

# Jellybean Learning

The Future of The University Campus



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## 1. Introduction

For hundreds, if not thousands of years, education has followed the same process: someone with knowledge and understanding of a subject attempts to transfer this knowledge to a group of less knowledgeable people. Although the process has remained largely the same, the world has changed drastically around it.

Not only do we understand a lot more about how best to teach, but there have also been numerous advancements in everything from building design to personal technology which have changed the way we interact on a physical and social level. Many of these changes have been harnessed by industries and governments, but education has been slow to catch up.

Computer technology, for example, has now totally changed the way we work and live, and has also influenced education. But what we're starting to see now is the next wave of effects. Not only are people using computers, but the use of computers has started to change how they process material, and other technology is being used to gain insights into this. This has begun to influence education; for example, many students now consume at least some of their course materials through digital media. Other technologies, like virtual reality,

let people explore environments and objects remotely and collaborate effectively across distances. Harnessing such technologies to enhance education is vitally important.

Another important factor in the development of the education sector is the influence of fluctuating demographics as our world continues to become more closely integrated and more globalised. Increases in foreign student numbers at many leading universities and more mature students looking for an edge in an ever more competitive workplace will further alter the funding environment for universities and necessitate rethinking services and engagement strategies. Universities will also have to think carefully about how effectively they are using their space. Novel ways of using their space to its maximum potential will need to be explored, such as making the building 'smart' and partnering with other organisations.

As part of our research process, we spoke to academics, support staff and students through workshops and interviews. This crucial insight into both where universities are now and where they should be in the future was invaluable. Workshops allowed us to present existing ideas from universities and get feedback from these key stakeholders on the topics raised. Following these workshops, experts were also interviewed for a more detailed examination of specific topics. From this research, we were able to identify a series of fundamental attributes that should be considered when looking at the university of the future; these became the Jellybean Learning Model. These discussions also gave us the opportunity to gauge the responses of people in the sector to questions around the preparedness and adaptability of the sector.

**We hope you enjoy reading Jellybean Learning**



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## Workshops

As part of our consultation process, we held workshops with a range of university stakeholders, including students, academic staff and support staff to help explore what the physical space, technology and services of the campus look like now, and

what they should look like in the future. This table is the result of condensing those ideas and findings down into a series of activities and dimensions. These themes serve to introduce ideas used in the report and will recur throughout.



**INDIVIDUAL WORKING**



**LECTURES**



**SEMINARS**

ACTIVITY	PHYSICAL SPACE	TOOLS & TECHNOLOGY	SERVICES
<b>Individual working</b>			
NOW	<ul style="list-style-type: none"> <li>Cell-like spaces, discipline based with libraries and labs.</li> </ul>	<ul style="list-style-type: none"> <li>Laptops and PCs.</li> </ul>	<ul style="list-style-type: none"> <li>Physical storage and manual retrieval/ management of materials.</li> </ul>
FUTURE	<ul style="list-style-type: none"> <li>Range of flexible spaces, large and small.</li> <li>Less individual space, more communal.</li> <li>Different areas to support different kinds of work.</li> <li>Spaces to support digital learning.</li> </ul>	<ul style="list-style-type: none"> <li>Comfortable screen-reading.</li> <li>Tablets.</li> <li>Seamless integration of technologies.</li> </ul>	<ul style="list-style-type: none"> <li>Digital storage and robotic systems for retrieving and managing physical materials.</li> </ul>
<b>Lectures</b>			
NOW	<ul style="list-style-type: none"> <li>Traditional spaces, used in traditional, didactic way.</li> </ul>	<ul style="list-style-type: none"> <li>Totally standard, nothing new, very limited.</li> </ul>	<ul style="list-style-type: none"> <li>Inconsistent timetabling.</li> </ul>
FUTURE	<ul style="list-style-type: none"> <li>Small and large flexible spaces, facilities for immersive lecture experience and live lessons around the world.</li> </ul>	<ul style="list-style-type: none"> <li>Easy lecture capture.</li> <li>Interactive video presentations.</li> <li>Augmented reality.</li> <li>High-bandwidth internet connections and infrastructure to deliver lag-free lectures throughout the world.</li> </ul>	<ul style="list-style-type: none"> <li>Consistent IT support and timetabling.</li> <li>Lecture capture rooms, automatic release of rooms.</li> <li>Professional staff to assist with aspects of production, e.g. lighting technicians, directors.</li> </ul>
<b>Seminars</b>			
NOW	<ul style="list-style-type: none"> <li>Individual areas in the library.</li> </ul>	<ul style="list-style-type: none"> <li>Unreliable connectivity and lack of technology.</li> </ul>	<ul style="list-style-type: none"> <li>Limited access to services.</li> </ul>
FUTURE	<ul style="list-style-type: none"> <li>More collaborative and different spaces, e.g. 'amphitheatre'.</li> <li>Types of space that allow fluid collaboration – walls to write on, flexibility and adaptability of space.</li> </ul>	<ul style="list-style-type: none"> <li>Adaptive technology.</li> <li>Remote access.</li> <li>Multiple writing surfaces.</li> <li>Interactive collaboration screens.</li> </ul>	<ul style="list-style-type: none"> <li>24/7 access to spaces.</li> <li>Fluid services: correct equipment and services automatically ordered into room.</li> </ul>

## 2. Executive Summary

The world is undergoing huge changes in the way we work, communicate, live and learn. The education sector, not immune to these changes, has to adapt to the latest technological developments, respond to cuts in funding, and meet evolving student expectations. To remain successful, universities must understand how to teach the next generation of students. That entails recognising everything from how macro trends will shape the demographics of the students

of the future, to how and what future students will need to learn to achieve their goals. With property being a major cost for universities, developing clever and innovative approaches to how they use physical space, while at the same time ensuring that they react to other developments, is essential. This will mean taking a careful look at what space is used for, and what it could also, or alternatively be used for, in order to gain the maximum from existing space.

This report identifies eight key themes that are going to need to be considered by campuses to effectively face the challenges of educating today's ten-year-olds: We call this model Jellybean Learning. These themes should all be considered when designing and adapting campus space to help enable the future's students to unlock their full academic potential.

### The factors identified in Jellybean Learning are:

#### Learn

Students in the future will be learning in very different ways to the traditional didactic approach favoured by universities. Rather than a simple one-way data dump from lecturer to student, the next generation of students will be learning in more social, immersive and interactive ways.

#### Research

The way that people access information is now largely digital, and so a new approach to areas like library spaces is required. Related changes to what is taught will include more skills in evaluating information rather than simply finding it.

#### Engage

Universities are constantly trying to update their campus offerings and deliver the right mix of services and spaces to students, and engaging students in new ways is going to be extremely important in the university of the future, as students will expect their needs and wants to be taken into account.

#### Teach

New approaches to how information and skills are taught will be vital to the university of the future. This will involve novel approaches to teaching,

utilising emerging technologies such as virtual reality (VR) and adopting new tools to connect students to a wider range of teachers and courses.

#### Analyse

Advances in technology have made it possible to harvest vast amounts of data from a range of sources to help understand how to increase the efficacy of certain processes. Students are no exception to this and it will be increasingly important to analyse student data to improve retention, classroom engagement and the student experience.

#### Work

Universities will have to improve efforts to prepare students for the world of work, shifting their focus to teaching skills, rather than simply imparting knowledge. Changes in the employment market, such as the rise of the 'Gig Economy' will cause universities to focus more on making courses more flexible and applicable to a more diverse body of students.

#### Partner

Financial pressures are causing institutions to look at new ways to use their space. These include partnering with external

### Typologies of the Campus of the Future:

Creating spaces that incorporate different elements of the Jellybean Learning Model will be vital in responding to trends shaping the future of education. Future campuses should make use of different mixes of spaces to support students learning and

researching in different ways. Technology will be more closely integrated with pedagogical practice, and universities will shift focus from being purely educational to a more holistic model, involving close partnerships with companies and other agencies.



Together, these factors help to provide a framework to best prepare higher education institutions for the challenges of educating the next generation of learners. Weaving these themes into the design of campuses will best position universities to meet the needs of the next generation of students and continue providing excellent education into the future.

## 3. All Change in Education

The world is changing like never before: Industrialisation in developing economies, technological disruption and changing demographics are all rapidly reshaping the economic, social and political landscape of our times. Every organisation, from small businesses all the way to government bodies, is being impacted by these changes.

In the education sector, we've already started to see changes in how institutions teach, research and operate. The onward march of digital progress, a more diverse and demanding student body and changes in the employment market have challenged the way that universities teach and interact with students. The fact that they operate in a constantly changing environment has made it critical that educational establishments keep pace with

new developments to achieve the best outcomes for their students and staff, which in turn helps them with funding and league tables.

The political and economic spheres also have their own huge influence on student numbers. With funding often determined at the national level, finances can be a result both of economic performance and political will. With many economies looking to squeeze

spending, universities have faced cuts to their funding and have had to experiment with new sources of revenue. Furthermore, unpredictable events, like the outcome of the UK's European Union referendum, changing government policy (for example, in fees for nursing students) and visa regulations are making the competitive environments universities operate in more challenging and volatile.

### 3.1 Tomorrow's Students

Student numbers continue to rise and show little sign of abating. Universities are still feeling the effects of policies like the UK's target to have 50% of school-leavers enrolled in higher education. Not only because of policies aimed at encouraging enrolment, but also due to more recent changes such as the removal of caps on student numbers and on fees, universities are deriving most of their funding from students. This will continue to drive student numbers up as a whole. The traditional demographics of

university students, however, is shifting from school-leavers to a more diverse base. Several key factors are feeding in to this. First, rapid industrialisation in countries including Brazil, Russia, India and China is creating more affluent middle classes who can afford to study at their choice of institutions across the world.<sup>1</sup>



In the academic year 2015/16, there were over 231,000 international students in the UK (27% of whom were from China)<sup>2</sup>. This is up from around 176,000 (14% from China) in 2006/7. These countries and others are also developing towards more knowledge-based economies as well, which further increases the demand for academic skills. This is in part influenced by the development of overseas campuses by several universities. These can act as a funnel, to enrol students in their home countries and then enable them to come to the 'parent' campus as part of their course.

Another factor to consider, along with international students, is the model of overseas campus used. Although some universities have entire campuses in other countries that they own and operate (e.g. Nottingham University), others opt for different models. Approaches include the adoption of a 'fly-in fly-out' model whereby students complete part of their course at their home university and perhaps a term or two at another institution. The education delivery model will adapt to the conditions faced by overseas students trying to study in other countries. If they find it more difficult to reach the UK, for example, it is possible that a higher proportion of universities will invest in different ways to reach the students.

Universities are going to need to take account of the cultural, pedagogical and lifestyle needs of this rapidly growing segment of their student base. For example, the University of Melbourne is one such university

which has a large number of international students, particularly from China and other Asian countries. The cultural difference between Asia and Australia is large, exemplified by differences like language. At the University of Melbourne, a survey of their student body has found that students from Asia score significantly higher on measures of cultural stress than those from other continents. This will only become a more pressing concern as numbers of international students increase. Universities will have to enhance their efforts to mitigate this, as it will negatively impact on their retention and student engagement rates. Imperial College London is one of many universities where international students have specific events designed to help them connect with other students from their own and other cultures and also has events featuring food from many different cultures, as well as integration events.

