TRIBAL

THE WORLD IS GETTING SMARTER:

Better Technology, Better Learning

CLOUD-BASED APPS, DISTANCE LEARNING AND EDUCATION ACROSS THE GLOBE

Contents

Introduction

For more than a decade, hopeful EdTech futurologists have optimistically prophesised about the potential benefits of technology to education. Adoption, however, has been staggered and underwhelming. We have either been unprepared in our level of systemic and structural advancement, or uncertain due to its perceived or, in some cases, actual complexity.

Now, with advances in cloud technology making access to real-time information and services eminently possible for educators across the globe, we are on the cusp of a paradigm shift in education.

Couple this with the current global economic and bureaucratic instability that's prompting providers to embrace opportunities to tip the balance in favour of education progress – and we are in an unprecedented position to foster a synchronised, global, interconnected delivery mode of knowledge, which will empower institutions and the teachers and learners within them for decades to come.

IF EVER THERE WAS A NEED FOR THIS SCALE OF CHANGE – IT'S NOW.

In 2017, a global learning crisis was declared by the UNESCO Institute for Statistics. Only half of the world's children achieve minimum proficiency in reading and mathematics by the time they leave school. A total of 230 million adolescents will not achieve minimum proficiency levels in reading and mathematics by the time they should be completing lower secondary education – and while many of them are out of school, approximately 60 per cent or 137 million are in classrooms.
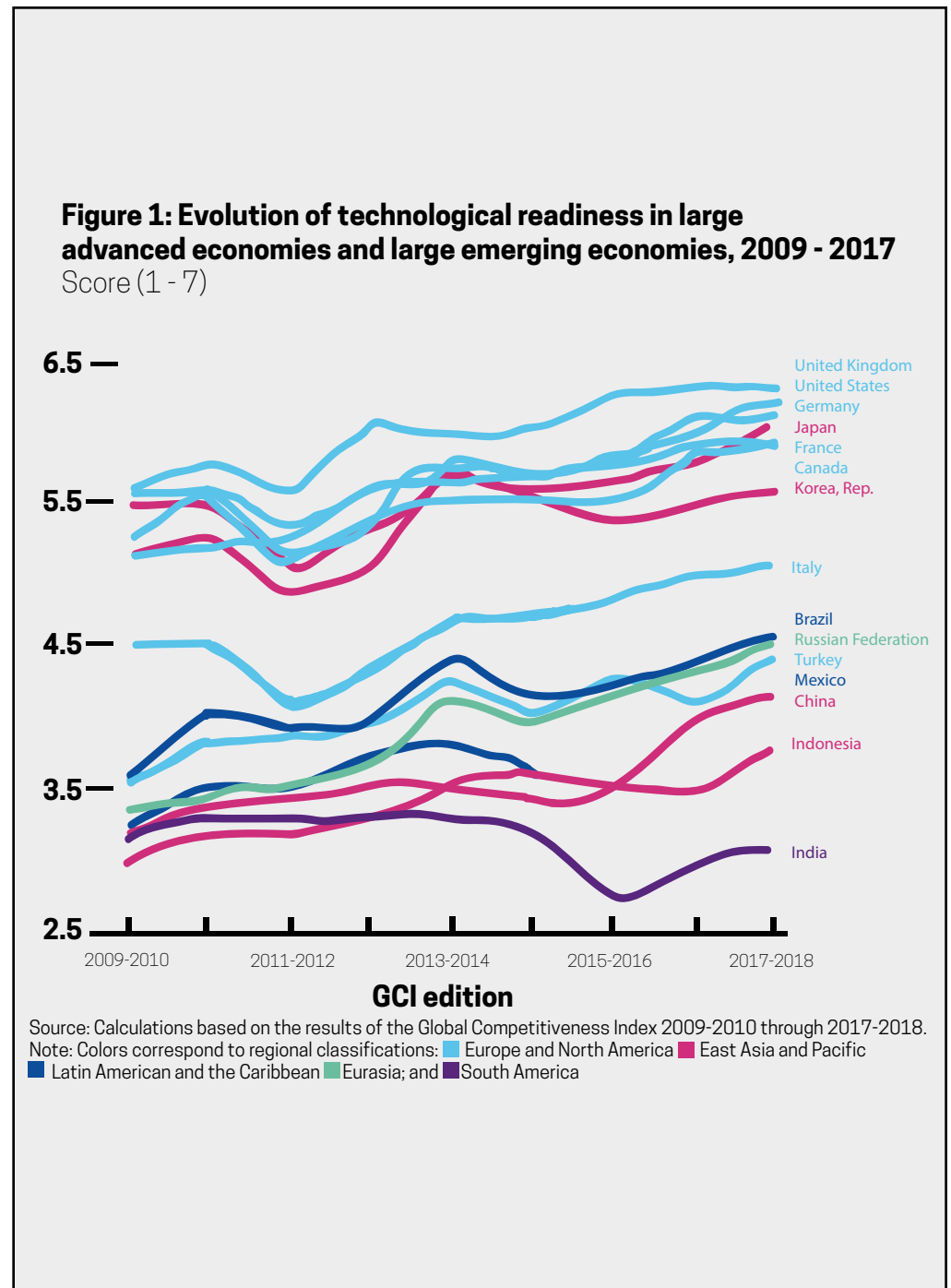
In the developed world where international competition is on the rise, funding and financial structures are making institutions stumble through hurdles – so recruitment and retention are more important than ever. At the same time, students are becoming more aware of, and questioning, the value for money of their education: student experience and wellbeing are under scrutiny. They are seeking alternative routes and delivery modes of education.

