

# FROM BRICKS TO CLICKS

THE POTENTIAL OF DATA AND  
ANALYTICS IN HIGHER EDUCATION

THE VOLUME, VELOCITY AND VARIETY OF DATA WE ARE GENERATING IS RAPIDLY INCREASING. WE CREATE DATA ON ALMOST ALL ASPECTS OF OUR LIVES, WHICH CAN BE HARNESSSED AND ANALYSED TO PROVIDE POWERFUL INSIGHTS INTO OUR BEHAVIOUR, OUR PREFERENCES AND OUR FUTURE ACTIONS.

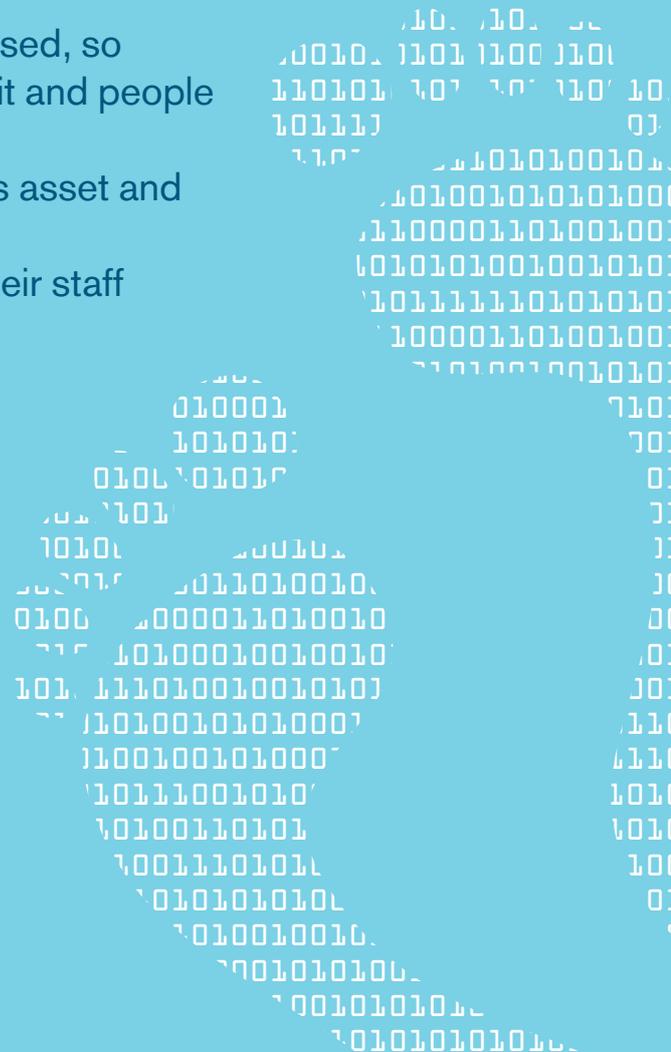
IN HIGHER EDUCATION STUDENTS ARE LEAVING A DATA FOOTPRINT BEHIND IN THE COURSE OF THEIR STUDY, WHICH TELLS US ABOUT THEIR LEARNING AND EXPERIENCES AT UNIVERSITY. UNIVERSITIES CAN USE THIS DATA TO UNDERSTAND HOW STUDENTS LEARN AND OPTIMISE THE STUDENT EXPERIENCE AT UNIVERSITY. THIS IS CALLED LEARNING ANALYTICS.

**Learning analytics** has the potential to be enormously powerful for improving the student experience of university. To ensure students get maximum benefit from analytics, universities should use analytics systems that are:

- Designed in **consultation** with students
- Supported by an **ethical** framework or policy
- Driven by the improvement of learning and teaching processes and student engagement
- **Tailored** to the particular needs of each institution
- Embedded in an institution's **strategic** plan

**Good data management** is essential for higher education institutions looking to support their students in a data-driven world. This involves:

- Allocating one person or area **ownership** and **leadership** of data management
- Ensuring the data is **accurate** and **consistent**
- Keeping data **secure**
- Ensuring appropriate **access** controls are used, so that people who need the data can access it and people who don't cannot
- Creating a **culture** where data is everyone's asset and everyone's responsibility
- Developing good **data capability** among their staff



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This report follows a ten month inquiry co-chaired by Lord Norton and Sarah Porter.

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# Foreword

Higher Education is at a point of unprecedented uncertainty and change, with fiscal changes that are leading to increasing focus upon a more student (and customer) focused model. There are new entrants into the market place, some of them offering flexible education online, and increasing focus upon international competition and overseas' markets. Our inquiry found that institutions today have to respond to many external pressures in an effective and dynamic way, as well as to better understand – and better meet – the needs of the student body, as both key participant and funder of higher education.

We are all aware of the fast-changing pace of technology and how it has revolutionised most parts of the business world; and equally aware that the higher education system may seem slow to embrace technology's potential for change. We believe that there is often good reason for this; HE is a mature sector which has managed to adapt and develop in order to fit its shifting environmental context over many years. However, we are now faced with both more dramatic impetus to change coupled with the huge potential offered by the digital revolution. This inquiry has found that big data and analytics are trends in technology which are being used to make businesses to have more understanding of their customers and products and so become both more efficient and also able to spot trends and opportunities, and be more innovative.

This report sets out recommendations that emphasise the importance of a strategy for data and analytics that needs to be put in place, and kept up-to-date, by each university. We recommend that institution needs to plan for how it will move forward from where it currently sits, in terms of systems, data and capability, to where it would like to be in the future. Change is needed in order to make this possible – and the will to change needs to come from the leadership at the head of each institution.

There is an essential role for national agencies and bodies, in particular HESA, Jisc and UUK, to play in challenging and supporting institutions to play a part in this new data-informed and dynamic world, and also in providing some of the central tools and services that can help to make the HE system as a whole more efficient and effective. We recommend that national bodies develop a sector-wide strategy for excellent and innovative data management and also that HESA leads a process of rationalising the data collection process across the sector.

The inquiry has found that although HEIs have in place many of the essential building blocks that will enable it to grasp the opportunities offered by data and analytics, the quality of the data that are used to manage an institution and plan for the future may be poor. Institutions should ensure that digital literacy, capability and good data management strategies are an integral part of their strategic plans. We recommend that institutions should immediately review their internal data management approaches and take steps to ensure good quality and management of data.

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It may be difficult for an institutional leader to be informed fully about areas of strength and areas of concern, and to proactively plan ahead for change. We recommend that universities should ensure that the digital agenda is being led at an appropriate and senior level within their institution, and that their staff have the skills necessary to implement that change that is needed.

We found that data and analytics can help institutions to better understand themselves – ‘know thyself’, as the aphorism goes – and having timely, up-to-date and accurate knowledge of their own business is essential to shaping the successful university of the future. There is potential for learning analytics to be used to help institutions to support their students through their educational journey, and we recommend that all institutions should consider introducing an appropriate learning analytics system to improve student support and performance. The inquiry showed, however, that there are important ethical questions around the use of data and analytics and we also recommend that institutions put in place clear ethical policies and codes of practices and seek informed consent from their students to the use of their personal and learning data in analytics.

There are many instances where universities are already sharing data and intelligence to the benefit of the sector as a whole. This experience can be used to further foster high quality teaching through the higher education system and to continue to shape and build a highly successful sector. National bodies can help lead institutions through the next few years of change in order to build a more dynamic, better-informed and more knowledgeable sector.

The Rt Hon the Lord Norton of Louth  
Sarah Porter  
Inquiry Co-Chairs

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# Executive Summary

The ‘data revolution’, or ‘big data’ as it is commonly referred to, describes the massive increase in the amount of data that exists, and also to our ability to perform increasingly sophisticated analytics using this data. Data is now being considered an economic and a policy asset for decision-making and we anticipate it will be crucial in all policy-making in coming years.

The UK has a world-class higher education system and the strengths of our system attract students from all over the globe. However, to retain this competitive advantage the sector needs to adapt to the realities and challenges of the 21st century – in particular, the increasing importance of data and analytics.

For this inquiry, the Commission set out to investigate the transformative effect that data and analytics can have for university students, higher education institutions, and the HE sector as a whole. Given the breadth of the topic, we focused particularly on students, looking at how the wealth of data within the HE sector can be used by institutions to improve the student experience of university. Accordingly the inquiry concentrated on teaching and learning and did not investigate research, or look at university business systems in great detail.

The HE sector has always been a data-rich sector, and universities generate and use enormous volumes of data each day. However, the sector has not yet capitalised on the enormous opportunities presented by the data revolution, and is lagging behind other sectors in this area. Unless institutions and university staff are data-capable and equipped with the resources and skills to manage data well, HE will not be able to catch up and students will miss out on many potential learning and support benefits. The sector needs to improve its data capability and data management procedures, and the Commission believes HESA, Jisc and Universities UK should work together to lead on this.

In this report the Commission draws a distinction between what we call ‘static data’ and ‘fluid data’. Static data is that which is collected, recorded and stored by institutions and traditionally includes student records, staff data, financial data and estates data. Fluid data is the data that is generated through the increasingly digital way a student interacts with their university, such as swipe card data from access-controlled campus buildings, log-ins to the virtual learning environment (VLE) and e-books or online journal downloads.

Static data has always been a strategic asset for both institutions and government. It informs all operational and business decision-making and planning in an institution, and indicates to government and the public how the sector is performing as a whole. A major use of static data is in data collections, where institutions submit data returns to a variety of institutions who use HE data, such as HESA, UCAS and the SLC. We found that the current system of data collection is overly complicated, burdensome and involves unnecessary duplication, where institutions are required to submit the same or similar data to a range of different bodies. We recommend that

HESA should take responsibility for rationalising the data collection process across the sector.

In terms of the overall information landscape, HESA and HEDIIP are embarking on a body of work to rationalise current data collections and modernise the HESA returns process. This will make the data collection process more frequent and reduce processing times, as well as centralising various separate collections. The Commission supports this approach. However, we believe that institutions may need to be prepared for growing demand for more instant data in coming years, from government, the sector and the public, and so will need to adopt the good data management principles we discuss throughout this report.

Fluid data has the potential to provide an instant, accurate picture of how a student is performing – if it is able to be collected, linked and analysed. This is called learning analytics, which is the measurement, collection, analysis and reporting of data about learners for the purposes of understanding and optimising learning and the environments in which it occurs. The Commission believes this has enormous potential to improve the student experience at university, by allowing the institution to provide targeted and personalised support and assistance to each student.

Learning analytics is still in its relative infancy in the UK, and most institutions have not yet implemented a system in full. Institutions have a diverse range of motivations for introducing analytics and currently use a variety of platforms, methods and metrics.

The major motivations for introducing learning analytics include:

- Increasing retention
- Providing better feedback to students
- Capturing attendance data
- Enhancing teaching and learning

The Commission believes that learning analytics is a powerful way for institutions to achieve their strategic goals as well as providing huge benefits for their students, and that all HEIs should consider introducing an appropriate learning analytics system to improve student support / performance at their institution.

There are a number of issues and challenges facing the sector in introducing learning analytics. Firstly, we considered the ethical issues related to the use of student data by institutions, particularly in terms of student consent and privacy. We recommend that institutions put in place clear ethical policies and codes of practices to govern the use of student data in analytics and other digital systems. This not only gives universities a guide to ensure their analytics systems are appropriate and legal, but also increases student acceptance of their own data being used in analytics. These policies should, at a minimum, address student privacy, security of data and consent, and should be updated whenever there is a change to the data used or the analytics undertaken. The Commission felt it was crucial that institutions sought informed consent from their students.

Another issue the Commission heard in the course of the inquiry was the concern that students might ‘game the system’, manipulating analytics in order to achieve false positive results and reducing the overall performance of the system. This is a concern with many systems of measurement where the underlying metrics are known (such as the NSS). In learning analytics, the Commission believes the best way to prevent unnecessary gaming is to remove the incentives to do so. This approach requires creating formative analytics systems rather than summative, which means using analytics to encourage students to reflect on how they are learning, or to initiate a conversation between a tutor and a student, instead of using the system to assess the student’s performance or ability.

The Commission also looked at capacity and resourcing. We found that most institutions do not have effective data management systems in place, and data is currently held in silos and is inconsistent with other institutional data. Given how critical good data management is to introducing analytics (and to performing a range of other jobs in a data-driven environment), we recommend that institutions should immediately review their internal data management approaches and put in place plans to ensure that their data is clean, accurate, consistent, secure and fit for purpose.

Finally, we found that the senior leadership was crucial in encouraging the take-up of new practices such as analytics. This requires a strong strategic vision from management, who need to drive forward a culture shift within their institutions where data is seen as integral to all aspects of the university. In particular, staff data capability needs to be increased. We recommend that staff be empowered to perform their roles well in a digital, data-driven world, and should be provided with appropriate training and support to improve their digital capability and data management skills.

In Part Three, the Commission considers some of the data-related trends that will drive development in higher education. We believe that learning at university will become increasingly digital, with more course material taking place through VLEs, augmented reality learning environments and increasing use of portable devices such as wearable technology. All of these systems will add to the volume of data that is being generated about a student’s learning, which can be used in analytics to provide a more complete and powerful portrait of the student.

We also expect to see widespread adoption of analytics in the next three to five years, as well as increasingly advanced analytics systems in use in institutions. These will include predictive analytics, adaptive learning systems and analytics designed specifically for students, presented in student-facing apps. We may also see the development of sophisticated course advisor systems, which use data about previous students’ study choices to advise current students on what modules to choose and what extracurricular activities or internships they should consider. All of these will be powerful assets for students, giving them access to instant, personalised information and resources that fit into their daily lives.

The open data agenda, a growing area in government and society generally, is having less traction in HE. While we have seen the rise of MOOCs and a push from government for more high-quality information, the more marketised HE landscape is making institutions more reluctant to share data. The Commission believes that as institutions use more data, they should be encouraged to be transparent about how they use their data and to continue to publish high-quality information about their courses, campuses, destination data and fees. Accordingly institutions should remain subject to the requirements of the FOI Act, and any new providers who enter into the HE market and receive public funds should be brought within its scope.

If all institutions adopt the good data management practices and follow our learning analytics principles, the sector will be in possession of a powerful dataset that may be especially relevant for the TEF. As learning analytics data provides a snapshot of how engaged students are and how well they are performing, this could be considered a useful indication of where excellent teaching is taking place. The Commission recommends that institutions should be encouraged to use the information from learning analytics systems to identify and foster excellent teaching within their institutions, and to consider using this information in their submissions to the TEF.

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# List of Recommendations

## Recommendation 1

HESA, Jisc and Universities UK should work together to develop a sector-wide strategy for excellent and innovative data management. This strategy will support and enable sharing and collaboration between institutions.

## Recommendation 2

HESA should take responsibility for rationalising the data collection process across the sector, working in partnership with others.

## Recommendation 3

All HEIs should consider introducing an appropriate learning analytics system to improve student support / performance at their institution. Any such decision should be fully informed by an analysis of the benefits, limitations and risks attached.

## Recommendation 4

Institutions should put in place clear ethical policies and codes of practices that govern the use of student data in analytics and other digital systems. These policies should, at a minimum, address student privacy, security of data and consent.

## Recommendation 5

In particular, when introducing learning analytics, HEIs should seek fully informed consent from students to the use of their personal and learning data in analytics. This should be sought again if new data is incorporated into the system, or existing data is used in new ways.

## Recommendation 6

Learning analytics should be driven by improvement of learning and teaching processes and student engagement. At the present early stage of maturity in learning analytics, we recommend that learning analytics is used for formative purposes, not summative purposes.

### Recommendation 7

Many internal and external systems rely upon good quality data being in place. Institutions should immediately review their internal data management approaches and put in place action to ensure that their data is fit for purpose. This may include development of a roadmap for cleaning up data.

### Recommendation 8

To be equipped for the future of higher education, institutions should ensure that digital literacy, capability and good data management strategies are an integral part of their strategic plans.

### Recommendation 9

HEIs should ensure that the digital agenda is being led at an appropriate level within their institution.

### Recommendation 10

University teaching and administrative staff need to be equipped with the necessary skills to perform their roles in a digital, data-driven world. Staff should be provided with appropriate training and support to improve their digital capability and data management skills.

### Recommendation 11

The government should not exempt higher education institutions from the requirements of the FOI Act, and any new providers who enter into the market and receive public funds should be brought within its scope.

### Recommendation 12

Institutions should be encouraged to use the information from learning analytics systems to identify and foster excellent teaching within their institutions, and to consider using this information in their submissions to the TEF.

PART

# 1

# CONTEXT



# Definitions

## Big data

High volume, high velocity, and high variety information assets. Some definitions also include veracity, which refers to the need to ensure the data is correct (which is an increasingly difficult task in big data)

## Open data

Data made available to others with no strings attached, free for open use

## Shared data

Data that could be made open but contains personal information (e.g. health related information), so instead it is shared with restrictions among others who have to make a case to access the data

## Analytics

The science of examining raw data with the purpose of drawing conclusions about that information

## Learning analytics

The measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs<sup>1</sup>

## Predictive learning analytics

The statistical analysis of historical and current data derived from learners and the learning process to create predictive models that improve the learning environment within which it occurs

<sup>1</sup> SearchDataManagement, 'data analytics (DA) definition', available at: <http://searchdatamanagement.techtarget.com/definition/data-analytics>.

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## 1.1 Introduction to big data

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Data is almost always identified as one of the key trends driving change in the 21st century. Variously described as the ‘data revolution’, the ‘era of big data’, or more simply ‘big data’, this describes the enormous increase in the amounts of data we generate in all aspects of our lives.

Big data refers to the large volume of data – both structured and unstructured – that we create and deal with every day. It is most often defined through the ‘three Vs’: high-volume, high-velocity and high-variety:

- Volume** Organisations collect data from a variety of sources, including business transactions, social media and information from sensor or machine-to-machine data.
- Velocity** Data streams in at an unprecedented speed and must be dealt with in a timely manner.
- Variety** Data comes in all types of formats – from structured, numeric data in traditional databases to unstructured text documents, email, video, audio, stock ticker data and financial transactions.<sup>2</sup>

Data itself is not new – we have always generated data and used it to inform decision-making. However, most of this was structured and organised, through regular data collections, surveys and censuses. What is new, with the invention and dominance of the internet and the expansion of digital systems across all sectors, is the amount of unstructured data we are generating. Every transaction, interaction and contact we carry out on our phones, computers and other devices produces data, such as through emails and text messages, online shopping and banking, music and video streaming, and social media. This is what we call the digital footprint – the traces that individuals leave behind as they interact with their increasingly digital world.