The second factor affecting demographics will be the

increased uncertainty around employment. Technological disruption has made the employment market significantly more volatile and fluid than it has been in previous years. The rise of the 'gig economy' puts more responsibility for organising and paying for training on to individual employees in the form of additional qualifications. This necessitates flexibility and adaptation amongst the workforce, with the ability and willingness to enhance skills in order to be able to change their career direction. It is already clear that the prospect of a 'job for life' is an antiquated one – future generations will likely not expect this and will be constantly looking to switch direction and maintain an edge over the competition, which will also be higher than in previous generations. One way they will do this is through learning later in life and this will cause an increase in the proportion of mature students in education.



As a reaction to this, many people are choosing to return to education to enhance their skills and learn new ones as a way of developing and maintaining a competitive edge in the workplace, and potentially changing career path. The National Centre for Education Statistics reports that student enrolment for over-25s has increased by 16% over the period 2004-14, and they expect this trend to continue: enrolment among the over-25s is projected to increase by 18% from the present to 2025, compared with an increase of 13% for students under 25 over the same period.<sup>5</sup>

This is going to shift towards lifelong learning; the model of a huge amount of full-time learning crammed into the early years of life is failing to deliver for many workers. Jobs disappear faster than before, and we are currently educating children in schools for jobs that we do not yet know the nature of. Workers need to be re-imagined as being closer to putty – reshaped throughout life and pliable – rather than clay, which is formed once then baked into one shape.

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There is also the related issue of the how to understand and adapt to the 4<sup>th</sup> industrial revolution that is going on around us. This has been suggested to be the next big industrial surge, building on the electronics and automated production of the 3<sup>rd</sup> industrial revolution. The 4<sup>th</sup> industrial revolution will be characterised by cyber-physical systems that

offer entirely new capabilities for both humans and machines. Artificial intelligence and cryptocurrencies are both examples of technologies that contribute to this revolution. Understanding the 4<sup>th</sup> industrial revolution and probing student's future readiness in order to improve it will be a key challenge for tomorrow's students.

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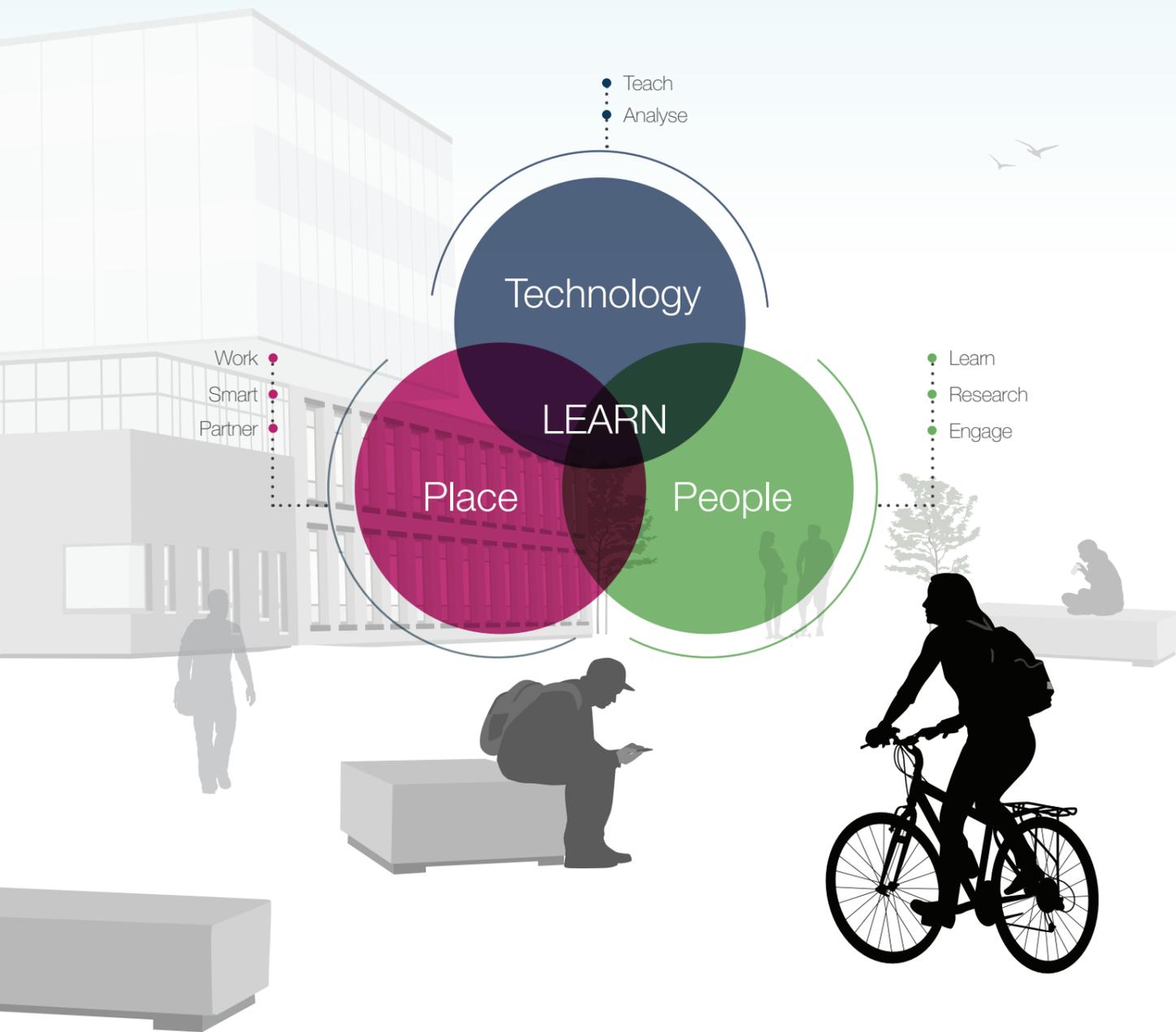


# 4. The Future of the University Campus: Jellybean Learning

Campuses have existed in one form or another for almost 1000 years, and are constantly changing and adapting to meet a variety of demands in learning and research. Recognising the challenges and changes that universities

are facing, this report sets out a new model for thinking about how the university campus should respond and adapt. Our starting point is that learning exists at the confluence of three overlapping aspects: People, Technology and Place. Each

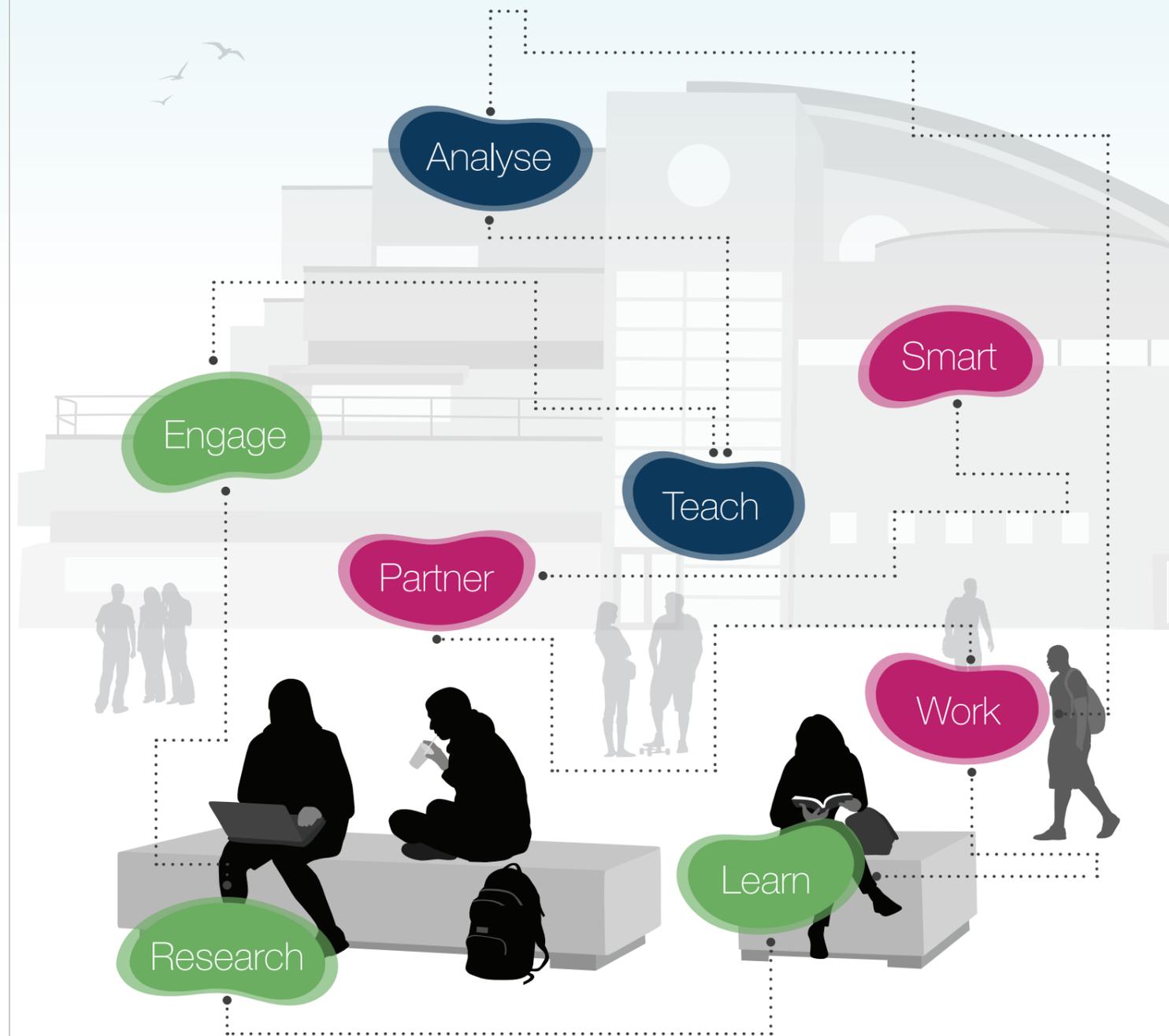
one of these aspects can be further broken down into eight elements that, together, represent Jellybean Learning, a model of the future of the university campus.



# 8 Jellybeans campus of the future

These eight jellybeans are Learn, Research, Engage, Teach, Analyse, Work, Partner and Smart. The central focus of this report is that the campus of the future will be a hybridised

model of each of these jellybeans, bring them together in different combinations to transform how students consume education, and universities operate.