There is also a concerning skills gap beginning to emerge, with other skills voids left by impending automation, meaning unexpected demographics will require skill adaption and refreshment. Notoriously difficult to reach, providers increasingly need to be able to engage these learners but existing modes of delivery aren't working. Interestingly, recent stats from HESA show that, while the number of full-time students from disadvantaged backgrounds rose by ten per cent over the past five years, the number of similar part-time students fell by 54 per cent.

DESPITE ALL THIS – THE WORLD IS GETTING SMARTER.

And it's thanks to the continuous upward trend in the development of technological infrastructure. Connectivity of and access to sophisticated devices and networks has vastly improved. The current initiatives in place mean that 2018 is the year we will truly start to reap the benefits of this position.

Figure 1 (World Economic Forum, 2017) details the evolution of 'technological readiness' from 2009-2017 in large advanced and emerging economies:

Figure 1: Evolution of technological readiness in large advanced economies and large emerging economies, 2009 - 2017
Score (1 - 7)

Source: Calculations based on the results of the Global Competitiveness Index 2009-2010 through 2017-2018.
Note: Colors correspond to regional classifications: ■ Europe and North America ■ East Asia and Pacific ■ Latin American and the Caribbean ■ Eurasia; and ■ South America

Technological readiness in this context is defined as:

- **the availability of latest technologies,**
- **firm-level technology absorption,**
- **foreign direct investment (FDI) and tech transfer,**
- **individuals using the Internet,**
- **fixed broadband Internet subscriptions,**
- **international Internet bandwidth, and**
- **mobile broadband subscriptions.**

As we can see, the chart illustrates the 'perfect storm' of technological readiness and levels of sophistication that is set to usher in a new era of technological resource connectivity and distribution in education. And it's exciting.

So how are institutions seizing this opportunity to become a digitally oriented educator? And how much stronger are they emerging?

THIS PAPER EXAMINES THE APPROACH THESE PROVIDERS ARE TAKING AND AIMS TO 'SIZE THE PRIZE' FOR INSTITUTIONS THAT ARE YET TO BE CONVINCED ABOUT THE CLOUD IN EDUCATION.

We start by looking at the technologies bolstered by the growing infrastructure and levels of sophistication: cloud technology, and the improvement and proliferation of blended and distance learning.

The Cloud in Education & Blended Learning

THREE CATEGORIES OF CLOUD COMPUTING

To recap for those unfamiliar, cloud computing (as defined by Amazon Web Services, 2013) is:

"The on-demand delivery of compute power, database storage, applications, and other IT resources through a cloud services platform via the internet with pay-as-you-go pricing. Cloud service platforms provides rapid access to flexible and low-cost IT resources. You can access as many resources as you need, almost instantly, and only pay for what you use."

The three distinctive categories of cloud computing are:

- **Software as a Service - SaaS – Any type of software program that is managed remotely and delivered via the web.**
- **Platform as a Service - PaaS – A set of application infrastructure services such as platform and OS rented from a vendor.**
- **Infrastructure as a Service - IaaS – Compute resources outsourced on demand.**

BLENDED LEARNING: A CONCISE DEFINITION

"Blended learning provides a combination of face-to-face learning and dynamic digital activities and content that facilitate anytime/anyplace learning"
– Jisc, 2017

COMBINING THE TWO

If you consider the benefits of cloud computing and blended learning, some distinctive parallels can be drawn:

- **Reduced physical infrastructure and hardware**
- **Flexibility**
- **Scalability**
- **Configurability**
- **BYOD mobility**
- **24/7 access to synchronised materials**
- **Increased availability of high-performance applications from the user end, such as analytics**
- **Single point of data – increased reliability and accessibility (single point of data)**
- **Reduced costs of operation**
- **Quick deployment**

The cloud has been an almighty buzzword in the past decade and during its infancy fears of security and dependability were rife. While the initiative was there, secure, reliable and high-speed Internet connections were lacking. Over recent years, this has changed.

SWOT OF CLOUD SYSTEMS AND TRADITIONAL ICT INFRASTRUCTURES

The following are Strengths and Weaknesses of Cloud Computing in Education as listed in The Economics of Cloud Computing on Education Services (Boja, 2013).

Cloud Systems Strengths

- Low Maintenance Costs, Instant Access to More Resources
- No software and hardware limits

Cloud Systems Weaknesses

- User's uncertainties and concerns, security and trust concerns
- Requires a permanent Internet connection; Dependency relation

Traditional ICT Infrastructures Strengths

- High Security; Data and IT infrastructure owned by the organisation
- Opportunities to expand the infrastructure or to make a hybrid cloud

Traditional ICT Infrastructures Weaknesses

- Maintenance costs
- The infrastructure can be very fast ovverrun by resources and can become deprecated

Analyst are recommending that education CIOs consider three key factors:

- **Look at investing in cloud-based modules**
- **Consider what social, mobile and analytics functionality new modules provide**
- **Map the migration journey to the cloud and SaaS**

If you've kept an eye on many education software solution providers, chances are their latest or soon to be major release is SaaS. When surveyed, 96 per cent of UK universities and 35 per cent of schools have implemented some sort of cloud technology in 2017. And it's not just the UK clueing into the listed benefits: according to Technavio in their global cloud and education 2017-2021 report, the global cloud computing market in the education sector is expected to grow more than 26 per cent every year until 2021. Market drivers include reduced cost of ownership, growing usage of learning analytics, and increasing adoption of mobile learning.

