Once AI is integrated into all platforms, it will not be possible to avoid it or substantially change how it is used.

Some participants also felt that mass data collection and aggregation is too great a risk for the supposed benefits. These benefits ostensibly include student wellbeing and individual course monitoring. However, tutors and staff already support students, and student evaluations already provide feedback to tutors for monitoring course quality and making improvements. Individual data collection and aggregation pose significant risks, especially in relation to surveillance performed by individuals, institutions, or even state authorities.

2.3.5 Universities as data organisations

Universities are expected to be, and in many instances explicitly aim to be, data-powered organisations. Our participants spoke about common expectations of the benefits that this can generate. They also recognised that universities have changed how they relate to proprietary digital platforms and software regarding user data. While universities have always collected data on their students and staff, digital user data is relatively new. Participants observed that until recently, universities used digital products and services they needed but did not pay much attention to user data generated by platforms beyond respecting privacy legislation. It was accepted that Tech companies would process user data and use it to drive innovation. However, since the Covid pandemic, universities have become more conscious of the value of user data and analytics and want to process and analyse data internally. As noted above, this has given rise to questioning the legitimacy of business models premised on companies extracting and exploiting user data. Universities increasingly demand that their user data be returned to their data lakes, seeking this as a condition in new contracts. While vendors offer dashboards for displaying user data analytics, universities now increasingly want their data back via APIs and do not necessarily find dashboards useful.

Universities are thus developing into data-powered organisations, but are at different stages of technology and data maturity. Participants from universities

in our study with a more entrepreneurial spirit suggested that, thus far, data maturity is greatest at the corporate level, in relation to analysing enrollment figures and competitor benchmarking, while educational analytics are in earlier stages of development.

Some universities have fully developed data warehouses, while others are still struggling with dispersed data repositories that are not yet interoperable. For example, one participant mentioned that they have over 30 different databases relating to students, and it is challenging to organise seamless data flows.

Universities experiment with occasional projects to learn from the data they collect, but enthusiastic individuals often champion such work in addition to their regular work as a one-off experiment. These experiments might prove useful (e.g. insights into BAME students' progression paths, which proved useful in developing support and intervention measures), but they are often not sustainable. For data analyses to be made systematic, there is a need for new positions and role profiles – universities would need to employ data scientists and others who would act on data (e.g. counsellors, project managers).

Many participants spoke about how large volumes of data are collected without a clear strategy. This results in the collection of potentially meaningless data and subsequent impact on the quality and value of analytics. Participants gave examples of analytics that did not hold value for them, such as the time spent on video calls, which is not a relevant metric for staff in HE.

Some participants felt that the datafication of universities is an extension of performative, neoliberal modes of governance. Participants stated that the possibility of data collection should not be a sufficient reason to collect it. Moreover, even if data is collected, participants felt that this does not necessarily mean it should be used for analytics and governance.

Many participants noted that learning and business analytics use and display large volumes of data, but in many instances, users are not able to interpret and act on this information in a sensible manner. There is a sector-wide lack of skills in data analysis and interpretation and a lack of people who can use data appropriately to drive decisions. This includes people in various university committees or leadership positions. Overall, participants felt that discussions

about data are often disassociated from discussions on how to act on data. For example, one focus group participant shared the following experience of participating in university committees:

> *"I don't think anyone really has the experience to understand the data or to analyse it properly. So, we're looking at graphs, we're looking at spreadsheets, we're comparing like NSS spreadsheets against attainment graphs, going up and down. And no one there is a statistician. No one really understands how to understand stuff, and it's all very much anecdotal, and you know, well let's try this, well let's try that, you know, maybe that will make a difference. And so even at the highest level of the senior management team, we have all this data, but no one really knows what to do with it. It just becomes kind of a, it's just a bit of an early warning system. So, if something is showing up, then we can pay attention to it, but we don't know what it means particularly apart from that there's a problem." (G3P2)*

Participants highlighted the lack of shared understanding of the institutional data landscape at their respective universities.

Despite the problems of whether various metrics are truly representative of what they claim to measure (e.g. analytics of actual learning), and difficulty interpreting various metrics, our findings highlight an omnipresent logic of data solutionism. The majority of participants spoke about university leadership believing that data analytics would improve things, that unified measures were needed (e.g., engagement score), and so on. Significant labour, time, and other resources are given to data collection, sorting, and processing. Even if external processing is available, including AI-driven services, universities still need to prepare and input the data, which requires time and effort. Many participants felt that the necessary results were not delivered and questioned this logic of data solutionism.

Many participants stated that various data displays and analytics are useful and necessary to satisfy regulatory demands. These include providing data for specific initiatives (e.g., Data Futures project led by HESA with Jisc), but also providing quantitative evidence to meet general accountability and regulatory

expectations. For example, universities are expected to cater for accessibility and diversity, improve employability, and more. They can use data from various platforms to evidence their work, such the number of students using a career app, for example. The usefulness of many metrics generated by platforms and apps for reporting purposes was highlighted continuously. However, these numbers and metrics were often talked about as being irrelevant in real practices. This points to a situation where external policy demands pressure universities to do more and provide proof of impact in specific ways, but leading to a vicious cycle of demands and reports without actual time to reflect and implement constructive practice. For example, participants spoke about Jisc and OfS pushing for data in relation to their policies, demands, and reports.

2.4 Technological changes

In this section, we discuss how broader technological changes are affecting universities. We investigate integration and interoperability, digital ecosystems and clouds, and discuss examples that our participants highlighted.

2.4.1 Integration

All our participants agreed that integration is key for universities to use digital technology productively. Universities aim to integrate different infrastructures, platforms, applications, databases, and data sources. One participant explained how they are able to add value to software via integration as they can manage their aggregated data using bespoke approaches. Tools such as Single Sign On are used to trace user data across platforms and applications. Integration is also needed to create an overall architecture for the user experience of staff and students.

However, universities face challenges with integration, including bringing together ‘patchy’ legacy systems within a cohesive ecosystem. Some legacy software is also nearing the end of life as technology providers move to SaaS models. Many participants highlighted that legacy software at universities is often not interoperable, causing challenges for universities to process data and integrate functions.

Another challenge universities face with integration is that some platforms and systems are not designed to be integrated, especially larger ones. We were

given examples of a Big Tech company used by most universities in the UK and a large VLE provider. Informants said that none of these companies wanted to integrate their software, which caused more work for universities.

When we asked focus group participants about what is missing in EdTech innovation and what they would like to see developed, integration was one of the key messages. For example, participants wrote:

> *“bringing services together simplifying and streamlining all the bits” (FG3).*

> *“something that can integrate all services/ products into one seamless user friendly interface” (FG2).*

> *“platforms that plug and play with each other. Everything should then talk to a central identity database” (FG6).*

> *“a single pane of glass into all the "things" that make a learning environment. Students have to jump from pillar to post very often. The effort is wasted navigating rather than learning (see data architecture)” (FG6).*

When procuring new technologies, universities are careful about ensuring integration into their ecosystem. However, at the same time, integration can also pose a risk. For example, EdTech companies might be acquired by other companies and change their products, or start-ups may cease to operate along with their products and services. Some participants spoke about only working with established and older EdTech companies to mitigate such risk. Other participants spoke about maintaining two parallel strategies: (1) acting slowly and cautiously in relation to core infrastructure where the risk to the institution is high; and (2) acting quickly and more experimentally where institutional risk is lower, for example, with learning environments and tools. Universities with more mature technology strategies appear to have mechanisms in place to explore new technologies with lower risk.

2.4.2 Digital ecosystems and clouds

All participants described their digital technologies and data in terms of an ecosystem. Typically, one platform or infrastructure provides a central backbone on which other platforms, applications and databases are connected and through which all can be integrated. This is organised slightly differently at each university, but the overarching principles are shared.

Digital ecosystems at universities are composed of enterprise software for key functions such as finance, HR, student administration, etc. Our participants stated these are mostly legacy systems that pose integration challenges, and each university has created workarounds to integrate them. The providers of these systems are often perceived as monopoly-like by our participants insofar as they are only two or three big players per function, and many universities use the same systems. It is difficult for universities to switch providers due to the expense and risk. Participants felt that the only stakeholders who can potentially able to challenge these legacy software systems are Big Tech – specifically, Microsoft and Salesforce.

Most universities have on-site servers and private clouds; however, they are increasingly moving to public cloud providers. AWS, Microsoft, and Salesforce were mentioned frequently. VLEs are also considered to be part of the core infrastructure. Most universities use three systems: Canvas (provided by Instructure), Blackboard (Anthology), and Moodle, which is open access. Our participants mentioned Turnitin as the most popular plagiarism detection software. Participants spoke about MOOCs and OPMs being used for online programmes and micro-credential delivery. Key MOOCs that were mentioned are FutureLearn, Coursera, and EdX.

Participants discussed how universities are, in general, keen to explore new and experimental EdTech, but it needs to be assessed for risk or piloted in relation to non-core tasks or with a smaller number of people. These technologies then need to be integrated into the university's ecosystem to provide interoperability. However, new EdTech constitutes a very small share of university digital ecosystems in the majority of cases. Legacy software providers and Big Tech are more prominent. Consequently, university digitalisation processes are more impacted by changes in EdTech incumbents

and Big Tech developments than by the EdTech start-up industry, which is backed by venture capitalists. Key changes driven by incumbents and Big Tech are new data-operations that built into their products and services, such as analytics functions in VLEs or generative AI becoming embedded into platforms.

UK universities are increasingly using Microsoft for data warehousing (reaching 40% of universities in 2021), as well as for business intelligence (65% of universities in 2021), as per the UCISA survey over the 2011-2021 period[3]. These numbers show that Microsoft is taking over legacy software, such as SAP Business Objects, in the business intelligence market and from Oracle and in-house solutions for data warehousing. Moreover, universities are increasingly moving their digital infrastructure to the cloud. Fiebig et al. (2021)[4] show that in 2015, 75% of British universities used cloud providers, while in 2021, all of them did (with 50% using a combination of Amazon, Google, and Microsoft; and 50% using a combination of Amazon and Microsoft). However, this does not mean that all university infrastructure has moved to the cloud. Rather, these numbers show that while universities are developing interoperable ecosystems, they are moving away from in-house solutions and towards Big Tech solutions.

Some participants reported they are currently undergoing a full migration to a specific Big Tech cloud provider. This is a lengthy and costly process that can last approximately 5 years and with costs in the range of £20 million and more. Participants also reported that they had engaged cloud-based providers of various enterprise software, such as cloud-based student records management or HR systems. A few participants talked about how they are reorganising business and administrative processes around these new technologies (rather than the other way around). One participant noted that all new and renewed contracts on technology are required to be cloud-first at their institution.

[3] https://www.ucisa.ac.uk/Groups/Corporate-Information-Systems-Group/CIS-survey-2021-results

[4] Fiebig, T., Gürses, S., Gañán, C. H., Kotkamp, E., Kuipers, F., Lindorfer, M., Prisse, M., & Sari, T. (2021). Heads in the Clouds: Measuring the Implications of Universities Migrating to Public Clouds. http://arxiv.org/abs/2104.09462

Established technology providers in HE, such as Salesforce, traditionally a CRM system mainly used for supporting student recruitment, are expanding and developing new verticals, such as their student record system. This allows universities to merge data and analyse students from first contact to alumni. As universities move from legacy software to cloud providers, participants mentioned that contracts and terms and conditions are changing too. When working with software providers that operate and provide storage in the cloud, contracts need to reflect who owns what data. Participants mentioned that while universities are already moving to public cloud providers, there is still some concern across the sector among some stakeholders, including in relation to the perceived safety and benefit of locating technologies and storing data on campus.

2.4.3 EdTech examples that add value to university operations

Participants gave examples of EdTech and other technologies that they perceived to hold value and bring positive benefits to their university operations, including the following:

CoSector provides excellent service for Moodle development and management. Moodle is open-source software, but not all universities have the resources to develop it for themselves. Consequently, many universities in the UK use CoSector, which allows them to share the cost and benefit of development.

Kaltura was an example of software that integrates well with the university ecosystem and shares user data. It also provides a dashboard with detailed and useful analytics. Moreover, the company and its customer service team were noted for working well with the university sector.

Miro is a widely used and appreciated platform. For example, one participant explained that ‘Miro has been transformational; everyone here uses it and loves it. We have changed our brains to become Miro shaped’ (FG3).

Vevox Q&A gives a voice to those who are not confident enough to ask questions and is perceived to support inclusivity.

2.5 Values and attitudes concerning technology

In this section, we elaborate on procurement processes, discuss how EdTech and Tech are seen to bring value in HE, and examine participants attitudes concerning technology.

2.5.1 Procurement

UK universities must comply with public sector tendering procedures when procuring software, including the purchase of EdTech products and services priced above relevant thresholds. This formal process requires universities to follow fixed procurement processes and is intended to provide suppliers with fair, equal, and transparent opportunities. While our participants recognised the intent and value of following public tendering procedures, procurement is thus often lengthy, complex, and resource-intensive.

To work collaboratively and support each other's procurement processes, universities have organised networks, such as the UK Universities Purchasing Consortia (UKUPC)[5], which consists of eight regional consortia. UKUPC and regional consortia organise framework agreements which set out overarching terms and conditions between approved suppliers and member universities. This is not the same as the contract signed between the supplier and the university. Framework agreements aggregate demand and help to secure better deals and reduce administrative burdens and time[6]. As we discuss below in relation to EdTech start-ups, inclusion in the approved suppliers' list requires that vendors meet specific criteria, including compliance with specific IT standards and having particular policies in place. Meeting these criteria can be demanding for start-up companies due to their limited resources and experience, and our participants told us that public tendering procedures thus favour bigger, established companies. Procurement can serve as a form of a *'lock-out'* for emerging companies that are seeking to challenge incumbents in the EdTech market. Some participants described moving to dynamic

[5] https://www.ukupc.ac.uk/

[6] For example, see an explanation from one of the regional consortium here: https://www.lupc.ac.uk/frameworks/framework-q-a/

purchasing systems, which allows new suppliers to be added and is, therefore, seen to be more flexible.

Procurement processes usually take several years for large purchases, such as acquiring a new VLE. Since contracts for software provision are typically signed for three to five years, a university must start a new procurement procedure almost immediately after acquiring a new system if it wishes to change in the future. This is not in any university's interest. Therefore, procurement can also be seen as a form of practical lock-in. In other words, while universities can technically change provider at the end of a contract from a legal perspective, the burden of procurement discourages universities from doing so. Instead, universities prefer to retain the existing providers and to extend current contracts.

Our participants explained that when they are in the process of purchasing software, the key factors they consider are accessibility, data protection, GDPR compliance, and cookie policies. Moreover, they have adapted their approaches to consider products not only from an IT perspective, but also from pedagogic and educational perspectives. Some participants talked about procurement teams working closely with academics or university communities when making significant decisions about digital products. This takes time for careful consideration and does not align with the different temporality of VC-backed, fast-paced start-up companies.

After the procurement process is completed, products are purchased, and contracts are signed, the relations between vendors and universities still require constant work, including vendor management. Some participants explained that they manage more than 150 contracts for core IT services. Another practical issue is that contracts signed with vendors are lengthy and complex to interpret. Some participants reported that many contracts lack clarity and allow different interpretations. Vendor management is increasingly complex and demanding for universities, especially if vendors shift the business models of their platforms and software.

Participants stated that technology vendors have shifted their business models and operations in several ways in the past few years. First, vendors are shifting away from perpetual licences towards subscription pricing models for their

products. This trend has implications beyond pricing because vendors must consequently update their terms and conditions, including allowing data processing to deliver the services run according to a SaaS model. Several participants stated that technology vendors, especially bigger ones, have moved to a 'take it or leave it' approach and no longer want to negotiate on terms and conditions, which breaks with precedent in the HE sector but is common in other sectors. Previously, universities were able to negotiate terms.

Big Tech[7] companies, in particular, do not want to negotiate on product functionalities, feature rollout, and terms and conditions. Several participants felt that universities are not powerful enough to influence Big Tech, even if all UK universities work collectively. Microsoft was a frequent example. While Microsoft was perceived positively (e.g. discounts for HE, providing useful technology, and so on), it was also viewed as challenging from a vendor management perspective. For example, Microsoft rolls out various features automatically in its suite of products, and universities cannot turn them off, which limits university control over their digital infrastructure), Teams is changed and updated regularly; and Microsoft does not want to negotiate on terms.

Participants noted that prices for digital products and services have increased by 15-20%, especially during Covid, and that this was possible because the sector is a captive market. Rising prices were, therefore, not seen as resulting from increased actual increased costs, but rather as a result of the challenges universities confront in moving away from products and services that have been rolled-out. For example, EdTech companies that offered free products during Covid later charged for them. A focus group participants described:

> *"the offering of resources and features during lockdown as free, but then telling customers they need to pay for them later" (FG2).*

Participants also spoke about how, from a procurement and vendor management perspective, it is challenging when vendors change terms and conditions and want to change contracts as well. Another concern is that

[7] By Big Tech, we mean international technological companies that are globally most prominent in market share and company valuation. Examples include Alphabet (Google), Amazon, Apple, Meta (Facebook), and Microsoft.

companies may change ownership or the nature of their operations, such as in the case of EdX, which went from open source to private. These changes of ownership affect agreed terms, business models, and who controls digital products. With digital platforms, it is often hard to exit existing relationships easily or quickly because the service is established as part of the university structure (including technically) and day-to-day operations. One focus group participant stated:

> *"[W]e're in the middle of quite a big problem where a company that we're relying on, so we've basically been locked in, so a company we're relying on has been bought by someone else. So exactly going through that problem of, we might have to change because they've been bought and they're being changed so it might no longer suit our needs." (G3P1)*

2.5.2 (Ed)Tech

HE is still collaborative, and universities tend to look at their peers, which motivates trust in particular products if institutions in the sector already use them. When we asked about the value of technology, our participants offered two perspectives. The first was financial, such as increasing institutional efficiency to save money or recruiting more students to increase income. The second was the utility and functionality of technology, such as improving student engagement, delivering services to end users, and increasing the quality of university operations. The overall aims that universities have for EdTech are to increase student experience and engagement, deliver personalised services, and increase institutional efficiency. Some universities also have more specific aims, such as scaling classes online.

Participants were varied in their views on the technology used in HE. All of them saw the potential of technology to benefit the sector and its constituents, but at the same time, many were sceptical about what was on offer, as well as of the ways in which EdTech is developing. Moreover, a few participants noted that they follow technology developments outside the sector as these are perceived to be more exciting and of higher quality. They then look to import and adapt these developments for use in a university context. Some participants recalled the values of openness and democratisation that characterised EdTech in its

infancy but felt that EdTech has evolved into an exploitative business model based upon profiting from data extraction. Moreover, the EdTech was perceived to normalise monopoly business practices and to promote distrust in existing educational structures and methods to justify the value of their new products and services.

On the other hand, a few participants were more positive about EdTech and its potential for transforming the sector in future. One of the participants stated that at the moment, the UK HE sector has good technology, but in the utility sense where technology is omnipresent, reliable, and people can use it when needed. Technology is mostly there to support non-digital activities. However, they believed the HE sector is not yet using technology to thoroughly transform learning and other practices, or to become fully digital. They are keen for EdTech to bring entirely new digital practices to the sector.

Most informants noted that new technologies are not routinely evaluated, and there are few benchmarks for determining whether an EdTech service is delivered well. Participants from one university only explained that they consider the usage numbers of particular platforms as measures of their value. This is an interesting observation because if platform use is a requirement, then usage analytics would constitute one measure of impact.

Beyond EdTech providers, many other tech vendors want to increase their footprint HE (e.g. Zoom). As part of their strategy to gain market share in the sector, they offer cheaper licences in exchange for using the university brand in their marketing. Some participants explained that this was considered a reasonable trade-off for a cheaper deal.

2.5.3 EdTech start-ups

Participants described how many EdTech start-up companies operate in the HE sector. They have different strategies for approaching universities, and most start-ups come up with proposals to develop VLEs and student records management systems. One participant stated that they tend to develop proposals on the automation of back-end processes rather than the user experience. This participant believed that there is already enough technology

on offer to deal with back-end solutions and that it would be more productive if start-ups aimed to innovate in relation to front-end dynamics.

Another challenge is that start-ups often approach universities with proposals for testing products for free but without meeting the criteria to apply to public tenders, comply with framework contracts, and enter approved vendors list of university procurement consortia. Our participants stated that universities do not have the infrastructure and contractual terms that readily support start-up free trials and similar proposals. Therefore, it can be difficult for universities to work with start-ups. As a result, some universities have established separate organisational units that operate under different parameters to facilitate these relationships, with small budgets of their own to enable them to move fast and test specific products.

Participants also reported that some start-ups have unrealistic ambitions and claims in relation to what they can deliver. They would prefer that start-ups honestly discuss how their products offer one potential solution (and not the ultimate solution) and how it can be integrated into the university's digital infrastructure.