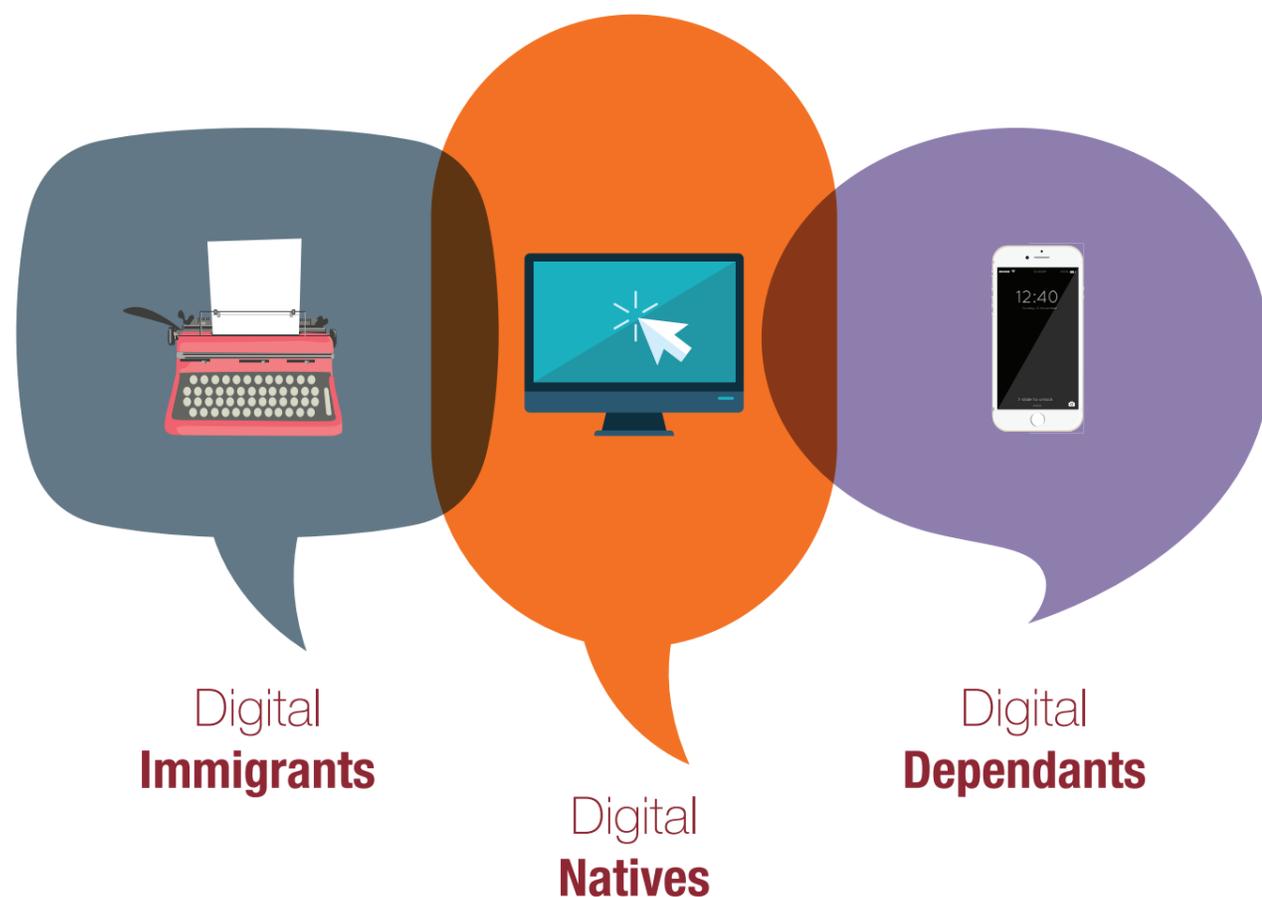
## 5. People: New Ways to Learn, Research and Engage

Those soon to be leaving school and entering universities are no longer members of the millennial generation, but are members of a group commonly referred to as 'Generation Z';

what we are calling the Jellybean Generation. Broadly speaking, this generation will have been born between the mid to late 1990s and the early 2000s. They have grown

up surrounded by technology that has revolutionised the world: Personal computers, smartphones and the Internet.

Consequently, they have a different relationship with technology than other generations. They are 'Digital Dependants', who have grown up after the Internet, and so have been surrounded with connected digital technology since birth. These digital dependents have had their entire experience of the world shaped by technology, and it is their preferences and demands that will have the greatest influence on the ways of learning in the future.



Today's students might be described as 'Digital Natives', who have grown up in situ with technological developments such as the Internet, but remember what life was like before them. The Dependents, however, have been exposed to the digital environment from a very early age – they've had a smartphone since childhood, and have grown up on Facebook and social media as much as in real life. They're accustomed to navigating a rich and encompassing digital landscape. It is also important to note that there are some who straddle the boundary between native and dependant. These people welcome the challenge, and so there is some uneven development across the sector.

The generation that's teaching Digital Dependants, however, is different. They are best described as Digital Migrants – those who have come to accept digital working as a useful and/or necessary part of modern working life, but are not native 'speakers' of the digital 'language'. For most of their lives, they will have used pen and paper, black or white boards and telephones. Migrants tend not to fully utilise new technologies, or often use them in a slightly different

manner to the intended one: printing out emails and bringing someone to look at a webpage on their own computer instead of emailing a link. While the Digital Migrant is perfectly capable of using digital technology, it does not come as naturally to them as Natives or Dependants. When the Migrants are teaching the latter, clearly there is some disconnect.

Dependants have a vastly different technological experience to their forebears and consequently they will have new ways of learning and working. Universities have already started to respond: most university courses are now a mixture of lectures and traditional assessed work blended with more interactive and social learning. This is reflective of how students are already undertaking group work and private study using the latest technologies, which presents staff with both opportunities to develop and deliver content in ways that students are also learning, but also the challenges associated with staying ahead of students on the technological curve. Although universities have begun this journey, they have not all completed it yet.

## 5.1 Learn

The rise of the Digital Dependants creates opportunities for universities to rethink how students best learn. Traditional learning space has changed very little in hundreds, perhaps thousands of years. The lecture has always been a convenient means for one educated individual to disseminate an expensive resource to multiple attendees. While books were prohibitively expensive and many could not read, this was one of the best pedagogical methods. The physical learning space has always reflected this one-way didactic process: rows of seats and desks facing a central focal point. This basic design has persisted throughout educational history.

Learning spaces need to adapt to the learning methods of the future. In order to do this, first we must understand how learning is changing and how the process will look in the future. Because Digital Dependants are experiencing a much more vibrant digital landscape than before, they are coming to school and university expecting this environment to follow through. As such, they will be looking to learn in a much more digital, social and interactive way than ever before. This is partly mirrored by the rise in different ways of digital learning. So far, these have taken a very basic form. Some courses upload lectures online to be consumed at will and some courses are entirely digital, with videos, coursework and problems all distributed online.

We should consider the ways in which students will be accessing resources in the future. Currently, although resources are often electronic, many libraries are still in the habit of directing students towards certain areas to access digital resources. This often results in students simply bypassing the library and finding alternative sources of information on the Internet. This in turn impacts how they are exposed to information. Taking the path of least resistance, students may encounter sources far more open to bias than they are expecting. Students of the future will have so much information available to them that they must understand how to synthesise and evaluate it coherently, made even more important by the fact that the information will not be directly controlled by the institution.

This intersects with the physical space, as students are likely to use spaces where they are comfortable and can be sociable. If these spaces do not have access to resources, students will simply find other sources online. Students will choose resources they can access from a physical space that meets their requirements, rather than choosing a physical space based purely on access to relevant resources. This trend is driven by the overabundance rather than scarcity of information that the students of the future will have.

According to leading experts we spoke to, students also have an expectation of being able to work at any place and any time, another feature supported by more digital learning. This is a direct result of the increasing level of technology in classrooms.

Learning is continuing to be transferred to the digital sphere, with a recent JISC report finding that in higher education 90% of students use their own laptops and 79% had been asked to produce work in a digital format in the past six weeks.<sup>6</sup> There is a consequent requirement for universities to have the infrastructure (e.g. Wi-Fi with appropriate bandwidth) in place before digital technologies become widespread, and predicting what future generations will need is therefore a constant challenge.

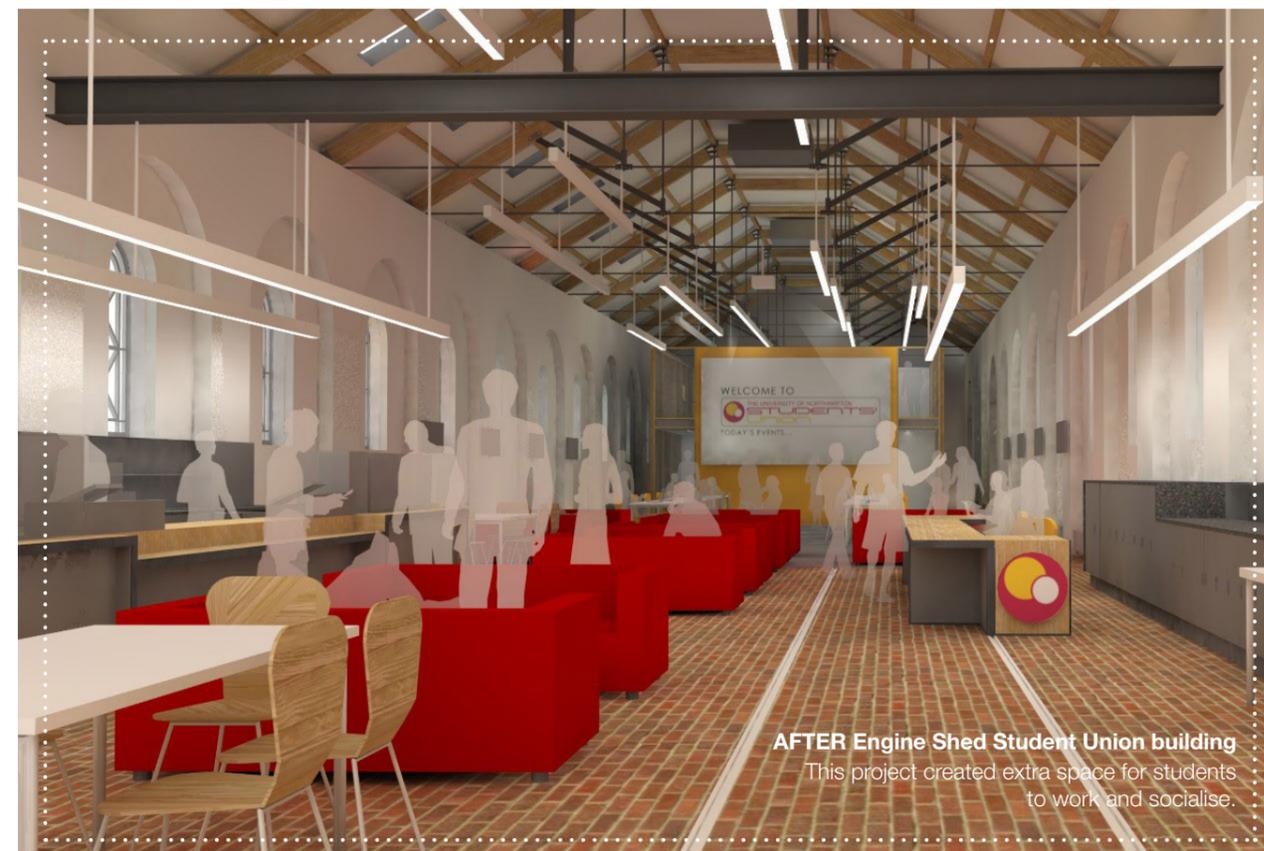
Over the last decade or so, online learning has often taken the form of the massive online open course (MOOC), a collaborative distributed network for propagation of content. Key features of the MOOC are that rather than traditional distance-learning

approaches, they tend to be unlimited in student numbers, credit-less and have often been provided free. These courses have allowed universities to greatly expand their reach, teaching people from far outside their usual student pool. They have proven particularly popular with those for whom traditional campus based learning is difficult, such as mature students juggling careers and children and international students who may not be able to afford a traditional overseas education. There is also potential for mixing this with traditional study – for example adding in a term at a participating overseas university. In a year, the MOOC provider Coursera reached 1.7 million users – a rate of growth faster than that of Facebook.<sup>7</sup>



**BEFORE Engine Shed**

At the University of Northampton, a derelict engine shed was transformed into a Student Union building.



