Moving learning online and the COVID-19 pandemic: a university response

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SHORT SUMMARY

The COVID-19 pandemic has accelerated the introduction of online teaching and has embedded digital ways of working in universities and other higher education institutions. These need to reach the full range of current and potential students, including individuals from disadvantaged backgrounds and those with limited digital skills or access. Better understanding is also needed of the challenges and unintended consequences of digital learning and working, including the need for informed consent and other privacy and data protection issues. While general in focus, this paper specifically considers a case-study university in the UK.

Abstract:

Purpose: This article investigates some ongoing issues faced by Higher Education Institutions (HEIs) having to rapidly move their teaching online during the early stages of the COVID-19 pandemic.

Design/methodology/approach: The article incorporates a review of academic and policy literature concerning digitalisation and online learning in universities, and qualitative interviews with staff involved in online teaching and learning at a university in Scotland.

Findings: For most HEIs and organisations across the globe, the COVID-19 pandemic has accelerated the speed at which digitalisation and digital ways of working have been embedded in organisational life and service delivery including new ways of learning and working. This has led to a recognition of the need for practically-focused, effective inclusive digital interventions. A range of initiatives have been developed or accelerated in response to the pandemic are discussed. These should be explicitly designed and implemented to also reach individuals from disadvantaged backgrounds, including those with low skill levels or qualifications and older

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age groups. Effort is also needed by policy-makers and HEIs to better understand the challenges and unintended consequences that digital learning and working poses.

Originality/value of the paper: This article provides an analysis of the processes, issues and impacts associated with the rapid shift to digitisation in HEIs at a point in time shortly following the onset of the COVID-19 pandemic in 2020. It raises issues around inclusivity of online learning, pedagogic issues, unintended consequences of digitalisation and privacy issues when moving to online teaching relevant both during the pandemic and in the longer term.

Research limitations/implications: More research is needed into the methods and implications of increased online teaching. The range of interviewees is limited to one main organisation. A wider range of staff, students, HEIs and other types of organisation would add additional insights.

Practical implications: Insights from interviews highlight a number of institutional responses to digitalisation, which were accelerated by the Covid-19 pandemic. These identify learning and reflection points for HEIs moving to enhanced online teaching provision.

1. Introduction:

Digitalisation is transforming the skills needed by the world's young and working populations if they are to successfully engage in a globalised modern economy. It is also changing the way students learn and the ways institutions deliver education. As digitalisation remains high on national, regional and international agendas, Higher Education Institutions (HEIs) across the globe are undergoing constant transformation in order to respond to the needs of the societies and labour markets. It is posited, that for universities to remain relevant, they must develop capabilities that match the needs of the digital age. The COVID-19 pandemic has forced HEIs, as well as governments, businesses and other institutions, to rapidly increase their provision of digital services, and in doing so accelerated a number of existing trends. This has meant moving student support, teaching and research, into online formats, requiring different methods, processes and skillsets (Ali, 2020; Webb et al., 2020).

HEIs have had to rapidly evolve their digital strategies and the digital literacy and skills of their staff in order to respond to the current demands for online delivery and global digital connectivity. However, prior to the onset of COVID-19, innovative learning and teaching was increasingly utilising modern digital technologies. The expectation that HEIs will act as key drivers for developing digital skills in society has led many of them to embed digitalisation in the curriculum and capitalise on opportunities that a digital sophisticated university can bring to staff and students. In this respect, the digitalisation of higher education offers new innovating ways of delivering teaching and learning, as well as new ways of organising and managing taught processes.

However, increasing online delivery also raises concerns about the 'datafication' and automation of higher education provision, where students and staff will be subject to greater digital scrutiny and transparency and where more educational tasks can be automated (Williamson, 2017, 2020). The long-term effects of the dash to digitalisation also raises questions about which short-term adaptations are likely to become permanent, or whether they will be discarded or amended after the pandemic. A significant concern emerges in relation to whether recent practices will lead to fundamental and deep-rooted changes in the ways that education and learning are realised. Other 'unintended consequences' include inequalities in access to educational opportunities, effects on types and content of learning materials and approaches to learning, the effects of being 'locked-in' to specific technologies, software and private companies, which may create future 'path dependencies', and the effects of different digital resources on competition between universities. Additionally, there are a range of issues relating to data protection, privacy, surveillance (of staff and students), cyber-security and the ethical aspects of student attendance and performance monitoring practices (see for example: Vance and Tucker, 2016; Williamson, 2020), all of which need to be understood in more detail.

This article investigates some of the issues faced by UK, and specifically Scottish, HEIs when rapidly moving their teaching online during the onset of the COVID-19 pandemic in March 2020. The next section presents an overview of broad national digitalisation policy, followed by a section on the specific higher education context for the accelerated move to online teaching, specifically in Scotland and the rest of the UK. The case of an unnamed Scottish university is then presented as an example of evolving digitally informed teaching and learning practices implemented during the early disruptive period of the COVID-19 pandemic. This is followed by a discussion of the impacts and consequences of rapidly moving to an online digitised teaching and learning environment, and some concluding comments.

2. Digitalisation in the UK and Scotland:

Enhancing innovation and increasing productivity are seen as key driving forces to achieving social and economic prosperity. As a result of the evolving digital landscape and advances in technology, a number of jobs are likely to change, disappear or be transformed in the coming decades. Potentially, up to 30% of UK jobs are at high risk of automation by the early 2030s, a figure that is lower than the US (38%) or Germany (35%), but higher than Japan (21%) (Berriman and Hawksworth, 2017), and in Scotland it has been estimated that over 46% of jobs i are at high risk of automation (Thomas and Gunson, 2017). These trends are likely to affect some social groups more than others, with young people and women likely to be disproportionately affected (Arntz et al., 2016; ONS, 2019; Servoz, 2019).