Some participants in our focus groups spoke about a mismatch between the university and EdTech logics. They felt that a university identifies a problem and seeks a specific solution. However, EdTech companies come from a different perspective; that is, with a solution looking for a problem. Thee strategy is to convince universities that they have not yet identified the real problem. For example, focus group participants stated:

> *“[B]ut quite often you find the university has a problem of some kind, looking for a solution. Whereas your EdTech provider has a solution, perhaps looking for a problem and that can be a tension.” (G1P3).*

> *“[T]ech in general, but also EdTech, is seen as the solution to a problem that has not yet been defined. Instead of looking at the problem and identifying the route to attack it, we’ll just look for something shiny and hope that it’ll solve the problem that we do not yet understand.” (G1P1).*

Some participants in IT-related administrative roles came from the private sector. They shared a view that HE is not exceptional or specific when it comes to technology. For example, they talked about how all industries use technology to connect people (between themselves or with technology), and so does HE, and how user data being collected in HE is beset by the same challenges as data collected elsewhere.

Participants also mentioned that universities could take a stake in start-up companies with which they partner. Since universities already help these start-ups to develop and scale products, they might as well benefit. On the other hand, if universities take a financial interest, this might affect the start-up's position in the broader EdTech market.

Focus group participants identified specific positive and negative experiences with EdTech companies and their strategies of promotion and operation. The positive examples include when companies accept and act on feedback and development requests, provide training and material on product use, and have good account managers who work closely with universities and meet regularly. The negative examples largely focus on when university representatives felt misguided. Participants shared experiences of: (1) being invited to dinners, which turn out to be intelligence-gathering opportunities for future sales pitches; (2) companies organising large, expensive parties to 'show the money', but at the same time increasing product fees; (3) companies organising research events which turn out to be sales pitches, sometimes co-organised with sectorial bodies; (4) companies giving discounts for including university brands in promotional material; (5) companies organising speed-dating type events for university senior leadership to meet EdTech company representatives. However, participants felt that EdTech incumbents were often more aggressive in marketing and selling strategies than start-up companies.

2.5.4 MOOCs

Some participants talked specifically about MOOCs, noting their benefit in reaching a scale that universities could not achieve alone. The scaling-up purposes ranged from disseminating research results and knowledge to promoting the university brand and delivering full study programmes.

In terms of the MOOC business models, participants noted that MOOC companies recognise that their content needs to come from universities and that they cannot deliver legitimate content alone. Importantly, participants observed that MOOCs have not managed to change the universities as was imagined when MOOCs emerged in the early 2010s. Instead, universities have changed the operating model of MOOCs and integrated them into their strategies.

Some participants also explained that MOOC providers allowed more research in the past and gave free access to user data. While this is still possible, informants felt that MOOCs are becoming more rigid in relation to accessing user data for research.

2.5.5 University attitudes towards tech and marketisation

Universities are diverse organisations, both internally and in relation to other universities. Our focus group participants stated that university leadership is typically 'charmed with EdTech promises' and makes decisions accordingly. In contrast, staff 'on the ground' often have a better view of what is needed and what can be done (e.g. learning technologists, IT specialists, vendor managers, etc.). Academics were characterised as the group that is most sceptical of EdTech, based on the view that they already have good working relationships with students and often don't see added value in EdTech solutions.

The universities we studied each had different strategies, approaches, and attitudes towards the EdTech industry and working with start-up companies. While all were open to learning about new technology, those universities that had more entrepreneurial overall strategies had the most welcoming attitude to EdTech as well. There is a connection between increasing competitiveness in the sector, the growing marketisation of university strategies and collaboration with the EdTech industry.

Participants from more entrepreneurial universities met regularly with EdTech start-up companies, participated in events with EdTech companies and investors, tested pilot projects with EdTech start-ups, learned from similar universities worldwide, and so forth. They shared the discourse and terminology we encountered in the industry itself, such as using EdTech to be disruptive, to

differentiate themselves from other universities in a competitive HE market, and needing to identify problems that EdTech can solve. They felt that the rhetoric of disruption is now common in the sector more generally, including with university leaders. They also talked about the HE sector being behind the curve of digital transformation, with very few exceptions who are scaling their provision online. These participants shared views on what needs to be transformed by EdTech, such as automating assessment as the low-value added activity in the teaching process to free academic time for other purposes and using AI to replace teachers in large-scale online learning communities. They also told us that they tend to use established technology with enterprise needs when utility and reliability are key (e.g. finance); but they purposefully experiment with start-ups when they want to innovate (e.g. in teaching processes) and there is lower institutional risk. However, they were not able to identify whether students appreciated the variety of EdTech available at those universities.

2.6 Digital strategies and changing management of IT

In this section, we discuss how university operations are changing in relation to the development and implementation of new digital technologies.

2.6.1 IT management

Participants spoke about the changes their universities are implementing in managing technology and its costs. One important shift is the centralisation of staff requests for software and procurement. Previously, departments or individuals could purchase software independently, resulting in many disconnected and small-scale ecosystems. Centralisation was required not only to manage cost and cross-institutional use but also to ensure that vendors meet relevant legal requirements. The university has to make sure that all software it uses, even if it is small-scale and provided for free, complies with data privacy legislation. Moreover, they must also ensure that relevant IT and security standards are met. All of these considerations make decisions on technology purchases slow and costly.

Universities follow different practices when making decisions about EdTech. Participants in our focus groups elaborated on a variety of approaches, and

some universities still exercise a bottom-up approach where academics are free to purchase what they need. Other universities have centralised committees to which individuals send purchasing requests. The structure of these committees varies, and at some universities, it includes academics and/or students. Most participants agreed that IT professionals should not be the sole decision-makers in relation to EdTech procurement and that cross-university teams or committees are best practice for bringing together IT professionals, academics, students and TEL administrators.

A second important change is that universities are introducing dynamic software management. Universities typically pay subscriptions and licence fees per number of users, time used, or similar measures. Whether end users, in fact, use software for which the university paid a licence is, therefore, a significant concern. Our participants explained that universities monitor the use of software, and if it is not used in a certain period (e.g. 3 months), access may be given to someone else. End-users are not generally aware of the licence and cost management procedures at the back-end.

Some participants spoke about the need for staff and students to be supported in using procured software. Guidance and support for staff must be well developed, and it is not enough for a university to purchase access to specific software; it must also educate staff and students in relation to its use. The higher the number of platforms and applications that a university procures for its staff and students, the higher the cost for licences and subscriptions, as well as the cost for managing and supporting use.

One of the most important new dynamics that our participants described is the logic that universities apply to their thinking about the cost of software and a shift towards capitalising on digital services. Our participants spoke about how software is accounted for as revenue in universities' accounting books. Some participants talked about how the IT, legal, and accounting teams are working together to change this approach and account for software as assets. The software they purchased or developed could already be understood as IP. And the labour required to develop IP is reframed as capital rather than a cost.

2.6.2 Changing universities

University roles and practices are changing due to technological changes and the rise of EdTech. One notable change is that learning technologists have become more central; universities employ more of them, and they have become more prominent in support services. The second notable change is that vendor management has become a critical task, with growing departments that demand employees with specific skill sets. The number of vendors for core IT that vendor management needs to maintain relationships with is in the range of 100-200.

Focus group participants described different ways in which universities can manage their relationships with EdTech companies. Universities are advised to organise a strong vendor management approach with a mature technology procurement framework. Before negotiating, universities should have clear demands and expectations, and before signing any contracts with EdTech companies, universities should have an exit strategy. Participants explained that it is helpful if universities are not too dependent on one particular EdTech company and sustain a balance of relationships. Students should also be asked about their views on technology.

Participants also spoke about the need to monitor the state and strategy of the EdTech industry. Having representatives sitting on the international advisory boards of larger EdTech companies gives universities opportunities to monitor strategic decisions and the direction of EdTech development, and to potentially influence these decisions and directions. Universities can also monitor publicly available companies' statements and annual reports, including buy purchasing a small number of shares in EdTech companies to receive reports and participate in shareholder meetings. Universities can also form joint ventures with companies to drive innovation.

IT staff need a different skillset than previously required. Universities once needed on-premise IT architects, but now, they increasingly need cloud engineers and developers. IT support is being restructured, and many informants described the continuous reorganisation of their university's administration with the aim of evolving agile organisations. Technological changes are also seen as business changes.

Most participants felt that EdTech brings more work to universities, which is related to the entire lifecycle, including decision-making on what to procure, procurement processes, implementation, integration, data management, maintenance, support staff, etc.

2.6.3 Digital strategy

Different universities are at different stages of development and maturity when it comes to technology. Some have explicit digital strategies, others have a digital strategy that is distributed across other strategies. Some informants spoke about global consultancy firms developing a new digital strategy for their university.

During the period of the study, universities were undergoing changes that were described differently at different institutions but shared similar aims. These changes related to curricular transformation and reimagining universities, included changes to the content and form of HE, and explored how technology can be utilised to change processes at universities more profoundly.

Some informants spoke about monetising their IT support and resources – such as establishing a consultancy for other universities, renting out digital resources to external parties, and similar.

2.7 EdTech now and future

At the end of each focus group, we asked participants to answer three questions by posting them in the virtual white board. Participants wrote down their ideas collectively and without a verbal discussion. In this section, we present answers to these three questions.

2.7.1 Needs discussion

'What issues in EdTech require further discussion in HE (as in democratic debate and policy intervention)?'

The **first theme** covers sector-related issues, where participants stated that Edtech needs to be specific to HE and that HE constituents should collaborate in defining the direction of Edtech. The sector must work together to identify the sectorial needs guiding EdTech innovation. All HE stakeholders should be

included in the debate. The HE sector should work with Edtech to develop industry-wide infrastructure to replace legacy platforms that are patchy and not interoperable.

Participants felt we also need to monitor and understand the impact of EdTech. There is a need for more discussion on EdTech's impact on teaching, staff, and students. Positive uses of Edtech should also be discussed, along with the opportunities it brings, including trackable LLL, employability, and flexible education delivery. Participants felt the sector needs to discuss internally, or even within a single HEI, how it organises Edtech decision-making to ensure that it is driven by education and research agendas, not by an IT agenda. The sector should have an internal strategy in relation to where universities can experiment with low-risk and higher-risk core functions. The sector discussion should also address staff and student digital skills.

The **second theme** is related to data and data governance. Participants felt a sectorial discussion about ownership and control of user data is required. Transparency is lacking, and universities should inform students about how their data is collected and used. Moreover, universities and platforms should collect only the data that they need and have clear purposes for collecting it instead of adopting the strategy of collecting as much as possible for yet to be determined purposes. Ethics in AI and ML should be addressed. There should also be sectorial debate about data custodianship, use, and policy. GDPR rules should not be an obstacle in working with data, so a better understanding of GDPR, data regulation, and policies is needed.

The **third theme** is related to commercial and business practices. Participants believe that monopoly and monopoly tendencies should not be allowed, including among Big Tech. Participants questioned the uncertainty created by potential future acquisitions of technology companies. Some participants felt that EdTech companies should not influence policy agendas. Examples were given of JISC-sponsored reports that were co-written by Emerge Education, an EdTech investor based in the UK.

2.7.2 Wanted but missing innovation

'What kind of innovation do you want to see in EdTech? What is missing?'

The **first theme** is related to the desire for technology that is reliable and accessible and where it is easy to report problems. Participants also talked about mobile-first technology and having more apps. One key message was that enterprise technologies have caught up with innovation in education, and there is no need for EdTech to be in a position where it is still catching up. Participants want EdTech that focuses on pedagogic value instead of giving emphasis to gaining efficiencies, actionable insights, and similar aims. They also stated that EdTech should respond to the needs of universities rather than their own views on what is needed in the sector.

The **second theme** is related to integration and open access, open standards, and open data. Participants want technology that is based on open access, standards, and data. An important message was that integration of services, platforms, and products is needed. Integration can enable one user-friendly interface connected to a central identity database.

The **third theme** is related to online and hybrid activities. Participants want technology that can support online learning and activities that make asynchronous activities more engaging and support virtual communities of practice. Moreover, software that can support hybrid learning is needed, as well as software to scale online courses, including assessment, without increasing staff numbers. Participants felt that social applications are missing where EdTech users can connect and where peer-to-peer learning is supported.

The **fourth theme** is related to collaboration between universities. Participants mentioned that cooperation between universities was needed to define the course of EdTEch technology and policy development. Moreover, sectorial collaboration in relation to data flows was considered beneficial. Finally, automated data analysis for reporting purposes would be appreciated.

2.7.3 Digital disruption

'Can you offer any examples of digital disruption in HE?'

The **first theme** is related to the gradual pace of change, which includes mundane digital practices that have gradually created a transformative impact on HE practices. Examples include video calls to deliver distance education, lecture recordings so students do not need to attend class in person, online assignment submission that helps underprivileged students by not requiring them to commute and print papers, and increased accessibility of software. However, Covid was mentioned as speeding up digitalisation in the sector.

The **second theme** is related to specific platforms and tools that were considered to be transformative, including Miro, Vevox, Zoom, Menti, YouTube, and ChatGPT.

Participants also noted that micro-credentials and online providers have increased competition and that open access imperatives and creative commons licencing have transformed access to knowledge.

Section 2: (Ed)Tech companies

3. EdTech Start-up Companies

Our analysis of EdTech companies began with an interrogation of Crunchbase. As of 18 January 2024, the Crunchbase database included 185,763 organisations classified as education companies worldwide. Of these, 9,711 were classified as specifically EdTech companies[8]. Since the 2010s, venture capital investment in EdTech has been sharply increasing[9], and the EdTech industry has grown in scope and diversity, culminating during the Covid pandemic. The EdTech industry has consolidated, and the number of unicorns (companies valued at more than $1 billion) has increased over the past decade to a current total of 83 (as per Dealroom on 6 March 2024[10]). The number of acquisitions is also growing. Similar to other sectors and wider market contractions, EdTech investment has been dropping since 2022[11], including the number and size of investment deals in 2022 and 2023[12]. Despite this financial instability, EdTech investors remain active in the industry, as described below.

The EdTech industry was evolving quickly when this project started, with rapid growth in venture capital investment in EdTech start-ups and scale-ups. We focused on investigating these EdTech companies because they are portrayed as delivering transformation, or even disruption, to the HE sector, serving as challengers to the status quo by enabling much-needed digital innovation. The UK supports the EdTech start-up industry in its policies and expects EdTech companies to bring change to the sector. The expectations for the EdTech Sector are thus high, and this is reflected in industry and policy discourse characterised by hype and grand promises regarding the benefits of new

[8] These numbers have to be taken with caution. Classification of companies might not be consistent (e.g. a company might be an EdTech company, but is not classified as such, or the other way around); and not all companies existing in the world might be listed.

[9] Komljenovic, J., Birch, K., & Sellar, S. (2023). Analysis of the Edtech Industry and Edtech Investment in Higher Education. Zenodo. https://doi.org/10.5281/zenodo.10092315

[10] https://edtech.dealroom.co/unicorns/f/industries/anyof_education/tags/allof_verified%20unicorns%20and%20%241b%20exits?

[11] See HolonIQ: https://www.holoniq.com/notes/2024-global-education-outlook

[12] See Brighteye Ventures (2024). European Edtech Funding Report 2024, 5th Edition. https://www.brighteyevc.com/post/the-european-edtech-funding-report-2024

products and services. We aimed to investigate the practices and strategies of EdTech companies and understand how they are working with or changing the HE sector.

3.1 Dataset

Our dataset was collected in 2021-2022 and includes 24 interviews and 540 documents relating to 16 EdTech companies. We interviewed professionals working in EdTech companies, including data and product managers, regional managers, and founders or CEOs. The interviews covered business models and strategies, data practices, digital ecosystems, and digital assets. The collected documents include strategies and financial statements, websites, company reports, press releases, product terms of use and privacy policies, blogs, videos, and customer testimonials.

Out of 16 companies, 11 were headquartered in the UK, three in the USA, one in Australia, and one in Ireland; however, all companies are operating in the UK. Five companies were incorporated between 0 and 5 years, seven companies between 6 and 10 years, and four companies for more than 10 years. The most common type of products they offered were learning platforms (7); however, these vary widely in approach and focus, from traditional learning management systems to more contemporary and data-driven platforms for delivering teaching, followed by reading platforms (3) and six other types of EdTech company (see Figure 1).

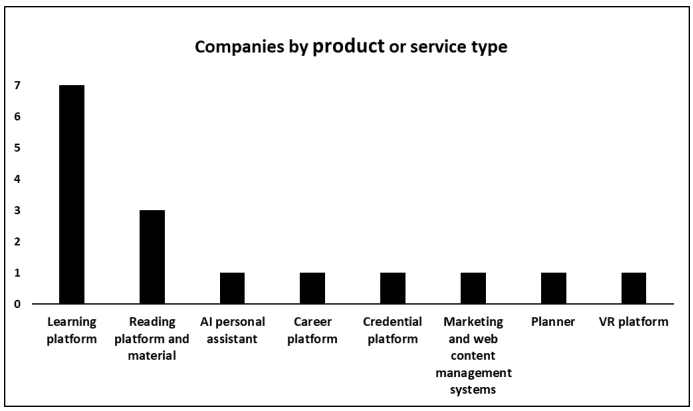

Figure 1. Companies in the dataset by product and service type.

EdTech companies in our corpus all worked in the HE sector, broadly understood. However, they operated according to different business models, including:

- business-to-business (B2B) serving universities or enterprises, or both;
- business-to-customer (B2C) serving individuals;
- a combination of B2C and B2B;
- products that facilitate two-sided connections – e.g. a virtual learning environment connects students and tutors in a university; and
- products that facilitate multi-sided connections between different groups of institutions or individuals (e.g LinkedIn, which connects individuals, employers, universities, and others. Note: LinkedIn was not our case study).

We could publicly verify the financial statements of 10 of the companies that we analysed. Of these, three companies made a profit for the last available financial year, and their average profit was £0.6 million. The remaining seven companies made a loss with an average of £5.6 million. While public accounts were not available for the remaining six companies, we believe that their profit/loss distribution would be similar, given the maturity and age of the companies and our discussions with company representatives.

A number of start-up companies indicated that profitability and scale could be hard to achieve simultaneously because the latter is often associated with lower prices. It is common for start-up companies that have not yet reached profitability to engage in further fundraising rounds with a focus on growth rather than revenue generation. These companies need to strategically find a balance between seeking more investment in further rounds and focusing on consolidating their product development. Thus, for some companies, further funding is accompanied by sustained financial losses and external growth pressures. The specific ways these tensions manifest depend on the products and services provided.

Companies who endeavour to scale seem to be early in their profit journey and attempt to automate interactions and services on their platform. Companies that are more 'high-touch' (i.e. companies that engage directly with students or otherwise personalise aspects of user experience in a non-automated way) tend to be more profitable but without the same scaling potential. This reflects a difference between business models focusing on high volume (i.e. scale) and lower price versus lower volume and higher price.

3.2 Key themes

Our analysis of EdTech start-up companies active in the UK highlighted three main themes. The first theme is the **challenging circumstances of the HE sector**. Our informants recognised the circumstances in which UK universities operate, including lack of funding, fierce competition for students, needing to respect various policy demands and regulations, responding to changing public expectations, and defending the university's role in society. This context contributes to universities being cautious when procuring EdTech products. Consequently, EdTech companies must take time to understand this context to help universities achieve their aims.

The challenging nature of the HE sector can also be seen from a different angle: the perspective of the EdTech industry. Our informants reported on challenges they confronted when working in HE. These include slow decision-making at universities, lack of funding for universities to invest in tech, universities wanting to negotiate on conditions and price, and so on. These conditions are difficult for start-ups, which work across different temporal and spatial dimensions to larger, established companies. Few EdTech start-ups operate only in HE, and many expand or reorient towards offering products to enterprises for staff development and training or to individuals directly. Our informants also spoke about many (but not all) investors being hesitant to invest in products targeting universities because the return on investment is deemed lower compared to other sectors; universities are not considered sophisticated software consumers. Good tech products require high investment, which in turn requires high prices for tech that not many universities can afford. Some informants talked about EdTech falling behind other sectors in terms of quality of service and technology.

Participants described how HE is also challenging because of public and stakeholder sensitivity. Companies must be very careful with user data; selling user data or financing products through advertising is generally seen as bad practice. Indeed, we have found no evidence of user data being sold or used for direct advertising in the companies we examined. Academics and students may also be more knowledgeable and sensitive to data and tech operations than users in other sectors and are more vocal and likely to speak publicly about their concerns. Together, these circumstances make HE a rather specific space in which to operate.

Finally, another challenge is the discrepancy in fundamental values and strategies between some EdTech companies and universities. Start-ups, especially if backed by venture capital, need to scale fast and the pricing for their products changes. A typical model is that prices are set low at the beginning to grow the user base, and is later increased to a more sustainable and profitable level. Importantly, many start-ups plan to be acquired by established EdTech or Tech companies in future, typically within five years. These dynamics contrast with the university's needs for stability, longevity, and predictability.

The second theme is **'data is hard'**. While all of our participants believed in the value of user data, some stated that they do little with the user data they collect. These participants predicted that would change in the future as most were considering how to make user data valuable and how to monetise it. They mostly explored different kinds of analytics that could be provided to different customers and user groups. Other participants spoke about already processing user data and integrating feedback loops or analytics into their products. There is a clear strategy in EdTech where user data is made valuable by integrating different kinds of analytics into core digital products. In the majority of companies we studied, the analytics processes are rather simple (e.g. descriptive statistics that provide feedback on individual or group use of a platform or its features). Only two companies used AI and more sophisticated data processes. Moreover, the dynamic of making data valuable includes continuously developing new metrics and indicators, and convincing university leaders and users that these are relevant.