TIMESCALES OF THE DEPLOYMENT OF SAAS ACROSS HE/FE TABLE

According to 2015 Jisc data summarised by GlobalData in 2018 (Stoneman, 2018) SaaS student email platforms are already deployed across the majority of HE and FE institutions. Research Management, LMS, VLE and Core Business Apps are also on the horizon in the next 1-3 years. This is a significant shift in decades of business software infrastructure deployment.

Back in 2012, KPMG surveyed government/public and private sector businesses, asking them to describe the potential impact of cloud on their business model and operations. Key points listed are:

- **Reduced costs (50%)**
- **Enhanced interaction with customers and suppliers (39%)**
- **Fundamental changes to business model (32%)**
- **Accelerated time to market (35%)**

LET'S NOW LOOK AT AN EXAMPLE FROM THE EDUCATION SECTOR. STAFFORDSHIRE UNIVERSITY REPORTED THAT, INSTEAD OF REPLACING ITS AGEING DATA CENTRES, IT SAVED AN ESTIMATED £6.4M IN CAPITAL SPENDING BY MIGRATING ITS ENTIRE APPLICATION ESTATE INTO THE MICROSOFT AZURE CLOUD.

Also, by allowing applications to be 'provider side', many of the university's administrative processes could be automated, saving time for both staff and students.

Automation means larger quantities of student applications and services can be processed and data can be managed more easily, with fewer errors - freeing up funding and staff time. While in many industries there are concerns around automation-induced redundancy - education sector administrative staff need not fear. Ultimately the most repetitive, low-cognition tasks will be automated, empowering administrators to be more innovative, creative and efficient in their roles.

A pilot market survey that ran in early 2017 also shows that automation overcomes three of the top daily challenges reported by IT professionals in the education sector.

During a pilot market survey in early 2017, we asked 72 institutions across all education sectors of their biggest daily challenges. Frequent topics mentioned were Time Management (16.44%), resources, (10.96%) and data consistency & accuracy (5.48%), all of which can be mitigated with automation. These themes were all expanded on further in our recent Global Market Survey 2018.

That said, transgressing cultural inertia and investigating how roles will be impacted in future by such application developments will put professionals in education ahead of the curve and make the most repetitive elements of their roles streamlined, allowing them to focus on what matters in the organisation.

Professionals who actively investigate how their roles will be impacted in the future by application developments will put themselves ahead of the curve, ensuring the most repetitive elements of their roles can be streamlined, so that they can focus on what matters in the organisation.

So, the software infrastructure in education is shifting, but what about the education system itself?

System Shift

TAILORING STUDENT EXPERIENCE WITH CLOUD-ENABLED COLLABORATION AND ANALYTICS

The need for more learner-centred systems (over institution and educator dictated systems) is growing. After all, digital natives demand flexible and tailored services – their apps and lifestyle tools are increasingly 24/7 and accessible from smart devices. Cloud-based apps assist resident students, blended students and distance students: students are empowered.

No longer restricted to classrooms or libraries, students have constant access to resources as well as the ability to submit materials. Meanwhile, educators can safely and securely deliver these resources and content - campus-wide, on any number of devices, in real-time. They no longer rely on large facilities, cumbersome paper-based documents and hard-drive hogging programs to enhance collaboration.

COLLABORATION

Enhanced technology has enabled new teaching methodologies. For example, the quality of your average Skype/FaceTime call of a decade ago (patchy 3G and paid WiFi services) has been superseded by 4G and strong, free broadband connections which has facilitated a significant rise in the adoption of video conferencing. Teaching is no longer restrained to the classroom.

According to a 2017 report by Kaltura, in which they surveyed over 1000 teachers, IT professionals and students from all levels of education around the globe, emerging video technology has made leaps and bounds to empower teaching and learning:

- **On video in the classroom:**
  - » **99% of institutions report they have teachers regularly incorporating video in their curriculum.**
  - » **73% of higher education institutions use video for remote teaching and learning.**

- **On advanced video features:**
  - » **More than half are using video to feature remote presenters.**
  - » **More than half express interest in additional video features:**
    - o **in-video quizzing with grading and analytics (63%),**
    - o **synchronized slides in which a presentation is uploaded and synchronized to the video (61%),**
    - o **in-video search (60%),**
    - o **running polls in the classroom (54%), as well as**
    - o **closed captions (52%) and**
    - o **live public broadcast of features (52%).**

ANALYTICS

The future is set to be data driven, propelling data to have the same value as oil did in the last century and the transition to new manufacturing processes did the century before that. Education, in contrast to other sectors, has an abundance of data, however to date, not many providers have capitalised on data connectivity.