The UK is ranked eighth of the 28 European Union (EU) Member States in the European Commission Digital Economy and Society Index 2020[2] (DESI, 2020), but still faces a digital skills gap. As digital employment is predicted to rise, related skills shortages are predicted to increase and will continue to impact businesses and productivity. Overall, in the UK, 74% of the population are judged to have basic digital skills, compared to an EU average of 58%, with 49% of the population estimated to have above basic digital skills (see Department for Education, 2019), compared to the EU average of 33%. Despite strong demand for Information and Communication Technology (ICT) graduates, the UK scores (3.8%) just above the EU average of 3.6% of all UK graduates graduating with an ICT degree, Similar shortages are observed across e-commerce and other growing sectors which rely on advanced digital, technological and analytical skills.

The Scottish Government's digital strategy sets out their vision of Scotland as an inclusive, ethical, innovative and productive digital nation (Scottish Government, 2017). This rests on an aspiration to "*harness the technologies of the Fourth Industrial Revolution to increase economic and social prosperity*" (SCDI, 2019, p.2). The strategy promises investment in the connectivity, digital infrastructure and digital skills development of individuals, communities and organisations. It also highlights technological ambitions to drive further developments in Artificial Intelligence (AI) and machine learning, and to capitalise on growth attributed to the data revolution. Some initiatives to tackle the digital skills gap and digital connectivity, improving the nation's digital capability and reducing digital exclusion, have been already set up. These include a new E-commerce Institute, multiple digital hubs, and local and national Digital Skills Partnerships which bring together regional businesses, large employers, charities, and public sector organisations to tackle local digital skills challenges and build thriving and inclusive local economies (House of Commons, 2018; Webb, 2020). Scottish universities are responding to these demands, with national and local practices aimed at improving the digital skills of students and staff, and offering competitive and demand-driven programmes in ICT, AI, Data Science, and Cybersecurity. They are also embedding digital skills and competencies more widely throughout the university curricula.

Scottish policies (for example, Scottish Government, 2018) echo UK-wide policies and strategies, and include a promise for significant investment in education, training and support for equalising access to good employment opportunities and the supporting development of digital and cognitive technology skills. These policies are also aligned with the European Union's digital competency framework, which includes five key dimensions for realising the

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[2] The Digital Economy and Society Index is a composite index published annually by the European Commission. It measures the progress made by EU Member States towards a digital economy and society, bringing together a set of relevant indicators.

opportunities offered by digitalisation (Table 1). They include both physical and technological aspects (connectivity such as broadband and the integration of digital technology, including e-commerce), alongside more people orientated human capital factors (such as e-skills), and the use of digital services by individuals (citizens' use of internet and eGovernment services).

Table 1: Principal Policy Areas of the Digital Economy and Society Index (DESI)

1 Connectivity	Fixed broadband take-up, fixed broadband coverage, mobile broadband and broadband prices
2 Human capital	Internet user skills and advanced skills
3 Use of Internet	Citizens' use of Internet services and online transactions
4 Integration of digital technology	Business digitisation and e-commerce
5 Digital public services	e-Government

Source: Adapted from the Digital Economy and Society Index (2020) (see: https://ec.europa.eu/jrc/en/digcomp/digital-competence-framework)

Skills and digitalisation:

There are various analyses about the effects of automation on workforces and on learning (Wharhurst and Hunt, 2019). Bughin et al. (2018) predict that, in addition to digital skills, social and emotional intelligence[3] and higher cognitive skills[4] will grow in demand over the coming decade due to automation. Jobs requiring caring, creativity and/or emotional and social intelligence, will be less affected by Artificial Intelligence or extensive automation, as machines cannot yet match uniquely human interactions and performance in these roles. Global projections expect greater demand for: healthcare providers; professionals such as engineers, scientists and analysts; IT professionals and other technology specialists; managers and executives; educators; and, people in creative industries (artists, performers and entertainers) (Manyika et al., 2017). It is anticipated, that economies like the UK and USA, where creative occupations make up a large part of the workforce, may be better placed than others to deal with the predicted disruption of future employment (Bakhshi, Frey and Osborne, 2015). In the currently polarised labour market, the dangers of automation are being associated with a range of occupations, not only low-waged jobs. Workers in these jobs may need to reallocate to roles

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[3] *Social and emotional skills:* including entrepreneurship and initiative taking, leadership and managing others, advanced communication and negotiation skills, adaptability and continuous learning, interpersonal skills and teaching and training others.

[4] *Higher cognitive skills:* including creativity, complex information processing and interpretation, critical thinking and decision making, project management and quantitative and statistical skills.

and activities that are less susceptible to automation – i.e. tasks requiring creative, emotional and social intelligence or develop advanced digital skills for new jobs and sectors of growth in the digital economy.

According to Frey and Osborne (2017), the social intelligence element of work is a substantive barrier to their computerisation, as people-centred services and occupations are not as likely to be significantly substituted by computer capital, unlike workers in transportation and logistics, office and administrative support, and production occupations. Social intelligence constitutes abilities like social perceptiveness (being aware of others' reactions and understanding why they react as they do), negotiation (bringing others together and trying to reconcile differences), persuasion (persuading others to change their minds or behaviours), and assisting and caring for others (providing personal assistance, medical attention, emotional support, or other personal care to people). An example of such a person-centred sector of growth in Scotland is Early Learning and Childcare, which has been recently stimulated by the publicly funded expansion in free childcare (Webb and McQuaid, 2020, 2018; Webb et al., 2020). To increase the employability of graduates, HEIs have an important role in helping to develop such social skills among their students, and greater online teaching and learning may affect this.