At the same time, integrating analytics into products presents a big challenge. Collecting, sorting, cleaning, and analysing data demands significant labour and is costly. Moving beyond simple analytics and feedback loops is especially challenging because delivering value from user data is hard overall. In addition, participants felt that universities were sceptical of the value of data outputs and wanted to see proof of impact.

The final theme is the **variety of services**. EdTech companies offer a wide variety of services. Common to all of them is that they keep expanding in diversity and the number of users, as well as in the services provided by adding new features to their products. EdTech companies see themselves improving the HE sector by boosting efficiencies, efficacy/quality, access, innovation/disruption, and legitimacy. Efficiency and savings are key promises made by most EdTech companies regardless of their product type. For example, if the product is a platform for large-scale online study programme provision, the value proposition is to save costs by scaling teaching without academics, by automating learning processes, or by enabling networked learning. If the product is a reading platform, the value proposition is to save publisher subscription costs based on reading trend analytics and purchasing licences based on actual reading trends rather than simply user numbers.

Aims to provide personalisation and efficiency are complex and include a range of ideas and practices. For example, personalisation includes anything from different font displays in an app based on user preference to adaptive learning. Efficiency might mean efficient learning, efficient career advising, or efficiency in paying publisher fees for academic texts. Therefore, it is important that universities and EdTech companies elaborate in more detail on what they mean when they promise personalisation and efficiency.

3.3 Product and service

In this section, we summarise the characteristics of EdTech products and services.

3.3.1 Variety of services

EdTech companies provide a wide variety of digital products and services. There are differences between these products and services in relation to both their features and foci, even within a single category. For example, different virtual learning environments structure content, communication, and features differently. Here, we summarise key trends that are common across digital products regardless of the kind of service they deliver.

The EdTech companies we examined were growing and expanding. First, they sought to expand in terms of user and customer numbers by scaling and increasing the number of individuals who subscribe to a platform or the number of universities that procure a platform. Second, they try to expand in terms of customer groups. For example, they could expand from offering services to universities to also introducing services for employers and parents. Third, they can expand by adding new features to their products. For example, reading apps might add a feature for students to keep notes and share them with their peers.

Another aim of many EdTech companies is to increase the long-term value of users by making their products or services valuable for end users over an extended period. For example, a platform offering employability services to students might add a mentoring feature where graduates could mentor students after employment. As a result, the service is not used only when one is a student but also later when one is employed. Adding new features to the product can also encourage people to use the platform longer. The dynamic of adding ever-new features and expanding the customer base is generally ongoing.

A notable finding from our data is that EdTech companies regularly ask their users for feedback to inform product and feature development. Many participants reported the need to accommodate customer needs and follow user preferences.

One way to promote the value of EdTech products is by aligning with universities' broader strategic aims. Our participants explained that it is not advisable only to promote their ‘primary’ service, such as providing access to e-textbooks or offering a virtual learning environment. Instead, it is better to

highlight how that primary service supports universities' broader and more substantive aims by creating efficiencies, automating processes, or improving the student experience.

3.3.2 Services and data operations

One of the most prevalent discourses on digital products promotes the idea that the services rely on data processes, such as AI, ML or advanced analytics. For example, companies such as Meta (Facebook) and Alphabet (Google) rely on aggregating and processing user data for targeted advertising as the main revenue source, and a company like Uber relies on user data to organise drivers, travellers, and pricing. It would be expected that digital products and services in HE also rely on user data to a great extent.

However, we found that this is not the case. Some of the EdTech products in our dataset focused on delivering services without relying on user data processing or even without including data processing in the main product. However, some companies that we examined did provide products that include data processing, most commonly by offering a form of analytics. For example, a virtual learning environment might integrate learning analytics for students and teachers. Another group of companies act as multi-sided platforms organising and matching users, such as students, employers, and skills. The value of their service depends on controlling data and organising matching between users. Data analytics generally remained at a descriptive level in all of these cases. Only two companies in our dataset had more sophisticated AI and ML operations at the core of their products. We elaborate on data processing in more detail in the next section.

3.3.3 User data

EdTech products and services mostly come in the form of digital platforms and thus have the capacity to collect user data. Companies must respect user privacy regulations as they process user data for the customer universities or for developing their own products. In the latter case, user data is likely de-identified and aggregated.

The most typical way of making user data valuable is to integrate a form of analytics into products for which companies charge higher subscription fees. In

most cases, collected user data is not fully monetised despite the widespread view on data monetisation as being a critical business strategy. All SaaS EdTech companies we examined anticipated that they would be able to do more with user data in future.

3.3.4 Ecosystem

Like all technology companies, EdTech companies are subject to the challenges of operating in a sector dominated by Big Tech. Most EdTech companies use cloud infrastructure for their operations, such as Amazon Web Services (AWS) or Microsoft's Azure. Consequently, a portion of their revenues go to these providers for their services. Moreover, B2C companies that rely on app usage purchased in app stores must comply with sharing revenue with app store providers. For example, Google and Apple app stores charge app providers up to 30 per cent of app costs[13].

The reliance on cloud infrastructure also means that if EdTech platforms grow, so do cloud costs. If EdTech platforms use cloud providers (or other commercial software providers) to conduct their operations, then those running costs can also increase. At the same time, given the spatiality of cloud computing, it is unclear how companies can ensure the financial sustainability of platform-delivered EdTech without a business model that ensures future revenue generation through pay-as-you-go, licence, freemium, or advertising forms. Once a company's core infrastructure is rented from Big Tech, a valuable service needs to be built on top that generates sufficient willingness from users to pay prices that enable platform providers to cover labour and other costs, as well as costs for cloud infrastructure. In some cases, EdTech providers also need to pay licences or fees to other organisations, such as publishers, to access texts provided through their service. These dynamics demonstrate that economies of scale do not benefit only EdTech companies and their investors but Big Tech companies too.

[13] Statista. (August 28, 2023). Commission rates for leading app stores worldwide as of August 2023 [Graph]. In Statista. Retrieved January 08, 2024, from https://www-statista-com.ezproxy.lancs.ac.uk/statistics/975776/revenue-split-leading-digital-content-store-worldwide

3.3.5 How companies perceive their role

EdTech companies perceive themselves as well-positioned to deliver on the digitalisation of HE. Digitalisation is understood to enable new modes of communication, greater visibility, better organisation, and automation. It is promoted as driving quality and efficiency, and EdTech companies aim to work with universities in ways that disrupt and challenge existing practices and modes of authority.

Key ways in which EdTech companies see themselves improving the HE sector include boosting efficiencies, efficacy/quality, access, innovation/disruptions, and legitimacy. In Table 1, each theme is associated with a mechanism of change and a key challenge for companies, alongside exemplary quotes from our participants.

Table 1. How companies perceive their role: key themes.

How they improve the HE sector	Assumed mechanisms	Key challenge for companies	Exemplary quote
Efficiency	Digitalisation drives efficiencies. This includes: automation, personalisation, coordination, and economies of scale.	Positioning users in a relationship with the software and learning content in such a way that automation, coordination, and scale efficiencies can be realised.	"We have the ability to automate some of the thinking around who to put into which group based on, for example, the polls. Or it doesn't matter to just do it randomly and just remove the load from the instructor. Some of the pieces that are growing is also to be able to highlight, which learners have not been as engaged thus far in class or to even pop up to the instructor and say, hey, there's like a general decline or dip in engagement. Why don't you run a poll right now, or do you know a small group activity? And so those are pieces that are being built-in that will increase that automation. And, you know, technology is not, in and of itself, is not going to solve any of our learning challenges; but I do think there's a lot of essentially data crunching that the platform can be doing in the background to then give tips or nudges to the instructor just in time to be able to moderate what they're doing in class. " (Interview C13P01)
Efficacy/quality	Visibility practices and analytics can	Going beyond engagement measures. While	"For example, we worked with an arts school, and when they bought [access to] [Company A] for their students, they

	improve learning practices, through direct or indirect interventions, and, as a result, improve learning outcomes.	engagement measures are widespread, it is harder to construct impact measures.	expected their students to be consuming a lot of the content that was on the reading list revolving around arts. But, they noticed that the students actually started to read more about entrepreneurship on [Company A]'s [platform]. And that's because a lot of their students wanted to set up a business after graduating. So they took those insights and they've actually tailored their course now to actually train people up to start their own business once they've graduated. And, for sure, I think institutions feel a lot more empowered when they can see what students are actually reading on [Company A]'s [platform], and that's where I think E-books have a huge advantage over print books, for example, because you can have that data insight" (Interview C03P01)
Access	Digitalisation makes it possible to increase participation. This is described as 'democratising education', 'democratising access', and similar.	Access does not equal learning and users do not guarantee profit. All EdTech companies need a revenue source. If this, ultimately, does not come from students, parents, government, or employers, then advertising is one of the only options left.	"Students can learn anything from literature to history to medicine to theology and so in what I was saying earlier on, direct to consumers really are focused because we know that when a student's assigned a reading list at university, the first thing they need to do is think, what's the most *convenient* and *accessible* way for me to receive this content. And actually, what we find is that most students don't actually want to own the book. In a survey, 73% of students said that they cared more about *access* to the textbook rather than *ownership* of the textbook." (Interview C03P01)
Disruption/innovation	Innovation involves bringing together an entrepreneurial attitude, technology, and (often) capital, to develop new solutions.	Finding compelling problems and use cases for technology solutions. Building momentum, scale, and sustainable business models.	"Synchronous online education platforms have quite a few benefits, including access to student data. We need technology that gives instructors insight into student habits and understanding at a level that is almost impossible to collect in an in-person classroom. Instructors have an unprecedented opportunity to leverage that data to make short- and long-term changes to teaching practices and curriculum content." (Written communication from C13)
Legitimacy	Technology can help universities deliver value to their	Delivering on the objectives above. Ensuring stakeholder buy-in for the vision that software can help	"Institutions are willing to pay a lot more for quality products because there's a lot more to prove from the institutional side of why students should go to university. And the more universities can take on

	stakeholders, which boosts legitimacy.	deliver value and/or help establish that value for the wider community.	that burden financially, the more they can attract students […] At [the] moment, what they [students] are saying is, 'I'm willing to put up with the high tuition fees in order to get this degree which will guarantee me a good career path when I'm older.' But of course, lots of students have been through the degree route for years and a lot of students finish their degree without any certain career path. … So, universities are actually coming up against stiff competition now to actually fill class spaces and course spaces. So … financial inclusion is going to be a huge barrier they're a lot more willing to pay for resources to make sure that students are well supported and actually put up a fight against the career apprenticeships." (Interview C03P01)

3.4 Business models and working in the sector

In this section, we describe our findings regarding business models, the higher education sector as a business environment, challenges and competition that EdTech companies face, strategies they employ, and so on.

It is important to note that these insights are influenced by the specific nature of our case studies companies, as they mostly target universities as their primary customers (B2B). For most, but not all, of the products and services they offer, end users are staff and students who do not pay directly for access to these services. Instead, their respective universities pay subscriptions or other types of charges. This is an essential characteristic because the customer who pays for the service and the end user might have different priorities or views on how the product/service should or could operate.

3.4.1 Charging for services and types of software

EdTech companies in our study charged for services in several ways. The first model is a **perpetual licence** fee. In these cases, customers pay for the licence and retain it indefinitely. Institutional or individual users generally download the software to their computers and use the software for as long as they desire. However, they do not have automatic access to upgrades (for which they may need to pay for a new license) and may lose support after a certain time. This

was a common way to charge for software before the emergence of SaaS, supported by the cloud infrastructure and subscription models. In this sense, it can be seen as an 'older' method of charging for products and services; however, it still works for those software companies whose software delivers a reliable and established service within institutional infrastructures or in relation to specific individual needs and preferences. Such companies often do not see the benefit of moving to cloud infrastructure. Three companies in our dataset operated this model, and all were older companies (e.g. more than 20 years since incorporation).

The second model is **subscription**. SaaS is the most typical form of digital product or service that EdTech companies offer through this model [14]. Customers pay a recurring subscription fee to access the product in line with the terms and conditions. For B2B, the subscription could be on an annual basis or over several years, and the terms of use are negotiated in a contract between the EdTech company and the university. However, some participants explained that universities tend to negotiate on price rather than terms and conditions. In the case of B2C, customers typically pay subscription fees monthly or annually, and the product provider issues terms of use the user must accept in order to access the service. There is no negotiation in this case, and individuals must consent to the terms to access the product. In both cases, customers lose access if they stop paying subscription fees or breach the terms of use. Most commonly, SaaS platforms are designed and delivered via cloud infrastructure such as AWS. The product is updated continuously and automatically for all users. Continuous updates also rely on user feedback. Another version of the subscription model is the **'freemium'** approach, which was used for one of the user groups in one of the companies we studied. This group is able to access the product for free for the basic service or pay a premium subscription to benefit from targeted services and analytics insights.

Our participants explained that the average B2B subscription cost increase for universities is 5-7% annually. However, if universities sign a longer contract (e.g., three to ten years), the yearly price stays fixed during that period. We also

[14] We found that universities also increasingly use PaaS and IaaS products and services, but these were not found among the EdTech companies that we examined.

learned that predicting income from a subscription model is easier than a perpetual licence. Participants believed that users would keep paying subscription if they remain satisfied with the product.

Another dynamic we encountered was **price changes** for the products and services provided by new start-up companies. Generally, a company cannot charge high prices before the product scales (i.e. before it reaches a high number of users or desired network effects). Consequently, universities procuring products from new start-ups will likely experience substantial price increases in future. Some participants saw this as a necessary business model, with the first step being to drive up usage and then determine how to charge for it.

SaaS running on cloud infrastructure allows collaboration, synchronisation, and, from a technical perspective, data storage and web services. If EdTech companies store data for customers, cloud infrastructure provides scalability and security. At the same time, EdTech companies in our study recognised that using the cloud for their SaaS products is costly, not only due to paying for cloud infrastructure and platform provision, but also due to the engineering labour costs for setting up and maintaining this provision.

The third model is **revenue sharing**, in which the university and the EdTech company share the revenue fees paid by users. The percentage of sharing varies, with some participants reporting an average of 20-50%, similar to OPM models[15].

Finally, Edtech learning platforms can be designed to distribute skills-based training material or short courses to complement university academic study programmes, for which universities pay a **licence fee to access and utilise the content**. From the perspective of one participant, this is a substantial and lucrative opportunity, emphasising the high potential for profitability within the domain of content licensing.

[15] In 2017, The Century Foundation conducted a major study on OPMs and public universities available on its website: https://tcf.org/content/report/dear-colleges-take-control-online-courses/

There are an increasing number of acquisitions in the EdTech industry. Companies might acquire others for different reasons, including expanding services, complementing datasets, acquiring competition, and increasing market share. After the acquisition, companies generally merge their services under one umbrella and look bundle new products and services in terms of technology and pricing.

3.4.2 Business models

EdTech companies operate using two key models. The first is **B2B,** with universities as primary customers and staff and students as end users. A variant of B2B includes offering products to other educational institutions or enterprises for staff training. The second model is **B2C,** with EdTech companies targeting individuals, most commonly students. In different combinations, products might target business and individual customers at once or act as a multi-sided operation, brokering relationships between them. However, the key difference between models used by EdTech companies to organise their products and sales strategies generally depends on whether the customers are institutions or individuals.

One concern for EdTech companies, particularly start-ups, is **customer acquisition**. A typical metric in considering the potential value of a start-up is customer acquisition costs. In the case of B2B, EdTech companies reported that they need to employ large sales teams, which can be a very costly endeavour. However, the benefit of employing a B2B model (i.e. with universities as customers) is a stable and lasting income stream. It is common for universities to sign recurring subscription contracts for a period between 3 and 10 years.

In the case of B2C, EdTech companies market their products mostly via app store optimisation, search engine optimisation, paid ads, and referral schemes. These strategies entail a much lower cost of customer acquisition. B2C is also considered more scalable than B2B and faster in reaching scale. A benefit reported by participants was avoiding long decision-making processes at universities. We were given an example of the scale needed to achieve high ROI and were told that the industry standard is a 5% conversion rate in B2C models in the app store (5% of those who have seen the app will download it).

In the case of a freemium model, 2-3% will go on to pay the premium subscription. To earn enough from these conversion rates, the strategy is to scale user growth quickly.

EdTech companies provide a variety of services, and one particularly interesting and relevant trend is related to **online learning** and the balance between affordability and a high-touch approach. Participants identified two key moments of decision-making regarding the cost of online learning. The first is teaching input, and the second is assessment. Traditionally, both of these activities rely on human labour and are consequently costly. Reducing costs associated with teaching can involve transitioning from one-to-one or one-to-few interactions (i.e. a tutor with a small group of students) to a one-to-many approach (i.e. where one tutor oversees numerous students). Other cost reduction measures include hiring staff at lower remuneration rates, exemplified by instances of recruiting retired teachers from countries like India. Most recently, the focus has increasingly been on automating teaching on the platform itself, thus entirely removing human labour. The costs of assessment depend on how it is performed, who assesses an assignment (i.e. human or machine), whether there is moderation, and so on.

Our participants highlighted a noteworthy trade-off between, on the one hand, asynchronous learning that is self-paced and more affordable for students) and what some participants called a 'premium experience', which is marked by human interaction, tutor involvement, and synchronous engagement. Indeed, one participant compared the HE sector to the music industry, where attending a concert in person is considered a premium experience and costs more while purchasing recorded tracks is cheaper. While automating teaching interventions is a popular aim and promises to save costs, there is a view that this is a sub-optimal option. These perspectives highlight the challenging dynamics involved in balancing quality and cost-effectiveness in the evolving landscape of online learning.

One participant suggested that cost-cutting and reducing labour does not work in education in the same way as other sectors. In their view, the value of EdTech is in increasing the student experience rather than making it more efficient or accessible by reducing intense human input. This participant argued for the

need to retain a focus on human interaction while complementing it with technology to enhance the student experience in new and different ways.

There seems to be a persistent trend whereby university credit-bearing courses with higher stakes and human input are more costly and often involve universities in their delivery. At the same time, universities are expected to work towards accessibility and target students who do not have university degrees for up-skilling, especially in the USA. In an attempt to ensure accessibility and affordability, companies are looking to reduce costs by replacing human labour with AI tutors. Hence, the affordability of the provision also often means less human labour and less teacher-student interaction. Finally, student recruitment can also be expensive. We learned that companies typically spend 35% of tuition income on marketing.

Amongst our corpus of EdTech start-up companies, we found examples of companies developing their products in association with a particular university. Companies reported that this improved credibility and the promotion of the product. University brands are important both for the legitimacy of credentials and the legitimacy of EdTech innovation. Unsurprisingly, the most successful EdTech companies thus far have benefitted from university brands (e.g. OPMs or MOOCs).

In summary, the common traits across the EdTech companies we studied included the following:

- all companies retained the copyright over their software;
- all but one company relied on licencing and subscription fees for their products and services (the one exception being a B2C company that provides a free app for users, but the company is exploring how to start charging subscription fees);
- none of the companies share or sell student and user data, with the exception of outsourcing data analysis as a service, which is common in all sectors;
- in case of company acquisition, collected and stored user data would be given to the acquirer; and

- all companies respect content IP produced either by university academics, students, or textbook providers and publishers.

3.4.3 start-up logic and relationships with investors

Investors are generally interested in EdTech because it is perceived to be a growth sector with significant opportunities for digitalisation. Moreover, students are seen as a promising customer base with a long lifetime, especially in the case of lifelong learning. However, participants reported that while EdTech is inviting certain investors, EdTech in HE confronts substantial challenges. First, they reported limited growth potential for start-ups due to a lack of revenue and available funds at universities. Building an 'exceptional' EdTech company, as one participant put it, demands substantial initial capital ranging from $50 to $100 million, primarily allocated for engineering, data sorting, product management, and commercial teams. In this case, achieving an ROI necessitates a challenging 70% to 90% gross profit margin, which is a threshold that is difficult to attain, particularly in HE, where only select universities can afford high-priced products. We were told this is unlike other industries where customers have more resources and a high ROI is easier to achieve. Second, there is a need for rapid growth and scaling when there is investment in a start-up company, typically requiring a fivefold expansion in three years. Such growth is challenging in HE also due to the inherent complexities of the sector, such as slow decision-making and limited market feedback during product development. Third, investors exhibit reluctance to focus on B2B investments for HE due to perceived inefficiencies in university software procurement. Universities are not perceived to be sophisticated software consumers. Consequently, few EdTech companies in the B2B for HE scaled successfully. Our participants reported that many smaller companies offer niche products instead, which are more easily provided through existing procurement procedures. Some participants also noted that, in general, the quality of digital products is lower in EdTech than in other sectors.

A common trend we identified was that B2B start-up companies that initially focused on universities as their customers later targeted other enterprises or even shifted their focus to other enterprises. For example, if a company provided a VLE for HE, they may then adjust it for enterprise so that employers

can use it for staff development and training. Participants explained that there is more money available in the enterprise side of the B2B, as well as faster decision-making and shorter business cycles. Moreover, some participants stated that the EdTech product and, consequently, the EdTech company, will not grow substantially if focused only on HE.