Similarly, the exponential growth in the amount of data we produce is not a new phenomenon. In 1944 Fremont Rider, the librarian at Wesleyan University, estimated that American university libraries were doubling in size every sixteen years and speculated that the Yale Library in 2040 will have “approximately 200,000,000 volumes, which will occupy over 6,000 miles of shelves... [requiring] a cataloguing staff of over 6,000 persons.”<sup>3</sup> In 1962, Gordon E. Moore – co-founder of Intel – observed that the number of transistors you could fit onto a silicon chip was doubling every two years, an observation which has held true since.<sup>4</sup> The sheer amount of data that we generate and the speed at which we do so provides new opportunities for greater insight than previously possible.

What is most important is not the amount of data that we have access to, but what we do with it. Data analytics, which we will discuss in detail in Part Two, is the process where data is collected and analysed in order to identify patterns, make predictions, and inform business decisions. Our capacity to perform increasingly sophisticated analytics is changing the way we make predictions and decisions, with huge potential to improve competitive intelligence.

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2 SAS, ‘Big Data: What it is and why it matters’, available at: [http://www.sas.com/en\\_us/insights/big-data/what-is-big-data.html](http://www.sas.com/en_us/insights/big-data/what-is-big-data.html).

3 G Press(9 May 2013), ‘A Very Short History Of Big Data’ Forbes, available at: <http://www.forbes.com/sites/gilpress/2013/05/09/a-very-short-history-of-big-data/>.

4 Evidence from scoping seminar

Across the UK and the world, organisations are realising the significant value of big data and using data analytics to improve business. For example, Tesco's Clubcard allows the supermarket chain to collect an enormous amount of data about their customers. This is used to not only target individual shoppers – through personalised newsletters and offers – but also to inform broader strategy, such as which products would be best placed close to each other or which products should be closer to the checkouts or the entrance.

Tesco is also using this data in predictive analytics, discussed in the HE context in Part Three, to forecast how many products will be sold when and where. For example, combining weather data and sales data allows Tesco to predict what types of food are most likely to be purchased during heatwaves, leading to significantly less food wastage as well as cost savings. They also analyse data about how their in-store refrigerators are operating in order to maximise efficiency and make savings.

The music industry is another industry that is beginning to make use of big data and analytics to change and improve the way it offers services and products. Music is often cited as a sector where companies have maximised the opportunities presented by the shift to the digital, with Apple and Spotify driving the growing dominance of digital downloads and online streaming in record sales. Spotify in particular is a data-driven company, with Spotify users creating over 600 gigabytes of data a day and the company holding 28 petabytes of storage in four data centres across the world. This data gives Spotify a wealth of information to use in analytics – for example the app's Discovery feature analyses user listening data to suggest more music the user might like, while Spotify Radio depends on data to determine which song is played next in the queue. It is not only user preferences that Spotify can predict based on the data it holds – in 2013 Spotify used streaming data to predict the Grammy Awards winners.

These are just two examples of the possibilities of harnessing big data in commercial sectors. Comparatively, there is a sense that in the UK the higher education sector is behind in this field, with some suggesting HE has to “catch-up” to other sectors. As the system becomes more competitive and marketised, and students are demanding better information and services, HEIs may seek to operate more like businesses and emulate successful practices in the business world, such as big data analytics.

Higher education, the focus of our inquiry, has a strong history of working with high quality data. English higher education is ‘data rich’,<sup>5</sup> with a world-class data collection system, and the sector is admired around the world for the quality and independence of its HE statistics. The UK is one of the only countries to have a separate agency solely responsible for higher education data and statistics, rather than managing data through the government department responsible for higher education.

Data is increasingly being recognised as an economic and policy asset for HE institutions and decision-makers. Firstly, it supports better and faster decision-making by regulators and policy makers, which is crucial at a time when the sector is more dynamic, diverse and fragmented than it has ever been. Secondly, data promotes public trust and confidence, where in a more marketised system, reliable and robust data informs student choice and helps taxpayers understand how public investment in HE is used. Finally, within institutions, data supports better strategic management – in a competitive market senior managers need to have instant, accurate data available to them to inform their decision making. We will explore the many ways data can be used for the benefit of the sector and institutions in Part Two.

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5 BIS Green Paper (6 November 2015), ‘Higher education: teaching excellence, social mobility and student choice’, pg. 27-28.

The Commission believes that the HE sector currently possesses a rich and vast amount of data, yet is not making the most effective use of this valuable resource. The sector should seize the opportunities that data and analytics presents immediately. This will require strong leadership from sector bodies such as HESA, Jisc and Universities UK, to encourage the sector to make the most of these new opportunities, improve data capability within institutions, and develop high-quality, innovative data management plans.

### Recommendation 1

HESA, Jisc and Universities UK should together develop a sector-wide strategy for excellent and innovative data management. This strategy will support and enable sharing and collaboration between institutions.

## 1.2 Government policy on data

Governments around the world have turned their attention to how data can also improve the services they offer their citizens, and how they can direct policy to take advantage of new opportunities.

Open data first came onto the agenda in the UK in 2009, when Gordon Brown's government launched Data.gov.uk, a large-scale project that makes (non-personal) UK government data available to the public. Datasets – not just public information but the raw data underneath – are available from all central government departments and a number of other public sector bodies and local authorities. This can be used to build applications using the data, or investigate how effective policy changes have been over time. Data.gov.uk is continuing to expand, and in February 2015 it contained more than 19,000 datasets. In 2012 the Government also published the Open Data White Paper: *Unleashing the Potential*, which outlines its plan to create a more transparent society by increasing access to data and make smarter use of data.<sup>6</sup>

The Coalition Government recognised the potential of big data in 2012, including it among the “eight great technologies” announced by Chancellor of the Exchequer George Osborne<sup>7</sup> and subsequently promoted by then Minister for Universities and Science David Willetts. Each of these technologies were fields in which the UK has world-leading research, could be applied across a range of industries, and where the UK had the potential to be at the ‘forefront of commercialisation’.<sup>8</sup> However, the emphasis and funding attached to the big data technology were focused on science (including social and physical sciences) rather than its application to new industries.

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6 Cabinet Office White Paper (June 2012), ‘Open Data White Paper: Unleashing the potential’, available at: [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/78946/CM8353\\_acc.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/78946/CM8353_acc.pdf).

7 G Osborne (9 November 2012) ‘Speech by the Chancellor of the Exchequer, Rt Hon George Osborne MP, to the Royal Society’, available at:

<https://www.gov.uk/government/speeches/speech-by-the-chancellor-of-the-exchequer-rt-hon-george-osborne-mp-to-the-royal-society>.

8 BIS(9 October 2013), ‘Eight great technologies: infographics’, available at:

<https://www.gov.uk/government/publications/eight-great-technologies-infographics>.

In 2013 BIS published *Seizing the data opportunity*, which described the potential impact of big data as “so significant that it could transform every business sector.”<sup>9</sup> The strategy identifies three overarching aspects of data capability: skills, data infrastructure and the ability to share data. Higher education was mentioned mostly in references to its capacity to help improve data skills across the board.

HE-specific policy has also seen a growing focus on data, in terms of the provision of better and more frequent information about the sector. The 2011 BIS White Paper, *Students at the Heart of the System*, outlined a number of policies which focused on improving the quality and amount of information about HE that was available to prospective students, parents, and advisers. These supported the Government’s plan to move towards a more marketised higher education sector, by providing the consumers of higher education – students – with more information to help them make decisions about courses and providers in a bigger, more diverse market.

This resulted in the creation of the Key Information Set (KIS), which brings together the most sought-after information by students in the one place, and is now hosted on the Unistats website.<sup>10</sup> KIS includes information on:

- Courses
- Costs
- Employment
- Student unions

The paper also outlined the need to reduce the current “burden of information collection” by “redesign[ing] the information landscape for higher education in order to arrive at a new system that meets the needs of a wider group of users; reduces the duplication that currently exists, and results in timelier and more relevant data.”<sup>11</sup> This led to the creation of the Higher Education Data and Information Improvement Programme (HEDIIP), which will be discussed in more detail in Part Two.

The drive to improve the information available about higher education is also seen in both the REF and, now, the TEF, which was announced in full in the 2015 HE Green Paper, *Higher education: teaching excellence, social mobility and student choice*. These frameworks are large-scale quality measurement activities, which seek to gather a wide-range of information and data about the quality of research and teaching within institutions. These are then used as the basis for rankings and funding allocations.

Much has been written on the REF, and as noted above this inquiry has chosen not to focus specifically on research. However, the TEF is particularly relevant to this inquiry, given its infancy and its particular focus on metrics – that is, the data chosen as the measures of teaching excellence.

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9 BIS (31 October 2013), ‘UK data capability strategy: seizing the data opportunity’, available at: <https://www.gov.uk/government/publications/uk-data-capability-strategy>.

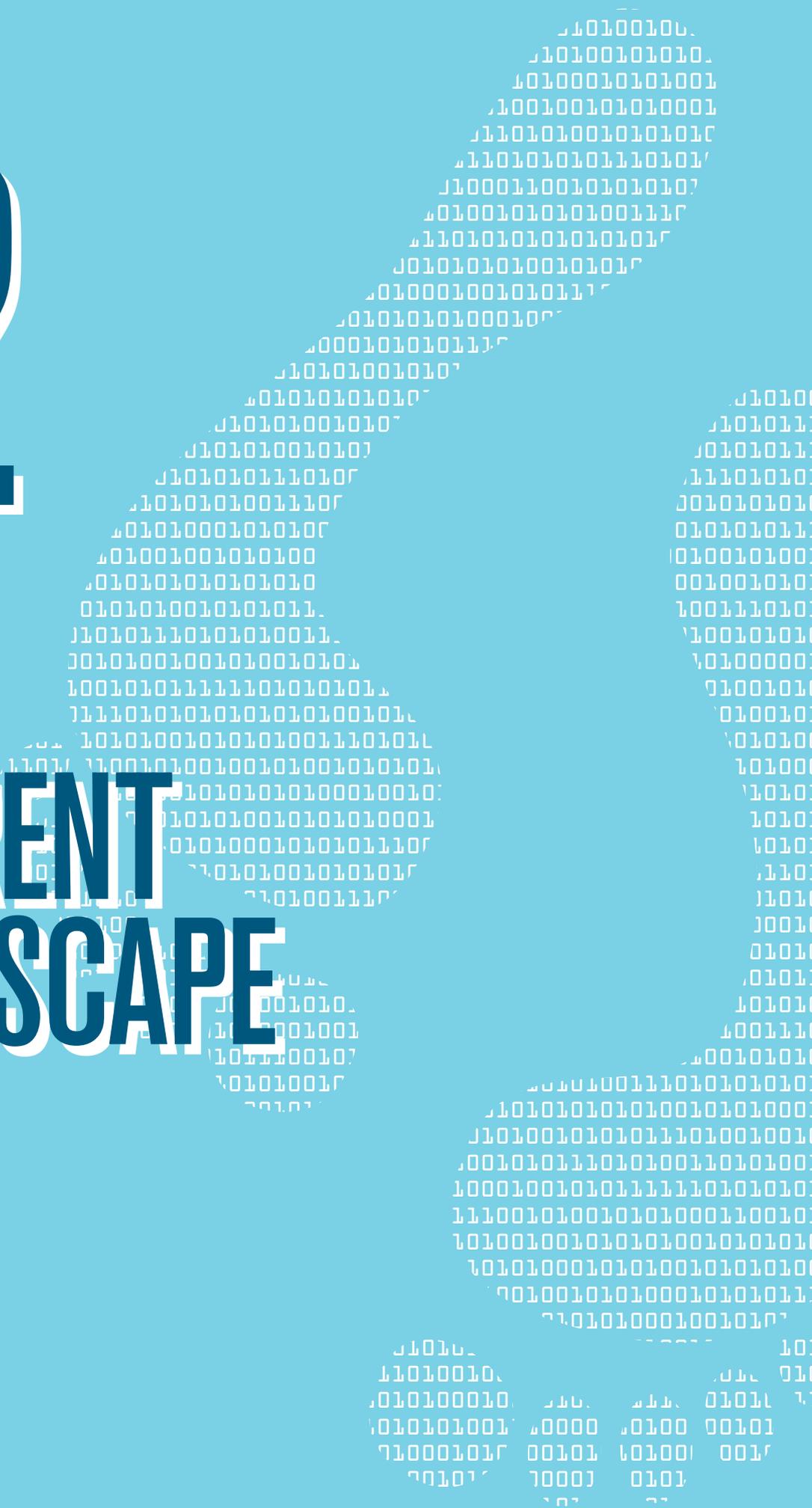
10 UNISTATS, ‘The Key Information Set (KIS)’, available at: <https://unistats.direct.gov.uk/find-out-more/key-information-set>.

11 BIS White Paper, ‘Higher Education Students at the heart of the system’, pg. 71.

PART

# 2

# CURRENT LANDSCAPE



## 2.1 Data

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What do we mean when we talk about higher education data? The sector collects, generates, uses and reports on an enormous range of data each year, and, in a big data world, is increasingly doing so in larger volumes and with higher velocity.

In this section, the Commission draws a distinction between two types of data – static data and fluid data. Static data is the information which the sector has been collecting since its inception, and includes basic student records (names, addresses, grades), staff details, course information and financial records. Fluid data is what is now being generated by the increasingly digital nature of the university.

This is a somewhat artificial distinction, and much data straddles the line between old and new. Information on how a student uses their library, for example, has been collected for years but now includes new information such as online journal use and swipe card access to the library building. However, the Commission finds it useful to frame the discussion around this distinction, to consider how the current data landscape could be improved and to investigate the ways institutions can use data analytics to improve student learning and the overall student experience.

### 2.1.1 Static data

Higher education institutions have always operated in an information-rich landscape, generating and collecting vast amounts of data each day. Below is a quick snapshot of the types of data that higher education institutions deal with every day:

**Student record data:** A typical student record may include the details of the student's name, age, address, ethnicity, socioeconomic status, school, A-level results, course undertaken, modules studied, examination results, degree awarded and degree classification.

**Staff data:** Institutions hold data on their staff, including the number of people employed full-time and part-time, the number at each level and within each faculty, and staff equal opportunity data.

**Admissions and applications data:** These records will include details of the number of students who applied to the institution, the acceptance rate, and any widening participation data such as ethnicity and socioeconomic status.

**Financial data:** Universities hold data on their finances, including income streams, expenditure, and predicted profits and/or losses, held both at an institutional level and by faculty and school.

**Alumni data:** The university will hold data on its alumni including graduate destinations (i.e. employment or further study), current address and contact details, and details of any previous donations made to the institution. This is increasingly important as institutions look to diversify their income streams and US-style philanthropy becomes more common in the UK.

**Course data:** Includes data on students enrolled in each course and per module.

**Estates and facilities data:** Includes data on the number and type of rooms across the campus (lecture theatres, classrooms, computer labs, science laboratories), room capacity, equipment, accommodation, facilities and retail.

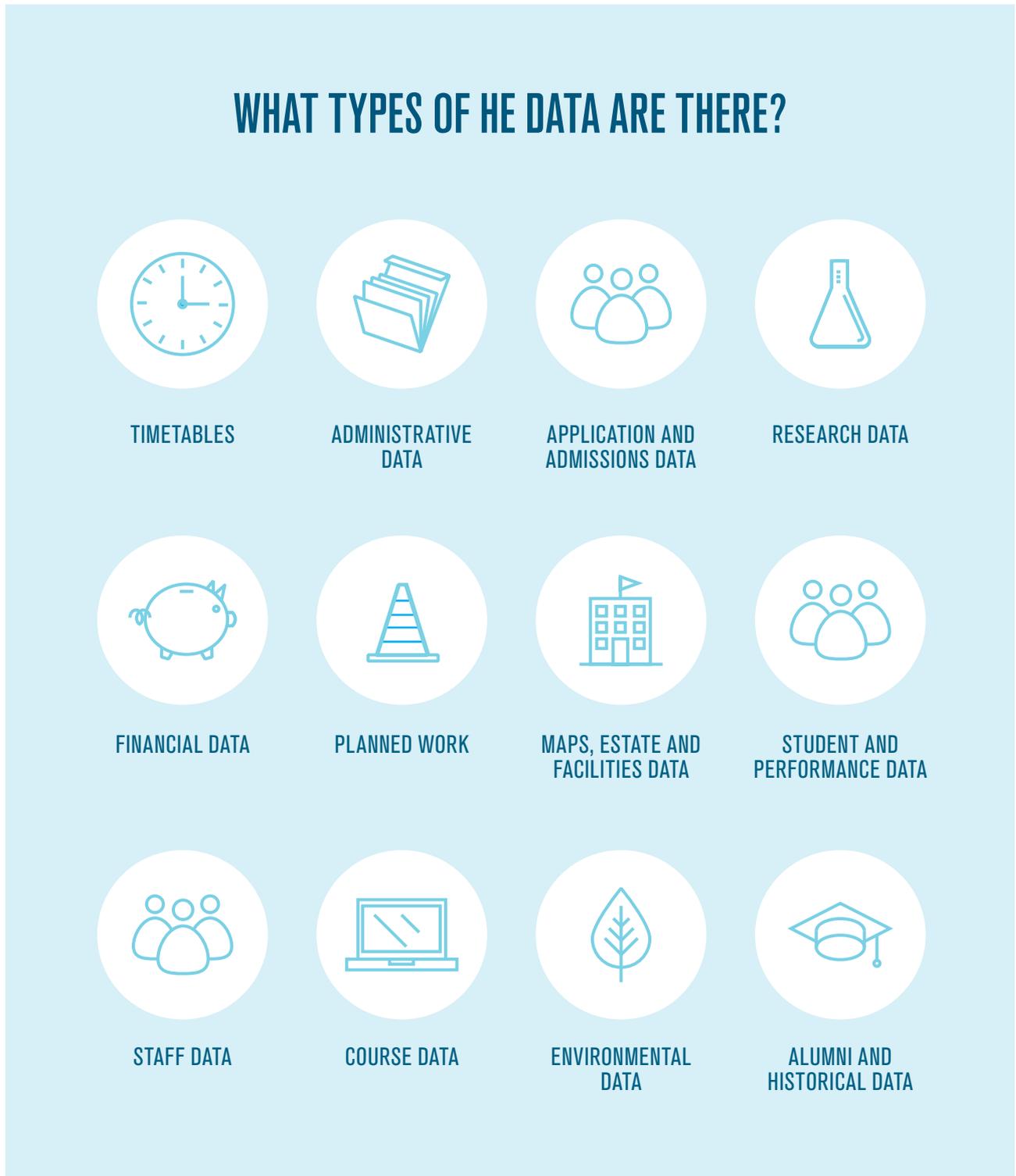


Figure 1. "Types of HE Data." Source: Deloitte, 2014

Data has always been a significant asset for institutions, and has been used to inform their day-to-day operational decisions as well as longer-term business and strategic decisions. To take a common example, creating the timetable for each semester requires drawing on a range of different types of data across the institution. To work out how many lectures, tutorials and labs to schedule per module, the timetabler will need to bring together information about student enrolments in the module, staff numbers in each faculty (including staff with the relevant expertise/qualifications to lecture or lead labs) and estates data on rooms available with the necessary capacity and any equipment required.