In general, it is evident that new sets of skills will be sought by employers in the context of the changing nature of jobs and continuing advancements in technology. However, the term 'digital skills' covers a wide array of competencies, knowledge and skills. An important distinction can be made between 'baseline' digital skills (i.e., those that are easily transferrable from one role to another, and from one sector to another), and 'specific' digital skills (i.e., those that are role, or sector, distinguishing and required for jobs in a specific role or domain) (Nania et al., 2019). 'Baseline' digital skills are commonly required by employers, with over 75% of job openings across all areas requiring digital skills. 'Specific' digital skills can be described according to clusters, such as, Software and Programming, Computer and Networking Support, Data Analysis, Digital Design, Customer Relationship Management, Digital Marketing, Machining and Manufacturing Technology. Based on an analysis of millions of online job adverts in the UK, evidence suggests that digital skills are required in at least 82% of online advertised openings, although the precise skills demanded are not uniform from one job to another (Nania et al., 2019). Their research suggests that specific digital skills may reduce the risk of automation, by 59%, and will support career progression and increase in wages as roles requiring digital skills pay 29% more than those roles that do not. This difference is apparent at all skill levels, but the wage differential increases in higher wage bands. Therefore, in addition to soft skills (such as communication, teamwork or project management skills) current

and prospective workers need to develop more specific sector and role digital skills to maximise their chances of employment and success in the digital economy. This may include becoming competent in using digital tools and software, such as Computer-Aided Design for engineers and manufacturing workers, Customer Relationship Management software for sales and marketing professionals, and computer programming and networking for IT professionals. These specific digital skills are required in 28% of low-skill jobs, 56% of middle-skill jobs, and 68% of high-skill jobs (Nania et al., 2019).

According to a recent Open University (2019) study some 88% of UK organisations currently lack digital skills, with many expecting these shortages to increase in the next five years. As almost all jobs require basic level of digital skills, 72% of employers state that they are unwilling to interview candidates who do not have basic IT skills (CEBR, 2018). Interestingly, despite concerns related to automation and new consumer trends, not all employees express an interest in acquiring new digital skills, with about half (48%) of all employees indicating that they want digital training (Open University, 2019). This level increases amongst younger workers, with two thirds (67%) of 18-34 year-olds, and a fifth (22%) of younger employees funding their own training in this area, a direct contrast with the 26% of over-55s who say that they would like digital skills training. HEIs have a role in developing specific high-level digital skills for specialists, as well as low-level universal digital skills for all students across the taught portfolio.

Barriers in digital infrastructure and connectivity, specific digital skills gaps and access inequalities include, for example, female under-representation in cybersecurity and similar training and roles (DCMS, 2020) and digital exclusion most generally (CEBR, 2018). These barriers need to be addressed to allow graduates to participate fully in the digital economy, and to fulfil the UK and the Scottish Government's ambitions for inclusivity and productivity. Because of the heterogeneity of 'digital skills', HEIs, governments, and skills and training bodies need to design interventions that address sector specific digital skills needs now and in the future. Digitalisation can support greater work productivity and break down some geographical and socio-economic access barriers, but can also profoundly disrupt society and facilitate the emergence of new, previously unforeseen, digital barriers. Hence digital transformation is generating considerable debate among education providers, policy-makers and industry leaders about its societal impact. Concerns are growing about how digitalisation is affecting students and staff on issues such as jobs, wages, inequality, mental and other health issues, resource efficiency, social relationships and security. In the higher education sector there are unique concerns over the long-term impact of digitalisation on educational work, pedagogy and the community of learners.

3. Education policy and university responses to online delivery:

There have been many examples of proactive developments by HEIs in addressing and creating strategies on digitalisation needs and in filling the digital skills gap across university degree programmes. This section describes these initiatives, ranging from increases in new digital courses (including conversion courses in Data Science and AI[5]), Degree Graduate Apprenticeships, strategies for the development of wider digital skills and competencies embedded in degree programmes and additional employability-focused activities for students, and the up-skilling of staff to meet digital delivery needs.

The impact of Digitalisation on Higher Education provision:

In the last decade, various digitally oriented terms and concepts have emerged and are prominent in teaching and learning scholarship; these include the *digital university, digital literacies, virtual learning, e-learning, online and blended learning,* and *technology-enhanced learning,* etc. New groups across HEIs have been created to enhance learning in the digital university for at least two reasons (Weller, 2016). First, initiatives led by the digitalisation strategy emphasise the importance of digital delivery as reflecting the way students want to learn and thus enhancing student participation and engagement. Second, the argument of efficiency emphasises the operational advantage that learning with technology offers, by allowing teaching to be conducted in a more cost and time effective, and potentially, in a more scalable manner (especially important in the context of increased student numbers). Another key reason for HEIs to engage with digitalisation is their institutional responsibility for the preparedness of students for work (PwC, 2015a, b). As such, the employability agenda has been at the heart of HEIs policies and practice, particularly in order to meet the demand for specific skills and to address the gaps in skills often reported by employers, although the non-employment related aspects of higher education should, of course, remain fundamental to HEIs (UKCES, 2014; McQuaid and Lindsay, 2005; McMurray et al., 2016).

HEIs digital strategies, together with the embeddedness of digital practices and the development of digital skills, have extended a debate about the pedagogical impact of digitalisation. Although technologies have always shaped pedagogic processes and have been used to support learning, the growth of the use of Internet and web-based technological tools in learning and teaching, is profoundly testing the technical competence and confidence of many teachers and educators (Weller, 2016). The emergence of the 'digital immigrant' (Prensky, 2001) suggests that there are generational differences in exposure to technology,

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[5] https://www.officeforstudents.org.uk/advice-and-guidance/skills-and-employment/postgraduate-conversion-courses-in-data-science-and-artificial-intelligence/.

and this often makes educators overwhelmed with the choices the digital realm offers, despite their motivation and enthusiasm for adopting digital technologies in teaching. Similarly, despite the wide embeddedness of technology in day-to-day living, questions are emerging about the digital capacities of students and their ability to effectively use and navigate digital learning environments, despite being considered 'digital natives' (*ibid.*). In a context of increasing and fast-moving embeddedness of technologies in teaching, learning and working practices, the development of digital knowledge, skills, attributes and behaviours seem to be an area of considerable importance. This technological shift highlights the need for rethinking traditional face-to-face pedagogies and points to significant changes in the way universities work.