**AFTER Engine Shed Student Union building**

This project created extra space for students to work and socialise.

### MCW Waterside University of Northampton

The Waterside Campus is purpose built to accommodate 21<sup>st</sup> century teaching, and aims to make student life as easy and accessible as possible.



### MCW Learning Hub University of Northampton

The Learning Hub at Waterside is designed to allow multiple styles of learning, from silent study to social learning. The classrooms are also highly flexible to adapt to the needs of the class.



However, MOOCs began around 2006 and 2012 was called the 'year of the MOOC'; by the New York Times, but this growth may not continue. Initially, MOOCs were seen as a way for universities to reach out beyond their geographic borders, but increasing corporatisation has 'captured' them, making them more of a commercial enterprise than a utopian, egalitarian university.

MOOCs are still a significant part of the new ways of learning, but are in something of a transitional phase. The next stage of the MOOC will take this form of learning beyond the requirements of millennials to adapt more closely to Digital Dependents. This will include more interactivity and the ability to compose a course of multiple elements. In the next decades, people enrolling in MOOCs will be able to pick lecturers in different subjects from institutions across the world, creating the perfect mix of subjects for their desired outcomes. Universities will also collaborate to create virtual departments of tutors irrespective of geographical location. This will increasingly tailor education to the individual, and this customised experience

is precisely what Digital Dependents will expect as a corollary of their social media experiences.

Gamification is another major trend in education that is beginning to deliver a more Dependent-style experience. Gamification is the application of principles and design from games into other contexts, like education and work. In education, gamification has produced courses that are arranged in discrete modules which 'reward' learners at certain stages. They tend to break up content into small chunks and focusing on completing each one of these is generally a much easier task than an abstract aim like earning a degree.

Predominantly online-based organisations have been making 'gamifying' their offerings a priority. The Khan Academy, for example, have said that they were interested in the potential for gamification to continually push people's boundaries and give them a way to improve themselves incrementally.<sup>8</sup> Services like Duolingo are also proving to be highly successful: not only do they appeal to the learning style

of Dependents, but they even fit in with the modern busy worker, who can easily complete a few lessons commuting to and from work. This can also provide novel avenues of socialisation which are not available to many people. Although they are using such technology at home, the Internet and online services offer a new way to meet new people with common interests, and network across university campuses.



## Embracing New Ways to Learn at the Hive: Nanyang Technological University

So how have institutions tried to address the unique needs of Digital Dependents? One university that has aimed to solve this challenge is Nanyang Technical University (NTU) in Singapore. NTU has a building called The Hive, which has been designed around the concept of the 'flipped classroom'. This is a new way of learning that better reflects the methods and tendencies of younger learners.

In the flipped classroom, rather than a traditional didactic approach emphasising one-way knowledge transfer from teacher to student, the knowledge transfer process takes place outside of the classroom, with students

consuming learning material on their devices. They then come in to the classroom to discuss what they have learned, asking questions and solving problems with the assistance of teaching staff. In this way, their contact time is spent on an interactive process of them putting their knowledge into practice, rather than just having a lecturer talking at a room full of students with varying levels of engagement.

The Hive supports this by providing a learning environment which is totally atypical in its design. There are no lecture theatres – in fact, there are no straight edges at all. The design aims to escape the concept of pupils

facing towards the front of the classroom, so there is no front. Rooms are all curvilinear with moveable furniture that can be adjusted to whatever orientation suits the lesson plan.

Other study spaces in the building are designed to encourage collaboration and serendipitous encounters. Comfortable spaces are prioritised over desks and every space (including classrooms) is equipped with the necessary technology to support any lesson function that users could want. The Hive is built from the bottom up to support this new way of learning and has shown itself to be at the cutting edge of innovation in learning methods.



The Hive is designed around the "flipped classroom" model which provides a range of spaces for students to do individual study and then come together to discuss ideas and solve problems.

### 5.2 Research

Research spaces have long been important learning environments in their own right; indeed, a recent study has found university researchers were instrumental in 40% of the top inventions since the 1950s<sup>9</sup> Learning is not the only aspect of the modern educational experience that is changing. The way people access information has undergone huge change since the first days of the lecture. Rather than an environment where few people could read and written knowledge was expensive, we now live in a world where literacy rates are higher than ever before and almost all of the world's knowledge is available cheaply in everyone's pocket. This changes the way that we access information; in the past it may have been necessary to visit a library to find out how starfish eat or who invented the MRI machine, but now all of that information is only a few seconds away on the Internet. This is doing interesting things to the

research spaces of the world, particularly areas like libraries.

Books are less and less ubiquitous in modern libraries, often moved in favour of computing space. They are no longer the fonts of knowledge that they once were, increasingly being seen as a relic of the analogue age. In 2011 it was reported that starting in 1986, the share of paper-based storage media began decreasing. It was 33% in 1986, but had declined to 0.007% in 2007.<sup>10</sup>

The amount of information we can store digitally doubles roughly every 2.5 years, and the amount of data currently stored digitally is so vast that it is difficult to calculate accurately. One estimate from a recent report is that the total stock of global data comprises 295 exabytes, meaning that if each bit of information is a star, there is an entire galaxy of information out there for every person on the planet.

**i**

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The scale of available information is huge, so the problem has become inverted. People do not need to work hard to find small amounts of data, instead they have very easy ways to access huge amounts.

This clearly necessitates a different approach to how institutions use their space. The library of the future is likely to be a hybrid space with both physical and virtual elements. This is going to be a result of the greater uptake of digital learning methods: both MOOCs and ideas like the flipped classroom, but will also be driven by trends like financial pressure. An example of this is an institution like San Francisco State University, where the

library holds only 25% of the university's collection of materials. The rest of the space is given over to open areas for use of computers, multimedia stations and a group study area. Only the most popular books are kept on hand at the library, with the rest being stored in buildings across the campus.

Desk-based research is not the only research method that is changing. In the future, even laboratories used for scientific research are going to be different. The super-lab is a new concept in laboratory work that makes the work a lot more interactive while also providing a saving by combining many labs into one. At London Metropolitan University, they

have created the first super-lab of its kind. The lab space is open plan and supports the full range of sciences. Embedded state-of-the-art audio-visual technology allows up to 12 classes to take place simultaneously with audio being delivered through headphones. Cameras, computers and screens allow for both real-time and recorded teaching, allowing students to work at their own pace, revisiting sections they need to go over again. Students are also able to access the Internet to undertake secondary research without having to leave the lab. This approach offers students a totally new research experience, catering for the interactivity and adaptability of tomorrow's students.



The University of Technology Sydney provides 24/7 learning space and rooms with more unpredictable layouts. It also hosts Australia's first "superlab" which encourages multidisciplinary study while the new Gehry-designed Business School provides an eclectic learning environment.

## The Library of the Future: **Fewer Books, More Robots at The University of Chicago**

The Mansueto Library at the University of Chicago, rather unusually for a library, does not actually contain any books in the main library space. The main area accessed by students is a large open space designed to support digital learning. Students bring their own electronic equipment, plug it in and use the Wi-Fi to connect to their course content. Beneath the surface, a robotic storage and retrieval system processes the 3.5 million book collection. The high-density storage system

is organised in floor to ceiling stacks of shelves, with robotic cranes moving between them to retrieve and store boxes of books identified by barcode. Students can have books retrieved in a matter of minutes, and the storage system has capacity for the next 20 years of acquisitions. The Mansueto Library has totally reinvented the concept of what a library is in a way that reflects modern education and, most importantly, what education will look even more like in the future.



### 5.3 Engage

Universities are the learning landscape of the present and continually develop their campuses of the future. In all types of spaces – old, ordinary or new, universities try to see where students and some staff see few or no boundaries in using space to meet their needs and are more liberated in their approaches to using technologies and colonising space or equipment to make the most of the facilities for their own purposes.

Whilst it is often a challenge to ensure a brief will always stretch opportunities within a room and still ensure an overall affordable and sustainable estate, universities often have the experience of adding technology that is not fully exploited and in reality, there are often too few examples of sharing spaces and facilities.

Creating transformational concepts into transformational spaces does not always equate into transformational learning; however, space needs to be enabling, both for the needs of today and the needs of the future. A range of university spaces at home and around the world shows that all types

of space can foster a wide range of learning, and a real challenge for many universities is about new demands being for different needs for existing spaces or additional demands for new spaces. Culturally, institutions struggle with doing something new in an existing space; it rates higher in a new space.

Whilst it is possible to engage with current employers and involve professionals in the learning environment and learning delivery and outcomes, knowing that up to 80% of jobs by the year 2025 do not currently exist, there is a need to ensure students are equipped with a range of skills that will deliver adaptability, flexibility and a confidence to tackle and deliver new roles. If this level of change does take place, these young workers will see high levels of change in job markets at a phenomenal level, with a requirement of more future skill development and adaptation. It is also apparent that more graduates are working in self-employed roles and using multiple skills to support their work, using technology to suit themselves and their needs and working in different styles to previous generations.

Feedback from students on facilities is often limited as they do not expect to see the benefit within their lifetime. Inevitably engagement from existing students links to catering and sports facilities, building opening hours and reliability or accessibility of technology or equipment. Although universities generally see large sums of money expended on technology, the latest phone, tablet or TV and regular replacements, this is not a model that many universities can afford or would see a need to deliver ubiquitously. Engagement with students often therefore focuses on minor, immediately impactful changes rather than more long-term major improvements.

We know from research that students rate their learning experience higher in a new and innovative space rather than the same experience in an older and more tired space and that over 77% of students link estate quality with student choice and expectations. Regular surveys show that students expect high quality facilities and services as part of their university experience at all times and in all locations.

Another challenge is the use of social media, used by some as the only form of engagement, used by some as part of their learning experience and for others at any point on the spectrum in between. Social media has immediacy and personal technology meets a range of needs and is seen to require an instantaneous response. Power outages or Wi-Fi failures can be noted on social media before any helpdesk is formally notified and the perception amongst many is to assume a failure – if not repaired urgently. Additionally, social media has become the common platform to praise or discredit behaviours and solutions – often in an area where the reality of a suitable or possible repair time is totally misunderstood. Whilst students can be attracted to universities via the media, they can also be harangued from everything from the price of the coffee to the working of technology in learning spaces and the cleanliness of the facilities. Comments can come from anywhere, including being posted totally anonymously.