On a strategic scale, data is used to inform senior management's business planning and overall strategy for their institutions. Student enrolment data, both historical and projected, as well as estates data, will influence the plans institutions make to build new buildings or refit current buildings to meet projected need. Financial data influences strategic decisions on expanding or reducing particular faculties or services provided.

### 2.1.2 Data collections

In addition to generating and storing much of this data themselves, and using it for internal purposes, higher education institutions are also subject to a number of external data collections.

The sector's major data collectors include:

- HESA** Collects and holds information on the composition of the student body, degree results, and destinations of leavers after graduation
- UCAS** Holds data on the prior qualifications of successful and unsuccessful university applicants
- SLC** Holds data about applicants for student support, the rate at which they repay their student loans after graduation, and the accumulation of debt and the total loan outlay
- UKVI** Holds data on international students, including attendance data

As noted earlier, the UK higher education sector's provision and use of data is among the best in the world, if not the global leader. However, while the UK is unique in having a central data collection body in HESA, it is also unique in that the sector is also subject to a broad range of data collections by a number of different groups and organisations.

In 2013 HEDIIP undertook an extensive survey of the current information landscape, identifying an enormous 525 separate HE data collections and 93 separate organisations collecting this data. No institution will be subject to 525 collections every year, as many of these are specific to particular courses or occur biannually or less frequently. Of the 93 organisations who collect student data, a number of these are large sector-wide bodies who conduct multiple collections, such as HESA, the SLC and UCAS. Many others are PSRBs (professional, statutory and regulatory bodies) who often conduct only a small number of small collections for accreditation purposes.

## Issues with the current system

Firstly, there is duplication in the data requested by the different data collectors. There is no routine sharing of data between data collectors, and no requirement for the collectors to collaborate with one another. This means that each data collector is generally operating in an autonomous manner and in isolation to other collectors, and HEIs are at times being asked to submit data to one collector or body that they have already submitted to another.

The lack of collaboration between the many collectors has also led to the development of multiple data definitions for the same or similar data field. For example, 'course' is defined slightly differently by the major data collectors:

- SLC** A course that has at some point been eligible for student finance i.e. has been designated for support. This is a generic (non-academic year specific) entity
- HESA** A combination of subject and qualification that defines what a student is aiming for
- UCAS** A UCAS Cycle specific delivery of a UCAS Programme, which is defined as 'a thematic curriculum of study covering the overall learning objectives the UCAS Provider intends to deliver to students'

Using different definitions for the same or very similar data makes drawing meaningful comparisons impossible. Given that the Government is increasingly looking to data and metrics to measure performance and quality, it is concerning that they may be relying on inconsistent data that cannot be used to draw reliable inferences. HESA, as the central data collection body, should lead on clearing up the current data collection system in the HE sector and ensuring it is accurate, efficient and effective.

### Recommendation 2

HESA should take responsibility for rationalising the data collection process across the sector, working in partnership with others.

## 2.2 Fluid data

Fluid data is the new kind of data generated by a student as the way they interact with their university becomes increasingly digital. This is what we call the 'digital footprint' – the data that is left behind as a student interacts with their university through online systems and on-campus technology.

For example, a university which requires swipe card access to its buildings will have a data set on how often each student is visiting campus, which buildings they are most frequently visiting, and which days and times of day they are most often on campus.

Each time a student logs into their institution's VLE, they create a set of data including login times, page clicks, downloads, length of time visited and comments made, etc. Video and audio lectures (if available) will also generate data, such as how long a student spends listening/watching to a single file, how often they rewind/fast-forward, and any points at which they close the file and stop listening.

In the library there will be a record of how many books each student is borrowing, and libraries which provide e-textbooks may also be able to collect data about how students are using these. For example, when a student uses an e-textbook, they will be generating data on page clicks, the speed at which they read, any highlights and notes made in the text, and potentially even tracking data on where students' eyes are falling on the page.

## 2.3 Analytics

The data we described in section 2.2 can be collected, linked together and analysed to provide insights into student behaviours and identify patterns to potentially predict future outcomes. There are a number of different ways universities can use analytics, and below we consider a few of these in detail.

### 2.3.1 Learning analytics

Learning analytics is the process through which data about a student's characteristics and learning behaviour is gathered and analysed to improve understanding and target interventions. It is defined by the Society for Learning Analytics Research (SoLAR) as "the measurement, collection, analysis and reporting of data about learners and their contexts, for the purposes of understanding and optimising learning and the environments in which it occurs".<sup>12</sup>

Learning analytics has been on the HE radar for some years now. The New Media Consortium (NMC) first identified learning analytics by name as a trend in its 2011 *Horizon Report*, putting the time to adoption at four to five years.<sup>13</sup> In 2015 the NMC said:

There is an increasing interest in using new sources of data for personalizing the learning experience, for ongoing formative assessment of learning, and for performance measurement; this interest is spurring the development of a relatively new field — data-driven learning and assessment. A key element of this trend is learning analytics, the application of web analytics, a science used by businesses to analyse commercial activities that leverages big data to identify spending trends and predict consumer behaviour.<sup>14</sup>

However, learning analytics, in the sense of gathering and analysing information about students in order to improve student support, has been used by HEIs for longer. The year before it debuted by name in the NMC's *Horizon Reports*, the

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12 B Smith (27 June 2014), 'Using student analytics to improve the student experience and underpin success at university' The Pie News, available at: <http://blog.thepienews.com/2014/06/using-student-analytics-to-improve-the-student-experience-and-underpin-success-at-university/>

13 L Johnson, R Smith, H Willis, A Levine, and K Haywood (2011), 'The 2011 Horizon Report' The New Media Consortium, available at: <http://www.nmc.org/pdf/2011-Horizon-Report.pdf>.

14 L Johnson, S Adams Becker, V Estrada, and A Freeman (2015), 'The NMC Horizon Report: 2015 Higher Education Edition' The New Media Consortium, available at <http://cdn.nmc.org/media/2015-nmc-horizon-report-HE-EN.pdf>, pg. 12.

NMC identified the trend of ‘visual data analysis’, which they described as blending “highly advanced computational methods with sophisticated graphics engines to tap the extraordinary ability of humans to see patterns and structure in even the most complex visual presentations” – a clear precursor to learning analytics.<sup>15</sup>

Similarly the Open University has been analysing data on their students in order to improve teaching and learning since their creation. However, what is newer is the rapid increase in the amount and types of data that students are generating, and the growing capacity of institutions to develop sophisticated systems to collect, link and analyse data. There are also a number of drivers that have been pushing this area forward in recent years – increasing pressure on university budgets, the need for evidence-based prioritisation of spending, and, in the US in particular, high drop-out rates.<sup>16</sup>

The Commission believes that learning analytics are a powerful method of achieving their strategic goals as well as providing huge benefits for their students, and that all HEIs should consider introducing an appropriate learning analytics system to improve student support / performance at their institution.

### Recommendation 3

All HEIs should consider introducing an appropriate learning analytics system to improve student support / performance at their institution. Any such decision should be fully informed by an analysis of the benefits, limitations and risks attached.

### Analytics: adoption

The UK is behind globally on the development and implementation of learning analytics. While some institutions in the US are using advanced and innovative technologies, the UK HE sector has barely begun to explore the potential of learning analytics.

According to a survey conducted by the Heads of E-Learning Forum (HeLF) in June 2015, nearly half of UK HEIs have not implemented learning analytics at all, with just one institution responding that learning analytics were fully implemented and supported within the institution.<sup>17</sup>

For those who are working with or towards learning analytics systems, there is often no consistent approach within the institution itself. Of the respondents to the HeLF survey, a number described the approach to analytics within their institutions as small-scale and per-system, indicating that different departments were implementing analytics on their own accord.<sup>18</sup> Only a few institutions are coordinating and consolidating learning analytics work across the whole institution and in many analytics work was split across different departments.<sup>19</sup>

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15 L Johnson, R Smith, A Levine, and S Stone (2010), ‘The 2010 Horizon Report’. The New Media Consortium, available at: <http://www.nmc.org/pdf/2010-Horizon-Report.pdf>, pg. 29.

16 Evidence session five

17 Heads of E-Learning Forum (13 October 2015), ‘UK HE Learning Analytics Survey 2015’, available at: <http://helfuk.blogspot.co.uk/2015/10/uk-he-learning-analytics-survey-2015.html>.

18 Ibid., 8.

19 N Sclater (2014), ‘Learning analytics: the current state of play in UK higher and further education’, Jisc, pg 5.

The Commission found that there were no clear trends in terms of age, size or location among the types of institutions that had adopted analytics. Of those institutions who are currently working on analytics, many are newer institutions with significant numbers of widening participation students – for example, University Alliance institutions – and are developing systems that focus particularly on retention. The Commission heard of no Russell Group institution that was currently using sophisticated learning analytics systems. However, discussions with analytics solutions providers and tech companies suggest that interest in analytics is broad-ranging across the sector and there are no specific parts of the sector where interest is higher or lower.

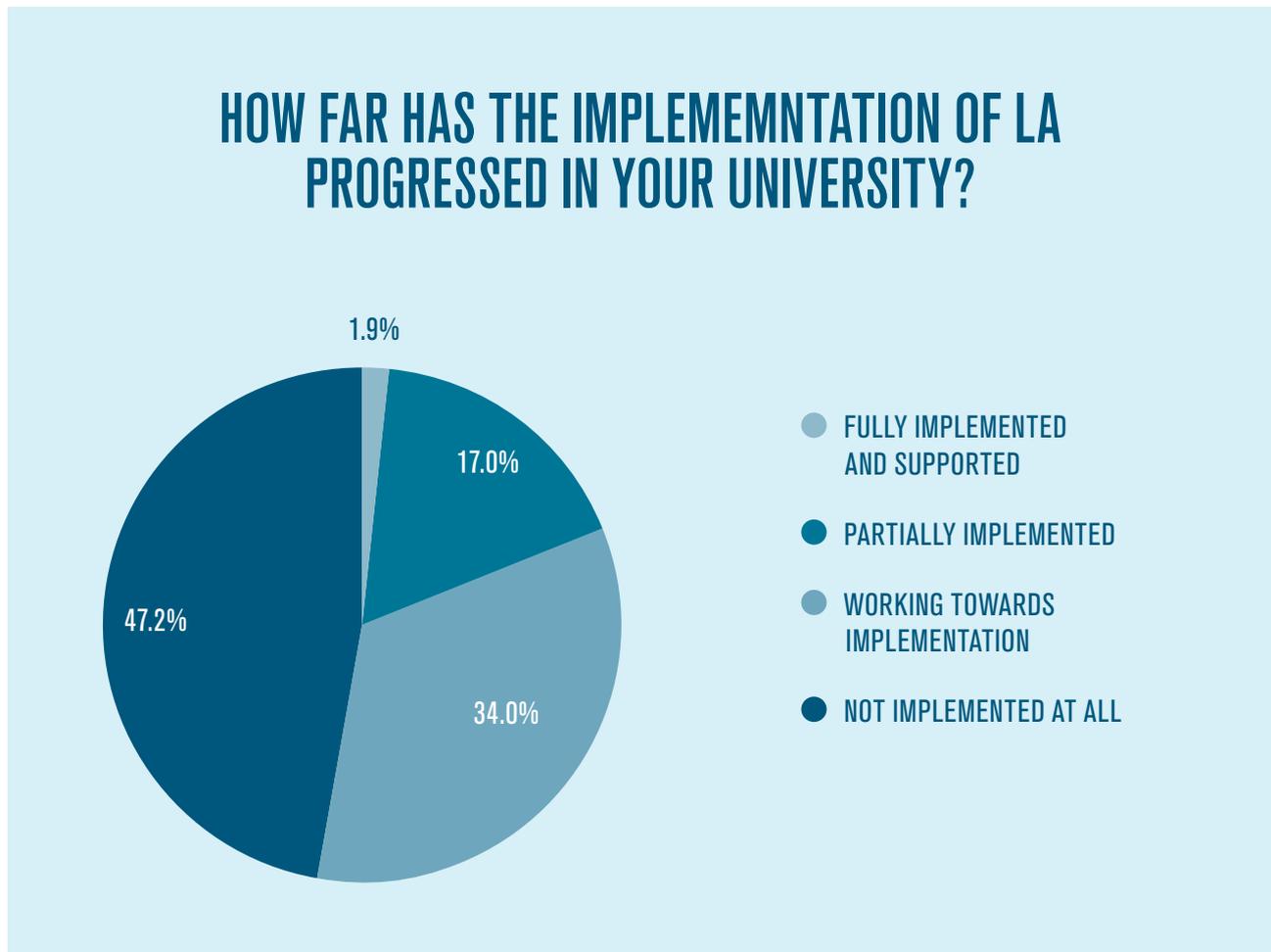


Figure 2: “How far has the implementation of LA progressed in your university?”  
Source: *Heads of E-Learning Forum, Learning Analytics in UK HE 2015 Survey Report*

## Analytics: motivations

Many institutions are looking to implement learning analytics systems in order to improve the student experience across the board. This includes enhancing achievement, reducing the number of exam or module resits, providing better feedback, and empowering students to become more reflective learners.

In a written submission to the inquiry, the University of South Wales recognised the benefits of implementing learning analytics:

Data and technology have become critical parts of the way that businesses enhance and develop their relationship with their clients, through the Big Data initiatives seen throughout the business world. HEIs should also be able to make use of the vast amount of data they have about their students to improve the student experience. These improvements can take part in the social and pastoral dimensions through personalisation and individualisation of service provision and improved interaction between students and between staff and students. The academic domain can also be critically improved by a closer understanding of students' learning approaches which can lead to better predictive outcomes of student performance and their retention, progression and success. Academic performance can be further enhanced by more timely data being accessible to students and their academic mentors (personal tutors), so that interventions to enhance and support students learning can be built into the student interaction more regularly during a period of study.<sup>20</sup>

The Commission has considered some of the major motivations for introducing learning analytics in detail below.

### Improving retention

Retention is currently the major motivation for UK institutions looking to implement learning analytics systems. This is particularly key in the current financial climate, where tuition fees form a significant part of institutional income and losing a student (and their subsequent fees) can have a serious effect. In a written submission to the inquiry, the University of Salford said that the focus on retention “is driven by the simple economic driver that it is easier to try and retain existing students than it is to have to go out and recruit another in a competitive market.”<sup>21</sup>

Data on how a student is interacting with their course and their institution can be an indicator as to how engaged the student is, and subsequently how likely they might be to drop out. For example, a student who isn't logging into the VLE or going to campus is likely not engaged with their studies, and might be at risk of completely disengaging and dropping out. Crucially, analytics systems give tutors the ability to identify students who are disengaging at a much earlier stage, meaning that tutors can intervene before the situation escalates, improving the likely success of their students.

NTU's Student Dashboard is a good example of an analytics system that measures engagement in order to target early interventions, and to improve retention over time.

20 Written submission: University of South Wales

21 Written submission: University of Salford

## Providing students with better feedback on their progress

Feedback is traditionally one of the poorer areas of performance for universities, with ‘assessment and feedback’ generally being the two NSS areas where students are the least satisfied.<sup>22</sup>

Analytics can provide a way for tutors to better understand how each individual student is progressing on their course, and in turn provide better – and more immediate – feedback for students. In many courses feedback is only provided when a student submits an assignment or sits the final exam, meaning that it comes too late to have any impact on their learning experience. An analytics system that combines data from all of the systems a student uses in the course of their study can provide a highly accurate, instant picture of student performance and engagement, and allow a tutor to provide high-quality, specific feedback more quickly.

The University of Salford noted in their written submission that analytics can also help students to better understand their own progress, and to compare themselves with their peer group if this data is made available to them.<sup>23</sup> NTU found that giving students access to their own analytics encouraged greater self-reflection on their performance and the factors that particularly affected this. It also encouraged competition, in that students were trying to beat their own scores of the previous week or that of the class average, or even comparing dashboards with their peers.

## Capturing attendance data

Institutions are required to monitor and report the attendance of international students to the UK Visas and Immigrations authority. Accordingly, a number of institutions are interested in how analytics systems can capture simple, up to date data on attendance. Many institutions are also finding that attendance data can provide a good measure of engagement, and so are developing analytics that incorporate attendance data, including swipe card data and roll-taking entered manually into the system.

It can also be one of the more difficult areas to gather data on. Some institutions have card readers outside lecture theatres for students to swipe their access cards, while others are experimenting with developing smartphone apps, portable card readers or proximity cards.<sup>24</sup>

**The University of Huddersfield** has developed an analytics-supported intervention project that has significantly improved retention. Focused on attendance, the system collects data from all timetabled activities and generates responses to patterns of attendance based on analysis of previous cohort demographics, behaviours, and outcomes. Interventions range from automated emails and text messages to a sophisticated targeting of ‘support priority students’ in the highest risk categories, who can be provided with personal support tailored to their circumstances and risks. Support is offered well before the usual signs of significant problems are evident, ensuring that it tackles issues before they become deep-seated and hard to address.

22 BIS Green Paper (6 November 2015), ‘Higher education: teaching excellence, social mobility and student choice’, pg.12.

23 Written submission: University of Salford

24 N Sclater (2014), ‘Learning analytics: the current state of play in UK higher and further education’, Jisc.

The results have been significant. Overall non-continuation rates have fallen from levels in the high-teens, and above benchmark, to well below 10% and now for the first time under benchmark. Among ‘support priority students’ withdrawal and suspension has been brought much more closely into line with the pattern seen in the rest of the student cohort.<sup>25</sup>

## Enhancing teaching

Information from analytics can also provide powerful feedback to tutors on how effective their teaching strategies are for particular cohorts of students. For example, if a tutor can see that no students are downloading a particular resource, or that all students are heavily relying on one, then this becomes a powerful piece of feedback for the tutor to take on board when devising teaching strategies or designing modules and lessons.