In recent years, HEIs around the world have invested heavily in the development of digital infrastructures, such as Virtual Learning Environments (VLEs) that enable technologically mediated blogs, wikis, document sharing, discussion forums, podcasts, lecture captures, virtual laboratories, screencasts and e-portfolios/e-submissions in online or blended learning. Massive Open Online Courses (MOOCs) are examples of wholly online learning experiences that utilise Web 2.0 technologies and social media tools, and provide a new way of learning, connecting and collaborating away from the physical campus. Digitalisation has been linked to enhanced student learning (Beetham et al., 2018; JISC, 2018) and some scholars argue that these new developments have given students more freedom as to where and when they want to study (JISC, 2009 in Weller, 2016, p.174), although there is a recognition for a close fit between individual students and online teaching styles, materials and technologies used (Sun, 2016), including library and associated ICT support, which vary across universities (Anasi et al., 2018). As new knowledge is being created through and with technology-enhanced learning, connectivity and digital interactions are being recognised as expected and necessary conditions for creating and sharing knowledge (Siemens, 2005; Cormier, 2008). This trend partly reflects the creation of knowledge and innovation in the world of work, and matches the new flexible patterns and structures of working (Skills Commission, 2014).

Despite an appetite for more digital provision across many HEIs, the implementation of digital needs and skills is an incremental and challenging process. Internationally, the COVID-19 pandemic has highlighted that HEIs need to support both staff and students in acquiring wider digital competencies and not just selected digital skills. At the same time as this digital integration happens, many unintended consequences of learning and teaching in digital realms are surfacing, such as personal data protection issues, cybersecurity concerns and ethical aspects of student attendance and performance monitoring practices. Only slowly are these issues becoming recognised as challenging and potentially altering the nature of online learning.

Scottish Universities' responses to digitalisation:

Scotland's higher education sector has a long history and is recognised as diverse and internationally successful (SFC, 2020). With a population of 5.5 million (NRS, 2020), it is home to 19 universities, funded to a large extent by the Scottish Funding Council (SFC). Universities in Scotland have responded to the increases market demand for digital skills in multiple ways.

There is a great awareness amongst university leaders, educators, learning technologists and career/student support services, that the response to digitalisation has to be holistic, and wider than the notion of education that directly develops knowledges and skills for specific digital skills clusters, such as data analytics, digital design or programming. A wider understanding of digital literacies, as a response to educational as well as labour market needs, involves developing student skills and behaviours across all subject areas, such as being able to: navigate through the digital environment; work collaboratively using VLEs and associated platforms, software packages and social media; search for, critically appraise, and use multi-format sources of information by articulating knowledge through various digital artefacts; and, present themselves professionally in the online realm. Such widened understanding of digital literacies is inherently linked with the current employability agenda.

Key policy-based initiatives and programmes influencing digitalisation in HEIs are generally aligned with the vision for Scotland as a productive, innovative and digital nation with an educated and skilled workforce able to successfully engage in the world of work in a globalised modern economy (QAA, 2020). The Scottish Higher Education Enhancement Committee (SHEEC) managed by the Quality Assurance Agency for Higher Education (QAA) oversees strategy, policy and practice in this area. HEIs' role in the development of digital skills has strengthened a longstanding preoccupation with the development of graduate skills and attributes and their readiness for work, closely entangling the employability and digitalisation agendas. The drive for digitalisation, however, has also highlighted the preparedness and gaps in the digital skill base of academics and educators directly tasked with the skills development of their students.

4. Digital innovation and skills development (Case study university):

This section presents a range of examples illustrating innovation in digital skills development, from a mid-sized Scottish university. Although these are deliberately broad, indicative descriptions of practices enacted in a specific institutional context, similar activities have been introduced or implemented across HEIs in Scotland and elsewhere.

Methodology:

Following the review of academic and policy literature and an analysis of background case material, a series of six qualitative interviews were conducted with university staff involved in online teaching and learning. The interviews took place in the summer of 2020, several months after the start of the pandemic. This was accompanied by a series of informal discussions with trades union representatives. Local initiatives were identified through these local experts at the University. These experts were from a range of academic backgrounds and were chosen because of their experience of teaching digital skills in higher education and/or their familiarity and knowledge of policy related to digitalisation and employability. The interview schedule used is set out in the Appendix.

New courses in digital topics:

In recent years, partly in response to the needs of the labour market, the case-study university increased its portfolio of courses focused on the development of digital skills. Six tailored specialist undergraduate (UG) programmes and nine post-graduate (PG) programmes were on offer in areas like Data Science, AI and Computing. All of these courses had been designed to develop a range of specialist digital skills, such as Software and Programming, Computer and Networking Support, Data Analysis, Digital Design, Digital Marketing and Customer Relationship Management, as these are essential skills for finding work and developing careers in commerce, finance, medicine, media, law enforcement and security, and public life.

The University offered a Graduate Apprenticeship in Data Science (BSc), designed as a combination of work-based learning and high-quality teaching delivered by experts in the field. This practical degree programme focused on developing mathematical and analytical skills needed to begin a career as a data scientist or analyst. It was a graduate-level qualification developed by Skills Development Scotland, the national skills agency, which is responsible for implementing the Scottish Government's strategies for up-skilling the Scottish workforce. Graduate Apprenticeships are delivered in partnership with the industry and the education sector to provide work-based learning opportunities for individuals who are currently employed, with the apprentices working for their employer whilst studying at the University. A Digital Skills Development Webinars Series for students and recent graduates was also run by the University's enterprise and innovation support unit. An Enterprise Programme, supported by a University Fund aimed at developing essential digital skills for future professionals and entrepreneurs. The initial series focused on digital strategy, digital marketing, web-design and E-Commerce platforms.