Investors typically pursue rapid scaling and growth in terms of customer numbers. Similar to other sectors, profitability and revenue growth are not high on the agenda in the first few years of a start-up. One of the start-up companies that we studied was self-funded by the founder, who was concerned with this general model and was wary of the risk that the company might never become financially sustainable. Therefore, this participant balances the growth of user numbers with the growth of revenue.

We were also interested in the relationship between start-ups and investors. Our EdTech participants reported that they engaged strategically with investors for financial support and to leverage their valuable expertise and experience. Beyond providing capital, investors can contribute to the growth of EdTech enterprises by offering insights, mentorship, and a social network that brings value beyond mere monetary value. Increasing resources through in founding rounds always has a specific purpose and aim, for example, enhancing engineering teams to develop new features or acquiring content to enrich educational offerings. Therefore, start-ups must select investors who share the vision and aims of their respective companies. Investors are pivotal in shaping key decisions regarding product direction, feature development, and user inclusion. Many EdTech companies also mentioned the importance of having investors with a specific focus on EdTech instead of Tech more generally, highlighting the challenges in conveying the intricacies of the sector to general investors who are unfamiliar with the specific requirements and sceptical of sector-specific risks.

Tech investment sentiment changed during the period of our project. Investment slowed down, and investors became more cautious. They started looking for revenue growth beyond rapid user growth and focused on more prominent companies that had already proven successful. Raising money became more costly, and many start-up or scale-up companies waited for new

investment rounds. In EdTech, investment was increasingly directed into later rounds for established companies with the provision of higher sums rather than into new start-ups. However, there are examples of new EdTech start-ups that were able to raise high sums of capital in just a few months due to the founders' reputation and their networks. Connections in investment circles matter significantly.

3.4.4 Working in and for higher education

The companies we studied viewed HE as still being in the early stages of digitalisation. The Covid pandemic accelerated the sector's digitalisation, but those effects are now wearing off. Participants explained that universities do not take EdTech, AI and ML products at face value but want proof and evidence of their value and impact.

Data we gathered from and on EdTech companies indicates that they recognise HE as being a difficult and challenging environment for universities. They recognise that universities must compete for student enrolment. They also understand that universities are continuously monitored by and held accountable for externally determined metrics, which requires significant reporting, including providing evidence of student engagement and outcomes, accessibility efforts, and social impact. Our participants described how universities include the reporting from EdTech products they use in marketing and promotion, which aligns with our findings from universities as described above. Companies see that universities must move or increase online course provision quickly and often request swift support from EdTech companies. This perspective aligns with online university education market predictions[16]. It is not surprising that Times Higher Education, one of the biggest university rankings

[16] Statista reports that the UK is already the second largest market worldwide for online university education after the USA. Online university education offered by UK universities is the most expensive in the world at an average of US$13,228 in 2023. Data provided by Statista predict that online university education will continue to grow in the next five years, mostly in the UK and USA. In China and India it is predicted that learning via EdTech platforms will increase. Source: Statista (2023). Online Education–Market Data Analysis & Forecast.

agencies, announced a new ranking of universities' performance in online learning[17].

While EdTech companies tend to follow the general trend of expanding features and services offered in their digital products, especially by including data analytics, they are careful about monetisation strategies. Our analysis shows that they do not monetise everything they can. Participants agreed that selling student or other user data to other parties or data brokers is inappropriate in education. They also agreed that generating revenue from advertising or direct targeting is not working well, with the potential exception of B2C or freemium models. Indeed, we did not find such practices in the digital products and services that we examined.

Our participants also spoke about the need to establish products that support universities' visions. Universities are focused on their specific priorities and strategically seek products that support these priorities. While participants spoke about the challenges of working in the HE sector, in particular slow decision-making and slow business cycles, as well as lack of revenue in general, they recognised it is possible to go to the market with relatively high prices with the right product (between £250,000 and £1,000,000 per year). However, EdTech companies need to understand universities, work with them, take care of university brands and adapt to the pace and culture of the sector. Universities are doubtful regarding the value of new (data) products and must be convinced about the costs and benefits of investing in new tools. EdTech companies feel that strong customer support is important when operating in HE and listening carefully to customers when developing features to be included in digital products.

An interesting hurdle for EdTech companies is the challenging funding environment for post-secondary education. Universities do not have substantial funds at their disposal and face uncertainty in relation to income. This can make universities reluctant purchasers of EdTech and averse to signing long-term contracts. The situation is even worse for Further Education institutions. Our participants from EdTech companies reported that Further Education colleges

[17] https://www.timeshighereducation.com/news/announces-new-ranking-online-learning

rarely know how much income they will receive, even in the coming academic year. Consequently, while the higher and further education policies in the UK aim to increase the marketisation of these two sectors, this funding uncertainty might stifle the growth and innovation in the EdTech industry because universities and colleges cannot afford to invest in and support the development of EdTech products.

As already mentioned, the EdTech companies we studied reported on specific characteristics of the sector, with the top characteristics being the scarcity of funds at the disposal of universities to spend on EdTech and slow decision-making. However, EdTech companies working in this space embrace these characteristics as part of doing business and work towards supporting universities. There were interesting nuances between how our participants perceived the sector, and those who genuinely seemed motivated to work with the sector did not mind these challenges and sector-specific characteristics. They recognise that working in HE may be more challenging than in other EdTech sectors or other industries, but they are ready to accommodate these challenges and any particular demands. For example, while procurement procedures are lengthy, some EdTech companies explained that they work hard to become compliant. In order to compete on tenders, companies need certain policies and certificates in place. It also helps if HE procurement networks list them as trusted vendors. Some of the companies understood that working in this way is important for the sector.

3.4.5 Building moats

'Building moats' has been a standard business strategy to protect against competition since the industrial revolution (Van Alstyne & Parker, 2017)18. The concept is still popular among investors and entrepreneurs, including in the digital economy. Using key social and other media outlets, industry experts write: "[t]he term "competitive moat" (popularised by Warren Buffett as an "economic moat"), refers to a business's ability to maintain competitive advantages in order to protect its long-term profits and market share from

[18] Van Alstyne, M., & Parker, G. (2017). Platform Business: From Resources to Relationships. NIM Marketing Intelligence Review, 9(1), 24–29. https://doi.org/10.1515/gfkmir-2017-0004

competing firms" (Luck, 2018)19. This is done via defensibility, understood as a way to guard against competition and unexpected market conditions. Techcrunch, one of the most popular news portals for tech businesses, writes about four key defensibilities in the digital world (Currier, 2016)20: economies of scale (e.g. Amazon Marketplace); brand (e.g. booking.com, Google), embedding (e.g. Oracle, SAP), and network effects.

Our data on EdTech companies indicate that they are working towards building moats. A very common way of phrasing this was 'to create stickiness' for their digital products. EdTech companies use 'stickiness' to refer to customers returning to the product and staying with their brand over long periods, possibly a lifetime. There are different ways to achieve such stickiness.

The second approach to building moats was integrating digital products into university digital ecosystems and/or business operations (i.e. embedding technology into institutions). We could interpret this as a form of lock-in since it is hard to move to another supplier once products are integrated. At the same time, EdTech incumbents, such as VLEs or other legacy software businesses, appear to have a big advantage because these are digital products that universities have used for longer than more recent products based on SaaS models. Although these products and services may have been provided in older software forms, many have now been reinvented as SaaS platforms and cloud enterprises. For example, Blackboard (which was not part of our study) used to be software hosted on university servers and functioned as a document repository. It has now become a cloud-based learning platform offering various collaboration tools, analytics, and other functions. If universities already use such platforms, then the companies have an advantage over newer and start-up companies offering learning environment products. This is due not only to being established brands but also to technological, legal, and economic integration into university systems. An interesting example in relation to this dynamic was a start-up company product that was being integrated into

[19] https://www.linkedin.com/pulse/defensibility-how-determine-your-competitive-moat-kristin-luck/

[20] https://techcrunch.com/2016/09/15/defensibility-creates-the-most-value-for-founders/

software provided by an incumbent, demonstrating that integration and embeddedness into university digital ecosystems can occur indirectly.

The third approach to building moats that we identified was through establishing network effects. This approach appears vital for B2C platforms but is also relevant for many B2B platforms. For example, digital textbooks or library platforms need scale on the publisher side and, if they aim to offer valuable analytics on reading trends to various parties, also on the university side. Another example is platforms connecting universities and employers, which need a scaling user base since the core service depends on network effects.

Finally, some participants offering B2C products talked about personalisation in terms of individuals having a personal relationship with an app. This is not dependent on network effects insofar as the service does not depend on calculations based on aggregate user data. Instead, the service becomes part of users' intimate day-to-day practices21. The moat that can be built here is not only superior experience or strong brand but also lock-in into people's individual personalities, preferences and everyday practices. Examples might include organisers, scheduling devices, and even reference and annotation tools.

Patents do not seem to be a notable trend in the EdTech businesses that we investigated. We found that the size of the company matters for filing patents, and smaller companies cannot afford the cost \. Instead, the most common way to protect the IP is via a software licence.

3.5 Data and analytics

In this section, we examine the practices, strategies, and ambitions of EdTech companies in relation to user data processing. We mostly focus on data operations of B2B platforms unless B2C is specifically mentioned or where we address the differences between these two.

By user data, we mean digital data automatically collected as an outcome of an individual engaging with a digital platform. A subset of this is personal data, but

[21] See Elif Buse Doyuran (2023) Nudge goes to Silicon Valley: designing for the disengaged and the irrational, Journal of Cultural Economy, DOI: 10.1080/17530350.2023.2261485

not all user data is personal data. There is also student data, which is not automatically produced in digital form by the platform, such as personal data provided by the student (e.g. date of birth, self-assessed skills) or by the university (e.g. information on classes and modules taken, assessment results).

These different datasets are normally linked together, especially when integrated to deliver a service. For example, one VLE we encountered pulled data on students from a student records database and used it to produce analytics based on user data collected by the platform.

3.5.1 Data collection methods in typical products

EdTech products normally come in the form of digital platforms and thus allow user tracking and user data collection. The data they collect on users varies and depends on the service the platform offers and the strategy of the company. Nevertheless, user tracking can be seen as an area where, on the one hand, there are companies that decide not to collect extensive user data (there was only one such company out of those that we studied); and on the other hand, there are companies that collect all possible user data (the majority of the companies), including:

- metadata, such as machine number, internet protocol (IP) address, platform access time, and similar;
- user behaviour registered by the machine, such as information on clicks, time spent on particular tasks, the sequence of user movement on the platform, and so on;
- content produced by the user, such as discussion forum posts, literature notes, peer comments, and so on;
- user data that is generated elsewhere when platforms collect data on users from social media sites, search engine providers, or data brokers; and
- other data on students provided voluntarily by students or their universities.

In the case of B2B models, universities are data controllers for user data produced by their staff and students. Hence, determining what EdTech companies can do with user data is complex and depends on the specific agreement between the EdTech company and the university. For EdTech platforms that target individuals directly (B2C), the platforms are data controllers and have more freedom over user data.

An example of what EdTech companies do with user data is including various analytics in their products or providing analytics in relation to product usage as an additional service. These analytics are often quite basic and usually remain at a descriptive level. Tracking students and staff allows various data services for different user groups, as illustrated in Table 2.

Table 2. Typical forms of analytics and other data processing in EdTech.

Beneficiary of user data processing and computation	Typical form	Example	Promised value
University administrator	Aggregated analytics	Digital library platforms that report on student reading trends	Efficiency, cost saving, evidence for regulatory reporting
Student	Recommendations, behavioural nudges, (comparative) analytics	Digital learning platforms that suggest which task to do when	Improved learning, personalisation, improved student experience
Course tutor	Student surveillance	Highlight whether students accessed a particular text	Support students, increase student retention, and increase engagement, teaching support

To provide any form of analytics or data operation based on user data, regardless of the level of sophistication, activities must take place on digital platforms or be digitally recorded. For example, if a student reads a book in a physical form or reads articles as PDFs saved on their devices or printed on paper, then there is no record of the student reading the text or which parts of the text they read, how long they spent on the text, which parts of the text they highlighted, what they wrote as notes, and so on. Even if students and staff use other platforms not assigned or controlled by the platform in question, then user activity and data may not be captured. Consequently, there is a continuous and increasing push towards more, if not all, activities happening via digital platforms. Platforms supported by universities motivate students and staff to move their activities onto these platforms. However, this might not always be the desire of students and staff. We found that EdTech companies search for ever new data analytics products for HE and associated audiences. There is an incredibly strong belief in the value of user data and data processing, although potential customers do not always recognise this as valuable.

Another common approach by EdTech companies is to aggregate user data from multiple universities they serve and to search for ways to make it valuable. Most commonly, this would be for product development. To avoid problems with

data privacy regulation, companies remove personal data and assign some other form of user ID. Even when user data is not yet monetised, this may not always remain the case. For example, one of the EdTech companies that we investigated was not doing much with its collected user data, but the participant expected this to change soon as their company was recently acquired by another company that is very focused on data.

Surprisingly, a huge majority of universities do not ask for their student and staff user data collected by EdTech platforms to be sent back to them. In other words, the data that their own students and staff produce on a proprietary digital platform is not normally sent back to the university's data lake. Based on our research, it is not yet standard practice for user data to be sent back to the universities for their use and analysis.

3.5.2 Data and computing operations

For any data-based operations, data processing demands a lot of time and effort for data cleaning, organising, etc. Participants commented that this is a general start-up-specific issue when data is still being accumulated; it is not a specific challenge to the HE sector. EdTech start-ups need to be active with a significant number of customers for sufficient time to collect enough data for aggregation and data operations. We were told that companies need to be around five years old before starting any meaningful data operations based on their collected data. Before then, companies can only provide some other services and basic feedback loops. An example would be providing access to digital textbooks. Initially, platforms can only provide basic descriptive analytics to individuals (e.g. you spent x amount of time reading x number of pages) and perhaps universities (e.g. x number of students opened x text for x amount of time). Only after they collect and organise enough data on reading trends from many universities can they analyse more meaningful trends for the sector and publishers.

As mentioned, personalisation of learning is one of the key aims of EdTech. The most common data operations found in EdTech products that support this aim are rules-based processing and like-like comparison. **Rules-based processing** refers to operations in which decisions are made based on a series

of pre-set rules. An example is an if-then logic. **Like-like** comparison[22] refers to decisions and suggestions being made based on comparing to other students with similar traits. An example would be the logic of 'if other students who read this book also liked that book, would you like to read it'. This is a common logic in digital marketplaces, other popular platforms, or the targeted advertising industry. One participant called the logic they use 'Amazon-style recommendation'. We do not comment here on whether these strategies are pedagogically appropriate for education.

Most companies that we examined did not use AI or ML. Only two companies we examined did so: one is a learning platform, and the other is an academic text organiser. Nevertheless, many of our participants thought their companies might introduce AI operations in the future but realised that AI currently has limited benefits. To paraphrase some of the interviews, participants said that AI is not a magic tool that would solve all educational problems. All participants said it is extremely costly and lengthy to collect enough data, then clean and organise it, run models on it, and so on. It is not easy to add value with AI; its benefits are not automatic and obvious; indeed, AI is best used only in limited cases, such as summarising and finding trends in large quantities of text. Some participants also spoke about the ethics of AI, not only in terms of the ethical use of AI but also in terms of whether it is even ethical that AI is used for particular purposes in education. A few participants explicitly supported human intervention over AI-based operations. Moreover, they sensed that universities are always sceptical about the costs and benefits of data products and are not always prepared to pay more for data-driven digital services.

Those companies that use AI or ML, or plan to introduce it in the near future, talked about how AI demands structured data collection using specific approaches. This has implications for how any given EdTech platform is structured, how content is organised, user interaction with the platform, and so on. Platform operations need to be primarily structured to maximise processing of user data collection. In other words, companies grapple with balancing the organisation of platform operations for the purpose of ML versus organisation

[22] For the like-like logic, please see: Kucirkova, N. (2022). The promise and pitfalls of personalised learning with new EdTech. In S. Livingstone & P. Kruakae (Eds.), Education Data Futures: Critical, Regulatory and Practical Reflections (pp. 220–229). 5Rights Foundation.

for pedagogical purposes. Some participants stated that they are experimenting with approaches to see what works. Some companies also reported on another challenge when they build AI-powered products: recruiting ML experts. There does not appear to be enough experts currently in the labour market.

The general discourse around the high value of digital data refers to data that is captured indirectly. As mentioned, there is still an ongoing search for the value of such data, including through learning analytics. We can distinguish between three types of digital objects constructed from indirect data to understand better what kind of data is used and how analytics are constructed: digital content objects, digital feedback objects, and digital behavioural objects. Behavioural objects are currently the most prevalent, while the other two objects are harder to construct (see Table 3 below)[23].

Table 3. Digital objects in EdTech and their prevalence.

Digital objects	Definition	Key proxy category	Data input	Prevalence in sample
Behavioural object	Deconstruction of student behaviour into component parts.	Engagement - Active/inactive - At risk/not at risk - More/less engaged	Mouse movement Keyboard strokes Activity/inactivity Camera movement Microphone inputs	HIGH
Content object	Deconstruction of learning content into component parts	Content - Right/wrong answer - Knowledge domains - Similarities and difference knowledge	Mathematics (specific) Natural language (specific) Change between slides Start of Q&A	MEDIUM
Feedback object	Deconstruction of teacher feedback into component parts	Feedback - Natural language - General categories	Teacher feedback to student	LOW

[23] Hansen, M., & Komljenovic, J. (2023). Automating Learning Situations in EdTech: Techno-commercial logic of assetisation. Postdigital Science and Education, 5(1), 100-116. Advance online publication. https://doi.org/10.1007/s42438-022-00359-4

3.5.3 Making data valuable through analytics

EdTech companies make data valuable mostly through analytics. Analytics can be integrated as part of the service that digital products provide or as an add-on for higher fees. Analytics usually come in two forms: feedback loops or descriptive statistics. **Feedback loops** support individuals and employ approaches described above (i.e. rules-based or if-then logics). **Descriptive statistics** provides numerical insights at the level of individuals, groups, or institutions.

A profound belief in the value of user data was found across the EdTech companies we studied. Our participants explained that user data is gold that needs to be mined, that it is the most valuable thing about their respective company, and that user data will drive the company's future value. At the same time, most of the analysed companies were still finding ways to make data valuable and monetise it. There is thus an interesting paradox between belief in the value of data that is not yet realised, at least not to the extent that participants would desire, and this belief driving investment, business models, actions, and strategies.

The most valuable user data are deemed to be **engagement data**. Our participants understood engagement data as relating to student interaction with platforms. Based on this interaction, various data are captured and indicators calculated. The underlying logic is that engaging with the platform implies active learning. Therefore, student interaction with the platform is perceived to indicate learning activity.

For example, data collected through a digital library application included mouse movements, the number of times a book is opened and closed, reading starting point, reading endpoint, engagement time, periods of inactivity, the printing of book sections, and so on. The data did not seem to be used for anything beyond measures of engagement that can be visualised at the aggregate level, such as how many people have accessed which materials. This information can be shared with universities to support their library subscription procedures, and it may also be shared with publishers.

EdTech companies' **strategies to find value** in data include:

- Finding more and more indicators and analytics to generate from the collected data. After new insights are presented, they can be launched in the existing products or added as new services for extra fees.

- Imagining new practices based on possible calculations and convincing users of their usefulness. For example, based on insights into how many students access an assigned reading via a VLE, statistics could be calculated on how well specific tutors chose course readings. This could be presented as a staff accountability measure. Some of our interviewees reported that this might be of interest to university leaders in the USA.

- Finding new audiences for new indicators. These audiences may not be only students and staff as individuals or universities as institutions, but other organisations too.

- Adding other information to data, which some of our participants called ‘embellishing data’ by adding additional data points. This includes making data useful and increasing the value of products.

- Finding different ways to report on a metric or constructing new indicators. An example might be calculating a popularity score on a book in a digital library platform. Such strategies include convincing users that new metrics are useful.

- Product analytics for product development. Companies collect info on user activity and use of their platform to support the product and enhance feature development.

A few participants felt that monetising user data in EdTech is more challenging than in other sectors. In education, companies cannot sell user data as this is not deemed ethical or widely accepted by the sector. Second, education users are perceived to be more aware of digitalisation processes and sensitive to their development than others. Other risks are hard to predict, yet they might have big effects, such as academics publicly criticising a product. Thus, some entrepreneurs felt it was harder to navigate the education sector than other domains.

Some participants reported that universities are seeking automation to alleviate administrative burdens. An example would be a VLE that automatically sends a reminder to students if they have not completed a particular task or accessed a particular resource. This would save tutors' time to send such messages themselves.

A few participants also reported that universities feel pressured to become data organisations and to innovate with data. This might be a challenge if they still have on-campus servers and they are challenged by the legacy software they use. However, if universities want data services, they need big data, and some participants stated universities cannot do this alone. Participants also discussed how universities need analytics and metrics to report to the regulator and demonstrate their impact. So, the metrics provided by EdTech and procured by universities can be useful 'evidence' for meeting various policy requirements.

Some participants talked about how basic descriptive analytics provided by most EdTech platforms might be useful, but they do not allow for actual research on learning. A different kind of user monitoring is needed for a more profound understanding of how people learn, supporting and conducting research on learning, and developing products that transform learning. The environment would need to be controlled and each element indexed and measured. Our participants felt this was not happening yet.