Liverpool John Moores University recently carried out a project evaluating the use of lecture capture software. Outcomes of this investigation showed that whilst many sessions were recorded, a significant number of lectures were not released to students. Furthermore analysis of access data showed that most students used the recordings strategically, repeatedly watching them to help them understand particular aspect of the lecture. Sections that related to assessment requirements or an activity that would be carried out in the laboratory were also watched more frequently. In focus groups students confirmed that recordings were useful ‘if I was struggling to understand a principle’.

Because of this analysis the role of the software has shifted from lecture capture to education enhancement with more flexible pedagogical approaches to the technology supported and promoted through the university’s Teaching and Learning Academy. This has resulted in an increase in the number of staff releasing recordings and students accessing them. Recordings have become shorter and more precise, focused on strategic aspects of the delivery for which repeated instructions or explanation are useful. Access data also shows that students are using recordings to support their studies throughout the semester rather than just for revision.<sup>26</sup>

At a time when teaching quality in higher education institutions is increasingly coming under scrutiny, data about students’ learning behaviours are potentially a powerful measure for how well tutors are performing. Better teaching should produce students who are more engaged with their studies and perform better, which, as we have seen, can be measured and analysed through the metrics discussed in section 2.2.

If institutions are measuring students’ performance and engagement through analytics, could they not use the same processes to measure tutors’ performance? This is a difficult question to answer. On the one hand, if students are paying £27,000 in tuition fees for a three-year course, there may be an obligation on institutions to ensure that the teaching students are receiving is of high quality. There is also likely to be increasing interest in ways to monitor and measure teaching performance once the TEF comes into effect. On the other hand, tutors are understandably wary of having their performance scrutinised, especially if there are subsequent consequences

25 Written submission: University Alliance

26 Ibid..

for high or low quality teaching. Jisc, for example, made a specific decision to avoid teaching analytics in their learning analytics architecture in order to improve the initial take-up of the programme.

This is an area that will become increasingly contentious in the future, and the Commission suggests that it is monitored closely.

## Analytics: software

The relative infancy of learning analytics in the UK and the absence of any clear sector-wide or government leadership in the area has led to a proliferation of different market solutions within the sector. In their 2014 survey of learning analytics adoption in the UK, Jisc found that almost all of the 13 institutions it surveyed were using different systems.

The competitiveness of the analytics market is somewhat surprising given that the market for other academic systems is generally monopolised by one or two companies. Blackboard and Moodle between them provide almost all VLEs, while Tribal is the major provider of student information systems. However, when VLEs were first becoming popular in the UK, it was not uncommon for senior leadership within an institution to decide to implement a VLE within their institution, only to find that there were already multiple systems in use within different departments.<sup>27</sup>

Most analytics systems take the form of a dashboard, which is an interactive visualisation of the underlying data and subsequent analysis. These will display the key datasets requested by the institution, often in easy-to-understand graphs, charts or tables. Depending on the software used, these are either offered on a standard basis or can be tailored to institutions depending on their preferences.

## Analytics: metrics

Most of the systems in place across an institution will capture data about what students are doing and accordingly provide potentially useful information that can be used in learning analytics. The most common metrics currently in use in analytics systems are:

- VLE use
- Attendance
- Library use (both through online systems and physical book borrowing)
- Assignment submission and grades

Most institutions are also incorporating data from their student information systems (SIS) into their analytics system, including widening participation data such as ethnic background and socioeconomic status. Data can also include logins to the SIS for timetabling and exam results. Some institutions are beginning to explore the possibility of incorporating more types of data into their analytics systems. The University of Lancaster is considering capturing and using data on which students are accessing library PCs and for how long.<sup>28</sup> NTU are also looking at capturing data on e-book usage.

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<sup>27</sup> Interview: Peter Tinson, UCISA.

<sup>28</sup> N Sclater (2014), 'Learning analytics: the current state of play in UK higher and further education', Jisc, pg.37.

Not every institution is using the same metrics. Some types of data will be more useful in certain institutions than in others – for example, Edinburgh finds that information on VLE usage is not so useful for them given that they are primarily a face-to-face university.<sup>29</sup> In other institutions particular types of data are yet to be used because they are not collected or stored centrally.

# CASE STUDY

## NOTTINGHAM TRENT UNIVERSITY: THE STUDENT DASHBOARD

Nottingham Trent University is one of the current sector leaders in the area of learning analytics, and was the first institution in the UK to develop and roll-out a comprehensive dashboard for both tutors and students.

The University cites three drivers as the impetus for creating the Student Dashboard. First, they ran a HEA-funded project from 2008-11 looking at student retention and engagement (HERE – Higher Education Retention and Engagement). Secondly, the University worked with several external vendors to test the viability of implementing learning analytics. Finally, the University conducted an internal audit, which found that while the institution was performing well on retention, it could be better at sharing data and at using data to inform interventions.

In particular, the University wanted to be able to implement one of the key lessons from the HERE project. The project had found that up to one third of students had considered leaving university at some point during their first year (similar to other studies). Although most of these ‘doubters’ remained in higher education, they reported feeling more distant from their tutors and peers, appeared to find their courses less satisfying and were less confident that they were coping with their studies. Ultimately they were more at risk of withdrawal or failure than their non-doubting peers.

This was a particular challenge given that, if students were not attending class, then generally tutors might be unaware of any particular issues they were facing and often there was little opportunity for them to spot a struggling student and intervene before it was too late. The aim of introducing a dashboard based on engagement analytics was to find a way to identify these students at an earlier stage, so tutors could intervene before the students were at serious risk of disengaging and not returning to their studies.

Whilst it was important that the University used the dashboard to support students at risk of early withdrawal, NTU developed the dashboard to improve students’ sense of belonging to their course (particularly with their tutors) and to help them develop strategies to improve attainment. Students are encouraged to periodically log in to the dashboard to see how they are doing in comparison to their peers and tutors are encouraged to use the dashboard in their tutorials and everyday interactions with students.

With the support of the senior management team, the University partnered with education technology company DTP Solutionpath, and spent 2-3 months developing the technology and testing the system, as well as ensuring legal and ethical issues were appropriately addressed. In the 2013/14 academic year, the University piloted the dashboard with just over 500 students.

NTU's Student Dashboard uses four metrics identified as being crucial factors in student success:

1. Attendance on campus, measured through swipe card data on building access
2. Library usage
3. Attendance in tutorials
4. Use of the VLE

The system aggregates these four factors to provide each student with an overall engagement score. If an individual student has no engagement for a period of a consecutive two weeks, their tutor receives an alert. Once the tutor is alerted to a disengaged student, they can check in with that student, and then add notes of their own to the system – for example, providing details of any emails, phone calls or meetings held with the student. Students also can monitor their own engagement (and progress over the year) through the dashboard, but do not receive alerts themselves. This was a deliberate focus as the University wanted to help build up the relationship between tutors and students.

The dashboard was created with a simple interface, so it would be quick and easy for both tutors and students to learn to use. Students and tutors are able to access the same interface, with the only difference between the two being that tutors can add comments into their dashboard detailing any discussions with the student.

The dashboard is focused on student-tutor interaction, in that, beyond spurring the tutor to send an email or make a phone call to the student, the data is not used in any other way and there are no adverse consequences for the student. For example, if the system generates a 'false alarm' (i.e. if the student has just been ill or away) then the tutor can note this in their comments and the student will not be penalised in any way.

Following the success of the pilot, which received overwhelmingly positive feedback from tutors and students, the dashboard was rolled out across the whole University in 2014/15, in all nine schools and for both undergraduates and postgraduates. Analysis of data from 2013-14 shows a strong correlation between high engagement and both high retention and high academic attainment. The dashboard won the award for Outstanding Support for Students at the 2014 THE Awards, and Jisc is building on their NTU model to develop their own sector-wide learning analytics service.

The dashboard team are currently working on the next phases in the evolution of the dashboard. The immediate priorities focus on increasing the number of data sources used in the dashboard. The University is currently integrating information about student attendance, the use of electronic resources (e books and e journals) and providing a view of assessments, feedback and grades. The following phase concentrates much more on strategies for using the data provided by the Dashboard to better support students. These are likely to include better integration into existing support systems and researching which strategies are most effective for helping to increase student engagement. NTU is leading the ABLE project, an Erasmus+ project in partnership with KU Leuven and Universiteit Leiden, to explore these issues in more detail.

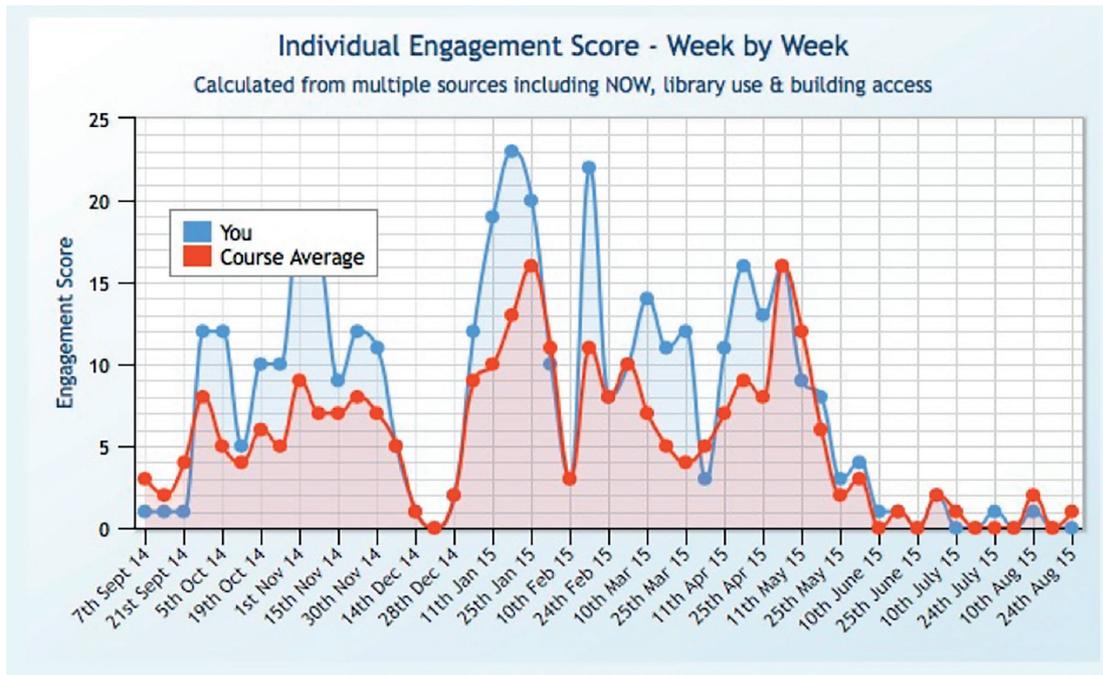


Figure 3: NTU Student Dashboard, Individual Engagement Score – Week by Week  
 Source: Nottingham Trent University

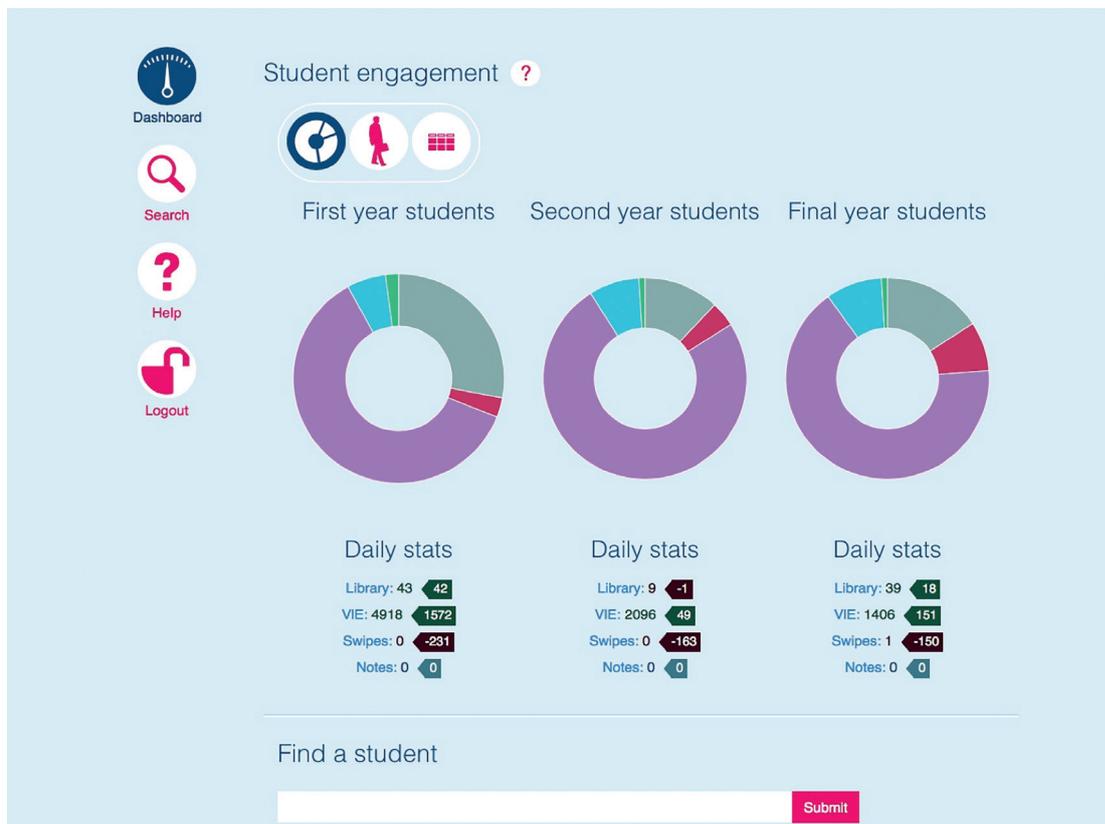


Figure 4: Staff login view showing overall student engagement  
 Source: Nottingham Trent University

# CASE STUDY

## THE OPEN UNIVERSITY

The Open University has been using analytics to support their students for longer than most of the other institutions discussed in this report. As the OU model means that all of their students are studying at distance, analytics is the way tutors have ‘sight’ of their students and are able to determine the timing and nature of appropriate interventions.

The most recent development in analytics at the university is an in-house tool called OU Analyse. First piloted in 2014, the project aims to identify students who might be at risk of dropping out of their studies to target interventions at an early enough point to help the student get back on track. Unlike the NTU model, this tool uses predictive analytics based on the behaviours and demographics of previous cohorts of students.

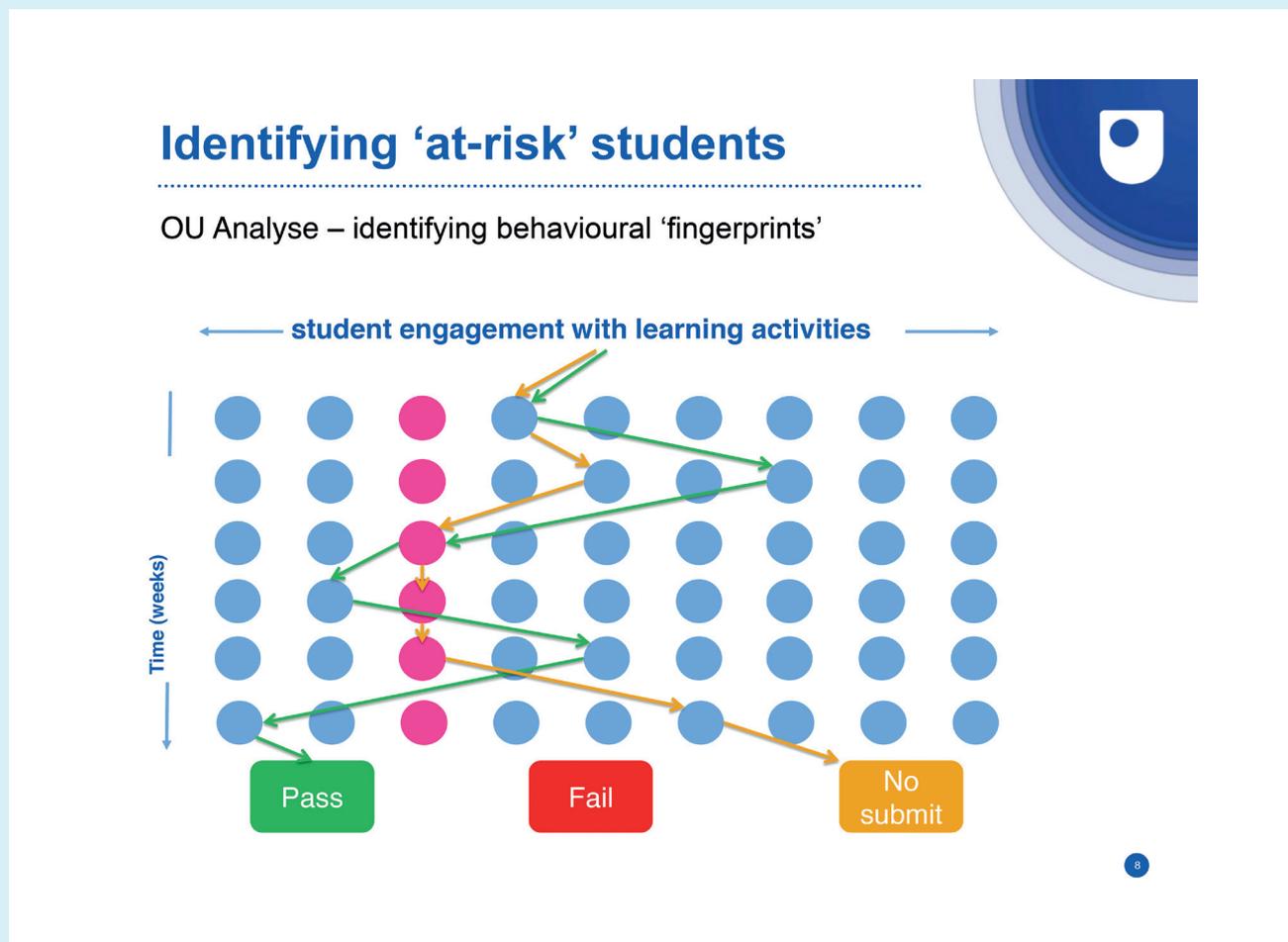


Figure 5: “OU Analyse – identifying behavioural fingerprints”  
Source: The Open University

The system takes two main datasets – demographic data, which includes gender, age, highest level of education, new/continuing students, etc.; and usage data from the virtual learning environment. The system measures VLE use and creates a behavioural ‘fingerprint’, which shows how the student is engaging with learning activities week by week though the module they are studying.