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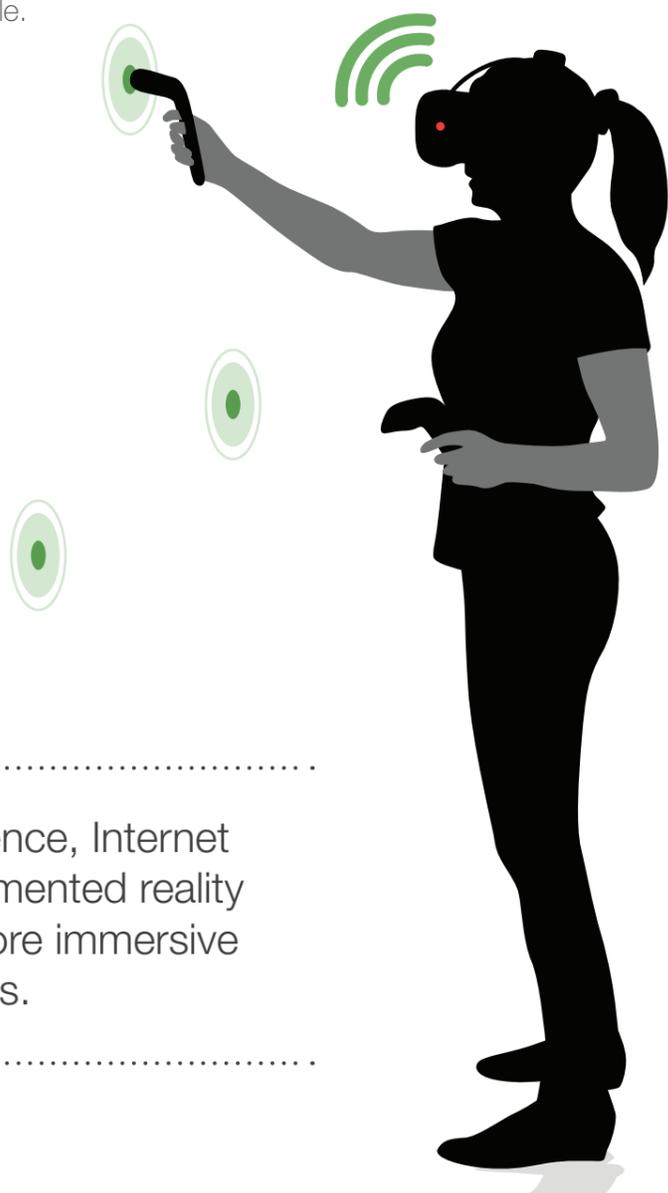
## 6. Technology: The Classroom in the Age of Digital Disruption

The onward march of technological progress has affected almost all areas of life. The concurrent rise in computing power and fall in computing power costs has transformed almost every industry. Almost every modern educational institution in industrialised nations has access to entire suites of computers. However, computing has often been used to do work that would previously have been done with pen and paper rather than being used for something new entirely. Rather than radically changing how education works, most of the impact has so far been on such mundane tasks, for example word processing instead of written work. We have only just begun to see how the nature of education is going to change beyond the basic parameters of education though.

Advances in artificial intelligence, Internet connectivity, virtual and

Advances in artificial intelligence, Internet connectivity, virtual and augmented reality (AR) are poised to create more immersive and rich learning experiences.

augmented reality (AR) are poised to create more immersive and rich learning experiences. Technology is positioned to change the way we teach and consume education – inexpensive Internet connectivity may allow students to supplement their university degree by taking an additional course with an e-learning provider, for example.



### 6.1 Teach

Even as late as the early 2000s, many schools, even in industrialised countries like the UK, did not have many computers in schools. Those who did often had computer-based lessons as an addition to the curriculum; an add-on to learn about new technology. The reality now is totally different. Every child has at least one electronic device, usually several, even before they get to primary school. The huge increase in levels of personal computing has bypassed the school as the teacher. Now the students in schools probably know more about using personal computing devices than their teachers do. They are also growing up in a much more intense, vibrant, interactive and social digital environment than their forebears. This will follow through into the education of Generation Z, with higher education being adapted to suit their unique style of learning.

The way that teaching content is delivered is changing to reflect all of this. With the availability of information, it is becoming crucial to teach principles and how to navigate through vast amounts of data rather than facts that will be outdated before the end of the course. Not only can information be retrieved easily, but it can also be transmitted

easily and through different media. Educators are also starting to recognise that skills need to be taught in synthesis rather than through repeated 'data dumps' of information. Students also need to know how to challenge and criticise data rather than assuming information is correct. Having better access to more information is not making people better educated; it may even be making them more gullible, in that they accept confirmatory information simply because it is found first. Without the skills to evaluate the veracity of the vast amount of information they are exposed to, future students will undermine their education. Teaching skills required to navigate the huge sea of data will be critical for future students.

Courses nowadays do not have to be taught in the same room, or even the same continent. Improvements in bandwidth, speed and reliability of internet connections are offering the opportunity to make learning both global and socially interactive. For the last decade or so, schools and universities have been adding more technology into classrooms in an effort to update technology: interactive whiteboards, laptops and tablets have all been rolled out extensively. Experts we spoke to during the course of our research

suggested that the next stage in this evolution will be doing things with technology that we could not do before rather than enhancing existing teaching methods. For example, mixed reality techniques can be used to give medical students simulated training almost identical to real-life experience, with an AI adapting to their specific strengths and weaknesses.

Without the skills to evaluate the veracity of the vast amount of information they are exposed to, future students will undermine their education. Teaching skills required to navigate the huge sea of data will be critical for future students.

Although these are all useful, the future of teaching is not in any one device, but in connecting those devices together through cloud computing. Use of the cloud will only require good Internet infrastructure and will let students learn at their own pace, access content in their preferred style and use cloud-based applications to deliver a more social learning experience. Classrooms will also support this by continuing the trend of new technology: interactive screens will cover the walls of classrooms which will allow students to interact with material at the same time as teachers. Grand Valley State University already shows how classrooms can be transformed this way with its impressive collaboration with Bluescape. This is a large, interactive display screen that supports multiple users inserting notes and adding documents to the

same piece of work, aiding their collaboration.

AR and VR are also opening up entirely new arenas for teaching. Systems for VR are becoming increasingly common as a way of creating a highly immersive and interactive environment. This has already started to happen in workplaces – Ford, for example, uses Oculus Rift headsets to allow teams of designers in different locations to meet virtually to experiment and explore new designs. These technologies are also being leveraged in academic institutions to aid teaching. Microsoft have recently partnered with Pearson to pilot Microsoft's HoloLens to create a mixed reality simulation for nursing education, helping educators standardise and replicate simulations to improve education.

According to Goldman Sachs estimates, the VR and AR market will be valued at around \$80bn by 2025, roughly the same size as the desktop PC market in 2015.<sup>12</sup> This will include a lot of choice in VR and AR systems, and many applications for their use. As well as teaching, there is huge potential to use VR and AR to enhance collaboration, for example amongst colleagues in different locations. In the future, universities are going to incorporate space to create immersive virtual environments for collaboration and training. Indeed, universities are already engaged in a constant practice of trying to create the university of the future, continually reviewing best practice around the world to see how technology is improving teaching, retention rates and costs.

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Ford, for example, uses Oculus Rift headsets to allow teams of designers in different locations to meet virtually to experiment and explore new designs.

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Using Oculus Rift, Ford can view vehicles remotely and collaborate across geographical boundaries.

## 6.2 Analyse

For the first time ever, we are starting to see developments in understanding what really drives the success of students. Why do some students fail chemistry but get excellent marks in physics? Why do they remember all they need to from a lecture two weeks ago, but not one they had this morning? Why do some students work well in groups, and some not? These questions have plagued teachers for the history of education. No educational institution has the time or resources to find out the answers to all of the questions they may have about each individual student. Advances in computing technology and artificial intelligence now mean that they can answer a huge range of questions much more easily than ever before. Currently, such technology is only employed in a limited

fashion in some institutions, but the demand for analysis of information that can lead to pedagogical insights is huge, particularly if it can be completed by computer, analysing an entire school's data in very little time.

Fundamentally, analytics is used to make sense of data. In the modern world, there is a wealth of data available about almost everything we do. Generation Z are already used to interacting with organisations that collect their data in order to customise experiences, such as Facebook. Schools are therefore in a position to glean large amounts of data from students with the aim of delivering a flexible and tailored educational approach. The problem facing the institutions of the future will not be having too little data – it will be having too much. Powerful algorithms and a clever approach will be

needed to make the best use of the available information, as well as how to collect it. Data collection in particular will have to be handled carefully – schools must bear in mind that they are collecting the data of minors and this must be kept secure and safe from others who may want to use the data for other reasons.

Another thing to consider is how we can and should access this information. During our research, experts highlighted that analytics services are not currently well integrated into education. Teachers should not have to seek out information on their classes, but this should be presented to them almost as soon as they access their computer. In the future, this technology will be integrated into the very core of the teaching process, to help guide teachers and enhance the learning experience.



Skyfactor analyses a range of student metrics to provide research-based student retention, academic programme assessment and student affairs programme assessment services. Using their predictive models, Skyfactor can provide valuable information about likely student numbers and programme quality that can inform decisions about resources in the future.

## Immersive, Interactive and International Teaching: Harvard Business School

At Harvard Business School, they have truly pioneered the classroom of the future with a classroom that has been re-designed from the bottom up to support a programme called HBX Live. At HBS they wanted more than just a classroom with some cameras to capture lectures. After using simple lecture capture, they found it disrupted teachers' normal teaching styles and made lecturers who were very engaging lose what made them popular as they had to stand in place and adapt their material to be captured properly by cameras. HBS wanted to create a classroom that was intended from the beginning to be an immersive and interactive virtual space that could be accessed from anywhere in the world. A roaming camera operator, five stationary cameras and the laptop cameras of up to

60 students work together to create a collaborative teaching environment. Custom integrated technology has also almost completely eliminated latency, as the designers did not want to create a situation where people cannot talk at the same time as this would reduce the experience to being more similar to a normal recorded lecture. HBX Live can also transmit to up to 1000 additional students with a 15-second delay. Although these additional students would not be actively participating in the class, they still have the opportunity to experience a more standard lecture.

The classroom has been built in an existing studio space because HBS felt that this was needed to truly deliver the experience of an immersive, interactive class. No classroom on campus had ceilings high

enough to accommodate the lighting grid, an uninterrupted power supply or the curved video wall. Using an existing studio space also gave them access to the TV production professionals needed to make the class a success. They have previously experimented with lecture capture, but found that some of their most dynamic and engaging lecturers were being 'trapped' by existing set-ups, having to stand in one place for extended periods and losing a lot of their natural movement ability. The Harvard Business School has successfully created a classroom that can connect to an entire world of students to deliver content in a manner that really addresses some of the ways in which education is changing and will continue to change for future learners.



HBX Live allows students from across the world to collaborate and interact in real-time.

But the next big step in analytics is not going to be simply tailoring experiences through collecting data, but the use of predictive analytics to anticipate behaviour and trends before they manifest themselves. This will help educational establishments recognise patterns like students about to fail courses and put measures in place to remedy negative outcomes before they happen.