Now, analytics through the cloud gives institutions unprecedented levels of insights by enabling wider access to high-level processing. It also opens the door to using artificial intelligence, automation, and advanced, predictive analytics. As more and more educators adopt this technology, they have the power to transform the student experience by tailoring to individuals' course needs, in turn alleviating their feelings of pressure around value for money.

A single point of data access also has its benefits, with institutions increasingly aware of their data consistency and accuracy. This was shown in our Global Market Survey 2018, in which we asked them their 'biggest daily challenge'. Responses from 233 UK education sector participants are detailed in the chart opposite (the APAC version of the survey gave similar results).

The sheer investment and transformation rate of businesses and institutions turning to the cloud over the past decade is a testament to its utility and a clear sign we are now entering a period of enlightenment for cloud technology.

Or, 'the new normal'.
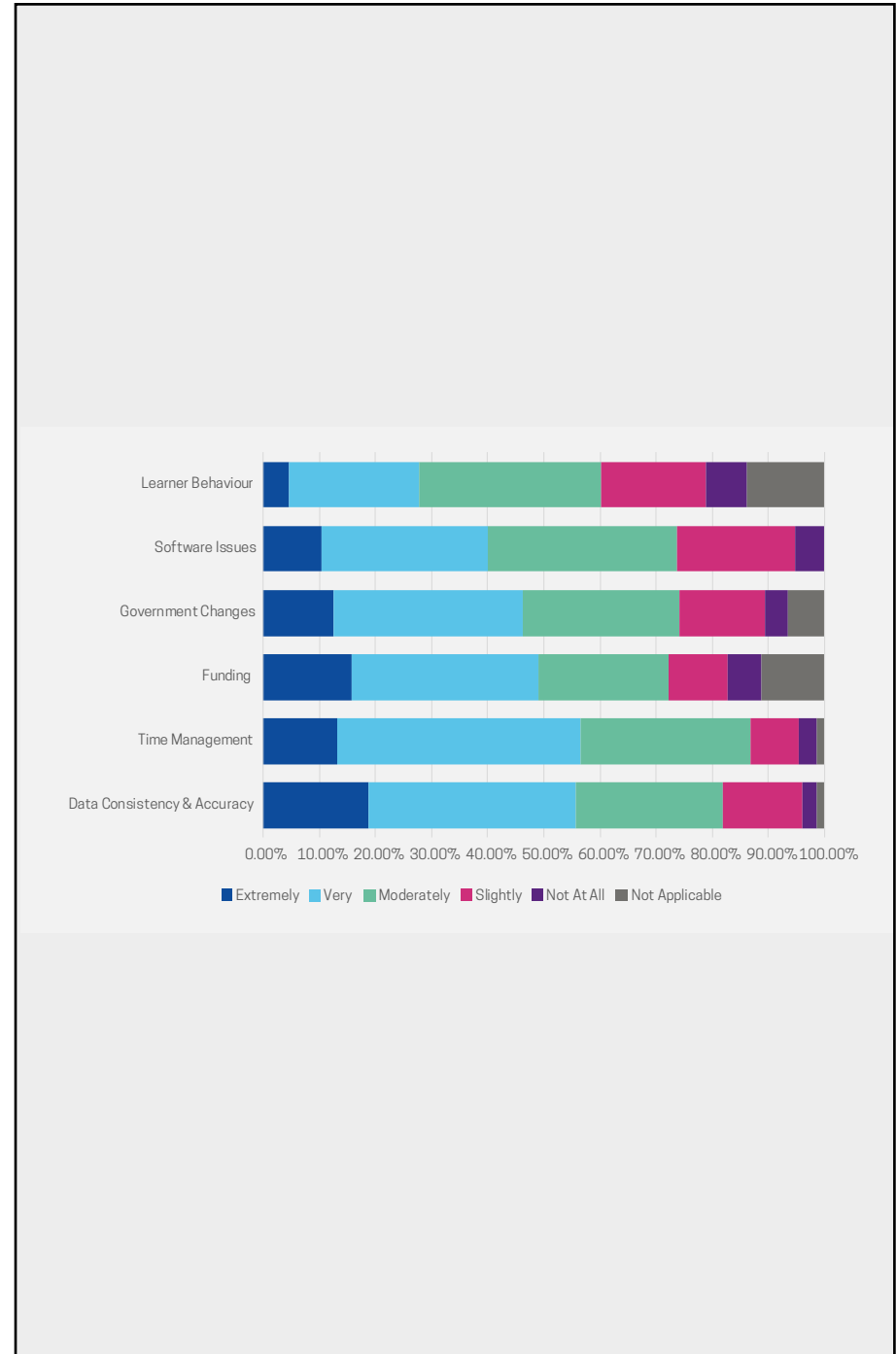
A NEW NORMAL

The UK provides a great example of this 'new normal': the current further and higher education qualification system is bubbling with sentiments looking to shake up the non-dynamic and antiquated modes of delivery and funding. Institutions are in a challenging time for funding, doubled with students becoming increasingly conscious of value for money in course delivery. It's more than words from hopeful bloggers. The government is saying as much since the appointment of the new education secretary, Damian Hinds:

"What we are doing in the review is looking at how that system works, making sure there are alternatives, making sure there is more variety." This could include cheaper ways of delivering university education like shorter courses and part-time study".