Innovative assessment and digital literacy:

In addition to the digital subjects on offer, the case study university is committed to embedding digital content to support students in their learning by focusing on developing a range of other digital skills and literacies through authentic and innovative assessments. These assessments prioritise the development of graduate skills needed in today's world of work, which suggests that they either enable students to present solutions to a problem (often based on data handling and analysis) or communicate gained knowledge in the format of a digital artefact (e.g., presentation, video, podcast, digi-essay). In addition to broader educational objectives, another focus is on developing specific working practices and professional behaviours that, in the contemporary world of work, take place increasingly in online space. These skills are often essential in graduates' competition for jobs or their successful exploitation once already employed. For example, as part of the core skills element of the Human Resources Management programmes at the University, the assessment methods were adjusted so that students were asked to demonstrate a level of digital competence that the course leaders felt was becoming essential to the employability of Human Resources graduates.

Realising that companies were increasingly making use of online video conferencing and meeting platforms as an alternative to face-to-face meetings, students were given instruction on video meeting set-up skills, paying particular attention to lighting, sound, background, and camera contact. Mindful also of the increasing use of video CV formats in job interviews, the programmes used assessments where students were asked to speak to camera about their skills and attributes without the use of notes. The module that instructs students on practice and communication skills (interviews, presentations, holding difficult conversations with staff) also makes use of an e-portfolio of video evidence of the skills in action, it also gave students the opportunity to set up their own practice blog site (not visible publicly) where they marketed themselves and wrote short pieces about HRM topics. Digital competences are embedded in the learning outcomes of all HRM degrees at the University.

Developing the digital skills of staff – courses in online and blended learning:

In recent years, Scottish universities have expanded their teams of learning technologists who support, develop and run courses focused on online/blended learning. Prior to the start of COVID-19 pandemic, the uptake of VLEs was increasing, and blended ways of learning were championed by institutions as a way of engaging students in more innovative, collaborative and inclusive learning, developing higher order skills, and reappraising the value of independent learning and critical thinking.

The case-study university encouraged and supported staff to think about digital accessibility. It placed considerable emphasis on promoting a wider and varied use of digital resources in

teaching, and particularly the engagement with or use of open-source resources. University staff were encouraged to attend various professional body opportunities, such as a *Blended and Online Learning and Teaching course*, Higher Education Academy (for HE teachers) fellowship development opportunities, and a wide range of small short Teaching Bites sessions focused on digital delivery and tools to deliver pedagogically sound student learning experiences. This emphasis on up-skilling academic staff in online delivery was accelerated by the COVID-19 pandemic in 2020.

Digital transformation of student learning and experience:

The case university was committed to supporting students in the confident use of the digital learning infrastructure and resources throughout their university journey. In line with the University's strategic vision of greater emphasis on the enhancement of the student experience, the University launched student digital experience insights surveys, which ran in 2016-2018. The evidence gained from these surveys was significant in helping to lead transformation initiatives in digital learning and the services offered to students. This included development of new digital learning approaches, improvements to services and digital provision (software, hardware and the learning environment), purchase and implementation of a new VLE and associated lecture recording systems, guidance about the effective use of students' own digital devices, quality of digital teaching on courses, and in digital security and online behaviour.

Resources were also used to market digital activities to students, staff and others via a 'Let's get digital - Tell us your digital study needs' campaign. This branding was used in a series of promotional activities in areas of high student footfall, as well as on digital screens around the University, notices on the VLE and student portals, and in a student newspaper. This evidence contributed to development of the Digital Learning Project Board that provides direction, scrutiny and governance around the digital learning agenda at the University. Some of the other initiatives that the University undertook in response to the evidence gathered included:

- the provision of cyber security training, with a campaign at the start of each semester and an ongoing presence on Twitter and Facebook;

- the creation of a new knowledge base and self-service portal to provide online support and guidance for digital issues, with information in bite-sized, easily digestible chunks, available to students at any time and via any device;

- the use of various channels and different communication methods to engage with and respond to students, for example the student newspaper, articles on the Information Services' blog, and the use of memes via social media);

- investment in a media management system that offers media creation and management options. Lecture recording is normally compulsory at the University and the recording software embedded within the institutional VLE;

- the introduction of a new stakeholder engagement toolkit for all staff to use that promotes the use of innovative techniques and shares findings from surveys and other activities;

- a laptop loan scheme to supplement desktop provision and address student feedback requesting greater more computing provision; and

- the development of a training module for the institutional VLE to support online learning, available to new students prior to arrival together with additional content designed to support use of the library, as well as the development of digital and data literacies.

This commitment to changing the experience and digital capabilities of students at the University echoes the JISC[6] NUS student digital experience benchmarking tool (JISC, 2016). This tool was embedded across the University's student support and careers services and offered a range of academic skills, development and employability workshops, in group and one-to-one formats.

Impact of the 2020 Coronavirus pandemic:

While it is too early to assess the full impact of the COVID-19 pandemic on HEIs, it is clear that the pandemic caused an unprecedented disruption in education and training systems. In June 2020, following the unprecedented use of digital technologies in schools and universities and an unexpected switch to distance/online learning during the pandemic, the European Commission launched a public consultation to learn from this major event (UKRO, 2020), including the distribution of a survey and a series of summer online outreach events. These were open to the general public, educational institutions, and public and private organisations to ensure a wide range of views and perspectives were gathered. A new Digital Education

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[6] JISC (formerly called the Joint Information Systems Committee) is the main UK higher education digital technology charity that supports the post-16 and higher education sector by providing advice, digital resources, network and technology services, and therefore it supports HEIs in developing the culture, infrastructure and practices in digital capabilities. JISC is funded by a combination of the UK further and higher education funding bodies, and individual higher education institutions.

Action Plan (CEC, 2020) was devised based on recent experiences and practices to consolidate a new European vision for the immediate COVID-19 recovery period and the long-term support for education and training sector's digital transformation. It sought to foster the development of a high-performing digital education ecosystem that enhances basic digital skills and competences from an early age, and further develops a range of digital literacy, computing education, a good knowledge and understanding of data-intensive technologies, throughout the educational journey.

In the UK/Scotland, numerous research projects and impact-focused feedback gathering events and initiatives have been undertaken. The COVID-19 pandemic highlighted the importance of digital delivery of learning and teaching in HEIs, particularly in the face of massive unexpected disruption. Institutions like the UK's Open University, which have historically delivered distance learning, were able to capitalise on their education philosophy and strategy with a business model that featured flexible, remote and digital learning.