The demographic data and behavioural ‘fingerprints’ are then used to create a predictive analytics model, the output of which is two weekly predictions for each student – one on submission of the next assignment and one on their final module result. These are represented in the dashboard through a traffic light system.

Both the students’ individual module tutors and the central Student Support Team receive a weekly list of ‘at-risk’ students, which includes detail on why the model is predicting risk for each student. The tutors and the central support team can use this information to choose the most appropriate intervention, such as emailing or calling the student.

Student PI	TMA	Justification	Number of votes [Not Submit]	Next TMA prediction	Final result prediction
A1486...	38 40 38 43	Forum VLE activity in week 23 >=0, Resource VLE acti...	[Progress bar]	Not submit	At risk
A1487...	40 70 65 70	education, Resource VLE activity in week 23 >=0, For...	[Progress bar]	Submit	Pass
A1975...	62 65 65 65	no summary VLE activity in week 24, no Homepage V...	[Progress bar]	Not submit	Fail
A2303...	64 60 76 64	Resource VLE activity in week 23 >=0, Forum VLE acti...	[Progress bar]	Submit	Pass
A2367...	64 64 66 74	Forum VLE activity in week 24 >=0, Resource VLE acti...	[Progress bar]	Submit	Pass
A2431...	60 60 66 65	no summary VLE activity in week 24, no Homepage V...	[Progress bar]	Not submit	Pass
A2453...	60 60 63 40	Forum VLE activity in week 23 >=0, 'Online activity' V...	[Progress bar]	Submit	Pass
A2480...	65 65 65 65	no summary VLE activity in week 24, no Homepage V...	[Progress bar]	Not submit	Fail
A2537...	72 64 46 60	Resource VLE activity in week 23 >=0, Forum VLE acti...	[Progress bar]	Submit	At risk

Figure 6: “OU Analyse – Identifying behavioural fingerprints”  
Source: The Open University



Figure 7: “OU Analyse”  
Source: The Open University

OU Analyse also includes a student-facing dashboard, which provides activity recommendations to students based on their activity to date, and shows the student their progress so far, though this has not yet been piloted with students.

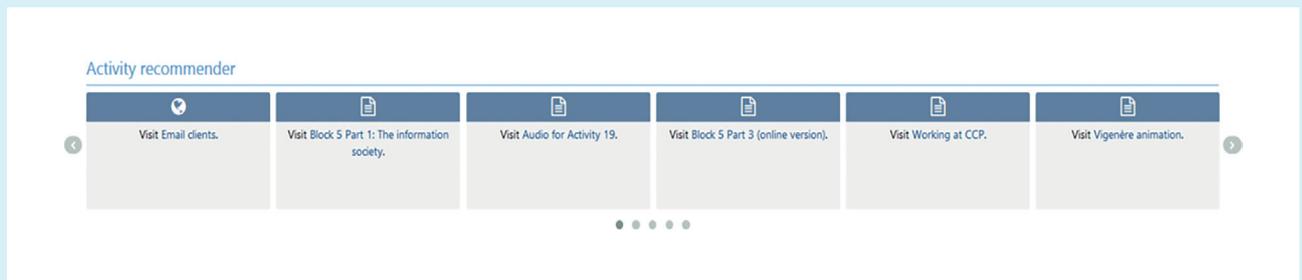


Figure 8: "OU Analyse"  
Source: The Open University

Before implementing OU Analyse the university developed comprehensive ethical guidance around the use of learning analytics, consulting with relevant stakeholders including the OU student union. The ethical policy is discussed in further detail in section 2.4.1.

### 2.3.2 Business intelligence

Business intelligence allows organisations to gather a wide range of data about how their business is performing, identify trends and measure performance over time, and bring together and analyse a vast amount of data. Like analytics, this information is often presented in the form of a dashboard, which visualises complex data and allows senior executives and business planners to easily access and analyse a wide range of information about their organisation.

Although business intelligence systems have been used in the commercial sector for many years, uptake in higher education has been much slower. While a business the size of the smallest university will have business intelligence and reporting in place, at the time of writing only around 30 universities are currently using such a system.<sup>30</sup>

Like in the commercial sector, business intelligence can be used to analyse the performance of current business models and identify ways to improve them. This can be used to improve the delivery of modules (using data on staff, income and expenditure, timetabling and room usage, and student feedback), to evaluate different delivery models (such as blended learning approaches using both face to face teaching and distance learning), and to perform a range of other analysis and review functions.<sup>31</sup>

However, getting the data needed for informed institutional planning has often been time-consuming and expensive.<sup>32</sup> Many institutions do not have centralised data warehouses or data management systems, and data is often fragmented across different departments. There are also concerns about the cost of introducing these systems, as many current market options are designed (and priced) for the commercial sector.

**Nottingham Trent University** was one of the first UK HEIs to produce a business intelligence management dashboard. This software delivers real-time monitoring of a variety of data sources and draws together student, HR and financial planning information in a user friendly way so that all managers across the university have access to real-time data. Managers can access information on cash balance, financial performance, space utilisation as well as staff and student number data. The dashboard is central to the university's ability to manage assets, set targets and benchmarks, and produce detailed forecasts.<sup>33</sup>

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30 Evidence session five

31 Written submission: Sheffield Hallam University

32 Written submission: Jisc

33 Written submission: University Alliance

Jisc and HESA are developing two new platforms – HEIDI-Plus and HEIDI-Lab – which will provide university leaders and managers with more sophisticated data to support decision-making.

HEIDI-Plus will be a shared business intelligence service that builds on the existing HEIDI service, replacing its management information service with improved data content. The service will offer new layers of analysis and visualisation developed with the sector’s professional bodies. The new service will also allow institutions to link HESA data with their own datasets.

As more datasets become available, HEIDI-Lab will provide a platform for institutions to collaborate on the development of new methods of analysis and the cross-matching of new datasets. As new analyses develop and are validated they will be migrated onto the quality-assured HEIDI-Plus platform. One of the first examples of this is an initiative to build on a UUK data taxonomy to share or broker operational cost benchmarking data.

At the time of writing, the service is currently in development and is planned for release in November 2015.<sup>34</sup>

### 2.3.3 Access and recruitment

As noted, the Commission focused mainly on learning and student experience in this inquiry. However, we also briefly considered some of the other innovative ways that institutions are using data and analytics today, particularly around improving access to university and developing more sophisticated recruitment strategies.

One of the motivations the Commission identified for institutions introducing analytics systems is the desire to provide support to particular student groups, such as underachieving students, students from minority groups, and other widening participation groups. Analytics can be a powerful way to identify students who are struggling, and when linking this with demographic data, it can provide insights to particular issues faced by certain groups.

For example, the Commission heard evidence from one university who identified through their analytics system that particular ethnic groups were having trouble with particular subject areas. Using this data, they were then able to put in place additional support for these groups, and saw an impact through better performance for this group in these subject areas in future cohorts. Similarly, Oxford Brookes University found that their dashboards have helped to identify issues with BME achievement on particular courses.

Institutions have the ability to use data to improve the way they identify, market to and recruit students to their institutions. As described by the University of Salford:

Like most industries, we are now using data to produce much more targeted marketing activity. Geo-targeting and targeting based on demographic factors are clearly helpful in focusing our marketing, but we can also use data to target potential students at different points of the decision making cycle which is particularly helpful in reducing information overload and assisting potential students by providing them with different packages of information when they need them. Data also helps us to target mature learners and potential students who may have specific subject interests or professional needs.<sup>35</sup>

The University of Leeds is currently developing a client relationship management system (CRM) as part of its institution-wide Student Education Service. Whilst the primary purpose of the CRM is to enhance the service to applicants/students across the student lifecycle – i.e. across the enquiry, application, admission and on-course stages – it is being designed to also enhance the quality and reliability of business data for business analytical purposes.<sup>36</sup>

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35 Written submission: University of Salford

36 Written submission: University of Leeds

## 2.4 Issues

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Given the relative infancy of learning analytics in the UK, it is unsurprising that there are a number of critical issues for the sector. Here the Commission has investigated a number of these in detail and suggested strategies to begin to address these problems, in order to move forward with analytics.

### 2.4.1 Student consent

Firstly, one of the more pressing issues raised by the introduction of learning analytics are the ethical concerns around students' understanding and consent to the use of their personal data in learning analytics. The Commission was concerned that students might not be fully aware of how their data was being used in analytics, or even that they were generating data, which was then being collected and utilised by their institutions.

Institutions have a number of legal obligations when collecting and using student data. Under the Data Protection Act 1998 (DPA), anyone collecting and using personal data must comply with the eight data protection principles, which require that the data is:

1. Fairly and lawfully processed;
2. Be held only for specified purposes and not used or disclosed in any way incompatible with those purposes;
3. Adequate, relevant and not excessive;
4. Accurate and kept up to date;
5. Not kept for longer than is necessary;
6. Processed in line with the rights of individuals;
7. Kept secure; and
8. Not transferred outside the EEA without adequate protection.<sup>37</sup>

Fairly and lawfully processed means that one of the 'conditions of processing' must be met whenever an institution uses personal data. Acceptable ways institutions can use personal data include if the individual consents to the use, or if the use is necessary to fulfil a legal obligation. The DPA also requires that institutions let students know what data they are collecting and how they intend to use it, which usually comes in the form of privacy notice or a fair processing statement.<sup>38</sup>

These provisions effectively mean that personal student data cannot be used for any purpose other than that which it is collected for, unless specific consent is sought. This presents a potential issue for institutions seeking to use student data in learning analytics, for if existing policies around data protection and usage are insufficient to cover this new kind of use, there may be initial legal roadblocks to implementing a system.

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37 ICO, 'Data protection principles', available at: <https://ico.org.uk/for-organisations/guide-to-data-protection/data-protection-principles/>.

38 ICO, 'Processing personal data fairly and lawfully', available at: <https://ico.org.uk/for-organisations/guide-to-data-protection/principle-1-fair-and-lawful/>

Many institutions currently incorporate a broad statement about the use of student data in their student contracts, or in the policies and forms that students sign at enrolment. At Sheffield Hallam, for example, students are made aware at enrolment that the university will use the data they collect to support their learning and success.<sup>39</sup> When implementing their student dashboard, NTU found that the existing policies they had in place were sufficient to cover the analytics they planned, as the analytics systems were simply using new tools to use data that had already been collected and consented to.

It is important to draw a distinction between consent and informed consent. NTU's student enrolment conditions, for example, state that "the purposes for which the University may process your personal data (including sensitive personal data)" include "to enhance the student experience".<sup>40</sup> This is regarded as sufficient to cover consent from a legal perspective, and NTU also ensured students understood how learning analytics were used by running focus groups with students when piloting the programme, and publishing an explanatory document called "A Short Introduction to the NTU Student Dashboard" on their website. The Commission believes all institutions should explicitly seek informed consent from their students, which means taking steps to ensure students genuinely understand how an institution intends to use their data in learning analytics and what the end benefits will be.

However, despite legitimate concerns from stakeholders about ethics, privacy and student consent, the Commission found that students are relatively comfortable with the use of their data in learning analytics. Some suggest this is due to the entry of the 'digitally native' population into higher education. Growing up in a digital world dominated by Google, Facebook, and Amazon, the current generation of young undergraduate students are used to providing their personal data in return for access to services and products, and perhaps see their relationship with their university in the same light.

NTU found that when they tested their system in student focus groups, students were on the whole relatively comfortable with the analytics system the university had developed. The OU had similar results, as once the student union understood how the system was designed and used and what the benefits were, any initial concerns disappeared.

The Commission strongly believes that all institutions using learning analytics should have clear and comprehensive ethical policies in place. In particular, these policies should cover privacy of student data, including access to the data, the security of that data (which we will discuss below) and informed consent by students. The Commission also believes that, where possible, these policies should be kept as short and succinct as possible, to ensure students both read the document initially and understand it.

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39 Written submission: Sheffield Hallam University

40 Nottingham Trent University, 'Student enrolment conditions', available at: [https://ntu.ac.uk/about\\_ntu/document\\_uploads/86792.pdf](https://ntu.ac.uk/about_ntu/document_uploads/86792.pdf)

## Recommendation 4

Institutions should put in place clear ethical policies and codes of practices that govern the use of student data in analytics and other digital systems. These policies should, at a minimum, address student privacy, security of data and consent.

## Recommendation 5

In particular, when introducing learning analytics, HEIs should seek fully informed consent from students to the use of their personal and learning data in analytics. This should be sought again if new data is incorporated into the system, or existing data is used in new ways.

## Jisc Code of Practice for Learning Analytics

In June 2015 Jisc published their Code of Practice for Learning Analytics. The Code acts as a guide for institutions implementing analytics systems, and sets out their responsibilities to ensure that learning analytics is carried out responsibly, addressing the key legal, ethical and logistical issues which are likely to arise.

The Code sets out the key principles for using analytics in eight key areas:

1. **Responsibility** – allocating responsibility for the data and processes of learning analytics within an institution
2. **Transparency and consent** – being open about all aspects of the use of learning analytics, and ensuring students provide meaningful consent
3. **Privacy** – ensuring individual rights are protected and data protection legislation is complied with
4. **Validity** – making sure algorithms, metrics and processes are valid
5. **Access** – giving students access to their data and analytics
6. Enabling positive interventions – handling interventions based on analytics appropriately
7. **Minimising adverse impacts** – avoiding various pitfalls
8. **Stewardship of data** – handling data appropriately

The Code is designed to either be used as a guide for institutions developing their own analytics policies or procedures, or to be adopted in full by an institution.

## The Open University

The Open University were the first institution worldwide to develop a policy specifically on the ethical use of learning analytics, published in 2014. The OU has produced both a detailed 11-page policy document and a four-page summary for students, outlining what data is collected and the principles for the ethical use of learning analytics. The policy emphasises that learning analytics is first and foremost for the benefit of the students, not for the institution, and that no student will be defined by their analytics.

The policy is based on eight key principles:

### Principle 1

Learning analytics is an ethical practice that should align with core organisational principles, such as open entry to undergraduate level study.

### Principle 3

Students should not be wholly defined by their visible data or our interpretation of that data.

### Principle 5

The University is transparent regarding data collection, and will provide students with the opportunity to update their own data and consent agreements at regular intervals.

### Principle 7

Modelling and interventions based on analysis of data should be sound and free from bias.

### Principle 2

The OU has a responsibility to all stakeholders to use and extract meaning from student data for the benefit of students where feasible.

### Principle 4

The purpose and the boundaries regarding the use of learning analytics should be well defined and visible.

### Principle 6

Students should be engaged as active agents in the implementation of learning analytics (e.g. informed consent, personalised learning paths, interventions).

### Principle 8

Adoption of learning analytics within the OU requires broad acceptance of the values and benefits (organisational culture) and the development of appropriate skills across the organisation.

The policy was developed with significant consultation with student groups, who on the whole were supportive of the policy and of the aims and outcomes of learning analytics. The Student Union, in particular, were very supportive.

The Commission also considered the possibility of an 'opt-out' system, in which students could opt-out of participating in a learning analytics system and having their personal data collected and stored. Currently in the UK institutions are proceeding with an 'all-or-nothing' approach to analytics, where students have no real say in whether their data is used as part of learning analytics beyond choosing whether or not to go to that institution.

While an opt-out system will provide the student with agency and ultimate power over their data, it also poses a number of issues. Firstly, the overall strength of the analytics system would be weakened, as it would not hold a complete dataset of all the students, meaning that conclusions drawn from the system as a whole would be less accurate, and its findings would hold less weight. If analytics systems are, as we recommend in section 2.4.3, designed to be used entirely for the benefit of the student, the student has more to lose from opting-out than they do to gain from keeping their data protected.

At the moment the Commission does not see significant value to be gained in allowing students to opt-out of analytics. However, we did hear evidence that if more data (and particularly more intrusive data) about students is collected in the future, then a dual consent system may be appropriate, where a core set of data is collected from each student but additional datasets need to be explicitly consented to by the student to be collected. We suggest this area is monitored by institutions and reviewed periodically to ensure existing consent policies are still appropriate and fit-for-purpose.

### 2.4.2 Privacy

There is a concern that analytics systems could eventually incorporate less appropriate data about a student's interactions with their university and their behaviours while enrolled. The Commission heard the example of a (theoretical) institution who might decide to link up all the data they hold on a student. If this institution can see that the student is not attending early classes and has no activity on the VLE, but their university card is showing activity in the campus bar each night – is that sufficient reason for an intervention? Is it overly intrusive or is it simply another method through which institutions can learn more about their students in order to tailor student support?

Generally, the metrics used in learning analytics are relatively consistent across the institutions who have adopted analytics systems to date, and are almost completely focused on academic / learning activity rather than social activity. There are exceptions – the University of Derby, for example, has developed a list of 29 metrics for monitoring student engagement, including outside commitments such as childcare, age profile and part-time/full-time status. However, most institutions are using a similar set of indicators because they are proven to be the most effective measures. To use the earlier example, a student who is spending evenings in the campus bar but is also at risk of dropping out will likely be scoring low on library engagement, VLE use and attendance, meaning that the metric of 'time spent in bar' is providing no extra information that isn't already captured by existing metrics.

The Commission believes that as much as possible, data used in analytics should be data that relates to a student's learning and their engagement with their academic course. This includes the metrics discussed in section 2.2 and excludes such things as participation in extra-curricular activities, and potentially sensitive data like ethnicity and physical and mental health conditions. This is a difficult line to walk, given that – as we saw in 2.3.3 in regards to ethnicity – this information may be relevant and helpful in targeting interventions and support. Some institutions are also interested in measuring engagement through how students are participating in campus clubs and societies.

### 2.4.3 “Gaming the system”

Another common concern with analytics systems is the fear that any analytics system will be gamed and manipulated by students, reducing the ultimate impact of the system. For example, a student who knows that VLE usage is used in their analytics might spend more time interacting with the website, downloading files and following links, yet without necessarily engaging in the behaviour being measured. The Commission heard of a student who would go into their campus library and take out 10 books in order to boost their “library engagement score”, and of another who stood outside a university building repeatedly swiping their access card to increase their “campus presence”.

To some extent, changing the way students behave is the entire point of an analytics system. A student who has taken books out of the library is more likely to then read them than a student who has not gone to the library at all, and a student who attends class is more likely to engage in discussion and gain some new insights and understanding than one who does not. However, gamification of the basic metrics with no added gain to the student remains a concern for learning analytics.