One participant spoke about the ethics of presenting metrics and how they constantly consider how best to present specific measures. Some might be sensitive, such as reporting on correlations between nationality or socioeconomic status of graduates and employment success and they carefully consider how to report on such data in a useful and inoffensive way. This participant also talked about the awareness of algorithmic bias and how the company refelects on such challenges. Their company employs people to tackle potential bias and work on data operations and ethics.

Academics and policymakers recognise the value of large data sets in other economic sectors where data is processed and used to produce business intelligence, predictions, and behavioural nudging. Yet, in EdTech, data operations seem to stay at the level of basic feedback loops for individuals or

institutions. Key imagined future data operations are (1) personalisation to allow individuals to learn at their own pace and content of their own interest and (2) automation to produce efficiencies and cut costs. The most tangible value in EdTech still seems to be in (1) expanding markets, such as using technology to deliver the same services to more students (for example, via OPMs); (2) creating new markets, such as staff development and training for employers; or (3) supporting student experience, such as via augmented reality or virtual labs. This begs the question of whether EdTech, as it currently stands, is able to deliver on its promise of disrupting or transforming HE more profoundly, and if digital data have any role in such disruption.

3.6 Personalisation and efficiency

Personalisation of learning, institutional efficiency, and efficiencies of HE processes are the key aims of EdTech products and services. However, it is not always clear what is meant by 'personalisation' and what exactly can be made more efficient.

3.6.1 Personalisation

Participants talked about different processes when referring to personalisation. Some examples of the variety of definitions and descriptions of personalisation include:

- Personalisation of learning enabled by EdTech diverges between personalisation of the learning process, which is content-agnostic and follows generic movement through the platform, and personalisation of the learning process that is content-specific: e.g. automated prompts to motivate students moving through learning content at an individual pace. Such personalisation can be designed either as a rules-based approach described before or with AI, which has not yet been substantially developed at the HE level.

- Personalisation of engagement with content including, for example, offering recommendations on reading, which is most commonly done based on like-like logic.

- Personalisation of the look and feel of the app for the user, such as font size, display colour, organisation of display, and so on.

- Personalisation of career support (e.g. matching students and employers, making connections specific to individuals, their profiles, and wishes, personalised displays of employment opportunities based on student profiles and needs).

- Personalisation of marketing and communication (e.g. during recruitment, displaying and communicating information only on courses of interest).

These examples indicate that personalisation discourse is complex and includes many different aims and approaches. In terms of personalisation of the learning process, our participants felt that content-agnostic forms have developed in HE mainly by recording, analysing, and visualising synchronous and asynchronous presence and movement through learning platforms or accessing various learning materials, as well as making automated recommendations that are generic across disciplines. Such content-agnostic intervention could be, for example, nudging a tutor or a student to 'raise' their hand if they have been inactive in a virtual classroom. However, personalised learning interventions that are content-specific are harder to develop.

Personalisation of learning by offering tailored content demands complex computational processes that start with the deconstruction of learning content into its component parts. Our participants explained that this is much more advanced at the school level than in HE, where learning and thinking become more complex. Many participants said that automated learning feedback and guiding students with the aim of content-specific personalising of learning, especially in less structured subjects, is not yet occurring. There are attempts in more structured fields, such as maths or languages, where it is easier to categorise and tag each micro- and sub-element of content that follows particular rules (e.g. 1 + 1 = 2). In these cases, content personalisation is somewhat easier. However, automating fields that demand interpretation, evaluation, and complex social thinking is harder. In such cases, there is often more than one right answer, and the focus of learning is to build a coherent argument rigorously rather than provide single answers. HE was also perceived

to be more open-ended compared to lower levels of education, where scripts may be followed. As such, personalising learning could risk narrowing learning opportunities and academic freedom. Our participants felt that we are far from achieving personalising learning at the HE level from a content perspective, and perhaps may never achieve it[24].

In general, companies that work towards personalising learning from the content side appear to have one or more of the following three characteristics:

- scale in terms of resources and data input for developing and training generative AI;
- structured and controlled learning content input, which allows learning content to be broken down into its component parts; and
- a clear theory of change that guides learning interventions.

3.6.2 Efficiency

When out participants described their EdTech products as supporting efficiency in HE, they had many different things in mind. Examples include cost efficiencies (e.g. paying less for publisher subscription), pedagogical efficiencies that support student learning, teacher efficiencies that reduce labour, efficiencies in transitioning from university to the labour market, and so on.

Efficiency discourses included mention of aims such as filling up classrooms, only buying relevant learning materials, and outsourcing software hosting to the cloud. While efficiency was also discussed as improving learning by, for example, helping students to see the parts of books other students found helpful, generating smarter deep search of text, helping with categorising information, and helping with mental health. The promises and discourses on efficiency were omnipresent in the interviews and document materials.

[24] This research was done before the release of ChatGPT to the general public. With the popularisation of generative AI, there are new ideas regarding the personalisation of learning, however, there are also critics. We do not comment here whether generative AI is able to personalise and automate content in all fields.

3.6.3 Challenges

One of the challenges for EdTech in pursuing personalisation is the different underlying logics of EdTech products. For example, one of the reading platforms we studied assumed that there is a problem with students not reading textbooks and that the aim is to get them to read 100% of assigned texts. Another reading platform, however, assumed that it is normal practice that students read only parts of a textbook and that, for this reason, they need lots of different sources so that they can search across various texts. Each of these two platforms had a different intervention and recommendation logic built-in their product. The first platform designed recommendation interventions to motivate students to read entire texts, while the second platform designed recommendation interventions to motivate students to move across texts. The question becomes: How does a university or an individual student reconcile potential contradictions in the basic premises of the platforms they use? At the minimum, the underlying premises and logics need to be very transparent.

One participant discussed user data collection and storage as potentially problematic, arguing that too much data is collected and kept, leading to scepticism regarding the potential benefits. Moreover, a few participants argued that students should be educated about data practices and what happens with their own data in terms of what is collected and how it is used. They felt this should become part of the standard education experience at universities.

4. Big Tech

Studying Big Tech companies was not a focus of our research project. We use the term Big Tech to refer to international technological companies that are globally prominent in market share and company valuation. Examples include Alphabet (Google), Amazon, Apple, Meta (Facebook), and Microsoft. However, Big Tech was mentioned frequently in the interviews we conducted with our participants at universities and EdTech companies, in analysed documents, and in HE and EdTech industry reports. The participants and documents described universities increasingly moving to cloud infrastructure provided by such companies and increasingly using cloud tools and capabilities for data processing and visualisation.

For this reason, we accessed publicly available material published by Amazon Web Services (AWS), Microsoft, and Salesforce, which are the three most popular cloud providers in the UK HE sector. We also collected news and information about these cloud providers from other sources. In doing so, we aimed to provide contextual information by summarising key messages from these documents, but unfortunately, we cannot offer a more in-depth analysis. Indeed, the use of Big Tech in HE and its impact is an area requiring further research.

4.1 Amazon Web Services

In 2022, we compiled 130 documents from AWS websites and public blog sites (the majority of documents), as well as YouTube videos explaining the potential uses and applications of several of their technologies, EdTech and/or industry-dedicated sites, and more than 1000 news items from July 2019 onwards.

In HE, AWS provides cloud-based services to EdTech companies and universities in order to (1) optimise, (2) scale, and (3) personalise businesses and interactions. The material did not provide a detailed explanation of how exactly these services help universities deliver specific educational aims, or how exactly data is processed and analysed. This may be due to the fact that AWS is an infrastructural backbone to organisations (including universities amongst any other organisations) that use it to structure and organise their operations. AWS does not provide end-user software or interfaces (such as e.g. Miscorsoft's Office 365 suite) or automated end-user visualisation dashboards or analytics (such as e.g. Microsoft's Viva reports). Consequently, organisations need their own developers to structure, run, and maintain their cloud infrastructure on AWS, or must outsource this task to another contractor.

AWS has created several AI and ML resources (TexTract, Lex, Personalize, RedShift, etc.) that both EdTech companies and universities can use to optimise, scale, and personalise their operations. In our brief review of the material, we did not discover how user data is extracted, and we assume that this is because AWS does not provide end-user platforms, albeit providers of platform services (e.g. an EdTech platform) may use AWS. The material we collected focuses on how EdTech companies and universities can use their data and optimise their data processes, as well as how AWS can facilitate

organisational digital transformation, including ML and AI resources. The labour to run data operations is managed on the university or EdTech business side.

The material also includes videos with universities as case studies to promote AWS. These describe enhancing student experience and increasing accessibility. However, the details of how exactly AWS helps with these aims are not clear.

AWS appears to want to enable EdTech companies and universities to do more with less. It uses the discourse of bringing the student to the fore and democratising access to HE by means of data analysis and automated interpretation of behavioural and raw data. Focusing on the student experience and democratising access is also an important message found on the EdStart member's site[25]. 'Doing more with less' might be an attractive proposition in an environment where universities are pressured for revenue. Saving on staff costs and staff shortages could require decreased investment in student experience, but AWS technologies promise to fill that gap while saving money.

4.2 Microsoft

In 2022, we compiled 107 documents from Microsoft's (MS) website, YouTube channels, news items, blogs, and reports. MS provides cloud storage services (Azure), which hosts a palette of data analysis, computing, and optimisation tools. These include (1) Cognitive Services (AI and ML services), (2) MS 365 Dynamics, (3) MS Power Platform (including Power BI and VIVA), and a variety of industry-specific versions of the three, including Microsoft Office 365, which is widely used in HE and comprises the classic applications (e.g. Word, Excel, Powerpoint) and newer collaborative applications (e.g. Teams, Sharepoint). Crucially, due to the underlying Azure architecture, data from all these apps and platforms can be analysed using 365 Dynamics and Power BI.

[25] AWS EdStart is supports EdTech startups to build teaching and learning solutions on the AWS Cloud.

The reports we analysed are contextualised within a vision of the year 2030, which mirrors the visions of education that EdTech investors also promote[26]: a focus on customisable/personalised learning, cross-platform use and data analysis of students' behaviours, and promoting the potential of education within a digital environment and in line with lifelong learning discourses.

The MS website offers detailed case studies of universities using MS products, including videos. Each case study focuses on the implementation of a set of different services, technologies, or applications and on the benefits of their use. The discourse is one of enhanced performance, enhanced student experience, and enhanced use of resources, while discussion about data valuation and extraction only focuses on security and flexibility of use. The case studies explore university usage of data warehouses that enable various data visualisations (e.g. dashboards) with specific insights at various levels. These are dynamic tools with dynamic updates.

Like AWS and Salesforce, MS has educational resources called the MS Education Center. AWS seems to be focused on experts, Salesforce is fully open, and MS Education Centre has structured its educational resources based on the profile of the person accessing their thousands of 'courses'. These roles are specific and include data scientists, data engineers, data analysts, AI engineers, and administrators. MS appears to connect all of these roles directly to the HE sections of their industry-specific site, and actors within universities are not fundamentally distinct from other sectors. HE administration and student services seem to be directly translated from a business discourse, similar to Salesforce's description of students in its adoption of 360 to the HE sector.

4.3 Salesforce

In 2022, we compiled 94 documents from the Salesforce website, public blog sites (e.g. Medium), technology news (TechCrunch), and YouTube channels. Salesforce is not a Big Tech company per se, but it is prominent in the HE

[26] Komljenovic, J., Birch, K., & Sellar, S. (2023). Analysis of the Edtech Industry and Edtech Investment in Higher Education. Zenodo. https://doi.org/10.5281/zenodo.10092315

sector in the UK and offers cloud infrastructure and data services. Therefore, we include it in this section.

Salesforce is a customer relationship management (CRM) solution. Running in other sectors with its Customer 360 approach, it also offers services to HE. The discourse that is used to understand universities is similar to other enterprises, and students are considered universities' customers whose behaviours can be predicted in relation to data points extracted from the university's digital infrastructure. Several videos published on YouTube focus on (1) how to set up a data-driven Education Data Structure (EDA) and (2) how to make use of different functionalities to drive decision-making processes.

Salesforce (mainly via RIO, which is its more specific HE-oriented system) provides cloud services with a prominent focus on CRM. The three main apps that are integrated are Slack, Tableau (formerly Einstein), and MuleSoft. These cloud-based apps/systems allow a 360-degree view of the student by extracting data from them, and predictions and recommendations (customisations) can also be made, which ostensibly optimises services and decreases expenses. The focus seems to be on student experience, scalability, predictability, and decision-making processes powered by data. Trails is Salesforce EDA's learning platform in the shape of stacked modules. It is similar to AWS Machine Learning University, but focuses on HE and CRM systems.

Salesforce visualises its education cloud for HE. There are three key areas that are highlighted: 'Student Success', 'Recruiting and Admissions', and 'Advancement'. It is particularly interesting to observe that recruitment activities (e.g., open days) are founded on predictions, provided by Einstein (Tableau), about what type of students universities need to recruit in order to achieve higher ratings and similar. The process is focused on how data enables better recruitment so that success rates are higher. Such data needs to be provided by both students and recruitment companies and so rather than selecting students, students' data is curated and fed into apps to generate models of student success.

The documents we collected described the pathway towards automating university processes in response to issues of scalability and staff needs. Salesforce claims that HEDA, apps and integration of both (via MuleSoft) will

free staff to focus on what is most needed, emphasising that the better use of resources can also democratise access to education.

4.4 Next steps

An annual survey of UK universities conducted by UCISA[27] indicates that universities are increasingly using Microsoft's infrastructure and tools for data services, such as business intelligence systems, enterprise web portals, CRM, and data warehouses. Moreover, and as discussed in the Universities section above, the university participants we interviewed and participants in focus groups talked about the usefulness of cloud infrastructure and tools, especially Microsoft's enterprise and business tools.

Microsoft stands out from other Big Tech providers not only because it appears most popular with UK universities, but also because it is offering platforms and services used by customers. While AWS, Microsoft, and Salesforce provide digital infrastructure and offer various services for data storage, data analysis, and data visualisation to support institutional decision making, Microsoft also offers a suite of applications for end-users (e.g. Teams, MS Office 365) that collect user data as students and staff engage with these applications and platforms. MS allows universities to collect and centrally store all digital content, data, and traces that students and staff leave behind when they use MS applications, enabling analysis and visualisation of data for different purposes.

At the same time, we have learned that universities use legacy enterprise software for core institutional functions, which can be difficult to integrate. The transformation of universities into data organisations is currently ongoing, and Big Tech plays an important role in it. More research is needed into this dynamic and the impact of not only the digitalisation of universities but also the specific role of Big Tech in this digitalisation.

[27] UCISA (2023). Trends in Corporate Information Systems 2012-2022. Harwell, Didcot: UCISA.

Section 3: Investors

5. Investors

As of January 2024, there have been 33,069 rounds of investment in education companies across all categories and levels of education, as per the Crunchbase database. In total, $184,701,705,893 was raised, of which 35% was invested in EdTech across 7,727 rounds[28]. While these numbers must be taken cautiously, they indicate that EdTech is a significant category of education investment[29].

Since 2010, investment in EdTech, including venture capital, has significantly increased[30]. Investors are increasingly relevant in EdTech and, consequently, HE. They are economic actors that influence which products will be developed and brought to market through their investment decisions. They are also political actors who promote specific ideas and strategise to influence education policy[31].

In this section, we analyse investors in EdTech, including their views, strategies, and activities.

5.1 Dataset

Between March and August 2022, we analysed 28 investors in EdTech. In a multi-method qualitative research design, we combined:

[28] The Crunchbase data has to be interpreted with caution. Not all investment rounds include data on money raised and hence, the total funding is likely significantly higher. Also, not all investments are included in the database.

[29] The share of investment that goes into EdTech out of all education is increasing over time, especially leading up to 2020, however investment in EdTech has decreased in the past two years. There might be several reasons, including the post-Covid waning of enthusiasm in digital technologies, a general drop of company valuations in markets across industries in the past two years, and a reduction of VC and other investments overall.

[30] Komljenovic, J., Birch, K., & Sellar, S. (2023). Analysis of the Edtech Industry and Edtech Investment in Higher Education. Zenodo. https://doi.org/10.5281/zenodo.10092315

[31] See for example: Komljenovic, J., Williamson, B., Eynon, R., & Davies, H. C. (2023). When public policy 'fails' and venture capital 'saves' education: Edtech investors as economic and political actors. Globalisation, Societies and Education, 0(0), 1–16. https://doi.org/10.1080/14767724.2023.2272134

- document analysis of 1,722 publicly available documents from 25 investors (see Table 4); and

- interviews with 8 investors.

Table 4. List of analysed investors.

	Investor name	Country	EdTech specific	Number of documents collected
1	Brighteye Ventures	UK	Yes	91
2	Ibis Capital	UK	No (but focused on media, education and health)*	124
3	GSV Ventures	USA	Yes	57
4	Y Combinator	USA	No	88
5	Owl Ventures	USA	Yes	171
6	Octopus ventures	UK	No	179
7	Heartcore Capital	Denmark	No (but consumer tech)	14
8	HenQ	Netherlands	No	3
9	Greyrock Investments	Australia	No (but focus on education and technology)	6
10	Project A Ventures	Germany	No (but only in digital companies)	156
11	Educapital	France	Yes	49
12	Bisk Ventures	USA	Yes	20
13	Learn Capital	USA	Yes	51
14	Reach Capital	USA	Yes	119
15	University Ventures	USA	Yes	156
16	Wayra	Spain	No (but tech-specific)	23
17	Kleiner Perkins	USA	No	49
18	SFC Capital	UK	No	17
19	British Business Bank	UK	No	68
20	Nesta (impact investment)	UK	No (but has a fund on EdTech)**	
21	Sequoia Capital	USA	No	65
22	Accel	USA	No	35
23	Andreessen Horowitz	USA	No	73
24	Tiger Global Management	USA	No	8
25	Emerge Education	UK	Yes	100
	All			1722

Notes: *Taken as EdTech-specific in our analysis due to its central role in EdTech, including establishing the EdTechX series of events. ** Taken as EdTech-specific due to its EdTech fund and relevance in the industry.

These investors were selected based on the combination of the following criteria:

- our Crunchbase analysis in Phase 1 of the project;

- the pool of investors in the companies we analysed in Phase 2;
- a review of the most relevant investors in HE EdTech that appear in the public discourse;
- identifying a combination of EdTech-specific and generalist[32] investors;
- ensuring some geographical diversity (albeit Chinese and South-East Asian investors are missing, mostly due to the language barriers).

The documents that were analysed include the following:

- Investors' website:
    - website content with all web pages;
    - outgoing links from web pages to investors' posts on other platforms; and
    - all reports, surveys, prospectuses, and other documents published on their web pages.
- Published content on Medium (https://medium.com/).
- Relevant information from TechCrunch (https://techcrunch.com/).
- Relevant information from Dealroom for EdTech (https://edtech.dealroom.co/intro).

In addition to the 25 investors we studied using publicly available material, we interviewed eight investors. Six of these informants are EdTech-specific. Two out of eight participants invested only in the UK companies, while the rest invested globally. Their headquarters are in Australia (1), UK (3), and USA (4). Three investors are venture capital, two are private equity, one is an investment banker, and two are seed investors.

[32] Generalist investors invest in various or all economic/social sectors; and education is only one of their investment interests.

5.2 Key themes

We highlight three key themes in analysing investors in EdTech. The first theme is **investors as moral actors**. Investors pursue financial ROI and consider standard metrics during investment decision-making, such as discounted cash flows, business growth rate, customer acquisition cost, etc. VC investors look for the potential to scale quickly. However, EdTech specialist investors also bring a moral dimension to their investment work. This is commonly expressed through discourses about democratising services via products in which they invest (e.g., access to apps for disadvantaged groups), contributing to UN sustainable development goals, and delivering social impact. Some investors developed evaluation guides or metrics for EdTech's social impact. The communication they developed includes numerical evidence (e.g. x percentage of users are from minority groups) and presenting digital products by highlighting a problem it addresses and a solution It offers.

Some investors spoke about their work on communicating the social impact of their investments in the context of the public's better acceptance of the EdTech industry. Moreover, they saw this work as contributing to transparency and market-making. The EdTech industry, as we know it today, is still quite young, and investors have spoken about how they need to create and consolidate EdTech markets.

The second theme is **the specificity of the HE sector and the diversity of HE markets**. Education has not been the most attractive sector for investors. However, EdTech is seen to present new opportunities for ROI because it is believed that education will digitalise akin to other industries (e.g. media), and there are opportunities for new products targeting individuals directly. Despite these expectations, investors recognise that education is different to other sectors because markets are fragmented across different cultures, languages, regulatory spaces, etc. There are also many gatekeepers in education, and deep public concerns about the delivery of education.

These factors play out differently in different contexts and countries, which impacts what kind of EdTech products are being invested in and developed. For example, the USA is a large market and with products that deliver content, while Europe has lots of smaller systems and products supporting existing

schools and universities to deliver services. This is just one example of how contextual factors impact what kind of EdTech products we see in different markets, and market differences depend on what is seen as possible from a financial ROI perspective.

Views on the current state of HE are diverse, with the majority of investors being critical of the sector. HE is characterised as being slow and unresponsive, not delivering on employability needs, and needing transformation and or even disruption. This discursive construction is productive for investors insofar as HE is portrayed as important and necessary (to legitimise interest), but at the same time as 'broken' and in need of change (to legitimise investment).