Some HEIs with suitable technological infrastructure and expertise in using the virtual environment were also able to quickly adjust to online teaching and complete their intended taught programmes of learning. In other relatively under-invested HEIs, or those with more traditional teaching approaches, the COVID-19 pandemic has questioned institutional and individual preparedness for online learning and remote working. Such rapid requirements to switch to online learning took many institutions by surprise. After the initial shock, there was a mobilisation in HEIs in Scotland for collating and sharing best practice to try to ensure that both staff and students were able to confidently use technology for teaching, learning and working in the post-COVID-19 reality. A general optimism was detected amongst some academics in Scotland, who despite initial concerns related to the substantial time investment needed for transition to online teaching, saw this as an unavoidable response to the changing times escalated by the pandemic. In addition to large investments in hardware and software, including VLEs, new approaches and resources (financial, technological and emotional) have been mobilised across HEIs to support staff and students.

Supporting staff and Digital Champions:

Initiatives, such as "Digital Champions" schemes, were introduced across the HEI sector to enable academics with greater knowledge and experience of using digital tools support their colleagues. These champions tend to be trained and supported by academic development teams and institutional learning technologists. At the case study University, 'Faculty Digital Champions' were appointed with a role including: augmenting the support on offer to teaching; improving two-way co-ordination across departments and across staff; sharing 'good' or 'best'

practice; and expanding skills development and support among staff (e.g., workshops, teaching 'bites', masterclasses and podcasts).

The changes associated with the shift to online teaching were seen as long-term rather than temporary responses to COVID-19. The overall objective of the scheme was to create self-supporting communities of practice and to meaningfully embed the technology in teaching. The knowledge and innovative solutions these communities could offer were recognised as important in post-pandemic times, as more flexible ways of learning may be expected from geographically dispersed student populations. However, training appears limited on how the pandemic specifically related to data protection issues, such as clearly (not in the 'small print' of agreements) informing students of the ways in which their personal and educational data trails were being used, or making staff more aware of potential consequences of delivery online that might enable third party providers to engage in unethical practices, such as reuse of personal data (of both staff and students) for commercial purposes.

Among some staff, a sector wide solidarity emerged during the pandemic. There were multiple examples of how employees (academic and non-academic staff) created divisional and university-wide digital platforms for sharing positive practices on how to better organise work, prepare materials/adjust assessments and plan forward. This also appears to be the case in the wider sector, where many colleagues from across different institutions have eagerly shared experience and supported each other in finding best solutions to the crisis caused by COVID-19. Despite some concerns related to the substantial time investment needed for transitioning to online teaching, many of the academics interviewed saw this as an unavoidable response to changing times. Many agreed that reappraisal of existing practices and up-skilling in digital skills for delivery of educational content was a worthwhile investment that had the potential to increase the quality of learning and student engagement.

Supporting students through difficult times:

The pandemic has affected students profoundly, for example with changing forms of: contact time with staff, one-to-one discussion opportunities, assessment and feedback, physical access to campuses including teaching and living accommodation, perceptions of university fees (although most Scottish undergraduates do not pay fees) and their value for money and cost of living. Overall, these have affected students in terms of their experiences of learning, social activities, social support, especially from peers, and individual physical and mental health. Globally, in a 62-country online survey Aristovnik et al. (2020) found that students appeared to be generally satisfied with support from teaching staff during the Covid-19 pandemic, although it recognised that there were issues in deficiencies in digital skills and

infrastructure, as well as social, emotional and financial factors that impacted on their studies. Overall, 47.2% of students appeared satisfied with their university's response to the pandemic.

The COVID-19 pandemic has forced university leaders, academics, technologists and support staff to consider the practicalities of operating in a fully digital space. For many institutions and academic staff, this was the first significant experience of moving towards a fully integrated digital environment, and equally this was also the case for many students, especially those who were used to a traditional delivery, where digital engagement only supported their normal class-based and campus-based education. Switching to a fully online mode of study required a substantial adjustment and a greater responsibility and engagement in learning. However, as students found themselves living and learning off campus, many lost not only the support from staff and peers, but also access to sufficient technology and infrastructure. Such moves signified major support issues that are required to enable students to participate in effective learning, such as peer and social support, suitable workspace at home and childcare.

Many students did not have equal or sufficient access to computer hardware and Internet connections as well as digital skills. Supporting students when they are unable to adequately access those crucial services has been reported as the most difficult and often frustrating aspect of the pandemic. Additional initiatives to support students provided by the case study University included: greater access to digital resources (including e-textbooks); adjustment to new digitally friendly assessment mechanisms; more asynchronous and self-guided delivery of courses; and, other supportive skills development workshops offered by the library, the information centres and the Student Support Services (to include videos on how to use VLEs). Additional online support was available for students self-isolating, to avoid contagion of the coronavirus, including access to psychological help, counselling and social support (e.g., a buddy system). A new University app was developed to integrate social support services and offer information in digital mobile format.

4. Discussion and Conclusions:

Digital technologies are constantly evolving and becoming increasingly embedded into our lives and work. This article has discussed this evolution in relation to governmental and Higher Education initiatives, with a specific focus on a case study university in Scotland. The future of education and work is seen by many as relying on basic and specific digital skills, but a digital skills gap exists across the labour market and specifically in some new employment areas like AI, cybersecurity and e-commerce. Higher Education Institutes have sought to increase both specific and generic digital education and skills among students. There has been a rapid increase in their provision of online teaching, learning and research activities, which has

undoubtedly been accelerated by the COVID-19 pandemic. Many of these changes are likely to continue, in whole or in part, post-COVID-19; especially those that are seen to enhance student engagement and those that provided for more inclusive participation in learning. However, the speed at which HEIs have adopted digitalised practices has raised a number of important issues.