There are a number of ways institutions are working to prevent or minimise gamification by students. Analytics systems can be “self-correcting”, in that they can identify and adjust for unusual spikes in behaviour. If the system sees a lot of behaviour from a student on one engagement factor, that factor can gradually become less important over time in the whole engagement score. This means that if the student is, for example, repeatedly taking books out of the library, the library score will diminish in importance over time, and that behaviour will no longer affect the student’s engagement score in the same way. NTU’s student dashboard operates like this, and tutors can also drill-down into engagement scores to see how the different factors are contributing to the overall score.<sup>41</sup>

The Commission believes the most effective way to manage any adverse consequences of an analytics system to remove the incentives to play the game. Arguably, the incentive to manipulate the system comes from the desire to avoid negative consequences, such as a poor grade, a threatening letter, or even a black mark on a transcript or on an analytics record that might be provided to an employer. If there are no consequences from having a low engagement score beyond an email from a tutor or a discussion after class, then the benefit the student receives from gaming the system is low or non-existent (beyond avoiding their tutor). This approach is called creating formative analytics systems rather than summative, phrasing that is also used by Jisc’s Code of Practice for learning analytics. This means using analytics to encourage students to reflect on how they are learning, or to initiate a conversation between a tutor and a student about how the student is doing, instead of using the system to define the student’s performance or ability.

#### Recommendation 6

Learning analytics should be driven by improvement of learning and teaching processes and student engagement. At the present early stage of maturity in learning analytics, we recommend that learning analytics is used for formative purposes, not summative purposes.

41 Interviews with Mike Day and Ed Foster, Nottingham Trent University.

## 2.4.4 Security

There are also concerns about the security of student data held by institutions and used in learning analytics, as the dataset holds significant value for a number of people and may therefore be a target for cybercrime. If institutions are considering implementing analytics systems without a strong data management system in place, which we consider in section 2.4.5, the risk of a security breach of their systems might be heightened. At the time of writing, the UK had seen recent large-scale security breaches of the TalkTalk customer record databases, and, more concerning for the HE sector, the Jisc-operated Janet network.

The DPA requires institutions to take particular care of sensitive personal data, which includes ethnicity, religion, political views, sexual orientation, and any physical or mental health conditions. Generally, this type of personal data is not used as part of learning analytics, as it has less bearing on academic engagement and performance than the metrics commonly used. However, there are some exceptions where sensitive data may be relevant for a tutor seeking to understand a student's performance, such as ethnicity or physical and mental health conditions. If using this type of data as part of their learning analytics system, an institution will need to ensure they take particular care to conform to the requirements of the DPA relating to sensitive data, including seeking informed consent from students, and keeping this data secure.

To protect data, good encryption is essential. This also requires an understanding of which data is the most sensitive and therefore needs to be encrypted. The recent TalkTalk hack was possible because the company had not encrypted the key sensitive data. Institutions are unlikely to develop an entirely secure system, but they can develop strong systems and do everything possible to minimise risk. Both the OU and the Jisc code of practices include provisions for handling data appropriately and storing it safely, and as noted in section 2.4.1 the Commission recommends that these types of provisions are included in policies governing the use of learning analytics. Adopting the good data management principles we outline in section 2.4.5 should also improve the security of all the data held by institutions.

## 2.4.5 Institutional capability and resourcing

Developing and implementing an analytics system first of all requires that the underlying data informing the analytics is consistent, accurate and easily accessible. This is the first stumbling block for many institutions, as most do not have effective data management systems in place.

A number of institutions have no centralised data management system, meaning data is stored separately by different departments. This can create 'silos', where data is held separately within the institution and it can be difficult to obtain the data from owners keen to maintain control over it.<sup>42</sup> While the data exists, the challenge is bringing it together and linking data from a number of different sources to the one student. Other institutions have fragmented IT systems without single sign-on, meaning that students need to enter their user credentials multiple times to access different university systems online (and that the relevant data from these systems is stored in multiple places). There is also relatively weak data governance in the sector,

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42 N Sclater (2014), 'Learning analytics: the current state of play in UK higher and further education', Jisc, pg 5.

where data assets are not treated as comparably important as finance and estate assets.<sup>43</sup>

Having a strong data management plan in place and following principles of good data management is essential for modern businesses operating in a data-driven world, and higher education institutions are no exception to this. By good data management, we refer to the following broad principles:

- Allocating one person or area ownership and leadership of data management
- Ensuring the data is accurate and consistent
- Keeping data secure
- Ensuring appropriate access controls are used, so that people who need the data can access it and people who don't cannot
- Creating a culture where data is everyone's asset and everyone's responsibility
- Developing good data capability among their staff

Currently, there is good practice in the sector with regard to good data management. Before developing their analytics system, for example, NTU spent years ensuring their data was correct, consistent, and able to be linked centrally to be used for student analytics. The University of Derby is first focusing on ensuring that consistent data definitions are in place and tidying up the data in general, rather than on producing "shiny" dashboards.<sup>44</sup> The Commission believes other institutions should follow this approach and focus first on developing good data management practices before moving ahead with learning analytics.

### Recommendation 7

Many internal and external systems rely upon good quality data being in place. Institutions should immediately review their internal data management approaches and put in place action to ensure that their data is fit for purpose. This may include development of a roadmap for cleaning up data.

Another major capacity issue for institutions looking to improve the way they manage data and conduct analytics is cost. At a time when institutions are facing increasing financial pressures, the cost of adopting and implementing an analytics system can seem prohibitive for many. In a written submission to the inquiry, the University of Leeds pointed out that:

It is also worth noting the revenue limitations which can inhibit HEI resourcing of innovations in data and business analytics, when compared to other sectors. For example, large scale industries [such as retail, media and music] largely operate in a commercial context, with a market-driven financial model set within a global economy. By comparison, significant elements of HEI business models are subject to regulatory control (e.g. tuition fee cap; overseas student visas; etc.) and Government spending decisions.<sup>45</sup>

43 HEDIIP (2016), 'Data Capability: a call to action', pg. 10.

44 Ibid., 24.

45 Written submission: University of Leeds

In their written submission, the University of Salford also noted their concern that ‘there is inevitably a cost inherent with the new technologies and the sector could become beholden to large multinational software vendors for expensive consultancy.’<sup>46</sup>

The sector is currently exploring a number of more cost-effective methods for introducing learning analytics. The HeLF survey found that among the institutions who had or were considering implementing learning analytics, the majority were intending to use elements within the existing VLE or student records systems.<sup>47</sup> Jisc is developing a ‘digital marketplace’, which they describe as similar to an ‘app store for universities’, where smaller, innovative education technology companies will be able to access the HE marketplace.

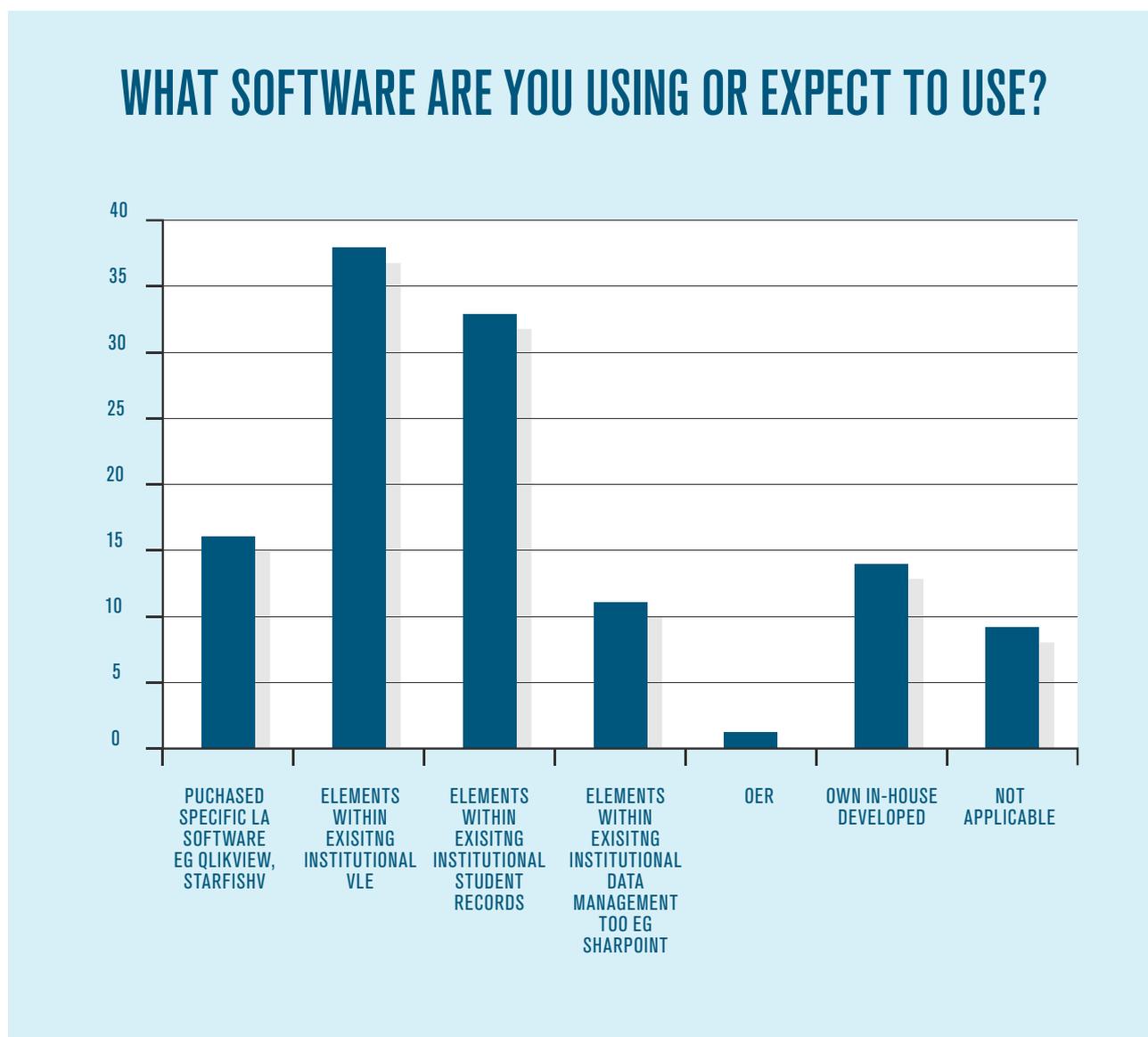


Figure 9: “What software are you using or expect to use?”  
 Source: Heads of E-Learning Forum, Learning Analytics in UK HE 2015 Survey Report

46 Written submission: University of Salford

47 Heads of E-Learning Forum (13 October 2015), ‘UK HE Learning Analytics Survey 2015’, available at: <http://helpuk.blogspot.co.uk/2015/10/uk-he-learning-analytics-survey-2015.html>, pg. 11.

In considering analytics software, the Commission believes institutions need to think strategically about the long-term impact and benefits to be had from the software. If analytics can help target interventions to at-risk students, and institutions are retaining additional students, then the institution will also be retaining the student's tuition fee income. One institution said that, given the current significance of tuition fee income, they only had to retain two additional students a year to cover the cost of the analytics software they had in place.<sup>48</sup> When developing their overall strategy for good data management and for analytics adoption, we suggest that institutions should consider the financial impact as a whole, in terms of both upfront costs and future income.

### **2.4.6 Staff capability and senior leadership**

The Commission heard repeatedly that the buy-in of SMT was crucial in encouraging the take-up of new practices such as analytics. However, many senior managers have little or no awareness of learning analytics, and are unfamiliar with the key tenets of good data management. The HeLF survey found that 75% of senior managers had limited understanding of the potential benefits and outcomes of implementing learning analytics in their institutions.<sup>49</sup>

Some institutions are leading from the top in this area – for example, the University of Edinburgh invested in seven new chairs in Science and Engineering, who are looking at technology-enhanced learning and are taking an interest in analytics, as well as appointing a separate Chair in Learning Analytics to further Edinburgh's research expertise in the field.<sup>50</sup> NTU's Student Dashboard was also largely made possible by a supportive and encouraging senior management team. However, in many other institutions there is no leadership on analytics or even on digital innovation.<sup>51</sup>

There are signs leaders within the sector are increasingly receptive to the significance of this area. Jisc is currently running a project on digital leadership, in conjunction with the Leadership Foundation for Higher Education, which aims to address the lack of consistency in digital literacy at senior levels. Their first session in October 2015 was oversubscribed. HEDIIP is also currently running a series of seminars across the UK to help institutions gain a better understanding of their current capabilities and identify areas in which improvements should be made – and again, have seen significant take-up on these sessions.

We recommend that senior leaders take immediate action to improve digital literacy, data capability and good data management across their institutions. In particular, leaders need to drive forward a culture shift within institutions, so data is seen as integral to all aspects of the university, rather than a side issue for the library and IT departments. This may involve including data capability strategies and good data management principles in their strategic plans, providing training and support for staff to improve their data skills and promoting data as an important strategic asset to be used and managed well.

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48 Interview.

49 Heads of E-Learning Forum (13 October 2015), 'UK HE Learning Analytics Survey 2015', available at: <http://helfuk.blogspot.co.uk/2015/10/uk-he-learning-analytics-survey-2015.html>.

50 Interview: Dragan Gasevic, The University of Edinburgh.

51 N Sclater (2014), 'Learning analytics: the current state of play in UK higher and further education', Jisc, pg 5.

The Commission believes it is crucial for senior management to look at data and analytics as a solution to a business problem, not as a solution to a technology problem or a technology problem in itself. Institutions who have implemented successful analytics programmes generally started with a business problem in mind – for example low retention rates – and used the information gained through analytics to address the problem. Implementing analytics simply for the sake of having a system in place, or to fill a perceived absence of a product, is unlikely to be as effective in improving student performance and engagement as systems that are designed to address specific problems or to produce certain outcomes.

### Recommendation 8

To be equipped for the future of higher education, institutions should ensure that digital literacy, capability and good data management strategies are an integral part of their strategic plans.

### Recommendation 9

HEIs should ensure that the digital agenda is being led at an appropriate level within their institution.

### Recommendation 10

University teaching and administrative staff need to be equipped with the necessary skills to perform their roles in a digital, data-driven world. Staff should be provided with appropriate training and support to improve their digital capability and data management skills.

## 2.5 Data and analytics internationally

The Commission heard evidence that the US and Australia are both ahead of the UK in terms of adoption of data analytics across institutions. Whilst there is brilliant work happening within individual institutions, there is less focus on how the sector is performing in this area on the whole, particularly in the US. The lack of empirical research in these areas makes direct comparisons difficult.

The US and Australia have experienced similar teething issues in implementing their data strategies, including cultural barriers, capability issues and a lack of resources, which the UK can learn from.

For example in Australia, the Government recently undertook a project to better understand why the adoption of learning analytics has been, as it says, “limited in scope and scale” despite institutions being positive about the potential impact. Only half of the institutions interviewed for the research had implemented a learning analytics programme, and no university had a programme functioning across the whole institution.

Where learning analytics have been adopted there are two divergent trajectories amongst institutions: one focusing on retention, and the other on pedagogy, curriculum, and learning. The report suggested that these trajectories are not expected to converge to a point where we see universities expanding the remit of their data strategies to include both goals. The drivers for implementing learning analytics are not only shaping how programmes operate presently, but also how they will continue to operate in the future. There is a possibility that the UK could see a similar split in the functions for learning analytics and this is something the sector should seek to prevent.

In the US there is a lot of research into the potential of learning analytics and predictive learning analytics, but there is currently a deficit of evidence of the impact on learning outcomes. The Campus Computing Project performs an annual survey of CIOs in universities across America and the 2015 results (surveying 417 participants) have shown that: 94% of participants agree that “digital curricular resources make learning more efficient and effective for students”; and 96% that “adaptive learning technology has great potential to improve learning outcomes for students.”

A challenge for institutions in the US has been demonstrating impact. The University of Georgia recently presented to the United States Senate Committee on Health, Education, Labor and Pensions and explained how data analysis has helped increase their graduation rate by 22ppt, with a dramatic increase seen particularly with minority students. They also put forward a list of ways policymakers could help them and others enhance these successes. Again, the issue of impact could be of great relevance to the UK, however with the REF and forthcoming TEF we might be better prepared (though perhaps not by design) for questions on impact.

Both the US and Australia will see the use of learning analytics increasing over the next five years, particularly the move to whole systems models, personalisation and predictive analysis. The US market noted that the next 5-10 years could bring more questions about the ethics of data usage amongst students. In the Australian market, it is thought that data will lead to a drive in recruitment, which may cause some ethical issues around using data in student recruitment. Given the similar policy contexts here – the recent lift of the student number cap and diversification of the HE market – this again is an issue that the UK will need to monitor.

PART

# 3

# FUTURE TRENDS



This section of the report turns to considering the direction the sector may be headed in the coming years. This is of course a difficult task, given the current rate of technological and policy change. However, the Commission believes that the future of higher education is going to be increasingly global, increasingly competitive and increasingly digital. To retain its position as a global leader in higher education, the UK sector needs to be ready to meet these challenges. Below, we outline the data and technological trends we expect to see in the coming years, and some of the steps the UK is taking – and needs to take – in order to take advantage of these.

## 3.1 Digital learning

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MOOCs are often referenced when discussing the rise of data in HE, because the digital delivery of the courses means that they inevitably generate large amounts of data. While the hype surrounding MOOCs has peaked, the Commission anticipates that more learning content will be delivered online through VLEs and other systems, in turn increasing the velocity of new student data. If higher education continues to expand, with the lifting of student number caps and the simplification of routes for new providers to enter the market (as signalled in the 2015 Green Paper), this may be a cost-effective alternative for university staff trying to expand their course delivery.