The final theme is **human capital**. Investors see the purpose of HE as enhancing employability and delivering skills. They bring education and training together with the world of work and see these as converging in human capital development and investment. Therefore, one of the major critiques of universities is that they do not deliver on employers' needs and do not cater adequately for graduate employability. The logic of why investment in EdTech is needed is associated with skills deficiencies, and the need to up-skill and re-skill the global workforce. Human capital formation does not only underpin the logic for investment in EdTech in HE, but also for digital products that connect universities and employers, bridging the gap between them using data collected during education. This is reflected in EdTech companies' plans for 'skills APIs' and skills infrastructure connecting skills, people, and (mostly precarious) jobs.

5.3 General overview

5.3.1 EdTech is making education investable

EdTech is a relatively young industry that has started to grow more substantially since 2010[33]. Historically, investors hesitated to invest in the education sector. The reasons stated in documents and by our participants are low returns compared to other sectors, long investment cycles, fragmented markets, heavy

[33] Please see our quantitative analysis of EdTech companies active in HE and their investors active at: Komljenovic, J., Birch, K., & Sellar, S. (2023). Analysis of the Edtech Industry and Edtech Investment in Higher Education. Zenodo. https://doi.org/10.5281/zenodo.10092315

regulation, and public hesitancy towards privatisation. Low returns are related to the restricted budgets of schools and universities. Historically, education investment tended to go into opportunities that received public funds directly from governments in order to avoid educational institutions' budget problems. As discussed in the section above on EdTech companies, returns are driven by the scale of service and price charged, both of which are challenging in education based on our analysis. Long investment cycles are related to long decision-making at universities and because it takes much longer to see the effects in education. Moreover, the kind of effect that is measured is different when one is interested in learning rather than selling products. The following example was given by one of our participants:

> *In the retail space, the fact that we like buying toothpaste with a blue kind of label is something that data, when collected, becomes very valuable because it can be very quickly translated into a product outcome that, from the manufacturer's perspective, changes our buying behaviour. But in the educational service, colouring a content blue and then waiting to see whether that means more people kind of buy maths textbooks, I don't think it plays out in the same way. And that means that we don't understand yet how the markets within education really work. (Interview I08P01).*

Fragmented markets were reported to arise from different regulatory, cultural, and linguistic spaces. At the lower levels of education, different countries or jurisdictions prescribe different curricula, languages spoken in schools vary, and cultural norms and expectations are diverse. Many of these elements apply to HE, too. The regulation was perceived to be another barrier for investors because it could limit or slow market expansion. Finally, in many places, education is dear to the public and is often seen as a public or common good. Hence, many stakeholders are hesitant about privatisation, which again impacts the potential for market growth.

The view that education is not an attractive investment sector has been changing with the emergence and growth of EdTech, similar to other sectors in the digital economy. EdTech is seen to have an enormous opportunity for

growth as one of the last sectors that have not yet been digitalised. As we elaborate in more detail below, investors' common message is that education is a multi-trillion dollar industry globally and that spending on education will only grow in the future. The percentage of that spending that is dedicated to digital is said to be too low at 3% and is predicted to increase to 5% or more. The growth of learners in formal education, lifelong learning, and informal learning, increasing spending on education, and increasing the share of that spending on digital learning, are predicted to create an enormous opportunity for Edtech and ROI.

The Covid pandemic was also perceived to boost investment in EdTech. During the pandemic, venture capital investment in EdTech peaked, with many governments dedicating substantial public funding to EdTech to help education institutions deliver teaching online[34]. Investors we studied expected long-term positive effects on the industry overall. For example, Brighteye Ventures mentions in their documents that the collective move online brought different learning cultures closer, making it easier to scale EdTech products. Similarly, our participant talked about how the pandemic helped with market fragmentation:

> *So when you overlay that with social impact, education's absolutely at the core of driving social impact, and if you can look for models that deal with fragmentation, so go for kind of consolidated groups of buyers, and you can see a market size that goes beyond the UK for example, then you can start to build an investment case. Covid and lockdown have totally changed the game beyond recognition. So, the adoption of technology by schools, but also by universities overnight, has made the investment opportunity much greater. (Interview I03P01).*

However, investment in EdTech has been dropping since 2021, but our participants were not overly concerned [35]. They saw this as part of the overall

[34] Williamson, B., & Hogan, A. (2020). Commercialisation and privatisation in/of education in the context of Covid-19. Education International.

[35] For example, see Brighteye Venture's reports on EdTech funding: https://www.brighteyevc.com/post/the-brighteye-half-year-european-edtech-funding-report-2023

drop in the valuation of companies and a result of more careful investment decision-making across economic sectors. Moreover, they thought that EdTech companies were overvalued like other tech companies, and we are now in a period of adjustment, which they see as a normal industry and investment cycle. The trend where service scale (i.e. user growth) was the most important metric, while revenue generation was almost disregarded, was discussed as potentially problematic by some. They also explained that this market movement had not impacted all companies equally, and many promising late-stage start-ups or scale-up companies kept their valuations high and even raised large sums of investment.

5.3.2 Emergence of EdTech specialist investors

Investors who specialise in EdTech investment have emerged in the past decade and have become critical actors in the EdTech industry and beyond. From an investment perspective, these investors pave the way for generalists. Education, including EdTech, was not high on the investment agenda, and thus, EdTech-specialist investors needed to create the market and educate others about EdTech, as one participant explained:

> *We started this work in [the early 2010s] and there was no such thing. EdTech was so niche. We've had to actually educate the market. So we've done a lot of that leadership and blog posting […] we had a big opinion around personalisation, differentiation and we had to do that because no one really understood the market. We had to educate investors, companies, things like [?].*
>
> *I: So it's like creating a market.*
>
> *A: Yeah, we had to create a market, exactly. We had to create the ecosystem, and we wanted to create it with the idea of what we would want to be true. (Interview I05P01).*

Specialist EdTech investors often invest at early stages (i.e. from seed to rounds A and B). Generalist investors typically invest at later rounds with higher tickets (i.e. bigger investments). It seems that specialist EdTech- investors do the political work of making EdTech an attractive investment opportunity, including policy, cultural, and normative work, and also take higher risks. By

investing early and supporting start-ups to scale, they also prove the concept of particular business models and companies. Conversely, generalist investors step into the process later and stabilise investments with bigger sums that support EdTech expansion. For example, one participant told us:

> *But certainly, it was the case five years ago that the earlier stage investors tended to be EdTech experts, and then they would form a group of investors around them that included some of the generalists, to back businesses and then through their As and Bs… and have always been entrepreneurs and family offices and friends and family. Not many EdTechs that I know have been backed at a seed stage by a major investor. There's a few, but not many. And the EdTech experts kind of validate the proposition for other investors and then bring them through and then the fact that they're in there in the first place, they become effectively promoters for the company as they become-, as they go through later phases. It's definitely true-, this is all definitely true of America. (Interview I02P01).*

We heard from our investors that although EdTech specialist investors exist, they are small in number in comparison to other industries. There are also regional differences. A participant explained that EdTech specialist investors are concentrated mostly in the USA and, to a lesser extent, Europe. This participant went on to explain that because US investors tend to invest in companies based in the USA, it is generalists who invest in EdTech elsewhere. The consequence is less investment and slower growth of EdTech companies outside of the USA:

> *I would have said that in other parts of the world, you've tended to see generalists backing education technology companies earlier [in the investment rounds], but you've probably seen fewer scale, fewer companies scale as a result of that. So, if you look at the history of [EdTech company based in Australia], for example, … most of their early backers were Australian VCs and none of those Australian VCs have a real, a number of them have started to have an eye on education technology and looking at it, but not many of*

> *them are dedicated EdTech funds. There's not a single dedicated EdTech fund in Asia Pacific that does early stage financing that I can think of. Almost all of them are generalists, and they may have an EdTech person on their team whose job it is to look at opportunities, but there's no, you don't see the same specialised funds that you do in America. (Interview I02P01).*

Not surprisingly, most generalist investors do not promote concrete ideas about HE or education more generally in their communications. Their EdTech investment decisions are instead made based on case-by-case consideration of proven business models. On the other hand, specialist EdTech investors have a very clear investment logic, views on HE, ideas about the role of EdTech, and so on.

In what follows, we first briefly summarise findings on generalist investors. We then move to discuss specialist EdTech investors in relation to five themes: their identities and investment logic; their ideas about EdTech; their ideas about HE; their understanding of digital data and value; and their activities beyond investment.

5.4 Generalist investors: A brief overview

We studied publicly available documents from 17 generalist investors. Two of our interview participants were generalist investors, one a private equity investor and the other a seed investor.

Generalist investors appear to have been established for longer periods than specialist EdTech investors and have larger investment funds. Some state that they help their portfolio companies with support, networks, and advice. In general, they do not publish content or specific views on EdTech, with a few exceptions. One such exception is Andreessen and Horwitz, whose EdTech-specific content tracks the content produced by specialist EdTech investors. Another exception is Kleiner Perkins, which already had statements on education as a service in 2011.

Project A (Germany) is an interesting case. It specialises in investing in digital companies, focuses on digital data, governance, and transparency; and has issued resources for developers. Project A talks about digital business models

and supports companies with data transparency using concrete tools. It has released its own data warehouse, Mara, as open-source software. It had made four investments in EdTech up to the end of our data collection.

Octopus Ventures (UK) also stands out in our sample. It is the only investor focusing on academic research and its commercialisation rather than teaching and learning or auxiliary services. It sees academic entrepreneurialism as a driver for academic growth. Following its vision, it developed a ranking of UK universities based on how successfully they commercialise their research. Octopus Ventures invests mainly in the UK and Europe, but also in the USA, although all its investments have a UK presence.

One participant, who is a generalist private equity investor, was not particularly impressed with the EdTech industry. In their view, the areas with the most potential are up- and re-skilling and vocational training. They see potential in expanding markets for online training rather than developing more sophisticated technologies for education.

5.5 Specialist EdTech investors

Specialist EdTech investors that we analysed are thesis-driven. In other words, they define the scope and aims of their investment in their investment theses. The thesis is highly relevant for two key audiences that investors work with: (1) the investor base that invests in their funds, ranging from pension funds, to governments, strategic investors, companies, wealthy families, and so on; and (2) the companies seeking investment, particularly to assure them that they have found the right investment partner.

EdTech specialist investors do much more than invest; they organise events, conduct studies, issue reports, educate entrepreneurs and other actors, organise networking, work with policymakers, etc. The scope and scale of investors' work often position them as political actors as well as economic actors[36]. One of our participants described investors' positionality as resulting

[36] Komljenovic, J., Williamson, B., Eynon, R., & Davies, H. C. (2023). When public policy 'fails' and venture capital 'saves' education: Edtech investors as economic and political actors. Globalisation, Societies and Education. Advance online publication. https://doi.org/10.1080/14767724.2023.2272134

from the two audiences they work with. In the view of this participant, European investors, in particular, work as family offices or are supported by government funds, which has effects on how they operate:

> *[A particular EdTech investor] obviously has to answer to the [country] government in part in terms of how it positions itself in the market. So, it has to play the politics within that. With the case of [EdTech investor], it is slightly different because it's got a family office, but I guess the play with the family office is that most family offices that are interested in the education market come to the education market because they're interested in the impact and the [impact related] angle that education provides. And they want to be seen as providing a benefit back into the community as part of their investment philosophy. And so that, in my view, the politics comes from where these early investors come from. (Interview I08P01).*

In terms of the second audience, investors must communicate to education stakeholders in specific ways to facilitate EdTech companies being accepted in the sector:

> *The second part is that the community of investee companies links into the wider community, as we just talked about. And the wider community is going to increasingly comment on the companies and the services they provide. And if they're seen as aggressive profiteers in this market, that is going to be a dangerous kind of development because it'll be seen as unattractive to be in this business. So, the politics in part very much linked to the underlying desire to make sure that the business models and therefore the successful business models are positioned so they're acceptable within the communities in which they operate. (Interview I08P01).*

Therefore, the investors' discourse, strategies, and communication are a key part of the investment process.

As discussed above, EdTech products have many purposes and aims, and EdTech specialist investors reiterated this. We grouped these aims into five

categories: (i) scale and flexibility of access; (ii) supporting employability throughout life (e.g. transition from the university into employment and then re/up-skilling), including shorter and more cost-effective alternatives to universities; (iii) automation and personalisation of learning or other service delivered by the product; and (iv) reduced cost to achieve more affordable learning for more people or cost efficiencies for HE institutions. In addition, investors expect EdTech to play a future role in developing HE resources (e.g. content, curriculum, courseware creation), delivery (e.g. digital lecture engagement, learning experience platforms, feedback and analytics), and learning support (e.g. learning pathways, writing support, communities). For example, in an interview for Crunchbase, one of the partners in Brighteye Ventures talked about EdTech targeting cost ($/hr of learning), relevance (value of the material being learned), efficiency (amount of learning/hour), or engagement (hours of additional time spent learning)[37].

We analysed documents relating to 11 EdTech specialist investors and interviews with six participants who were EdTech specialist investors, focusing on five themes: their identities and investment logic, their ideas on EdTech, their ideas on HE, their understanding of digital data and value, and their activities beyond investment. In what follows, we turn to the analysis of EdTech specialist investors.

5.6 Investment logic

Most EdTech specialist investors in our sample describe the education sector as worth $7 trillion (i.e. global spending on education). Most of them also claim that only 3% of that is spent on digital technologies despite 50% of education now being digital or digitally mediated. They see this as a gap that creates vast potential for ROI. Their investment discourse highlights digital disruption, transformation, personalisation of learning, institutional efficiency, and automation. The first key aspect of generating ROI is creating scale.

[37] TechCrunch: https://techcrunch.com/2021/01/28/12-investors-say-lifelong-learning-is-taking-edtech-mainstream/?guccounter=1

5.6.1 Scale

VC investors are looking for scale and rapid growth. For example, Brighteye Ventures states that as "a rule of thumb, to be VC-backable, you should be in a market in which you can feasibly reach $100m+ in revenue and build a business that could one day be worth >$1b"[38]. A discourse of scaling up accompanies such aims. For example, GSV Ventures states on its website that it "invests in EdTech leaders positioned to achieve disproportionate gains and become dominant players in technology"[39].

When investors talk about scale, they generally refer to the number of digital users, often beyond national or jurisdictional boundaries. So, when they talk about prioritising scale over revenue, that means that companies should use investment money to prioritise acquiring customers rather than generating short-term revenue and profitability. As mentioned in the section on EdTech companies, it is often believed that a normal approach in the tech industry is to first 'get the users and figure out the payment model later'. When scale is discussed, it is often in the language of *democratisation*, such as democratising access to learning, knowledge, skills, etc. Hence, the aim to grow the number of subscribing users is made to coincide with the aim to make education accessible.

However, for rapid growth of individual users (in B2C models) to happen, it logically follows that companies receiving investment should:

- have a high level of standardisation to be able to scale, which narrows the options of what exactly in HE can be scaled profitably and, consequently, is likely to encourage personalisation of education using like-like or rules-based recommendation systems or adaptive learning;

- be an intermediary and avoid fragmented and regulated education markets, connecting individuals to share knowledge among themselves, or HE institutions to individuals, or HE institutions to organisations; and

[38] Source: https://www.brighteyevc.com/post/how-to-prepare-a-seed-or-series-a-funding-round

[39] Source: https://gsv.ventures/

- function in parallel to institutionalised education (i.e. education delivered by accredited HE institutions) and/or work towards deinstitutionalisation of HE via direct-to-consumer (D2C) models, networked and peer learning, EdTech+, etc., which involves creating new lifelong learning (LLL) markets.

Some of the investors recognise that working with schools/universities (B2B) is hard, and it is easier to target consumers directly (D2C) and corporate customers via B2B for enterprise (staff learning and development, upskilling and reskilling, LLL). With the expansion of EdTech investment over the past decade, there has been some optimism about investing in B2B digital products for HE institutions. During the pandemic, investment in B2B for HE institutions flourished with the idea that 'education will never be the same'. However, B2B EdTech start-ups targeting HE institutions do not seem to be successful in delivering fast growth, and there is recognition that people returned to universities after the initial pandemic crisis. That being said, some investors in our sample persist with B2B for HE institutions because they believe this ensures social impact, but most investors remain open to all possible business models and make investment decisions on a case-by-case basis.

The objectives of scale, large returns, and rapid growth is crucial. For example, GSV often discusses the race for the first $1 trillion EdTech company. While it believes this is likely far off in the future, its communication on investment logic and decision-making aligns with finding the 'winner' of this race. A more realistic winner in the near future is the first company valued at $100 billion. GSV argues that winners will have a high return on education (RoE) and a high lifetime value (LTV):

> *"If learners receive tangible value and have reasons to come back again and again, the results will lead to powerful network effects, long LTV, high multiples, and a growing market cap. Those who can constantly deliver the highest value to learners, as measured by how learners are thriving in life and in a knowledge-based economy, will be the ones racing to a Trillion"*[40].

[40] GSV Ventures: https://medium.com/bubblin-from-a2apple/long-shots-8f5524645f99

GSV emphasises a need to retain education customers long-term, similar to companies like Uber and Spotify, and to treat EdTech as a global export. Investors might think of people as 'appreciative assets',[41] in the sense that users engage with EdTech over time because they value the experience and keep coming back. This suggests that EdTech is creating or aiming to create a new global market of LLL with various service providers and models (e.g. networked peer learning, institutional microlearning) and paid for by individuals, their employers, and/or governments.

Ideas about scaling products targeting universities (B2B for HEIs) are not as elaborated yet, and there seems to be less coherence in views on how to achieve this within our sample compared to scaling B2C models. On one end of the spectrum, a notable number of EdTech investors we analysed talk about EdTech that would entirely transform or disrupt the way universities operate. In other words, universities would profoundly change their teaching and learning practices, management processes, administrative tasks, and so on, using new technologies. EdTech could then scale as more and more universities implement these technologies. Alternative credential providers or new digital universities may also emerge to challenge traditional universities by using EdTech to automate and personalise learning. For example, Emerge Education talks about challenger universities[42]. However, on the other end of the spectrum, one of our participants saw more potential in *working with* rather than *against* universities in the case of B2B models. This could mean working in partnership to extend universities' programme provision (e.g. via OPMs), finding ways to support universities in auxiliary, non-core services, or providing technology that would support teaching in complementary ways (e.g. offering AR or VR in classes rather than replacing staff with automated teaching). One of our participants explained that it is not surprising that the most successful EdTech companies in the past decade are those that worked with universities and benefited from their partnerships and brands, such as OPMs and MOOCs.

The focus on scale thus applies to all investments insofar as investors want to see a steeply rising number of paying users. However, attention to scale is

[41] LearnCapital: https://www.learn.vc/about

[42] Emerge Education: https://medium.com/emerge-edtech-insights/does-higher-educations-2tn-global-market-have-space-for-something-new-794feeef5522

mostly focused on B2C models, and there is less talk about B2B models, which mostly focus on challenging universities to change their operations via automation, efficiency, unbundling of provision, etc. A minority of participants openly mentioned that scaling B2B is best pursued by supporting universities in what they already do.

5.6.2 Human capital formation and a focus on skills

Many investors bring together education and labour markets. They aim to invest in companies and concepts with the potential to shape the future of education and work, often framed as a focus on human capital. For example, GSV Ventures "look for companies that have high impact, provide essential services, and are critical in the transformation of human capital"[43]. LearnCapital talks about EdTech supporting human flourishing, and University Ventures focuses on 'last mile training' as a pathway to good jobs, competency marketplaces and bridging the gap between traditional HE and employers' needs. Reach Capital segments the market into onboarding, learning, credentialing, and earning. Emerge Education focuses on companies that are addressing the skills gap. Finally, Owl Ventures focuses on upskilling and career mobility. Knowledge as a currency is another way that companies talk about demonstrating capability beyond a degree, such as with certificates and badges[44].

The common view from investors is that the types and content of work in the future will be very different. Moreover, working arrangements are predicted to change, with more people being predicted to be employed precariously. Skills can be seen as individual assets that will be used for different 'gig' works. People can then update their skillset with 'just in time' skills training to perform particular tasks and get new gigs.

A trend that is emerging is a focus on employability and skills. Through discourses that emphasise the central role of skills, investors criticise current HE (e.g. HE does not deliver on employability), describe the threat (e.g.

[43] GSV Ventures: https://medium.com/bubblin-from-a2apple/long-shots-8f5524645f99

[44] GSV Ventures: https://medium.com/gsv-ventures/dawn-of-the-age-of-digital-learning-4c4e38784226

potential loss of GDP due to lack of skills), frame the future (e.g. the need for specific skills), outline strategies (e.g. reskilling and upskilling people), and underscore impact they expect companies to make. We now move to discuss these ideas in more detail.

5.6.3 Investing in EdTech for social good

All EdTech specialist investors emphasise that a moral function of their investment is to contribute to social good. For example, Owl Ventures says it works towards the UN's Sustainable Development Goals; for Reach Capital, financial success and social impact are non-negotiable, and it invests in companies that improve education and economic mobility; and Emerge Education invokes their founders' personal histories to explain why they invest in companies that aim to help millions of people by making learning accessible.