"The government's review of post-18 education and funding will consider how we can encourage and support learning that is more flexible for students - for example, part-time, distance learning and commuter study options."

- Damian Hinds

Now that the wheels are in motion for the government to push funding and new delivery models for more accessible, flexible learning (including part-time and distance learning) we can compound this by utilising up-to-date cloud infrastructure and blended learning.

Alternative Routes to Education – Is Distance Learning (Part Of) The Answer?

"As we try to make sense of a longer, more turbulent work-life, we must anticipate that the learning will have to be episodic and frequent. Working adults will be looking for truly flexible, on-demand pathways that tie education to economic relevance."

– Michelle Weise, Edsurge, February 2018

Looking into the not so distant future, lifelong learning and alternative education routes will be essential as lifespans increase and disruptive technology and societal changes mean we will need changing skill sets.

While we have established the benefits of cloud-enabled and blended education delivery modes for the digital natives demographic, flexibility and accessibility from progressive education infrastructure will also offer routes for non-conventional students. Mature learners, parents, and students with limited travel options, either through location or life circumstances, may not be able to use blended models. The answer to this most likely lies in modern forms of distance learning, e-learning and MOOCs (Massive Open Online Courses).

In both the developing and developed world, new routes to learning empowered by digital distance learning and virtualisation have been expanding - growing pains notwithstanding. MOOCs and e-learning were largely promised as revolutionary on their conception over a decade ago, but the immature output was seen as dry, non-engaging static. For a product that was intended to supplement learning with dynamic, flexible access, it was quite the opposite. Initially it was text heavy and asynchronous with a narrowed pedagogy from staggered email-based tutor-learner contact.

MOOCs were struck with a sticky statistic of 5.5% completion rate in the developed world: HarvardX and MITx recently reported that only 5.5% of people who enrol in one of their open online courses earn a certificate.

G2Collective stated the following issues with MOOCs in 2013:

- **Low completion rates**
- **Lack of one-on-one teaching and interaction**
- **Integrity (AKA cheating)**
- **No accreditation**
- **Perceived value**

According to research by Johnson & Asunda in 2014, the most frequently vocalised concerns from students over online and distance learning are:

- **Slow Internet access**
- **Online chats and discussions are difficult to participate in**
- **Teacher isn't online frequently enough**
- **Lack of interaction with other students in the class**
- **Lack of engagement with course materials**
- **Spend too much time dealing with technical issues**
- **Don't know what's expected of me in online courses**
- **Cannot upload my assignments to the course site**
- **Not sure how to study online**
- **Lack of interaction with the teachers**

Despite all this and the fact that MOOCs have not yet succeeded as the disruptive full course replacement they were touted as, their worth is finally being realised.

As educators, we have also realised it's not as simple as emailing a link to a MOOC and instructing them to read up and quiz – a fundamental learning ecosystem and pedagogic shift is needed for effective and modern learning delivery modes. Speaking from the early days of 2018, many of the issues listed above are notably reduced with progress made in infrastructure and cloud service connectivity. MOOC quality is improving and institutions are progressively taking notice.

One huge step forward in accreditation was that of the established Oxford University launching its first MOOCs in 2016. Also, University of London partnered with Coursera to offer their first fully-fledged BSc degree. Though growth in new learners has stalled, the number of paying users has increased. Indeed, Coursera saw paying users rise by 70 percent in 2017. Meanwhile, Udacity reports more than 50,000 paying students enrolled in its Nanodegree programs. Other recent notable examples include £30m from the UK government to develop distance learning digital skills.

COMPLETION RATES ARE ON THE RISE.

Of course, discussions are ongoing in relation to whether completion rates are the most accurate way of determining MOOC learning effectiveness in developed countries. Particularly when it is likely that learners are using it to inform themselves of subject matter in a modular way to supplement their own degree.

To allay another concern, we must also acknowledge the reports that state online and in-class students admitted cheating at the exact same rate (i.e., 32%).

PERCENTAGE OF STUDENTS TAKING DISTANCE COURSES 2012-2015 CHARTS

According to Digital Learning Compass: Distance Education Enrollment Report 2017, by Allen and Seaman of Babson Survey Research Group (Allen and Seaman, 2017), the proportion of U.S. students taking at least one online course for fall 2002 was under ten percent, at 9.6%. This fraction has grown as institutions introduced online programs and existing distance programs grew their enrollments.

The number of students taking at least one distance education course increased 3.9% over the previous year, and grew by 11.0% in the three years since 2012.

All these concerns aside, more than 50 per cent of the 500-plus UK managers who participated reported good experiences with online learning. More than 60 per cent said online learning had made a significant impact on their performance at work. Furthermore, in a report by Learning Technologies, e-learning is cited as the third most useful learning option (86 per cent), after instructor-led face-to-face training courses (92 per cent) and coaching/mentoring (90 per cent).

Looking outward from the UK, most of the growth in the total number of MOOCs available is attributable to the growth of MOOC offerings at international universities. In fact, the number of international universities offering 20 or greater MOOCs increased to 1 in every 2 universities in 2017 (Shah, 2018) : a phenomenal growth rate of 184 per cent

MOOCs, the Cloud and Developing Countries

MOOCs are all well and good for international universities in developed countries who are privileged enough to be raised with modern and progressive infrastructure, but what about those facing learning issues in developing countries?