Linked to this is the increasing use of augmented reality learning environments, which allow students to undertake practical learning assignments online. This is particularly relevant for STEM subjects that require lab or field work, and creative and technical courses which use specialised systems. Leeds College of Music, for example, is piloting an augmented reality system that allows their students to work with simulated mixing decks.<sup>52</sup> These systems may become more common as higher education continues to expand, making it easier to provide mass access to a simulated laboratory or piece of equipment than to obtain enough physical resources for every student. If students are then conducting more practical work online, they will also be generating greater volume of data which can be fed back into learning analytics systems. In a written submission to the inquiry technology company DTP Solutionpath said:

Technology will continue to make the learning process a more exciting and interactive experience with augmentation and VR. Great institutions will offer remote teaching services that could educate people in their homes or around the world, enrolment will not be limited to location.<sup>53</sup>

If institutions continue to expand and learning material and activities continue to move online, then we may also see increasing online migration of the ‘social space’ of university, which the HE sector has not yet mastered. While students are comfortable seeing the digital space as valid contact in their social lives (e.g. through Facebook), at university they still generally expect course content to be delivered in classrooms and lecture theatres and tutors to provide face-to-face support. However, if education will continue to move online as the Commission believes, then there needs to be a culture shift where both students and tutors are comfortable with having more of their learning take place in virtual and simulated environments, and having tutor support provided through electronic means (or even through analytics systems themselves).<sup>54</sup>

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52 Evidence session five

53 Written submission: DTP Solutionpath

54 Evidence session two

‘Wearable technology’, another current technological trend, is also beginning to make an impact in the education field. These are products such as Google Glass, Apple Watch and Fitbit, and more recently the Oculus Rift VR system. As these become integrated into our daily lives, it is likely that students will begin to demand that similar products are used in their education, such as happened with older types of technology like laptops and tablets. In a written submission to the inquiry, the University of Salford wrote that:

Technology can be used to create a student user experience which matches that external to HE – a user defined excellence which marries the increasing ‘internet of everything’ with a growing use of wearable technology. This will increasingly allow us to wrap our institutions around the students, whilst addressing the graduate skill set in innovative, flexible and demanding ways.<sup>55</sup>

## 3.2 Data’s influence on teaching and learning

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### 3.2.1 Analytics adoption

As we discussed in Part Two, learning analytics is still in its relative infancy in the UK. The Commission expects the pace of adoption to increase over the coming years, with widespread adoption within the next 3-5 years.

There are a number of drivers that will speed up this change. Current policy directions suggest that UK higher education will expand. Analytics may become more popular as a result, as they can assist tutors to manage large classes, giving them a line of sight to students who they might otherwise overlook. Additionally, if retention is to be included as a measure in the TEF, we may perhaps see a push towards greater adoption of analytics systems in order to improve identification of at-risk students. Jisc’s learning analytics architecture will likely assist in speeding up analytics adoption, as it will make analytics easily accessible to institutions that may not have had the motivation, the understanding or the resources to implement a system.

As the rate of analytics adoption increases across the sector, the market for learning analytics systems will also develop. Most of the institutions currently using learning analytics are all using different systems and platforms, and many are also using different metrics. If current trends continue, we could expect to see a highly fragmented market with multiple platforms and metrics in place.

While this might foster increased innovation and competition in the sector, it would also make centralising the data and using it to draw sector-wide comparisons impossible. The Commission heard how data warehouses and analytics in different institutions could be linked together to provide a powerful sector-wide data set providing an accurate snapshot of student performance. The potential of this is enormous, especially for researchers and for government looking to use whole-of-sector data to inform decision-making. However, this requires institutions to use common metrics, and to work with analytics systems and underlying data warehouses that are compatible and can be linked together. Jisc’s proposed learning analytics architecture would facilitate this type of centralisation, as each institution that adopts the software would be using the same systems and underlying metrics.

The problem with this approach is that to be most effective, analytics systems need to be fit-for-purpose and appropriate to each student. The Commission is concerned that a blanket approach to learning analytics may not produce the sophisticated results that a more tailored system would. For example, certain metrics commonly used in learning analytics – like library use – might not be relevant in all faculties. The Commission heard from one educational technology company who emphasised that to be most effective, metrics needed to be chosen specifically for each institution, and the underlying analytics needed to be tailored to the institution's needs.<sup>56</sup> It is also worth noting the argument that competition within the market fosters innovation and will produce high quality analytics options. There are clear benefits to both of these approaches and it is up to individual HEIs to choose how they would proceed with adopting analytics systems.

### 3.2.2 Student focused-apps

As learning analytics software becomes widely used across the sector, we also expect to see increased demand among the student body for dashboards and analytics specifically targeted at them, rather than designed predominantly for use by tutors. Students are likely to want access to analytics that can provide powerful, instant feedback – especially if they believe their tutors are able to see this information. The Commission believes that giving students access to their own data will encourage greater self-reflection on their performance, create healthy competition between students and make the idea of universities using their data in analytics more acceptable.

Some UK institutions are already exploring student-focused learning analytics applications, such as NTU's student dashboard. Jisc's learning analytics model includes a student app, which will give students the ability to compare their progress with others through an activity feed, their performance history and a function through which students can set learning targets.

These types of apps will complement the move to increasingly digital learning supplemented by portable and wearable devices, as we described in section 3.1. To do this, universities need to ensure that they are following the principles of good data management as described earlier in this report, and that any analytics systems are using appropriate metrics and are properly designed. If the analytics are poorly developed, then giving students access to their own dashboards will simply be another means of providing poor feedback on their progress and performance. Tangible benefits to students need to be present for these applications to be valuable.

### 3.2.3 Predictive analytics

Currently in the UK, most analytics systems in place – including the ones discussed so far in this report – focus on dashboards which produce a visualisation of past and current student data. This is what we would call post-mortem analytics, which uses past data to inform and target current interventions. While this is effective for monitoring student performance and identifying and assisting students who are disengaged or struggling, big data analytics have the power to go further in the HE sector.

The next stage in analytics is to move to predictive analytics, which uses data about previous cohorts of students to make predictions on how and if current students will succeed at all elements of their course. A recent ECAR Working Group Paper defined predictive learning analytics as “the statistical analysis of historical and current data derived from learners and the learning process to create models that allow for predictions that improve the learning environment within which it occurs”.<sup>57</sup>

This provides students, tutors and institutions with especially powerful information to inform their learning, tutor support and overall strategic decision-making. For example, predictive analytics can identify which students may not complete their degree on time or even hand in individual assignments, which is already being seen in the UK through the OU Analyse tool. Apart from the OU the Commission does not believe that any UK institution has made significant headway in this area.

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57 K Arnold, J Baron, et al (October 2015), 'The Predictive Learning Analytics Revolution: Leveraging Learning Data for Student Success', EDUCAUSE Center for Research and Analysis, pg.2.

# CASE STUDY

## CIVITAS LEARNING

Civitas Learning is a US-based educational technology company that provides analytics services to over 850 campuses in the US. The company expanded into the UK market in July 2015.

The analytics systems developed by Civitas Learning are a good example of how data science and advanced analytics can be used to create predictive models that improve outcomes in areas such as student engagement, progression, graduation, retention, satisfaction, employability and the student experience.

The company provides bespoke products for each institution, working with the institution's data to create predictive models tailored to the particular characteristics of the institution and its students. This means firstly cleaning and linking the various datasets together to create what they refer to as a 'unified data layer'. The company's data scientists then use this data to develop algorithms that form the basis of their predictive models, and which identify the crucial factors that affect student success and experience at university. In developing the analytics they de-identify all data before working with it, and destroy any data that is not needed.

These analytics are presented in dashboard form, and Civitas Learning provides a number of different products that do this. 'Illume', the core product, provides a whole-of-institution picture, showing historical and predictive information about an institution's student body. Users can drill down within the data to look at the top predictors of risk, how different factors affect student success and how accurate the predictive model is. They can also filter the data by different student characteristics, such as semesters of study completed, course, full-time / part-time, and more personal characteristics like age, gender and ethnicity.

'Inspire for Faculty' visualises data on students' engagement patterns in real-time. Each student has an individual profile within the system, which allows tutors to see their specific engagement and performance trends over time, for both students who are doing well and for those who are struggling. Tutors can also contact students directly within the application, which records all outreach and interventions made. Civitas Learning are piloting a student facing app based on individualised success models to deliver motivational real time nudges.

Civitas Learning has developed a powerful predictive tool, which can predict with 84% accuracy whether a student is likely to drop out, on that student's very first day of university. Institutions using these analytics are reporting an improvement in student outcomes, particularly in terms of student retention and course completion. For example, one US institution running a pilot of the 'Inspire' dashboard found that the pilot group using the software outperformed the control group in successful course completion by nearly 3 percentage points, which translates to 150 students who passed courses that they otherwise would have failed.

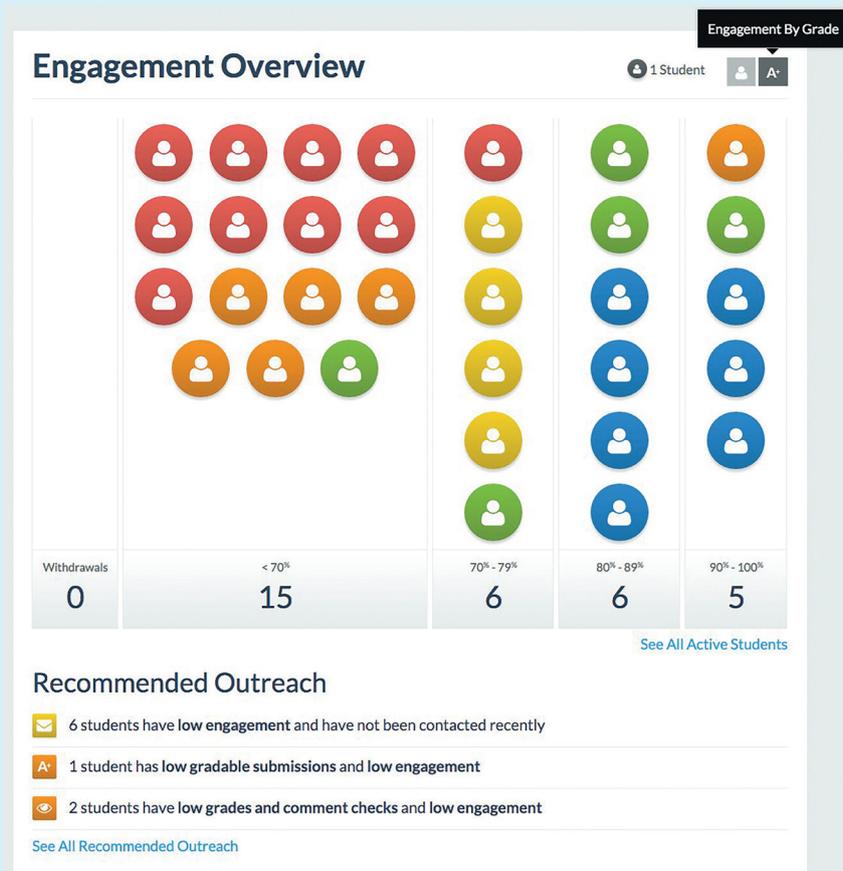


Figure 10: Student Heat Map: Shows a module-level engagement score for each individual, with the option to sort by grade and identify under-performing students. The Recommended Outreach section provides actionable insights derived from student engagement trend data

Source: Civitas Learning

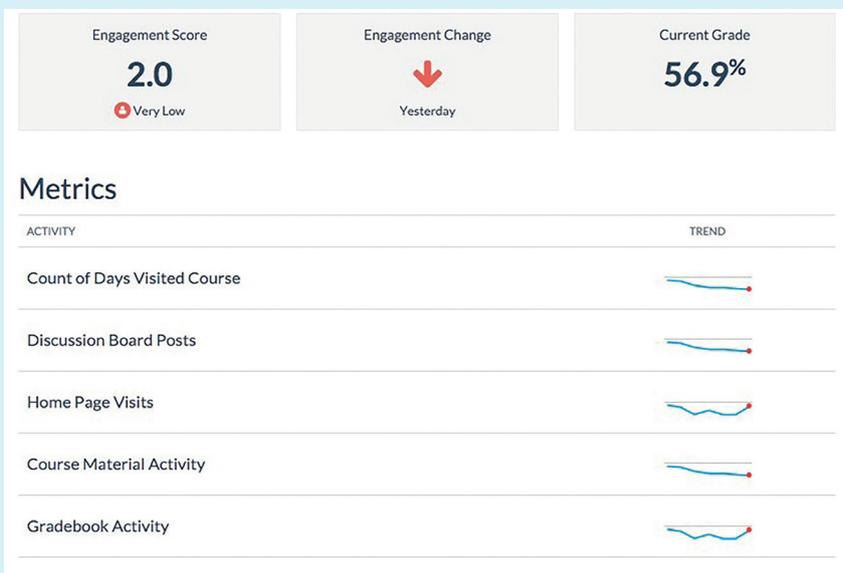


Figure 11: Detailed Student View: Ability to perform analysis on individual student engagement and performance trends, measured against class average over time

Source: Civitas Learning

### 3.2.4 Adaptive learning

Personalised learning, or adaptive learning technologies, is where a student's performance, learning behaviours and learning preferences will inform and influence the way that learning materials are presented to them. This means that as a student progresses through a set of course materials online, the system will choose the messages and the material to present to the student based on how the student is performing, has previously performed and how the student prefers to learn.

We may also begin to see a push from students themselves for more personalised learning systems. If, as we recommend, students are made fully aware that much of their data is collected and used by their institutions, they may start to demand the same kinds of personalised services they receive from other institutions who gather and analyse their personal data. As the University of Salford submitted to the Commission, "HE has access to extensive big data sets which would be prized by commercial companies but we are not using them productively. We ask our students to give us significant amounts of data and then we don't offer the personalised environment that they have come to expect from Amazon, eBay and Facebook."<sup>58</sup> With the introduction of the TEF and with tuition fees likely to rise, students may also begin to demand more from their teaching and their course material.

In a paper for BPP University, Simon Paul Atkinson says that adaptive learning has significant potential to tailor an individual's learning to their 'competences and learning preferences, but also to life contexts'.<sup>59</sup> For the latter to work, the learning technology needs to be able to integrate into a student's lifestyle. This is where wearable technology may increasingly play a role, as – like portable devices – it allows students instant and easy access to learning materials and their study planner.

### 3.2.5 Course advisor system

In the US, where course structures are more fluid and students need more guidance on how to choose modules to make up majors, analytics are now also being employed to help students and tutors with course advisor services. For example, in the US Civitas Learning offers a solution called Degree Map, which is a dashboard for students to assist students with course planning. The dashboard shows how many more credits they need to complete their degree, what other degrees and majors are obtainable based on the modules they have currently taken, and provides access to a catalogue of modules for students to load into a calendar-style planner for the rest of their degree.

We may also begin to see similar systems in place in the UK. This has particular potential for students from non-traditional backgrounds, who may not have the same support structures in place as other students for getting advice about course progression and extra-curricular activities such as internships. There is a huge opportunity for universities to fill in gaps for students who may not have these support structures, providing an extra vehicle for improved social mobility.

58 Written submission: University of Salford

59 SP Atkinson (2015), 'Adaptive Learning and Learning Analytics: a new learning design paradigm', A BPP Working Paper, available at: <http://www.joomag.com/magazine/bpp-university-final-adaptive-learning-and-learning-analytics/0734740001430901310?short>.

Again, students may begin to demand this type of service in their education. The Commission heard the idea of introducing an Amazon-style service multiple times in evidence, which could provide recommendations such as ‘You have taken X and Y unit, so you may be interested in B module or C internship’. Depending on the type of data incorporated into the underlying analytics, the predictive advisor system might also be able to offer recommendations about modules and extra-curricular activities undertaken by students who performed highly in their degrees and then went on to successful careers.

### 3.3 Open data

We noted in section 1.2 that there is a growing demand for more open data from public institutions. Organisations such as the Open Data Institute (ODI) are promoting innovation through open data in sectors such as finance, agriculture and for smart cities.

Given the breadth of the inquiry, the Commission did not consider this area in-depth. However, in evidence we did hear that better sharing of data between institutions could create significant cost savings. For example, Jisc is currently running a project with the EPSRC called *equipment.data*, which is an inventory of the all major valuable teaching and research equipment held by universities. This is designed to make it easier for universities and industry to share state-of-the-art equipment and tools, reducing the need for institutions to make costly investments in kit that they may use infrequently.<sup>60</sup> We suggest that the potential of the open data agenda for the HE sector is monitored by institutions and government, as this is an area that may become more important in coming years.

While we have seen the rise of MOOCs and a push from government for more high-quality information, the more marketised HE landscape is making institutions more reluctant to share data. The Commission believes that as institutions use more data, they should be encouraged to be transparent about how they use their data and to continue to publish high-quality information about their courses, campuses, destination data and fees.

This progress was recently stunted by an unexpected edit to Freedom of Information (FOI) policy in the 2015 HE Green Paper. Tucked away in two paragraphs towards the end of the paper, it states the intention to remove all higher education institutions from the scope of the 1998 Freedom of Information Act. The paper suggests that distinguishing between HEFCE-funded ‘public’ providers and alternative providers is now somewhat arbitrary given that ‘the income of nearly all of these providers is no longer principally from direct grant and tuition fee income is not treated as public funding’. Noting that alternative providers are not subject to FOI, the paper refers to ‘an uneven playing field in terms of costs and responsibilities’.<sup>61</sup>

Although not explicitly stating its intention, the Government says that “in principle, we want to see all higher education providers subject to the same requirements, and wherever possible we are seeking to reduce burdens and deregulate” – indicating that

60 Written submission: Jisc

61 BIS Green Paper (6 November 2015), ‘Higher education: teaching excellence, social mobility and student choice’, pg. 68.

they are considering exempting institutions from the requirements of the FOI Act.<sup>62</sup> This is a strange suggestion at a time when the general trend is towards increased transparency and access to information. The Commission believes that exempting all HEIs and alternative providers from the FOI Act is a mistake and should not be adopted following the consultation and that to create a more even regulatory playing field, alternative providers should also be brought into the scope of FOI.

### Recommendation 11

The Government should not exempt higher education institutions from the requirements of the FOI Act, and any new providers who enter into the HE market and receive public funds should be brought within its scope.

## 3.4 Redesigned information landscape

For UK HE data collections to continue to meet the needs of both HEIs and the agencies and individuals who use the data, the speed and frequency of data collections needs to be improved. In the era of big data, where large volumes of data is generated at a rapid pace, it makes little sense for central bodies to continue to collect data on a static basis. This is particularly the case given that it takes a significant amount of time for HESA to quality assure and process their returns, meaning that student data is not made available until the January after the end of the academic year to which it relates.

HESA is currently working towards a reformed data collection system that aims to speed up their collections process. In September 2015 they launched a consultation on their 'Data Futures' plan, which outlines their intention to move towards in-year data collection rather than a system that relies on an annual return.

The consultation notes that:

While the sector has changed substantially over the past few years, the data infrastructure has not kept pace with these changes. This infrastructure needs to be substantially upgraded so that it can more accurately reflect the sector as it is, can support better decision-making in and for the sector, and can enhance public trust and confidence.<sup>63</sup>

The reformed HESA data collection process will:

- Have a number of collection points during each year to balance the needs of different stakeholders with the availability of data
- Use a data specification that is closer to providers' own data. This will require less translation for reporting and will align cross-sector information more closely with providers' internal reporting
- Reduce the time from the business process to the submission and quality assurance of data by HESA, thus spreading the effort of reporting throughout the year.<sup>64</sup>

62 Ibid.

63 HESA (September 2015), 'Consultation: Data Futures Programme', available at: [https://www.hesa.ac.uk/dox/publishing/HESA\\_Data\\_Futures\\_Programme\\_Consultation.pdf](https://www.hesa.ac.uk/dox/publishing/HESA_Data_Futures_Programme_Consultation.pdf).