Focusing on social impact, in addition to economic ROI, has two effects. On the one hand, it signals to education stakeholders and the broader community that financial investment can serve the common interest, and investors can be moral actors. On the other hand, it encourages investors to think not only of ROI in economic terms but also in relation to other returns or outcomes. One of our participants explained:

> *[T]here is a general, from an investment community, interest in trying to look at how to become better investors in the marketplace. And this fundamentally comes from a societal reaction to the way that capital is deployed. And the challenge that then follows is how do you introduce that into a system that is not used to having other measures of performance that historically have been very simple and black and white because it's based on kind of financial return, which is very easy to measure. (Interview I08P01).*

Some investors have developed metrics and methodologies to inform their investment decisions. They believe this helps to make social impact more visible. For example, Ibis Capital developed a proprietary impact methodology, which considers "a number of factors including reach and affordability, quality

of education and attainment of skills and employment, efficacy and sustainability, customer privacy and data security, responsible selling and marketing practices, employee engagement, diversity and inclusion, and business ethics and competitive behaviour"[45]. It encourages other investors to use its methodology in valuation procedures. Another example is Educapital, which proposes an impact methodology that presents social impact and financial performance as correlated in a *virtuous dynamic* based on reach (scale), inclusion (proportion of women/disadvantaged, price), and learning outcomes (completion, employment, evidence base, accreditations). One of our participants emphasised that having such metrics helps the EdTech market by providing information and increasing transparency:

> *So, because we are a financial animal, we're interested in generating returns from what we do. But we believe that that can be done in a way that delivers better outcomes. And if we measure those outcomes and create transparency around it, that impacts and informs behaviour. And if more people are transparent about what they're doing, it doesn't mean that they have to set up the structure so that they're purely incentivised to do that. It's more about creating visibility around what's actually happening. And that data and knowledge, if it's commonly shared, becomes a motivation in itself. So you know, coming from a kind of background of trying to have open markets, data and transparency are the key to creating behaviour, not trying to put frameworks on top of people because that creates misalignment and sometimes strange behaviour within that structure. (Interview I08P01).*

Therefore, specifying how EdTech companies and EdTech investment contribute to social aims not only serves these aims but also helps to further develop EdTech markets by increasing market acceptance and building trust.

All participants spoke about the importance of social impact and having a 'double bottom line'. The most common way to express desired social impact is via democratising access to learning, skills, networks, and so on. In other words, investors aim to make the products they invest in available to as many

[45] Ibis Capital: https://ecosystem.edtechxeurope.com/2022-edtechx-awards

people as possible, especially those from lower socio-economic status backgrounds and those being excluded from formal educational opportunities. Hence, the scale of usage of their products becomes tightly coupled with accessibility and democratisation.

Most EdTech specialist investors expect companies in which they invest (or in which they consider investing) to demonstrate measurable social outcomes. Moreover, portfolio companies and other investment candidates need to state explicitly which problem they are solving. For example, Owl Ventures will not invest in a company if it cannot demonstrate and measure impact/outcomes in the three primary areas of scale and access, diversity, and outcomes.

> *[E]ducation investors that are focused on the impact of how technology can improve education, look at it from a couple of different perspectives. So one is like, does it improve access to education, does it make it more broadly available or make it available to people who it may not have been available to before? Or does it improve, does it make it cheaper, does it help affordability of it? Or just make it more interesting to people that it might not necessarily be any better is just, it may hold their attention better? Or, is it designed in an app that gets people to buy into it more? There's a number of different things. (Interview I06P01).*

Thus, the impact of particular products can be expressed in various ways, but the key thing is that it is explicit and numerical. For example, Owl Ventures publishes an Education Outcomes Report, which specifies how it contributes to social impact via its portfolio companies. Then, each company reports its impact using measures of scale, access, diversity, and outcomes. For example, Noodle is one of Owl's portfolio companies. In the 2023 Noodle report, there are three metrics for scale (53 schools, 65 HE institutions, 250+ employers), two metrics for access (50% students of colour, and 66% female students), and two metrics for outcomes ("$530 m+ generated in tuition revenue for our

partners in under 4 years", and "86% retention in Noodle supported programmes")[46].

Investors also expect EdTech companies to structure their communication in the form of 'situation – problem – solution'. All companies explicitly state which 'problem' they are addressing with their product, which is presented as a solution to that problem. This formula is being picked up by other actors, including universities, that have also started framing EdTech products in this way. However, this approach positions given 'problems' as a basic premise that is not disputed.

A moral mission is also expressed through investing in companies that will 'transform' education and focus on educational engagement. However, if we look closely, this is measured by engagement with platforms, which is likely different from what we would think of as substantive engagement in educational processes. Hence, this view changes the framing of meaningful/engaging learning. The idea of engagement might also include engaging directly with employers, such as through apprenticeships or companies designing coursework (Emerge Education and University Ventures specifically highlight this approach).

5.7 Discourse on higher education and EdTech

Investors often share data from studies conducted by investment banks or global management consulting firms. In particular, the Korn Ferry study is cited by several investors, which claims that there will be a global human talent shortage of over 85 million people by 2030, costing $8.5 trillion in unrealised annual revenues. This is provided as the reason why investors focus on digital products targeting the skills gap and up-/re-skilling human capital. Other cited data include: the increasing number of HE students in future, which investors argue is evidence of why current HE institutions can not handle the expected demand; the size of student debt as an argument for cheaper and more accessible HE systems; and the amount of money spent on HE globally, which is presented as an argument for why HE is a good investment opportunity.

[46] 2023 Owl Ventures Education Outcome Report: https://view.genial.ly/6525982780798f0011437cde

5.7.1 Education more broadly

Investors embrace the view that education allows people to fulfil their potential and flourish, enables social mobility, and supports development. Investors state that demand for education has increased in the innovation economy. They frame education as a lifelong learning activity (from 'pre-K to gray' as GSV Ventures puts it). With changes in technology and a future of work where automation is predicted to demand new skills, investors predict will be a severe need for upskilling and reskilling of the workforce.

Concerning HE specifically, the investors draw attention to student demands in relation to two key areas: career readiness/preparation for the workforce and positive student experience. Students' expectations as identified by academic research, such as critical engagement with knowledge and in-person, holistic experiences of diversity and exposure to new ideas, different views, and cultures, were not mentioned in the analysed documents or by our participants. Investor discourse, therefore, highlights the importance of education in our societies but frames the aims of EdTech in very specific ways.

5.7.2 Current state of higher education

Investors' discourse paints a bleak picture of the current HE system and focuses on three key messages. The first is financial: universities are said to be too costly. Moreover, investor discourse suggests the costs are rising and that universities cannot continue profitably on their current path. Investors recognise that students are indebted; they question if students get value for money in attending university, and they state that universities do not want to measure the value they add due to risking reputational damage.

The second argument is that university education is inefficient and has not changed in hundreds of years. As a result, it is not fit for purpose in the contemporary world, in terms of both content and how learning is organised, and that it is not aligned with the industry needs. Current HE education is perceived as not responding to new employability expectations, especially with the rapid digitalisation of our societies and economies. University Ventures even claims that HE is not only poorly equipped to prepare students for the workforce and is a gatekeeper for elites, but that it is the root of the political

divide in the USA. They also claim mass HE is a moment in history (created by baby boomers with a negative impact on the economy) and that it needs to be replaced with competency-based education. Emerge Education states that current education cannot cope with the growing demand for new skills and training and that traditional HE practices work for a small and homogeneous group of people.

And finally, the third theme is a message of opportunity and recognition that some universities have started digitising and aligning more strongly with employers' expectations. For example, universities increasingly see alternative and micro-credentials as important strategies for their future, which are said to make learning and skills accessible and affordable. In the context of the USA, it is said that while overall college enrolment is declining, the growth of online universities has accelerated, and traditional students are increasingly engaging as universities develop online courses.

These critiques of HE create opportunities for change, making investment attractive. Our participants explained:

> *[E]ver since we started [Investment company], one of the core areas that we have focused on has been education also because we saw how education was about to be disrupted by technology. It was one of the last industries globally to be kind of outdated and really the same that it used to be for the last century. And so that created a lot of opportunities. Clearly, we saw the first wave in the early 2000s with several EdTech companies, and then I think since 2013, '14, really since the birth of the MOOCs and Coursera's rise, we started to see this new wave of disruptive EdTech companies that got accelerated post-Covid. And you know we are one of a few EdTech investors, but at the same time, I think in the last four or five years, you saw a lot of the generalist VCs starting to be much more active in EdTech and having a real focus on that sector. (Interview I04P01).*

> *So, any market which is in transition is, from an investment perspective, always interesting because transition and change obviously create opportunity. (Interview I08P01).*

Ideas about the future of HE are important in the discoursive framing of investment opportunities; however, these opportunities need to be imagined and enacted.

5.7.3 Future of higher education

Talk about the future of HE indicates a deinstitutionalisation of HE insofar as degrees and formal university education are predicted to change and to be usurped by LLL in the form of continuous and constant on-the-job training and personal development. Work and learning are said to be connected in human capital development with the expansion of a 'learn on the gig' workforce. Ibis Capital states that by 2028, half of the global workforce will be made up of freelancers who will obtain skills on-demand or just-in-time skills. Investors argue that this will not only benefit the knowledge economy but also be better suited to the life plans of Millennials and Gen Z. LLL, delivered at lower prices and via shorter courses with content tied to professions, is said to democratise professional development. This way of organising LLL would be unbundled, faster, cheaper, and relevant. Hiring is also included in the human capital development that EdTech is predicted to support, with a focus on competency models and a less subjective hiring process.

In this imagined future, EdTech is framed as replacing existing institutions, at least at the post-secondary level. For example, online first pedagogy will be normalised for all, and universities will be replaced by online platforms or institutions like Arizona State University or Southern New Hampshire University[47]. What will differentiate these companies are the following elements, as explained by Brighteye Ventures:

> *"price (largely depending on both the amount of personalisation available and the pricing model), duration (whether short, intensive, bootcamp-style or an annual recurring subscription), method of delivery (whether asynchronous and on-demand or synchronous and live), content focus (whether content-driven or*

[47] GSV Ventures: https://medium.com/gsv-ventures/dawn-of-the-age-of-digital-learning-4c4e38784226

focused on relationships and mentorship), degree of accreditation (degree of formality around certification and accreditation) and of course whether providers focus on specific roles or broad topics"[48].

Despite the above, some investors recognised that the in-person experience will remain valuable for some students in the future. Those who can afford it will go to the traditional university, while others will go for abbreviated or online courses. This may increase the segregation of the HE sector by strengthening a few of the most reputable universities serving the social reproduction of elites while others either transform into delivering a different kind of online and hybrid learning experiences or close down. Brighteye Ventures also suggests menu pricing for universities:

"With this renewed flexibility, there's a strengthening case for universities to begin 'menu pricing', assuming the equivalence of qualifications awarded at the end of the course. Variables could include course length, whether provision is remote or in-person, access to full lectures, seminars and content vs. reduced access, type of assessment and a host of other options. It could reap significant rewards for universities: they might be able to expand the size of their cohorts and broaden their income base. Prices would reflect the student experience in each circumstance"[49].

Emerge Education proposes tech-enabled revenue diversification as the greatest opportunity for universities to grow income. In a report published with Jisc on revenue diversification, one of the key suggested strategies is online learning:

The future of revenue diversification will be characterised by a shift from the commercialisation of physical assets to new online offerings. So far, revenue diversification efforts have typically focused on the commercialisation of physical assets such as student accommodation, labs and technology for industrial

[48] Brighteye Ventures: https://brighteyefund.medium.com/the-unbundling-of-professional-learning-and-entrepreneurship-education-dd79623cbeb5

[49] Brighteye Ventures: https://medium.com/brighteye-ventures/ill-have-the-3-year-course-please-1e3afcee95bc

> *demand, conferences, and catering operations. … On the other hand, technology-enabled revenue diversification presents significant opportunities for growth, as demonstrated in the US where enrolment on online courses has more than quadrupled in the last 15 years… (Emerge Education and Jisc, 2021, p.12).*[50]

The report offers six suggestions for diversifying revenue through new technology: online degrees; immersive workforce-ready professional programmes; alternative digital credentials; education brokering from employers; commercialising IP for other institutions; and investing in high-risk strategic opportunities.

The role of the teacher is also predicted by investors to change in the future. Teachers are predicted to be more like coaches or motivators who facilitate learning rather than disseminating knowledge. Information exchange will increasingly occur outside of the classroom. Teachers at HE institutions are predicted to become more responsive to the labour market and student needs. Ibis Capital states:

> *"In this new world, the new teachers may take two forms. One could be software mobile companions or "bots" helping and encouraging humans to constantly upskill and earn Nano degrees in a race against accelerated skills obsolescence and job displacement. Another role could be the one of a "brain farmer", moving away from managing and transmitting knowledge to using the fields of learning science to seed motivation for learning and creativity. One thing is sure: education will change in the next 10 years much more than it has in the previous 2000 years!"51.*

This discourse on HE is relevant for Western English-speaking countries (UK, USA, Australia), which have already marketised their HE systems and are looking to expand their technology industries. However, it may be less

[50] Emerge Education and Jisc (2021). The future of revenue diversification in higher education: https://www.jisc.ac.uk/reports/the-future-of-revenue-diversification-in-higher-education

[51] Ibis Capital: https://www.linkedin.com/pulse/future-learning-age-artificial-intelligence-vedrenne-cloquet/

applicable to other systems, such as public HE systems (e.g. in Europe) or HE systems in the Global South. At least, this is the case for the part of the discourse that addresses universities (B2B models). Perhaps individuals will be targeted in D2C models, and some parallel systems to institutionalise HE will be developed. However, the relation between D2C and B2B products will most likely differ substantially in these contexts.

Finally, the future of HE is seen not only as focused on LLL and delivering just-in-time skills via digital means but also as involving growth in EdTech platforms, focusing on mentorship, networking, coaching, and connecting communities. Indeed, B2C markets that offer these services are said to have significant potential in future. As such, the framing of HE mirrors that of other sectors (such as health and medicine). On the one hand, investors need to signal that the sector is 'valuable' to consumers because this is why they are willing to pay for it. On the other hand, investors must communicate that the sector is 'failing' consumers because this is why the companies they invest in are valuable actors who can change the status quo.

5.7.4 Comparing EdTech to other sectors

EdTech is more broadly embedded in the digital economy, so unsurprisingly, we notice spillover ideas from other economic sectors. Comparisons of education to other sectors are particularly telling because they indicate the imagined path of digitalisation.

Media is often compared to education in terms of future digitalisation trends. For example, Ibis Capital states:

> *"As we witnessed the digitisation of the media industry via the profusion of new content, audience fragmentation, data centricity and the convergence between content and platform players, so will they impact the education in market, leading to a raft of opportunities for innovators in EdTech"*[52].

[52] Ibis Capital: https://hottopics.ht/14731/what-is-edtech-and-why-is-it-important/

Notably, Ibis Capital only highlights particular common trends and acknowledges that education is different and has its specific characteristics, mainly in relation to the slower pace of change and more regulation.

GSV Ventures compares education to music streaming platforms where students can create

> *"an undergraduate playlist rather than having to consume all of one's education from one 'label' (university) to listen to its 'captive artists' (professors), and instead be able to pick and choose from every academic course and instructor available in the world"*[53].

GSV proposes merging education and entertainment and relies heavily on 'gamification' and the attention economy[54]. Part of this is invisible learning through video games like Fortnite as an opportunity for expanding EdTech investment[55]. GSV argues that accreditation of a single university will no longer be important compared to an individual instructor and course content provided at scale. Furthermore, lifetime loyalty and 'return on education' in EdTech are akin to the strategies of Uber and Spotify. GSV also compares education to e-commerce in terms of digitalisation paths as a basis for predicting the pace and direction of HE digitalisation.

Brighteye Ventures understands EdTech to align with the tech industry more broadly:

> *"Post-COVID, we expect production standards to follow those in the wider tech market more closely. We also believe that a new crop of entrepreneurs will spawn from some of the frictions and frustrations experienced with existing platforms during our mass-distance-learning experiment, so we're hoping for plenty more*

[53] GSV Ventures: https://medium.com/gsv-ventures/dawn-of-the-age-of-digital-learning-4c4e38784226

[54] GSV Ventures: https://medium.com/gsv-ventures/hellosaurus-hollywood-meets-harvard-for-kids-4098683486a9

[55] GSV Ventures: https://medium.com/gsv-ventures/dawn-of-the-age-of-digital-learning-4c4e38784226

prospects to come on the scene in the coming months and years"56.

Finally, University Ventures imagines competency classification to be the new infrastructure for EdTech:

"Competency Based Education (CBE) is the new operating system for higher education; we're just awaiting the apps. As with smartphones – the development of iOS and Android were necessary, but not sufficient for adoption. Innovative and useful apps drove massive demand. We expect to see the same in higher education as new CBE-based apps reveal the true utility of CBE and usher in a Golden Age of American Education"57.

University Ventures further elaborates on how employers desire greater insights into peoples' competencies, skills and behaviours (clickable credentials); insights that may be more informative than a degree or other paper-based qualification.

These comparisons suggest that EdTech will mostly target consumers directly with intermediary platforms to connect learners to skill development. It follows that LLL via EdTech will become a personal investment. In this case, we can expect that, on the one hand, EdTech will compete with the entertainment industry for attention, and on the other hand, it will frame the potential benefit in terms of better employment opportunities and improving personal well-being and personal growth.

5.8 Digital data

From the perspective of investors, the key trends in EdTech include: (1) developing data-rich operations, especially using AI, ML, and natural language processing; and (2) technology-supported experiences such as virtual or augmented reality.

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[56] Brighteye Ventures: https://techcrunch.com/2020/10/15/brighteye-ventures-interview/

[57] University Ventures: https://techcrunch.com/2016/04/18/the-new-push-toward-competency-based-education/

5.8.1 Data-rich operations

A few investors address digital user data in their documents. Some state that data is important in their investment considerations (e.g. Learn Capital and Bisk Ventures position data as the main pillar of their investment strategy). IBIS Captial explicitly mentions that learning science is relevant for EdTech innovation and should be included in EdTech innovation and utilise user data[58]. University Ventures sees data on individual competencies as valuable for connecting educators, learners, workers, and employers. Nesta proposes that data on behavioural insights can foster learning design, and Emerge Education recognises the importance of data, although it feels that it is still searching for ways to make it valuable. One imagined pathway is for HE institutions to turn student data into future assets in their search for revenue diversification.

Owl Ventures states that transformative education companies that produce and analyse a lot of data are most likely to become unicorns (companies valued at more than $1 B). Owl talks about collecting and analysing data on excluded population segments in order to serve them better by understanding customer profiles and reporting that they are serving communities and, consequently, the greater social good.

We were also interested in how investors understood the value of user data more concretely. Our participants told us that they have not seen examples of big data aggregation in B2B models in education[59] (e.g. 'there is not yet such a thing as the Google of education'), and they have not heard other investors talking about it. They reasoned that this is likely due to privacy regulations. They also mentioned reputation being important in education, so companies must be careful in operating with user data to avoid public backlash.

Participants nevertheless had concrete ideas about the value of data in cases where they had already invested or planned to invest. They felt user data had the greatest potential in: (1) adaptive and personalised learning or learning support services (e.g. displaying content to students based on their ability); (2)

[58] For example, Ibis Capital: https://medium.com/edtechx360/eternally-learning-2018-edtechxeurope-opening-keynote-recap-9e9d84e29f49

[59] In B2C models, data aggregation is not the issue as the platform is data controller, and users have to comply with terms of reference if they want to use the service.

analytics for tutors (e.g. identifying students who are not active or giving real-time feedback in synchronous class interaction); (3) and increasing institutional efficiencies, e.g. (management information system providing data analysis for decision making). Some participants gave examples of their investments in these areas. However, data must be put to work or somehow processed and used to be made valuable, as one participant explained:

> *So, does ownership of the data create value on its own? Not unless you're executing it. Not unless it gives you a competitive advantage in a market that's large enough and going to remunerate the company. The data itself doesn't operate in a vacuum, it's only valuable if it's a doorway to an opportunity. (Interview I02P01).*

A small number of investors held opinions on the potential of data impact in the future that wer more profound and which go beyond basic feedback loops. One such idea is to use data to track students, especially in online programmes, in order to automate learning processes and communication. This would then enable AI-driven predictive analytics:

> *But then predictive, the predictive engine that you can build out of that that says, this is the trajectory of the student and this is how you can keep them on track to achieve the following. You know, that's an amazingly valuable thing. So can you separate that data from the student and can you separate that data from the company that's produced it and to say, here is raw data? Yes you can create a predictive engine that says, if you have the following characteristics and if your [institution] isn't doing the following things and if you, you know, then you'll achieve Y and you're on a pathway to becoming a doctor or you're not on the pathway to becoming a doctor. And you really, so it's going to be incredibly helpful in terms of things like career counselling and advising students on what they can and should be doing. (Interview I02P01).*

Another idea was to use data for more profound analyses of learning and pedagogy; however, the impact on education is only seen over a long period of time, and perhaps VC investment is not most suited for this kind of work.

5.8.2 Artificial intelligence

Investors see significant potential for AI to have an impact on education. Indeed, some participants argued it is already useful in applications such as adaptive learning:

> *… then you've got adaptive learning and AI, and how do you increase the efficiency of learning through adaptive learning and the use of AI by collecting lots and lots of user data. So that becomes more and more valuable because the more user data you have, the more effective the AI is in sending you the right questions and tailoring, kind of like precision medicine, precision education. (Interview I03P01).*

Most of our investors spoke about the positive potential of AI. Duolingo is sometimes given as an example of a successful use of AI in education, and it is said to productively combine personalisation and gamification, which are seen as key trends in the future of education.