First, the 'digital divide' is seen as important as there is a need to ensure effective inclusive interventions that are designed and offered to reach individuals from disadvantaged backgrounds and those with low level of skills or qualifications, including those from older age groups. The rapid move to online teaching needs to fully recognise the real situation that disadvantaged students find themselves in, in relation to physical access to online resources, necessary digital skills, appropriate social, pastoral and educational support, as well as support for those with child or other caring responsibilities. A variety of pathways to digital up-skilling and re-training need to be available across HEIs, including pathways such as Graduate Apprenticeships that are based partially in formal education setting, and partially in the workplace or the community. More flexible student funding routes could be made available, especially for mature students, carers and career-changers, to fully enable individuals to engage with learning throughout their lives, such as the 'lifelong learning loan allowance' for adults without a degree suggested by the Auger review of post-18 education in the UK (Hubble and Bolton, 2019).

Governments and HEIs need to reconsider how to make the delivery of university education fully flexible and fitting to lives of learners who are otherwise unable to take advantage of largely publicly-funded university education at UG level. More flexible study, by length of course, time, location and media, enabling students to move between work and study across their lifetimes, will be an important aspect of an effective response to rapidly changing labour markets. Despite an increased demand for lifelong learning, the provision of flexible adult education by UK Higher Education Institutions has been declining in recent years (Tazzyman et al., 2019). With the decline of more flexible ways of studying adult learners have been withdrawing from university enrolment (Butcher, 2020). Thus, greater consideration is needed for more flexible and modular training, in addition to traditional part-time and full-time modes of study. More flexible education,(including online learning),needs to be accompanied with more flexible and appropriate support for all learners, particularly for mature students who, as 'digital immigrants', might experience online learning as challenging (Prensky, 2001).

Second, when operationalising and implementing digital up-skilling both in response to both general digital globalisation and the pandemic, there are significant training requirements for all staff and students. The pandemic has forced many employers and educators to work and

deliver content remotely, finding solutions quickly for the short-term delivery of services. In this respect, the pandemic has acted as a catalyst for accelerating up-skilling and has highlighted areas that will require a more systematic training. This training should be broad as HEIs need to support staff and students in their acquisition of wider digital and educational competencies and not just selected digital skills.

Third, for almost all institutions and organisations, the pandemic has accelerated the speed of embedding digital ways of working leading to potential unintended consequences. These require significant effort by policy-makers and HEIs to better understand the challenges and consequences that digital learning and working poses and to debate these openly with all those concerned. Some of these unintended consequences relate to issues such as: the need for students and staff to provide clearly understood and informed consent for the use of their data for monitoring, assessment and other purposes; changes in student-staff and employer-employee relations arising from enhanced technologically mediated surveillance practices; concerns about cybersecurity; ethics of online surveillance and other practices; and monitoring and analysis of staff and student emails or other communications, which also try to 'nudge' behaviour in certain directions. Examples of the latter include, staff receiving 'action required' or 'to do lists' provide through the remote analysis of their correspondence; or staff receiving aggregated records about the time they personally spend on certain activities (such as meetings) with prompts to plan more 'down time' or other nudges to their individual behaviour. These emergent issues need to be fully understood, openly discussed and accounted for, if digital teaching and learning is to be effective and legitimate.

There are limitations to this study. More in-depth research is needed into the varieties of technologies and methods used in online teaching and on the pedagogic, managerial and governance implications of different approaches. The range of interviewees that substantiated this article's evidence was limited to one case study organisation and a wider range of university staff, HEIs and other types of organisation would provide additional insights. The timing of the study was also during the relatively early stage of responding to immediate COVID-19 crisis (mid-2020), and it is expected that future developments will occur in both technologies, the expertise of students and staff, curriculum design, as well as educational and pastoral support of students and staff. These, and a greater awareness of the drawbacks of some digitalisation, such as those discussed in this article, may affect how and what occurs in the future digitalisation of learning.

HEIs have entered a new era where learning is increasingly mediated by digital technologies. Despite the appetite for the implementation of digital, online and virtual solutions, this has often

been an incremental process built on existing infrastructure and practices. Many organisations and institutions, including HEIs, realise there are gaps to be addressed in relation to necessary skills and infrastructure, and overcoming existing and new social and digital divides. The COVID-19 crisis helped highlight and accelerate such issues. A major implication of this paper is that, while there is a clear need for HEIs to actively lead and support the development of digital skills and the digital competencies of staff and students, this requires a better understanding of the challenges and unintended consequences that digital learning and working poses. Research in this area is urgently required to ensure that the emerging digitalisation of HEIs follows and extends best practices in the interests of educators, learners and society. Research is also required into how universities and other HEIs respond to such complexities and the potential long-term consequences of digitalisation and online learning and working, and recognise how these may alter the nature of higher education.

References:

Ali, W. (2020): Online and Remote Learning in Higher Education Institutes: A Necessity in light of COVID-19 Pandemic, *Higher Education Studies*, Vol. 10, pp. 16–25. http://www.ccsenet.org/journal/index.php/hes/article/view/0/42784

Anasi, S.N., Ukangwa, C.C. and Fagbe, A. (2018): University libraries-bridging digital gaps and accelerating the achievement of sustainable development goals through information and communication technologies, *World Journal of Science, Technology and Sustainable Development*, Vol. 15, No. 1, pp.13-25. https://doi.org/10.1108/WJSTSD-11-2016-0059

Aristovnik, A., Keržič, D., Ravšelj, D., Tomaževič, N. and Umek, L. (2020): Impacts of the COVID-19 Pandemic on Life of Higher Education Students: A Global Perspective, *Sustainability*, Vol. 12, No. 20, 8438. https://doi.org/10.3390/su12208438

Arntz, M., Gregory, T. and Zierahn, U. (2016): *The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis*, OECD Social, Employment and Migration Working Papers. 189. Paris: OECD.

Bakhshi, H., Frey, C. and Osborne, M. (2015): *Creativity versus Robots: The Creative Economy and the Future of Employment*, London: NESTA.