The current use of learning analytics is typically to improve the quality of teaching and to improve student retention. For much of the history of teaching, the quality of teachers and courses has only been measured by the marks received by students at the end of their course. There is a lot going on in between teaching and exams that has been ignored for too long. Data sources can now be tapped to examine in great detail how students are learning. A huge source of data is that of the virtual learning environment used by many courses; library and student information systems can also be valuable sources of data. After the data is collected, it is a matter of using specific analytical techniques which may vary depending on what the user is trying to ascertain.



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At the University of Wollongong, educators are particularly interested in social interactions and collaboration between students. The result of this is the Social Network Adapting Pedagogical Progress (SNAPP) initiative. This aims to analyse student data from online discussion forums to show patterns and relationships in real time as a series of visualisations. Staff can then track the development of these interactions over time by comparing the visualisations. This can provide powerful insights such as which students are being isolated from discussions or those who are dominating discussions. Wollongong University has also identified different types of discussions students have related to their orientation in different aspects of education.<sup>13</sup> Nottingham Trent University has even found that 81% of first year students increased their study time simply by seeing their own engagement data.<sup>14</sup>

Rather than just doing the same thing they have been doing for centuries, certain educators are realising that understanding the pedagogical process and how it intersects with their students can pay dividends. Certain institutions are leading the way in developing learning analytics, but with Digital Dependents and Natives being more digitally connected and social than previous generations, this will

start to become the norm. The emergence of artificial intelligence will present a further opportunity to enhance analytics, as it will potentially open up large scale, almost instantaneous analysis of huge amounts of data, and may even be able to adapt pedagogical methods to students in real time, for example by identifying students isolated from discussions and then calculating a way to engage them.

81%

Nottingham Trent University has even found that 81% of first year students increased their study time simply by seeing their own engagement data.<sup>14</sup>

## Learning from Students Through Analytics: New York Institute of Technology

The New York Institute of Technology, like many institutions, recognises that it has a problem with student retention. Rather than merely dealing with the problem when it arises, NYIT realised that a much more proactive approach would be to build a predictive model that could identify at-risk students before they dropped out. Using admission application, registration/ placement and survey data, risk factors were identified based on the experiences of the counselling team at NYIT and retention literature.

Incoming grades, major subject area and a student's certainty in their choice of major were all identified as risk factors. After initial testing, some

issues were addressed and the analytics platform was streamlined. Machine learning was also used to identify risk classification factors after being trained on NYIT student data. Machine learning relies on using algorithms that learn from data and can make their own predictions, allowing computers to learn beyond the scope of their explicit programming. NYIT has used this approach to identify risk classification factors after being trained on student data. Additional sources of data have also been added since the initial analysis, like financial data (e.g. receipt of bursaries, independent income source and parental fee contributions).

As this study was also intended to evaluate the usefulness of

learning analytics, two main tests were given to the model: precision (essentially the inverse of the false positive rate) and recall (the inverse of the false negative rate). The higher both of the percentages are, the more accurate the model.

The model scored well with 74% for recall and 55% for precision. This is a significant improvement over several other models, and shows that the risk factors identified are good predictors of student drop-out, but there are probably other factors that have not yet been identified. For every four students who dropped out the following year, three of them would be predicted by this model.



The New York Institute of Technology collects a range of data and uses predictive analytics to forecast student drop-out rates.

## 7. Place: New Spaces to Learn, Work & Collaborate

Campuses were originally conceived as spaces for students to isolate themselves from the world in order to best focus on their studies. The physical space of many universities has changed very little from these origins; there are spaces for students to live, eat, learn and study.

But this does not necessarily reflect the nature of studying as it is today. The students of tomorrow will require a much more interactive experience, as well as one that encompasses aspects of education that are not traditionally academic, like working. However, simply making universities more work-like is not the answer; it is important to still see universities as communities of learning as well as delivering research-informed teaching.

A more competitive employment market and competition for university places will make it important for universities to have a way to differentiate themselves from one another through innovation. A significant part of this is how universities choose to use their physical space. With real estate prices in many countries both high and rising, it is more important than ever to use space in a clever way to maximise its potential. Many universities are now starting to use their space in more novel ways to cater to the needs of

new generations of students. Ideally, these spaces will also incorporate opportunities to generate income at all times of the year, and will be multiple use and multiple user spaces. This will enable them to meet both professional aspects of the work space, as well as engagement spaces for learners.

### 7.1 Work

As work is becoming more important to students, it is also becoming more important to universities. Although many institutions now have dedicated careers services to give students as much information as possible on jobs and the workplace, it has now become apparent that more is needed, and students of the future are certainly going to demand it. Employers are increasingly looking at practical work experience amongst new hires, and having this experience can be a key differentiator between one candidate and another. It is, therefore, important for universities to be able to offer

this opportunity to students and do more to encourage them to gain work experience alongside their studies. Another point to consider is that in many countries, education is increasingly being seen as a means to an end: a career. While previous generations have aspired to study as a way of bettering oneself and following an interest, it is now more often sold to people as a means to get the job they want. In countries like the UK, which has recently seen a huge increase in tuition fees, students are going to have to make sure they gain value from their degree and this means additional focus on how it leads to a career. Part of this can be achieved through partnerships with employers, but there is also an element of readying students for the world of work. This does not just have to be through careers services, but can also be done through partnerships which embed students into the world of work that they hope to be joining.



Working on a university campus is not just about students. Support services and academic staff are also affected by real estate costs, so we should also consider what to do with their physical space. Many academics like the idea of having their own office, with their own desk. The reality is, like in most workplaces, for the majority of the time this desk and office space is not in use. While lectures, research, meetings

and conferences are going on, this space stands idle. It cannot be used by anybody else and serves no function other than a place to keep a favourite mug. Many workplaces are tackling this through the use of schemes like Activity-Based Working (ABW). This approach creates a range of spaces for different activities and has no areas assigned to one person. People use an area that suits the task they are working on, for example using a breakout

space for informal meetings or a desk for writing. ABW has the advantage of freeing up large amounts of space, while also improving collaboration between employees as they mix with different people as well as improving their own productivity. Many university libraries already use a similar approach, so this concept would not be entirely unfamiliar to university staff.

### 7.2 Partner

There are other ways that universities can work with others to make the most out of their physical space. Some campuses have started opening up their space to others who can make use of it. Although certain spaces on campus may be unused for long periods of time, they are not flexible spaces that can easily be re-purposed. Some assets can be released if no longer needed, but for some, universities always need to have them to retain access to them, a sports field for example. What universities can do, is to trade the unused time of these spaces to build relationships with others who can make use of the space. At Oxford Brookes University, they have embraced this concept, with the use of many amenities being open to the public. Local residents can use printing services and the libraries for example, as well as sporting facilities. In this way, universities can make good use of their space when they are not using it, and students can integrate better with the local community.

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At Oxford Brookes University, they have embraced this concept, with the use of many amenities being open to the public. Local residents can use printing services and the libraries for example, as well as sporting facilities.

This is not a one-way process, however. Many institutions are looking to move into corporate spaces rather than bringing corporations onto their own spaces. There are also examples of innovative collaborations, in which universities and corporations have come together to collaborate in purpose-built spaces. For example, Warwick University has space within the Shard for members of their Business School to use. This will become more of a priority for future generations as universities start to feel the financial pressure of having to maintain large estates in countries with expensive property.

Many corporations have also set up their own institutions, such as Google University, in an effort to correct a shortage of skills and to mould their future workforce as they see fit. This shows that if universities do not adapt by partnering with corporations, corporations will simply take matters in to their own hands and cut universities out of the process.



Warwick Business School have opened a base at the Shard in London, putting their students right at heart of British business.



Warwick Business School

## The Campus with a Factory: University of Louisville

The University of Louisville in Kentucky has partnered with GE to create a community manufacturer to produce new devices: FirstBuild. Rather than just being a factory, FirstBuild is a community open to academics, students, GE staff and the world at large to come together and design new products. GE engineers work on problems with Louisville students and their professors, often crowdsourcing solutions to problems. FirstBuild offers a flexibility and ability to change course that is lost

in many large companies like GE, and thanks to small batch production it is able to create interesting and exciting products unencumbered by having to make sure they are financially viable to sustain mass-production.

With their 'fail fast' culture, this partnership allows students to develop ideas without the stress of them being right or wrong, or being marked on them. If they are interesting and possible, the FirstBuild community will help them

achieve their aim. GE engineers benefit from the novel and innovative approach of students without the burden of years of experience in business and engineering, and the students benefit by having the support and expertise to bring their ideas to fruition, as well as being exposed to important business concepts like the marketability of their designs, and being able to explore why and how some ideas may not work.



### 7.3 Smart

As the use and purpose of the physical space changes, so too must the concept of operations for university estates. Technology is becoming more embedded into the fabric of new buildings, helping them to deliver new services to students and other building users, while also operating in a highly efficient and sustainable way. The Internet of Things (IoT) is the term used to describe the connecting of physical devices, sensors and actuators to the Internet, allowing them to collect and exchange data. This data, when fed into a specialist software, can then be used to monitor performance, detect faults, and automate decision making. In the case of buildings, a plethora of IoT sensors is now being used to

create 'smart buildings', where data is used to sustain high levels of performance and enhance the experience of users. The Edge in Amsterdam is one such building, where 28,000 sensors monitor everything from electricity consumption to where people are in the building.

The development of smart buildings has two key advantages for estates directors. First, the collection and analysis of data on building performance allows a smart building to optimise its performance and, ultimately, reduce costs. In a smart building, for instance, intelligent energy management solutions can be deployed to optimise the performance of building systems and carefully manage energy consumption, enabling

smart buildings to achieve high levels of energy efficiency and consequently lower operational costs.