Once again, let's be optimistic. Barriers over the implementation of distance learning over the past decade included:

- **Technology access**
- **High-speed Internet access**
- **Internet costs (and finances as a whole)**
- **Technological literacy**
- **Time management**
- **Infrastructure, and**
- **Motivation to study**

Thanks to recent global advancements, all these risks to distance learning are gradually being mitigated.

The latest estimates by media measurement firm Zenith, suggest 66.5 per cent of adults are expected to own a smartphone in 2018. That percentage is up from 63 per cent in 2017 and 58 per cent in 2016. According to Zenith, mobile devices like smartphones and tablets could account for almost three-quarters of the time spent on the Internet in 2018.

Ultimately, this pinnacle of technological readiness, access, quality, and cost reduction of digital learning resources are combining to encourage developing countries to take advantage of educational resources. Below are some promising statistics on the availability of smart devices and data across the globe: take note of the huge increase in "Least Developed Countries" (LDCs).

## GROWTH OF FIXED-BROADBAND SUBSCRIPTIONS

According to the ITU Facts and Figures 2017 Report (International Telecommunication Union, 2017), over 2012-2017 developed and developing countries range in their growth of fixed-broadband subscriptions at a steady 5-13% CAGR. Least developed countries saw an exponential 35% increase, showing the rapid uptake and development of broadband access in economies that have historically lacked substantial internet access.

COST OF STORAGE AND GLOBAL DATA AVAILABILITY, 2009-2017

Combined with greater broadband penetration in LDCs, the cost of the storage and transmission of data is freefalling.

Going back to that sticky 5.5% statistic mentioned in the previous section, it was taken from 2013 (lightyears ago in technological terms). More recent 2016 research by The University of Washington investigated the usage of MOOCs from 1,400 users based in Colombia, the Philippines and South Africa in the report "An Examination of MOOC Usage for Professional Workforce Development Outcomes". The findings were extremely exciting and optimistic. The following are some key points from the report:

- **Low and middle-income populations make up 80 per cent of MOOC users, in contrast to wealthier populations reported elsewhere.**

- **Over 80% of MOOC users only have basic or intermediate level ICT skills, challenging the belief that MOOCs are predominantly taken by people with higher-level skills.**

- **Forty-nine per cent of MOOC users received certification in a MOOC class, and another 30% completed a course. This is far above the single-digit rates reported elsewhere.**

- **Women are more likely than men to complete a MOOC or obtain certification.**

- **The main motivations of MOOC users were found to be in gaining specific job skills (61%), preparing for additional education (39%), and obtaining professional certification (37%).**

- **Among non-users, lack of time (50%) was by far the largest barrier to MOOC participation. Lack of computer access (4%) or skills (2%) was not found to be a barrier.**

CLASS CENTRAL

Growth of MOOCs

By the Numbers: MOOCs in 2017
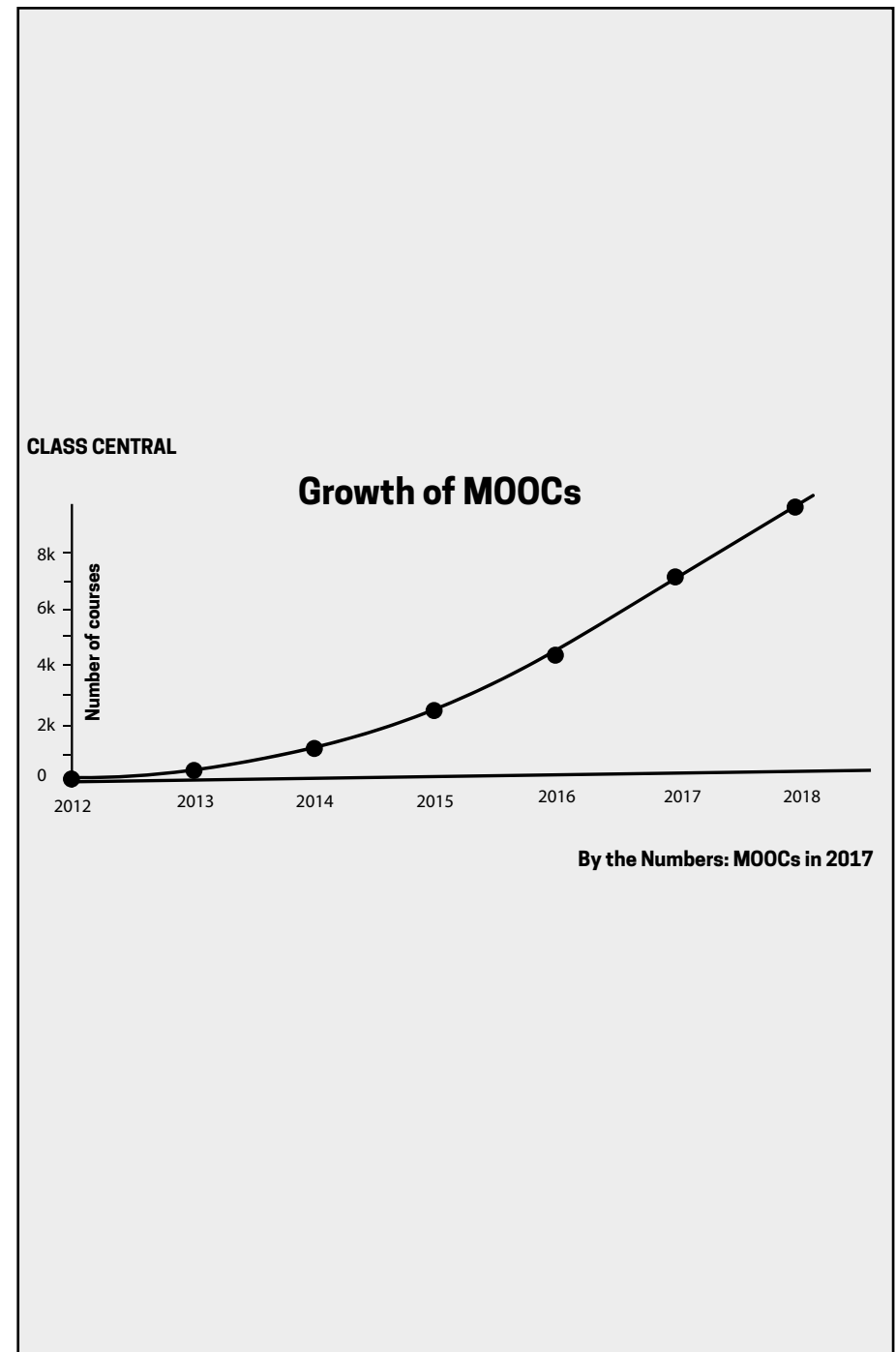
While they have not proved to be the absolute revolution promised in early days, the figures above show the changing face of MOOCs when compared to the disparaging stats of 2013.