64 Ibid., 6.

The new HESA will, as much as possible, be the centralised body for data collection, and other organisations that need HE data will be able to obtain the necessary data from HESA. The model is based on a ‘service delivery driven’ model, where the content and timing of collections is aligned to the needs of the users and the availability of the data from HE providers.

One of the other models identified, on the far end of the ‘radical’ spectrum, was what they called a ‘direct data pull’, where the data that HESA would collect was instead sent directly to HESA as it was created. HESA felt this model was not feasible as it would require open access to HEIs systems and the sector would not support this model at this time. However, institutions may need to be prepared for a future where data is expected to be more readily and immediately available. This will require institutions to adopt the good data management principles we described earlier in section 2.4.5.

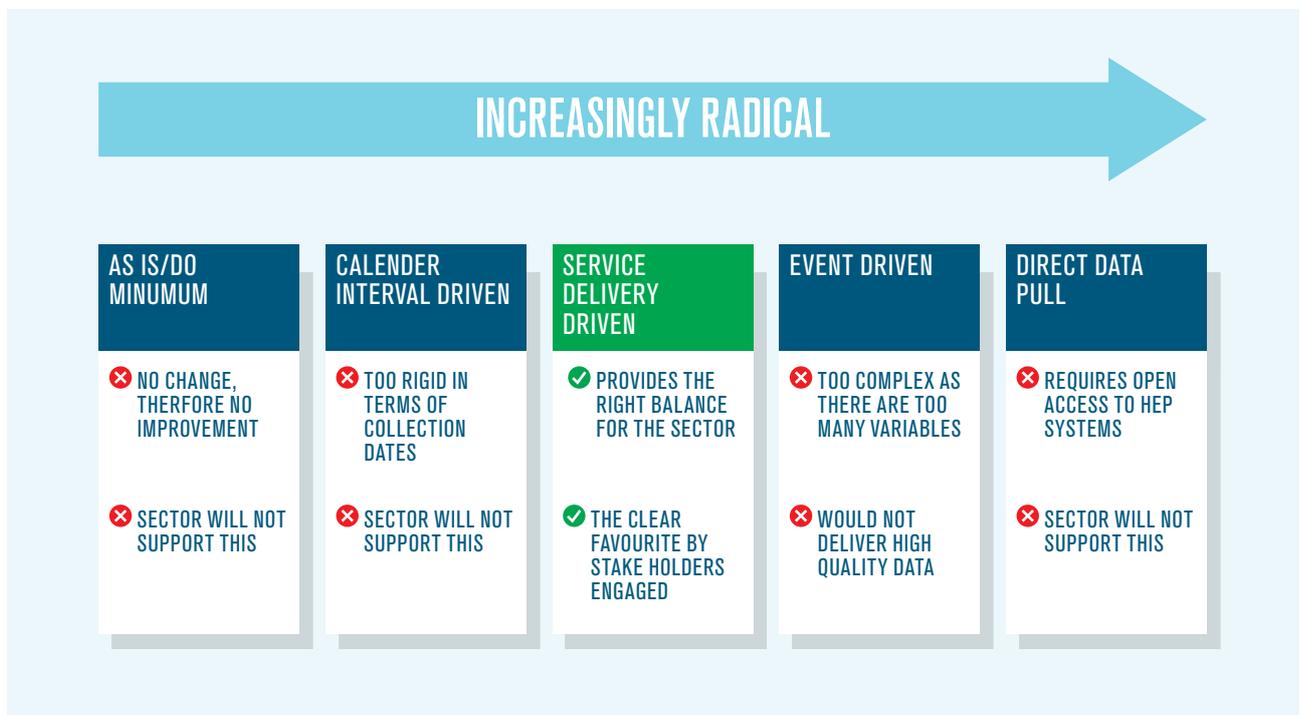


Figure 12: “Proposed new HESA data collection process”  
 Source: HESA, *Consultation: HESA Data Futures Programme*, 2015.

### 3.5 A data-driven sector

Taken together, the above trends suggest the sector is moving towards a future where data is central to all decision-making, both within institutions and across the sector as a whole. Jisc describes this as a ‘data-driven sector’, where HEIs will have “greater sources of data and intelligence available to them, and crucially the tools and systems capable of using that data effectively in order to inform decision-making.”<sup>65</sup>

65 Written submission: Jisc

In their 2014 and 2015 *Horizon Reports*, the NMC mentioned the mid-term trend of data-driven learning and assessment, and an increasing focus on using data to measure learning.<sup>66</sup> As students (and tutors) generate data, there is increasing interest in creating tools to analyse patterns within this data and using this to drive improvements. To date, much of the activity around this is on student-focused learning analytics – however, the Commission believes this could be expanded to cover more aspects of the HE sector.

Within institutions, we expect to see a growing culture shift, where data is seen as integral to all aspects of operational and policy decision-making. The improvements made to data management and reporting systems in institutions, and the growing use of data warehouses and business intelligence, will aid this. Data will also be an essential means of providing student support, through the analytics systems we have considered through this report.

For government, using data to make policy decisions presents an opportunity to create better predictions on the impact of policy changes. There is a whole realm of possibilities, particularly around student numbers, tuition fees, and regulation which could use data to drive evidence-based reforms, allowing them to make stronger arguments to the public and sector.

Across the sector as a whole, the redesigned information landscape will facilitate easy access to centralised, consistent and up-to-date sector data for use in decision-making. Similarly, widespread adoption of analytics will create a large and very valuable database of information about how all UK students are learning and engaging with their courses, especially if all institutions are using similar metrics. This would be an enormously powerful tool to monitor how effective learning is across the entire sector, by aggregating all the data and analysing it to draw sector-wide conclusions. As just one example, this information could be a powerful and accurate measure to introduce into the TEF.

The TEF is a key example of how timely and increased data may influence policymaking and government decision making. The months of speculation on the TEF that preceded the publication of the HE Green Paper in November 2015 mostly focused on the metrics that might be in the TEF. However, the metrics in the Green Paper are relatively few. Arguing that ‘at present there are three common metrics (suitably benchmarked) that would best inform TEF judgements’, the paper sets out:<sup>67</sup>

- **Employment/destination** – from the Destination of Leavers from Higher Education Surveys (outcomes), and, from early 2017, make use of the results of the HMRC data match
- **Retention/continuation** – from the UK Performance Indicators which are published by Higher Education Statistics Agency (HESA) (outcomes)
- **Student satisfaction indicators** – from the National Student Survey (teaching quality and learning environment)

66 L Johnson, S Adams Becker, V Estrada, and A Freeman (2015), ‘The NMC Horizon Report: 2015 Higher Education Edition’ The New Media Consortium, available at <http://cdn.nmc.org/media/2015-nmc-horizon-report-HE-EN.pdf>, and L Johnson, S Adams Becker, V Estrada, and A Freeman (2014), ‘NMC Horizon Report: 2014 Higher Education Edition’ The New Media Consortium, available at: <http://cdn.nmc.org/media/2014-nmc-horizon-report-he-EN-SC.pdf>.

67 BIS Green Paper (6 November 2015), ‘Higher education: teaching excellence, social mobility and student choice’, pg. 33-34.

In Part Two this report we discussed the importance of choosing appropriate metrics for any system that measures performance or quality. If the measures chosen are poor, or rely on bad data, then the output will be unreliable and may lead to incorrect or poor conclusions. It is crucial that the TEF gets its metrics and qualitative submissions right, given the significance of the results – allowing institutions who perform well to raise tuition fees.

Given all the new data that we expect to be created in the coming years, it may not be appropriate to rely entirely on older, static, returns-based sets of data in the TEF. Both the DLHE and HESA's retention figures take time to put together, meaning that the end data is not an accurate reflection of the current performance of the university. Additionally, the National Student Survey data is an example of an indicator that can be gamed, where institutions can identify which factors impact most on the NSS and direct attention to improving these particular ones to boost their ranking in the NSS – and now, perhaps in the TEF as well.

The Green Paper specifically notes three other additional metrics that had been suggested by the sector and others:

- **Student commitment to learning** – including appropriate pedagogical approaches
- **Training and employment of staff** – measures might include proportion of staff on permanent contracts
- **Teaching intensity** – measures might include time spent studying, measured in the UK Engagement Surveys, proportion of total staff time spent on teaching<sup>68</sup>

Learning analytics data could act as a measure of the above. For example, student commitment to learning could be seen in how frequently they are logging into university systems and accessing library resources, and teaching intensity could be measured by how long students are spending on VLEs and other learning systems, and potentially how often tutors are engaging with their dashboards (although bearing in mind the sensitivities around teaching analytics described in section 2.3.1). More generally, adopting learning analytics could be seen as a commitment to excellent teaching as it shows a desire to improve the student experience.

In their written submission to the inquiry Jisc recommended that learning analytics be included in the TEF on a kite mark basis, with potential scope to use a more sophisticated measure in future TEF iterations. The information an institution receives through its analytics may also provide a useful addition to its qualitative submission, in terms of highlighting the impact of good teaching. We believe institutions should consider learning analytics as a powerful measure for identifying and encouraging excellent teaching, which may provide evidence for their qualitative submissions to the TEF.

## Recommendation 12

Institutions should be encouraged to use the information from learning analytics systems to identify and foster excellent teaching within their institutions, and to consider using this information in their submissions to the TEF.

It is not just government and institutions who will benefit from a data-driven sector, but students within the system too. Individuals in education will produce new 'big data sets', which will follow them throughout their education – from primary and secondary school and then onto the workplace – holding most details of their experience, engagement and performance in their studies.

This data set is clearly powerful and holds potential for students. The Commission heard the idea of 'LinkedIn+', in which a student could pull together all of the data that exists about their learning journey and present it in a public record. This could be a powerful document for the student, like a CV as a record of their academic and extra-curricular achievements, but unlike a CV is that aspects of it are supported by objective data. This could be supplemented by more qualitative statements added by the individual.

We also heard fears about the security of this data, in particular the risk that universities might be tempted to sell the data they hold on their students to third parties. For example, employers are increasingly looking for indicators they can use to differentiate between graduates, especially as degree inflation continues to be a concern.<sup>69</sup> Dashboard data on how engaged a student was during their courses could potentially be a way for employers to identify motivated students who might be more committed in the workplace.

The Commission believes that under no circumstances should a university use the data they hold about their students for profit or commercial gain at the expense of the student. As we noted in section 2.4.3, one of the most effective ways to ensure analytics systems are effective in their intended purpose is to remove any negative consequences for the student. If students fear that their dashboard data might affect their future employment prospects, they are more likely to manipulate the data and in turn prevent analytics from providing any useful support.

69 BIS Green Paper (6 November 2015), 'Higher education: teaching excellence, social mobility and student choice', pg. 12.



## Evidence Sessions

### Scoping seminar

[Dr Phil Richards](#)  
Chief Innovation Officer,  
Jisc

[Andy Youell](#)  
Director, HEDIIP

[Professor Stephen Heppell](#)  
Bournemouth University

### Session one

[Kathy Skelton](#)  
Head of Strategy and Insight,  
FutureLearn

[Kevin Mayles](#)  
Head of Analytics, The Open  
University

[Simon Budgen](#)  
Head of OpenLearn  
Commissioning, The Open  
University

[Professor John Domingue](#)  
Director of The Knowledge  
Media Institute,  
The Open University

### Session two

[Professor Diana Laurillard](#)  
London Knowledge Lab,  
Institute of Education,  
University College London

[David White](#)  
Head of Technology Enhanced  
Learning, Centre for Learning  
and Teaching in Art and Design,  
University of the Arts London

[Sarah Sherman](#)  
Service Manager, Bloomsbury  
Learning Environment

### Session three

[Paul Clark](#)  
Chief Executive, HESA

[Neil Gorman](#)  
Chair, HEDIIP Programme  
Board

### Session four

[Dr Paul Feldman](#)  
Chief Executive, Jisc

[Dr Phil Richards](#)  
Chief Innovation Officer, Jisc

[Niall Sclater](#)  
Consultant and Director,  
Sclater Digital

## Interviews

[Cheyne Tan](#)  
Civitas Learning

[Joel Mullan](#)  
Jisc

[Ed Foster](#)  
Nottingham Trent University

[Mike Day](#)  
Nottingham Trent University

[David Morris](#)  
NUS

[Professor Rebecca Eynon](#)  
Oxford Internet Institute

[Ian Kimber](#)  
QAA

[Laura Burley](#)  
The Open University

[Emma Neill](#)  
The Open University

[Peter Tinson](#)  
UCISA

[John de Pury](#)  
Universities UK

[Sam Roseveare](#)  
Universities UK

[Ian Powling](#)  
Universities UK

[Matt Robinson](#)  
University Alliance

[Dominic Passfield](#)  
University Alliance

[Dragan Gasevic](#)  
University of Edinburgh

[Dr Stuart Lee](#)  
University of Oxford

[Gosia Turner](#)  
University of Oxford

[Professor Rebecca Eynon](#)  
University of Oxford

## Written Submissions

Creative Skillset  
[Dr Dean Machin](#)  
University College London

[Dr Vikki Boliver](#)  
Durham University

HEDIIP

Jisc

Mixed Economy Group

[Professor Jane Seale](#)  
University of Exeter

Sheffield Hallam University

DTP Solutionpath  
University Alliance

University of Leeds

University of Portsmouth

University of Salford Manchester

University of Sheffield

University of South Wales

## Acronyms

<a href="#"><u>BIS</u></a>	Department for Business, Innovation and Skills
<a href="#"><u>BME</u></a>	Black and minority ethnic groups
<a href="#"><u>CIO</u></a>	Chief Information Officer
<a href="#"><u>CRM</u></a>	Customer Relationship Management
<a href="#"><u>DPA</u></a>	Data Protection Act 1998
<a href="#"><u>EPSRC</u></a>	Engineering and Physical Sciences Research Council
<a href="#"><u>FOI</u></a>	Freedom of Information
<a href="#"><u>HEI</u></a>	Higher Education Institution
<a href="#"><u>HeLF</u></a>	Heads of E-Learning Forum
<a href="#"><u>HESA</u></a>	Higher Education Statistics Agency
<a href="#"><u>HMRC</u></a>	Her Majesty's Revenue and Customs
<a href="#"><u>KIS</u></a>	Key Information Sets
<a href="#"><u>LA</u></a>	Learning Analytics
<a href="#"><u>MOOCs</u></a>	Massive Open Online Courses
<a href="#"><u>NMC</u></a>	New Media Consortium
<a href="#"><u>NSS</u></a>	National Student Survey
<a href="#"><u>NTU</u></a>	Nottingham Trent University
<a href="#"><u>NUS</u></a>	National Union of Students
<a href="#"><u>ODI</u></a>	Open Data Institute
<a href="#"><u>QAA</u></a>	Quality Assurance Agency
<a href="#"><u>R&amp;D</u></a>	Research and Development
<a href="#"><u>REF</u></a>	Research Excellence Framework
<a href="#"><u>SIS</u></a>	Student Information System
<a href="#"><u>SLC</u></a>	Student Loans Company
<a href="#"><u>SNC</u></a>	Student Number Control
<a href="#"><u>TEF</u></a>	Teaching Excellence Framework
<a href="#"><u>UCAS</u></a>	Universities and Colleges Admissions Service
<a href="#"><u>UKVI</u></a>	UK Visas and Immigration
<a href="#"><u>UUK</u></a>	Universities UK
<a href="#"><u>VLE</u></a>	Virtual Learning Environment

## What is the Higher Education Commission?

The Higher Education Commission is an independent body made up leaders from the education sector, the business community and the major political parties.

Established in response to demand from Parliamentarians for a more informed and reflective discourse on higher education issues, the Higher Education Commission examines higher education policy, holds evidence-based inquiries, and produces written reports with recommendations for policymakers.

The Higher Education Commission is chaired by Professor the Lord Norton of Louth, a Conservative peer and academic. The Higher Education Commission's work is generously supported by University Partnerships Programme.

### Inquiry Co-Chairs

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Professor of Government, University of Hull

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The Higher Education Commission is powered by Policy Connect.

Policy Connect is the leading network of Parliamentary groups, research commissions, forums and campaigns working to inform and improve UK public policy.

Working across a wide range of policy areas, covering mainstream and niche issues, the Policy Connect network of groups is recognised for providing the highest quality in impartial, policy-led research, events and campaigning.

Each group is led by parliamentarians and senior figures from across its policy field and is staffed by a team of full-time, dedicated policy experts. Every group within the network is unique, operating independently, with its own programme of events, research and campaigning activity. However, all groups share the same fundamental principles that comprise the Policy Connect approach: non-profit, cross-party, fully transparent, providing policy expertise in a highly organised and professional manner.

The Policy Connect network of groups is proud of the role it plays in providing a platform for thoughtful, collaborative and creative debate in UK public policy.

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The University Partnerships Programme (UPP) was established in 1998 and specialises in funding, developing and operating academic and residential infrastructure for universities across the UK. To date UPP has raised more than £2bn of investment in its long-term partnerships with 14 leading institutions and plans to invest a further £1bn over the next three years. UPP is committed to the long-term success of what is a world class sector and as a consequence is delighted to work with bodies such as the HE Commission to find potential solutions to issues facing a changing sector. Find out more at: [www.upp-ltd.com](http://www.upp-ltd.com)

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Through its public interest remit, ACCA promotes appropriate regulation of accounting and conducts relevant research to ensure accountancy continues to grow in reputation and influence. Founded in 1904, ACCA has consistently held unique core values: opportunity, diversity, innovation, integrity and accountability. ACCA seeks to open up the profession to people of all backgrounds and remove artificial barriers, innovating its qualifications and delivery to meet the diverse needs of trainee professionals and their employers. More information is here: [www.accaglobal.com](http://www.accaglobal.com)

### TEC Trust Fund

The TEC Trust Fund (TTF) is a small charitable fund established to further the pursuit of skills excellence in the UK.

Its mission is to support the achievement of high level skills: whether it is to develop a young talent who has been identified as having potential to excel and participate in a skills competition; or to further the high level training of an employee who has come into vocational skills later in life. We aim to encourage skills excellence and influence policy change through research.

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