Other investors were more sceptical and recognised the limits of AI. They argued that it might be useful in situations with structured learning, for processing large amounts of text or in more structured content or subjects, but not in more open-ended disciplines. This is similar to what we heard from EdTech companies. For example, one participant stated:

> *I think artificial intelligence and machine learning are based on larger and larger data sets, there's areas where that has a lot of promise. For example, things like Math or other things like that ... Probably I would say it's a lot tougher in all the subjects that are going to be more subjective or require-*
>
> *I: Social Sciences?*

> *A: Right, and I think that's the case with AI and machine learning, generally, is that its interactions dealing with more quantitative things are going to be better. At least initially, they're going to be better than they are with more judgement based things that just doesn't quite, you know, it doesn't quite do quite as well right now. And who knows, like as the technology, and I'm not a technology person, so I know that sort of one of the underlying, like the idealised version of AI it's going to continue to get better at those things with large data sets, with more interactions. But I think it's right that it probably lags. (I06P01).*

Overall, we identified a significant push in favour of AI in education amongst our investors. However, investors are less clear on how AI will work exactly, in what kind of learning situations it can be valuable, and when the use of AI is and is not appropriate and desirable.

Since our data collection and analysis in early 2022, attention towards AI has advanced in EdTech and HE, at least discursively. Some investors have developed a specific focus on AI, such as Reach Capital's AI learning catalyst[60]. Investors' work in relation to developments in AI after our data collection concluded is not included in this report.

5.9 Investors activities

Investors are key actors in the EdTech industry who, by making investments, shape decisions about which products will be developed and implemented. However, as mentioned before, they also perform other discursive, cultural, and political work. Here, we review their investment decision-making and survey their activities beyond investment.

5.9.1 Investment

EdTech specialist investors position themselves as 'smart capital' with dedicated teams. They often argue that their teams are devoted to the learning/education industry, which allows them to support founders with sector-specific knowledge, insights from experience, networks with thought leaders

[60] https://www.reachcapital.com/ai-learning-catalyst/

and other founders, and more. Because competition between investors for the most prominent investment opportunities in EdTech has increased, they argue that their specific focus is beneficial to founders as opposed to generalist investors.

Specialist investors, especially VC, provide many resources for founders in relation to EdTech market trends, areas of investment interest, and investment logic, including how to prepare the pitch deck with all relevant metrics and evidence, how to set the objectives and targets, how to set the price of service, and so on. Moreover, they organise learning spaces, such as the product-market fit academy by Emerge Education[61] or Brighteye Ventures's VC email course[62]. They also provide active feedback; for example, Brighteye Ventures offers feedback to questions via its Office Hours activity[63].

Through this work of providing resources, expertise, time, and more, specialist EdTech investors contribute to market making. Since EdTech, as we know it today, is a relatively young industry, investors aim to attract more entrepreneurs and more people to enter the EdTech industry. Some of our participants spoke about appreciating teachers becoming entrepreneurs as they have practical experience in the field and need support from the business side. However, other participants said this was not ideal as people then work based on their personal experience instead of researching the market properly. They would prefer experienced entrepreneurs, ideally coming from other sectors and having technology experience, or those who have previously founded and successfully exited EdTech businesses. This way, they could transfer the knowledge from their experience and other sectors. Either way, investors oil the wheels of the market through the information, support, and resources they provide and by sustaining communities for entrepreneurs who have already founded a company. Thus, they cater to those who are preparing to found an EdTech startup for the first time and those who have already found one.

Some investors also provide case study analyses of companies they determine to be successful and draw lessons from these companies. These are used to

[61] https://pmf.academy/

[62] https://www.brighteyevc.com/vc-email-course

[63]https://www.brighteyevc.com/office-hours

teach entrepreneurs about particular business decisions and strategies. While this might be useful, it might also contribute to the homogenisation of business models in EdTech.

Considering investment and valuing a company is a complex task. Our participants explained that they consider typical economic indicators: discounted cash flows, the growth rate of business, user peer group analysis, value to client, competition, value proposition, and customer acquisition cost. In addition, they consider the founding team and form an opinion on whether the team is fit to deliver the promised aims. Many specialist investors also require a theory of change and evidence of impact. Finally, some might look at technology capability and how technology can deliver value.

After the investment decision is made, investors sit on the boards of start-ups and support their portfolio companies in many ways. As board members, they engage with strategic direction and other high-level work, as one participant explained:

> *Yes, so we normally sit on the board to support the company strategically. We engage with the management team, the CEO in terms of the strategic direction of the company, funding options, and obviously all the basic kinds of accountability around performance. You know, are you doing what you said you would do? But also just bringing in our [experience], what we're hearing from where we sit in the market in terms of market intelligence and being helpful in terms of networks, things like that. (Interview I03P01).*

Since several investors may sit on the same board, there might be differences in their views. This participant provided the following explanation in relation to managing tensions between different investors:

> *It can be about cash often and kind of balancing how much cash should we be spending on growth and how much cash, particularly now, how much cash should we be preserving for a long runway so we don't have to go out to the market again. But it can also be, is now the right time to be making acquisitions or not. Is now the*

right time to be spending a lot on marketing or recruiting. So those kind of decisions. But the most important are the strategic direction decisions. (Interview I03P01).

Another participant explained their work on start-up boards and the challenge of managing potential tensions, particularly in relation to the different approaches EdTech specialist investors and generalist investors:

We're very active investors, we do seed and series A primarily. I do take forward seeds and so I'm on [number] boards right now, [I am] super active. But again, since we come in early, we're really with the entreprenuer as a thought partner alongside them. We'll do a lot of work around the initial strategy, go to market, where shall we focus. And we do a lot on hiring. So I'll help source candidates, but also interview candidates, to make sure they're the right fit for the company. Obviously we do the typical board stuff but, yes it's strategy, it's hiring, some board governance and then helping them manage the budget and things like that. Yes, sometimes there's tension. I would say sometimes when you have a mix of different types of investors with different types of expectations, and so sometimes you have a generalist who wants growth at all cost, versus you know, I may come in and say, I want to make sure we reach this population from an impact standpoint. So I think that [?] tension [with founders], that's where we make sure that from the beginning, when we get to know the entrepreneur, that we're aligned with the entrepreneur and things like that. But as long as we're all kind of going towards the north star, we can be flexible on how we get there. (I05P01).

Some participants gave us concrete examples of how their board profoundly impacted the direction of EdTech products and services. Due to confidentiality, we cannot share these examples. But we can point to examples in case studies, such as that of the investor Accel discussing its investment in SplashLearn:

One of the first things Accel does when we invest in a company is to look at the team heads — if the startup has the right product head, design head, and engineering head. That was sorted with

SplashLearn. The second aspect we focus on is the go-to market side. When we became the company's first institutional investors in late 2017, SplashLearn had one distribution channel — the app store where parents could pay for and download the app from.

Then they had an enterprise vertical where they were selling software to teachers — which was bringing in around $1.5 million in revenue.

However, as we discussed further, we realized that this approach wasn't scalable. We suggested that they shut down the enterprise vertical (despite the revenue) and provide the software for free for the teachers. The idea was twofold:

- *Selling to schools was more challenging, so if we provided this software for free to the teachers, it would become another distribution channel for us to get more parents.*
- *Second was that, the enterprise vertical did not seem scalable while this approach could possibly scale much faster*

It was a difficult decision for Arpit, but I knew that he would weigh it carefully. He is a very mathematical and analytical person by nature, and needs to picture the equation and have it make sense for him. It did, and so that helped him take the decision of shelving the enterprise vertical entirely. (Accel website[64]).

Contributing to strategy, coordinating with other investors, and negotiating with the founders makes the match between investors and companies highly consequential. It is not only a question of investors choosing where they will invest, but also of founders choosing their investors. Founders have increasing leverage the more attractive their company becomes for investment, to the point where there can be significant competition between investors.

64 https://www.accel.com/noteworthy/how-to-build-a-profitable-edtech-startup-from-day-1-the-splashlearn-story

5.9.2 Beyond investment

EdTech specialist investors do much more than simply invest in companies and provide relevant resources and support. They also organise events and summits; publish reports, studies and market maps; issue newsletters; publish detailed recommendations and advice to entrepreneurs, HE institutions and policymakers; publish opinions and predictions; publish content on social media or podcast platforms; organise start-up competitions; promote their portfolio companies; organise networking events; publish various rankings, and more.

Across this volume and diversity of activities and outputs, some are particularly notable. One is Brighteye Ventures's collaboration with Dealroom in creating an information and database platform65 on the EdTech industry, its actors, deals, etc. The database offers updated insights and can act as a market-making device and information tool to support market transparency and market ordering.

Ibis Capital established the EdTechX event series a decade ago, starting in the UK and quickly expanding to regional events hosted in various countries around the world. EdTechX was the first to bring together investors and entrepreneurs in Europe at such a scale. The event series normalises the EdTech industry and creates opportunities for entrepreneurs and investors as part of the education space. It also attracts policymakers and researchers. While it is not as prominent as GSV's education summit in the USA 66 , which attracts celebrities and high-profile politicians, it was nevertheless crucial in expanding investment in EdTech in Europe and beyond.

The list of these activities is impressive and proves that EdTech-specific investors are critically important actors in the HE space, including in policy. Investors create markets, order markets (, and capitalise markets with their investments. They imagine a particular future for education and work towards materialising that future.

[65] https://edtech.dealroom.co

[66] https://www.asugsvsummit.com/about-the-summit

6. Appendix: project structure and outputs

6.1 Project's structure

The 'Universities and Unicorns: building digital assets in the higher education industry' (UU) project was structured as follows.

The **Core Research Team** consisted of the following members:

- Principal Investigator: Dr Janja Komljenovic, Senior Lecturer, Lancaster University, UK
- Co-Investigator: Professor Kean Birch, York University, Canada
- Co-Investigator: Professor Sam Seallar, University of South Australia
- Research Associate: Dr Morten Hansen, King's College London, UK

The **Academic Advisory Board** was organised to support the Research Team in theoretical development and academic feedback. It consisted of the following members:

- Dr Charlie Eaton (University of California Merced, USA, economic sociology)
- Emeritus Professor Bob Lingard (University of Queensland, Australia, HE studies)
- Professor Noortje Marres (Warwick University, UK, digital sociology)
- Professor Ka Ho Mok (Lingnan University, Hong Kong, HE studies)
- Professor Fabian Muniesa (École des Mines de Paris, France, STS)
- Dr Juan Pablo Pardo-Guerra (University of California San Diego, USA, economic sociology and STS)
- Professor Susan Robertson, the University of Cambridge, UK
- Dr Ben Williamson, the University of Edinburgh, UK

The **Stakeholder Forum** was organised to participate in data interpretation, offer empirical feedback on project findings, and support the team in empirical and conceptual work. It consisted of the following members:

- Dr Alex Bols, GuildHE
- Rob Copeland, University and College Union
- Christopher Hale, previously Universities UK
- Charlie Leyland, Office for Students
- Professor Lawrie Phipps, Jisc
- Svenia Busson, CEO of LearnSpace, France
- Enrico Poli, Zanichelli Venture, Italy
- Mihaela Tabacaru, JA Norway, Norway

6.2 Project's outputs

Reports

Phase 1 of the project consisted of quantitative database analysis, accompanied by a qualitative discoursive analysis, and resulted in four reports:

- Emerging Edtech Trends in the Higher Education Sector: Executive summary (Report 1 of 4)
- Mapping Emerging Edtech Trends in the Higher Education Sector: Companies, Investment Deals & Investors (Report 2 of 4)
- A critical analysis of investors' logic in business discourse (Report 3 of 4)
- Methodological Handbook for Phase 1 (Report 4 of 4)

All can are freely accessible at: Komljenovic, J., Birch, K., & Sellar, S. (2023). Analysis of the Edtech Industry and Edtech Investment in Higher Education. Zenodo. https://doi.org/10.5281/zenodo.10092315

Peer-reviewed articles and book chapters

At the time of publishing this report, we have already published the following academic outputs:

1. Komljenovic, J., Sellar, S., Birch, K. and Hansen, M. (2024). Assetization of higher education's digital disruption. In: Williamson, B., Komljenovic, J., Gulson, K. (Eds) World Yearbook of Education 2024: Digitalization of Education in the Era of Algorithms, Automation, and Artificial Intelligence. London: Routledge.

2. Komljenovic, J., Williamson, B., Eynon, R., & Davies, H. C. (2023). When public policy 'fails' and venture capital 'saves' education: Edtech investors as economic and political actors. Globalisation, Societies and Education. Advance online publication.

3. Hansen, M., and Komljenovic, J. (2022). Automating learning situations: Techno-commercial logic of assetisation. Postdigital Science and Education, 5(1), 100-116. https://doi.org/10.1007/s42438-022-00359-4.

4. Williamson, B., & Komljenovic, J. (2023). Investing in imagined digital futures: the techno-financial 'futuring' of edtech investors in higher education. Critical Studies in Education, 64(3), 234-249. https://doi.org/10.1080/17508487.2022.2081587

5. Komljenovic, J. (2022). Where is Value in Digital Higher Education: From Commodities to Assets. International higher education, 111, 9-11. https://ejournals.bc.edu/index.php/ihe/article/view/15323

In addition, three articles are in peer review at the moment of writing; and we are working on a Special Issue for the Learning, Media and Technology journal that will be published in early 2025.

We plan to publish more articles on key insights from the project during 2024 and 2025. We invite the readers to follow our outputs.

Animations

At the end of the project, we have prepared and published three animations to disseminate some of the project results. Please find them on YouTube or Zenodo:

- Komljenovic, J., Birch, K., & Sellar, S. (2023, November 9). What are the key tensions in educational technology (Edtech)?. Zenodo. https://doi.org/10.5281/zenodo.10092117. Also available on YouTube.
- Komljenovic, J., Birch, K., & Sellar, S. (2023, November 9). How can higher education stakeholders support Edtech?. Zenodo. https://doi.org/10.5281/zenodo.10092216. Also available on YouTube.
- Komljenovic, J., Birch, K., & Sellar, S. (2023, November 9). What are assets, and why do they matter?. Zenodo. https://doi.org/10.5281/zenodo.10092061. Also available on YouTube.

Policy recommendations

At the end of the project, we have proposed principles for HE stakeholders to discuss and consider:

Komljenovic, J., Birch, K., & Sellar, S. (2023). Strengthening EdTech in Higher Education: Policy Recommendations and Principles 1.0. Zenodo. https://doi.org/10.5281/zenodo.10092259

Talks

During the project, we gave 35 talks to international audiences. We continue to deliver talks and workshops about the project results; however, here we report on talks during the project:

- 10.6.2023. Boston College, USA: Panel presentation and discussion: Existential threats to higher education around the world. (Komljenovic)
- 14.4.2023. University of Bristol, UK: Digital asset-making in the global higher education sector. (Komljenovic)

- 12.4.2023. British Sociological Association annual conference, Manchester, UK: Panel discussion ‘Thinking Sociologically About Educational Technology: Giving Voice to Future Action’. (Komljenovic)

- 22.2.2023. Comparative and international education society (CIES) annual conference: Assetization of digital disruption in higher education. (Komljenovic).

- 2022. Research Platform: Governance of Digital PracticesLecture Series, University of Vienna, Austria. There are no markets anymore: From neoliberalism to Big Tech (Birch)

- 2022. Accounting & Finance Research Workshop, University of Waterloo, Canada. Assetization as a mode of governance (Birch)

- 2022 Keynote talk at Digitalizing Welfare, Outsourcing Responsibility Conference, IT University of Copenhagen, Denmark. The strange futures of digital assetization (Birch)

- 2022 Malmo University Symposium, Sweden. Assetization as a mode of governance (Birch)

- 11.-13.10.2022 Malmo University, Sweden: Research symposium on assetization (invitation only). The (im)possibility of digital disruption of higher education (Komljenovic)

- 29.9.2022. Center for Higher Education at TU Dortmund, Germany: Summer School in Higher Education Research and Science Studies (HERSS). Workshop 5: Digital higher education: platformization, privatisation and a new governance model (Komljenovic)

- 26.9.2022. Policy Futures International Webinar Series, Danish School of Education, Aarhus University. The (im)possibility of digital disruption of higher education (Komljenovic)

- 7.7.2022. European Association for the Study of Science and Technology (EASST) annual conference. Emerging Big EdTech: disrupting education and assetising learning. (Komljenovic).

- 5.7.2022, Higher Education Close-Up (HECU) conference Keynote talk. Lancaster University. Higher education industry expansion: commodification versus assetisation (Komljenovic)

- 24.6.2022. NORRAG (Network for International Policies and Cooperation in Education and Training) and the United Nations Special Rapporteur on the Right to Education hosted by the United Nations High Commissioner for Human Rights (OHCHR) organised an online side event to the Human Rights Council on 24 June 2022. Contribution on assetisation in digital higher education (Komljenovic)

- 2021 Department of Science & Technology Studies, University of Vienna, Austria. Assetization as a techno-economic mode of governance: Unpacking the transformation of digital data into an asset (Birch)

- 2021 Department of Sociology & Anthropology, Concordia University, Canada. Venture capital as a mode of valuation: Stories, hi-tech financing, and a reflexive turn in 'expectations studies' (Birch)

- 2021 Platform Economy Research Network, The New York, USA. Technoscientific capitalism and rentiership (Birch)

- 2021 Trajectories of Big Data Platforms Workshop, University of Edinburgh, UK. Data as asset (Birch)

- 9.12.2021. Society for Research into Higher Education (SRHE) annual conference. Universities and unicorns: how are (education) technology companies making digital data valuable. (Hansen).

- 9.12.2021. Society for Research into Higher Education (SRHE) annual conference. Universities and Unicorns: Mapping Financial Investment Flows in Higher Education Technology. (Komljenovic).

- 9.12.2021. Society for Research into Higher Education (SRHE) annual conference. Universities and Unicorns: Investigating the Digital Transformation of Higher Education in the UK. (Sellar).

- 9.12.2021. Society for Research into Higher Education (SRHE) annual conference. Universities and ‘Unicorns’: A Critical Analysis of Investors’ Discourse of the Rise of Educational Technologies Within the COVID-19 Pandemic Context. (Mármol Queraltó).

- 24.11.2021. University of South Africa, Academic Development Open Virtual Hub (ADOVH). Digital technology in higher education: platformization, privatisation and new governance models (Komljenovic)

- 19.11.2021. Infoclio, Swiss Academy of Humanities and Social Sciences, Bern, Switzerland. Digital higher education: platformisation, privatisation and new governance models (Komljenovic).

    - Centre for Research into Information, Surveillance and Privacy (CRISP), University of Stirling. Digital rentiership in higher education: the future of personal data governance (Komljenovic).

- 24.9.2021. Centre for Higher Education Futures (Aarhus University) and Critical Higher Education research group (University of Cambridge). The digital: new wave of privatisation of universities (Komljenovic).

- 29.6.2021. Bristol Conversations seminar series, University of Bristol. Universities and unicorns: mappings and trends of investments in higher education technology (Komljenovic and Sellar).

- 22.6.2021. Research seminar, Lancaster University. Universities and unicorns: the discursive construction of digital higher education by financial investors (Komljenovic and Mármol Queraltó).

- 17.6.2021. European Sectoral Social Dialogue in Education, ESSDE (European Trade Union Committee for Education, ETUCE, and the European Federation of Education Employers, EFEE). Evidence for the Higher Education Working Group. Digital rentiership in education and what it means for higher education institutions, staff and students (Komljenovic).

- 16.6.2021. Research seminar, University of Edinburgh. Universities and unicorns: the discursive construction of digital higher education by financial investors (Komljenovic and Mármol Queraltó).

- 9.6.2021. Research seminar, University of Durham. Emerging digital rentiership in higher education: digital platforms, digital data and rents (Komljenovic).

- 26.5.2021. National symposia on Learning Analytics in Higher Education. The Centre for the Science of Learning & Technology, University of Bergen, Norway (part of mandate of the national centre for Learning Analytics). Title: Emerging education rentiership: digital platforms, digital data and rents (Komljenovic).

- 23.4.2021. Ideas Lab seminar series, University of Cambridge. Digital rentiership and assetisation in higher education (Komljenovic).

- 30.3.2021. Universities of Agder (Norway), Aarhus (Denmark) and KTH Royal Institute of Technology (Sweden). Talk at the event: Understanding Digital Transformations of Higher Education Teaching and Learning in the Nordics and Beyond. Title: Universities and unicorns: building digital assets in the higher education industry (Komljenovic and Sellar).

- 3.2.2021. Seminar at the Centre of Education and Policy Analysis (CEPA), Liverpool Hope University. Universities and unicorns: building digital assets in the higher education industry (Sellar and Komljenovic).

Dataset

Data was sent to the UK repository:

Komljenovic, Janja and Sellar, Sam and Hansen, Morten (2023). *Edtech in Higher Education: Focus Groups, Database, and Documents on Edtech Companies, Investors and Universities, 2021-2023.* [Data Collection]. Colchester, Essex: UK Data Service. 10.5255/UKDA-SN-856729