In the midst of distance learning case studies in HE for various countries, according to Richard Garrett of the Observatory of Borderless Higher Education five categories have emerged:

Distance, Not Online: Large distance learning sector with little or no use of online learning beyond some MOOC enthusiasm (e.g. Egypt, India)

Marginal: Strong growth in campus enrollment, with some online elements. Most distance learning is blended with in-person study centers (e.g. Saudi Arabia, UAE)

Blurred Growth: A poorly defined combination of informal, distance and online learning enrollment continues to out-perform the overall market (e.g. Mexico, Spain)

Clear Growth: A clear online distance learning sector continues to out-perform the overall market (e.g. United States)

Peaked/Decline: Online enrollment growth has been at the expense of the national distance university. Online enrollment is peaking or is in decline (e.g. South Korea, UK).

The potential of distance learning empowered by the cloud has been an early focus in developing countries.

CURRENT CLOUD COMPUTING APPLICATION AREAS IN DEVELOPING COUNTRIES

A study by Nir Kshetri of the University of North Carolina-Greensboro in 2010 (Kshetri, 2010) shows E-education as being one of the most popular application areas in cloud computing in developing countries throughout MENA and Asia when compared against E-heath, E-commerce, E-governance, E-environent and telecommuniting. This is a surprising statistic considering the potential popularity of the other E-sectors mentioned in government processes.

Philanthropic efforts from developed nations are also capitalising on the potential of e-learning. Learners in developing nations will receive free digital upgrades and certificates to online courses, created by UK universities, as part of a partnership between the British Council and the GREAT Britain campaign which uses the social learning platform FutureLearn. A total of 60,000 digital upgrades will be made available for free to eligible students enrolled on over 100 online courses across 30 UK higher education institutions hosted on FutureLearn.

Referring back to the Technological Readiness chart, a notable dip and increase can be seen in India and Indonesia. In India, concerns were raised about the lack of digital infrastructure proliferating the poorer regions so the Government of India enacted the Digital India initiative in 2015; the primary objectives were connecting rural areas with high-speed Internet networks and improving digital literacy, centred on three key areas - Digital Infrastructure as a Utility to Every Citizen, Governance & Services on Demand, and Digital Empowerment of Citizens.

Similarly, Indonesia over recent years has seen a boom in corporate and governmental investment in technological infrastructure. Investment in Indonesian tech start-ups reached $3bn year-to-date, and focused efforts from the Association of Southeast Asian Nations (ASEAN) in priority areas (connectivity, infrastructure development, and rural energy access) has enabled Indonesia's astronomical technological growth.

This increase in technological readiness has been largely attributed to such initiatives, showing the importance of the government drive to spread the technological focus away from their respective Silicon Valleys and middle to upper class areas - to all areas of society.

Even in volatile regions examples of the benefits of cloud-based distance learning can be seen. The non-profit organisation Cornertstone OnDemand Foundation which provides cloud-based learning and human capital management software, distributed their services to more than 13,000 aid workers, empowering them to respond more effectively to humanitarian needs across Syria:

"The DisasterReady team consulted with Syrian humanitarians to create and source sector-specific learning pathways, videos, online courses and simulations, mobile courses, job aids and materials on 22 topics specifically designed for aid workers in the Syrian crisis to include in the ISHA Online Learning Program, which went live in December 2016. In January 2018, the team launched a mobile app for ISHA learners, enabling them to view courses on their mobile devices and to download and take selected courses "offline." The mobile app has been critical to reach learners with limited or no access to the internet, as well as those who could only access the internet via their mobile device. The results of the ISHA Online Learning Program have far exceeded original expectations and have helped provide humanitarians the skills needed to provide assistance to communities across Syria. Results to date include:

- **13,050 learners in five key countries, including Iraq, Jordan, Lebanon, Syria and Turkey**
- **4,912 learners in Syria**
- **99,150 online course registrations**
- **21,126 online course completions**

ISHA will continue to provide support for all learners using DisasterReady, and will source new content, as well as explore opportunities to collaborate on new content development projects pending funding availability."