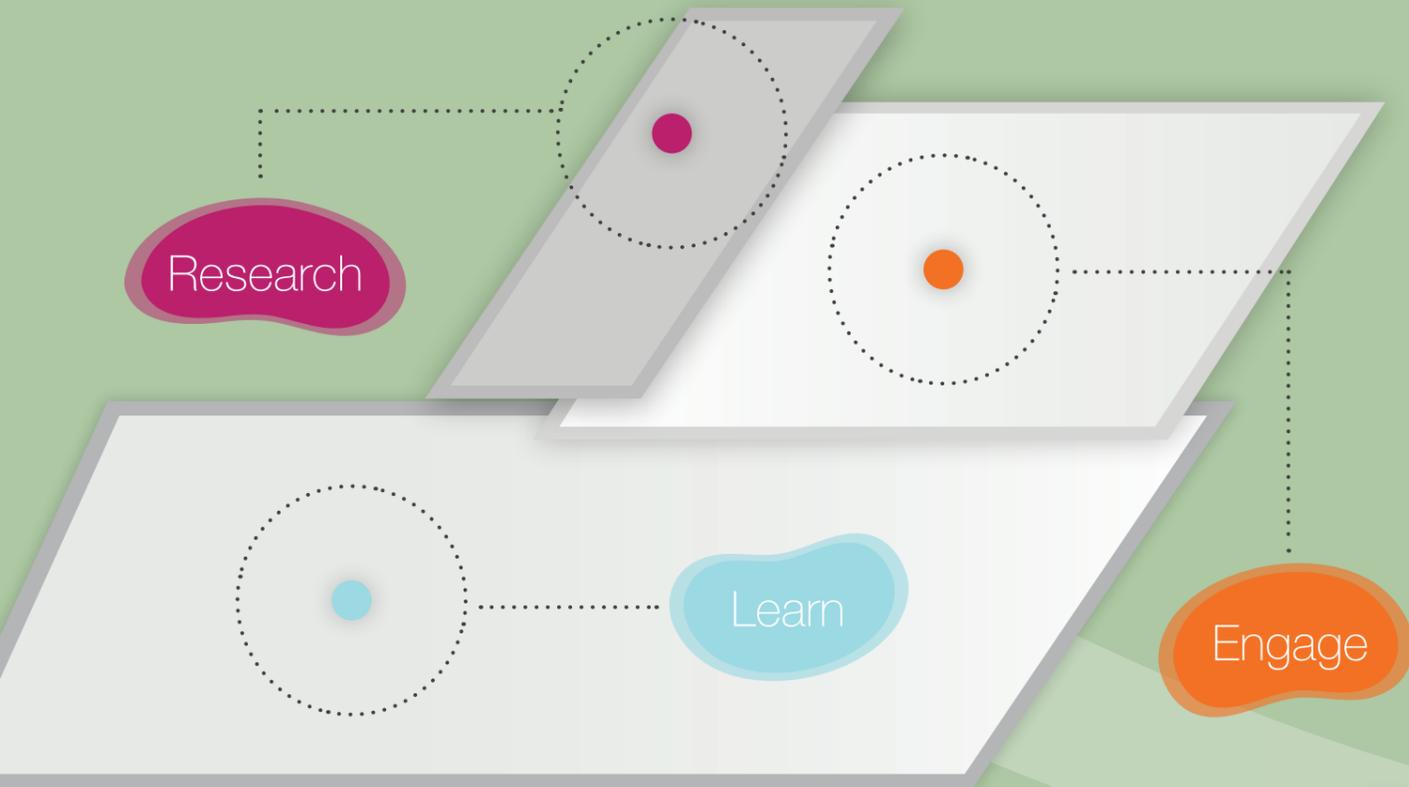
Second, through the development of sensor networks inside the building, smart buildings are able to deploy a range of services and experiences to building users. In a university, these could include location-based services and smartphone applications that are able to help students and professionals locate rooms, services or even individuals. These apps can even be tailored to the preference of individual people – offices and meeting spaces could identify the people using them, and then tailor the light and temperature settings of the space to their desired levels.



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# 8 Typologies of the Campus of the Future: The Jellybean Learning Model

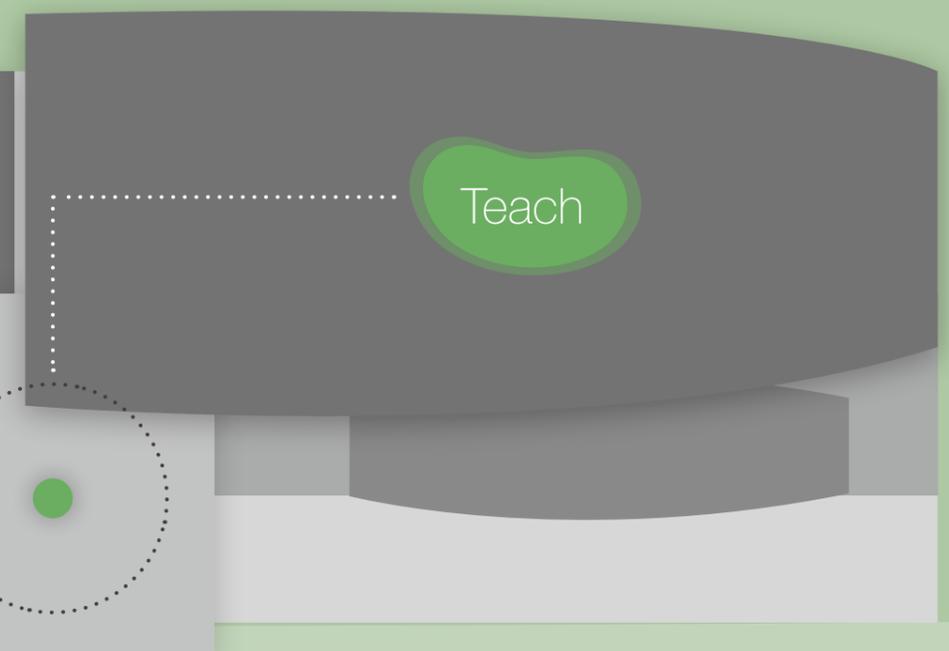
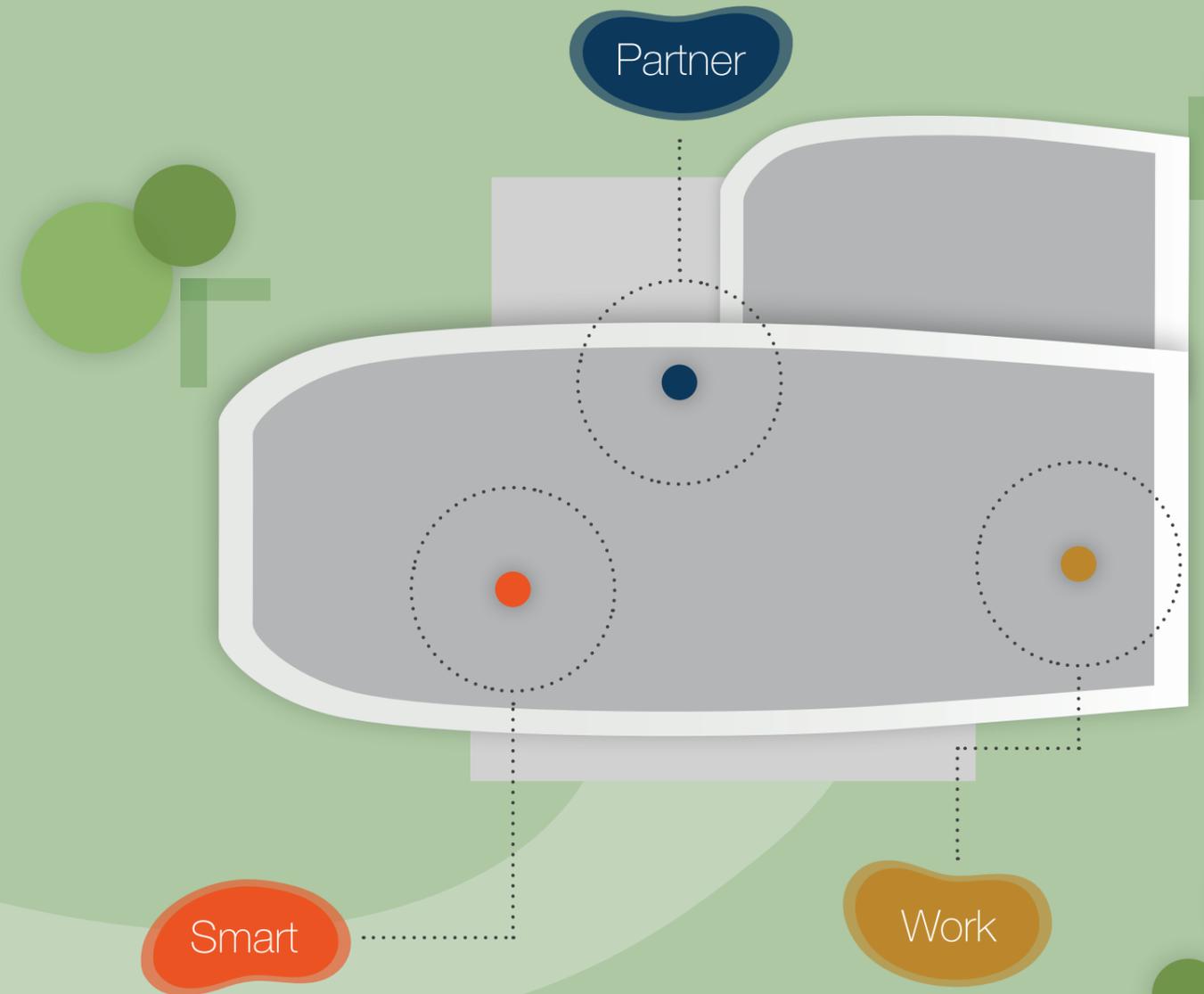
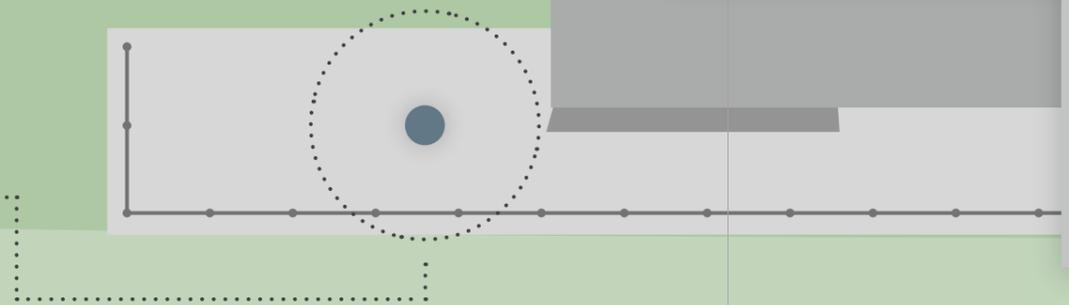


In response to the trends outlined in this report, estates professionals will need to create spaces that incorporate different elements of the Jellybean Learning model. Campuses will become hybridised, comprised of different mixes of spaces to enable students to learn and research in new ways.

Technology will be further embedded into pedagogical practices, creating new ways

for universities to teach and engage with their students. At the same time, universities will shift their focus from narrow objectives focused purely on education, to more holistic models that involve deeper partnerships with companies and outside agencies. As such, all types of space will need to meet certain benchmarks and have the capacity to be able to integrate new technology.

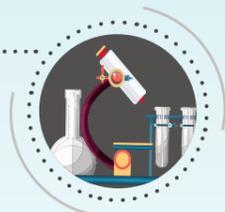
Analyse



# The Jellybean Campus

## Research

- Universities creating new spaces for researching.
- Removing physical resources, making room for digital working.
- Automated storage and retrieval systems being used to manage physical resources.



## Engage

- Engaging with students is increasingly important.
- Students feel they will not see an improvement during their time at the university.



## Learn

There has been a shift towards digital natives, and this has changed the way that people learn.

Students of today are also more likely to learn remotely, using digital courses such as 'MOOCs'.



## Analyse

- Organisations are now able to collect vast amounts of information about individuals and their activities and interactions.
- Using this information, universities can start to make predictions to enhance and improve the student experience.



## Partner



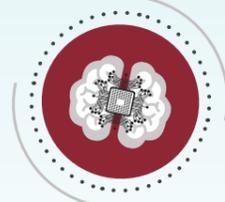
Universities are also exploring ways to move certain departments or functions outside of the campus to benefit from a different location or collaboration with industry.

Universities are forming partnerships with a range of external stakeholders that help the university utilise their space, and forge important links with the local community.

- Many organisations including universities are opening their space up to external users.
- The campus should be considered as part of an ecosystem, interacting with a range of other organisations for mutual benefit.

## Smart

- The embedding of technology is opening up new opportunities for innovation.
- Harnessing the power of smart buildings will enhance efficiency while delivering a better user experience and improved sustainability.



- As tuition fees increase, students looking to get value for their money, and so focus has shifted towards being able to get a job after university.
- Universities already offer dedicated resources and support for careers, but they are increasingly looking to create partnerships with employers.

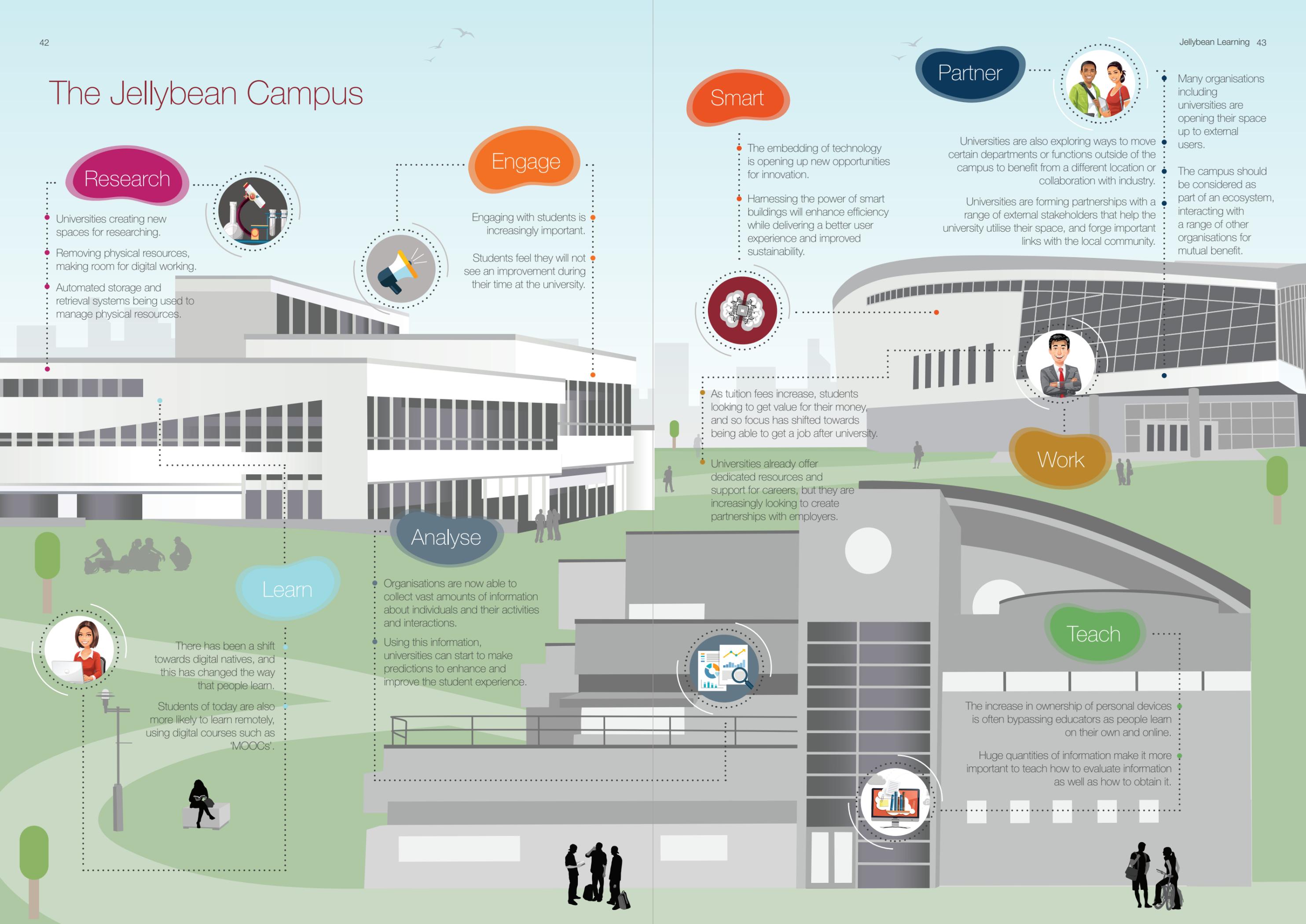
## Work



## Teach

The increase in ownership of personal devices is often bypassing educators as people learn on their own and online.

Huge quantities of information make it more important to teach how to evaluate information as well as how to obtain it.



## 9. Conclusion: What Estates Professionals Should Do Now

Society and technology are constantly changing, yet there are certain points at which the nature and speed of the change is greater than others, and things change drastically.

For a long time the education sector has been broadly doing the same things, with the same approach to students, technology and their physical space. While there have been great improvements in some areas like technology provision, the unique experiences of the

next generation of students is going to create new needs that will need to be addressed to teach them effectively. This means more than simply providing the latest technology, but includes teaching in ways that Generation Z respond to, adapting physical space to their

behaviour and preparing them for the workplace they will soon be entering. Generation Z are growing and developing with a relationship to technology and the challenges of the world that no other generation has, and so need universities to act to best provide for them.

There are eight actions that university directors of estates can take now:

01

**Prepare for the changing demographics of students**, particularly from developing nations like the BRIC economies. This may include researching any differences in pedagogical methods.

02

**Ensure that technology and technology-based learning approaches are suitable for future students**. Explore how technologies like virtual and augmented reality can enhance learning.

03

**Adapt the physical space of universities** to reflect the ways in which Digital Dependants learn, such as through modifying existing spaces to support digital learning.

04

**Explore innovative partnerships with organisations** both inside and outside the world of work to help best prepare students for entering the workforce and make efficient use of university space.

05

**Utilise the vast potential to gather and analyse data** to make evidence-based predictions on student behaviour to anticipate and respond to important trends.

06

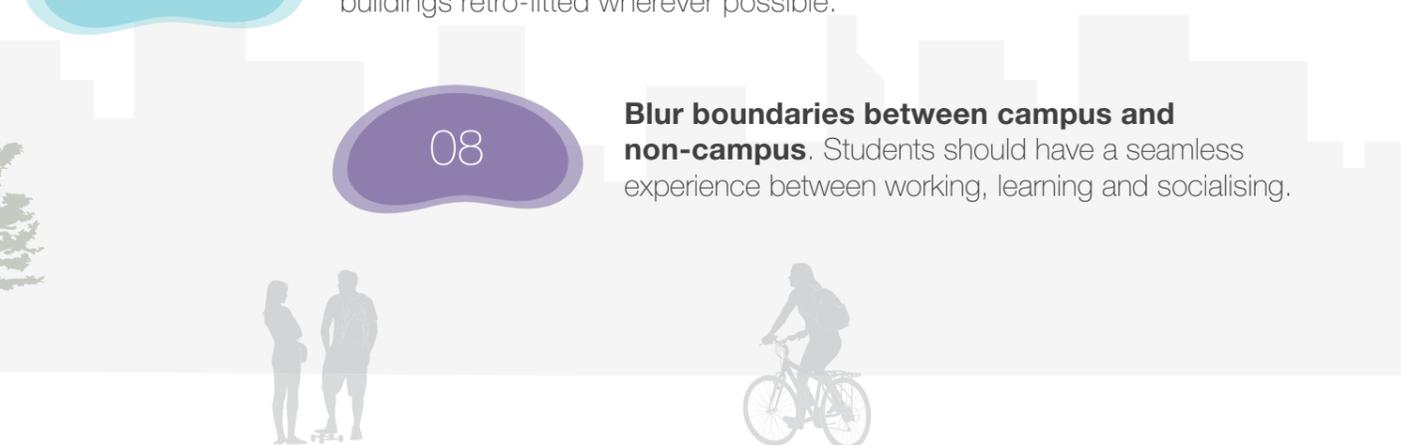
**Co-locate with corporations, markets and new clusters of business** to form new interdependent ecosystems.

07

**Start investigating models of smart buildings**. New buildings should be built smart, and existing buildings retro-fitted wherever possible.

08

**Blur boundaries between campus and non-campus**. Students should have a seamless experience between working, learning and socialising.



## 10. About Unwork



### The Future of Work

We specialise in creating the business case for new ways of working & learning, challenging established patterns and enabling businesses to understand the opportunity presented by agile working and alternative ways to organise work.

We focus on all aspects of the future of learning where people, place and technology meet.

We are particularly interested in ABW, change management and understanding the technology enablers required.

We believe there are eight key forces shaping the future of work, which we use to create a vision of the future of work for our clients:

- ✓ **Culture**  
Demographics and intergenerational working
- ✓ **People**  
Psychology and behaviour, company culture and workstyles
- ✓ **Organisational Design**  
Cohorts, communities and clusters
- ✓ **ICT**  
Technology, connectivity and collaboration
- ✓ **Transport**  
Travel and the city
- ✓ **Sustainability**  
Community and innovation
- ✓ **Brand**  
Creating a narrative that links organisation and workplace
- ✓ **Real estate**  
Property and workplace.

We focus our research and consultancy on these key areas:

- ✓ **Agile working**  
Meeting new business imperatives – new types of working
- ✓ **ABW**
- ✓ **Expectations of the next generation**
- ✓ **New technology cost**
- ✓ **People and productivity**
- ✓ **Insight and innovation**
- ✓ **Sustainability**
- ✓ **Language and behaviour**
- ✓ **Smart buildings**
- ✓ **Digital campus.**

We believe that work can only be properly understood as being the confluence of people, technology and place.

We provide unrivalled knowledge of global innovation in work and the workplace.

[www.unwork.com](http://www.unwork.com)

## 11. About AUDE



The Association of University Directors of Estates (AUDE) promotes excellence in the strategic planning, management, operation and development of Higher Education estates and facilities. AUDE offers membership to publicly funded UK bodies whose primary remit is higher education teaching and/or research.

### AUDE's activities include:

- ✓ providing opportunities for discussion, consultation, the exchange of knowledge and good practice
- ✓ helping members share expertise and take action to address common concerns
- ✓ promoting and enhancing professional competence
- ✓ representing member interests
- ✓ building partnerships with related organisations regionally, nationally and internationally.

### Objectives:

- ✓ To promote excellence in the strategic planning and management, administration, operation and development of the University Estate and Facilities
- ✓ To optimise solutions to common problems and concerns by disseminating and harnessing the particular expertise, experience and knowledge of Members for mutual benefit
- ✓ To further AUDE objectives by meetings, seminars, conferences, lectures, discussions and other activities  
To provide forums for discussion, consultation and exchange
- ✓ To influence opinion formers and decision-makers on estates issues
- ✓ To consider and advise on matters referred by Universities UK, the Higher Education Funding Councils and other outside bodies and individuals
- ✓ To consult with the professional institutions and other bodies on estate matters and to work in partnership with related organisations regionally, nationally and internationally
- ✓ To maintain and promote professional competence and ethical standards
- ✓ To promote opportunities for development and training for the benefit of Members and their respective staff
- ✓ To establish, develop, maintain and promote systems for the dissemination of information relating to estate matters
- ✓ To promote the reputation and activities of the Association and its members regionally, nationally and internationally.

[www.aude.ac.uk](http://www.aude.ac.uk)

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