Bridging the Digital Divide

The technology necessary for cloud-based blended and distance learning techniques is undoubtedly more prolific and cheaper – and developing economies are priming themselves for the 4th Industrial Revolution. Yet many argue that the digital divide is widening: the gulf between those who have ready access to computers and the Internet, and those who do not.

DESPITE NOT HAVING ALL THE ANSWERS, THE CONCERTED EFFORTS OF GOVERNMENTS, CORPORATES AND PHILANTHROPISTS TO LESSEN THE DIVIDE HAS IMPROVED TECHNOLOGICAL INFRASTRUCTURE AND ACCESS TO LEARNING RESOURCES, WHICH MAKES FOR EXCITING PROGRESS.

And this paper puts forward the case for reconsidering the integration of distance learning to help bridge the gap - as we are in a better position than ever to do so.

Other novel methods of bridging the digital divide take advantage of recent technologies. "Low power, low cost and fully-fledged" computer servers are being investigated in rural areas with restricted access to electricity and infrastructure. Advancements have also been made so that low cost servers utilising cloud-based implementations can provide the full IT related services of higher educational institutes for $170. In time, this number will only go down. Concerted efforts to connect developing countries include notable companies like Google and Facebook utilising solar powered drones and atmosphere balloons to deliver 5G wifi strength connections to areas that would not accommodate any ground-based Internet infrastructure in its current state. So, whilst it still undoubtedly remains – there is plenty of evidence to suggest the digital divide is narrowing.

On the subject of 'divides' – it's also worth noting that this paper is written from a developed Western country about the benefits of Western technologies and academic profiles. There is a risk that the approach proposed in this paper may have implications in narrowing each country's respective academic culture to Americanised/European academic content and pedagogical ideas. But it's a risk that can be mitigated by culturally sensitive and informed MOOC course design.

Conclusion

In summary, the conversation around 'the cloud' over the past decade has turned into a physical reality, with 2018 hurtling into cloud-based app domination in education and other major public sectors. It is dissolving our previously rigid siloed international education structures and advancing developments in global education at an unprecedented rate.

Previously stilted asynchronous education resources over dialup are now synchronised, mobile and dynamic over 4G/5G and broadband. From a governmental to organisational to individual level, the usage rates are set to rise, regardless of economic background or location. Network infrastructure development is ongoing - and the Internet was labelled a human right by the United Nations in 2016. Meanwhile, the UK has committed to providing everyone with a minimum quality of Internet access by 2020, and the encouraging examples of developing countries making concerted efforts to span the digital divide and improve connectivity are very recent - but already providing positive socioeconomic gains that are only set to expand.

The staggering advancements in mobile technology enforce all the above, with anytime access to near infinite informational resources and unprecedented computing power more accessible and affordable than ever. Students are increasingly using mobile devices and apps to enhance their learning, with education software shifting to the cloud revolution. The systems are already in place – Tribal Edge and others are creating new ways of accessing content that is designed around a student's needs – anytime anywhere access, communication and collaboration, support at your fingertips and a predictive learning analytics engine monitoring usage and identifying students that might be at risk of not completing a course.

Education routes are increasingly no longer restricted to antiquated educational models, typically reserved for 18-21 undergraduates with the resources and time to commit to qualifying themselves. Alternative education and blended learning have emerged as the answer to the next industrial revolution.

Governments, teachers and institutions are gradually shifting to embrace the usefulness of blended learning resources and MOOCs, which have traditionally, in the developed world, endured a tainted view. In the future, as automation and AI blossom, we'll need to be able to equip the next generation with the skills and learning needed to operate in this new environment – so alternative education routes will become the standard. Driven by data, we'll also need the systems and technology in place to provide learning systems and access to learning so that current and future generations can prosper.

Finally, it's worth noting that the optimism of this paper is not founded on 'throwing technology at education to make everything better'. Many studies have illustrated that you can't just thrust a phone and a quiz into the hand of a learner; they need to be engaged with a good curriculum and guidance. It has been proven, and repeatedly that in-face contact, supplemented with digital resources, is an effective way of learning, but for those not able or fortunate enough to engage with in-person pedagogy, digital learning will assist them with minimal resources. And for this, educators need to embrace 'the cloud'.

The Author

Duncan Windsor joined Tribal Group in 2016 after performing cognitive neuroscience research for Goldsmiths, University of London, and psychopharmacology research for the University of East London. He moved from academic to corporate research, taking his passion for academia and methodology with him, and now focuses on global education technology market activity across all sectors, particularly in the UK, US, ME and APAC. He currently performs and monitors the market survey series for Tribal.

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