Beetham, H., Newman, T. and Knight, S. (2018): *Digital Experience Insights Survey 2018: Findings from students in UK further and higher education.* VOCEDplus. Available at: https://www.voced.edu.au/content/ngv:82064.

Berriman, R. and Hawksworth, J. (2017): Will robots steal our jobs? The potential impact of automation on the UK and other major economies. *UK Economic Outlook*, pp.30-47.

Bughin, J., Hazan, E., Lund, S., Dahlstrom, P., Wiesinger, A. and Subramaniam, A. (2018): *Skill shift: Automation and the future of the workforce*: McKinsey Global Institute Discussion paper. Available at: https://www.mckinsey.com/featured-insights/future-of-work/skill-shift-automation-and-the-future-of-the-workforce.

Butcher, J. (2020): *Unheard: the voices of part-time adult learners.* HEPI Report 124, Higher Education Policy Institute, Oxford. Available at: https://www.hepi.ac.uk/wp-content/uploads/2020/02/Unheard-The-voices-of-part-time-adult-learners.pdf.

Centre for Economics and Business Research (CEBR) (2018): *The economic impact of digital inclusion in the UK*. VOCEDplus. Available at https://www.voced.edu.au/content/ngv:82295.

Commission of the European Community (ECC) (2020) Digital Education Action Plan 2021-27, Brussels: CEC, Available at: https://ec.europa.eu/education/sites/default/files/document-library-docs/deap-communication-sept2020_en.pdf.

Cormier, D. (2008). Rhizomatic education: Community as curriculum. *Innovate*, Vol. 4, No. 5, https://www.learntechlib.org/p/104239/article_104239.pdf.

Department for Education (2019): *Guidance: Essential digital skills framework*. Available at: https://www.gov.uk/government/publications/essential-digital-skills-framework/essential-digital-skills-framework.

Department for Digital, Culture, Media and Sport (DCMS) (2020): *Cyber security skills in the UK labour market* 2020. Available at: https://www.gov.uk/government/publications/cyber-security-skills-in-the-uk-labour-market-2020/cyber-security-skills-in-the-uk-labour-market-2020.

Digital Economy and Society Index (DESI) (2020): *2020 Country Report United Kingdom.* Available at: https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=66933.

Frey, C.B. and Osborne, M.A. (2017): The future of employment: How susceptible are jobs to computerisation? *Technological Forecasting and Social Change*, Vol. 114, No. 1, pp.254-280.

House of Commons (2018): *Digital Connectivity in Scotland*. Available at: https://publications.parliament.uk/pa/cm201719/cmselect/cmscotaf/654/654.pdf.

Hubble, S. and Bolton, P. (2019): *The Post-18 Education Review (the Augar Review) recommendations*. VOCEDplus. Available at: https://www.voced.edu.au/content/ngv%3A84257.

JISC (2018): *Evidence informed digital transformation*. Available at: https://digitalinsights.jisc.ac.uk/case-study-listing/university-stirling/.

JISC (2016): *JISC NUS Benchmarking tool – the student digital experience.* http://repository.jisc.ac.uk/6140/1/Jisc_NUS_student_experience_benchmarking_tool.pdf.

JISC (2015): *Developing digital literacies*. Available at: https://www.jisc.ac.uk/guides/developing-digital-literacies.

Manyika, J., Lund, S., Chui, M., Bughin, J., Woetzel, J., Batra, P., Ko, R. and Sanghvi, S. (2017): *Jobs lost, jobs gained: Workforce transitions in a time of automation*, McKinsey Global Institute, December. Available at: https://www.mckinsey.com/featured-insights/future-of-work/jobs-lost-jobs-gained-what-the-future-of-work-will-mean-for-jobs-skills-and-wages.

McMurray, S., Dutton, M. McQuaid, R.W., and Richard, A. (2016) 'Employer Demands from Business Graduates', *Education and Training*, Vol. 15, No. 1, pp.112-132.

McQuaid, R.W. and C. Lindsay (2005). The Concept of Employability, *Urban Studies*, Vol. 42, No. 2, pp.197-219.

Nania, J., Bonella, H., Restuccia, D. and Taska, B. (2019): *No Longer Optional: Employer Demand for Digital Skill*s. Burning Glass Technologies.

National Records of Scotland (NRS) (2020): *Population of Scotland*. Available at: https://www.nrscotland.gov.uk/statistics-and-data/statistics/scotlands-facts/population-of-scotland.

Office for National Statistics (ONS) (2019): *Which occupations are at highest risk of being automated*? Available at: https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandempl oyeetypes/articles/whichoccupationsareathighestriskofbeingautomated/2019-03-25.

The Open University (2019): *Bridging the Digital Divide.* Available at: http://www.open.ac.uk/business/bridging-the-digital-divide.

Prensky, M. (2001): Digital natives, digital immigrants part 1. *On the Horizon*, Vol. 9, No. 5, pp. 2-6.

PwC (2015a): *The 2018 Digital University. Staying relevant in the digital age.* Available at: https://www.pwc.co.uk/assets/pdf/the-2018-digital-university-staying-relevant-in-the-digital-age.pdf.

PwC (2015b): *The 2018 university – making the right choices, making it happen.* Available at: https://www.pwc.co.uk/government-public-sector/education/assets/2018-university-making-the-right-choices-making-it-happen.pdf.

Quality Assurance Agency for Higher Education (QAA) (2020): *Strategy*, QAA: Glasgow.

Scottish Council for Development and Industry (SCDI) (2019): *Building a World-Leading AI and Data Strategy for an Inclusive Scotland.* Available at: https://www.scdi.org.uk/wp-content/uploads/SCDI_AI-Doc_-Digital.pdf.

Scottish Council for Development and Industry (SCDI) (2016): *Digital solutions to the productivity puzzle What could digital technology deliver for productivity growth*? Available at: https://www.scdi.org.uk/wp-content/uploads/2018/03/SCDI-Digital-Solutions-to-Productivity-Puzzle-Report-Jan2016.pdf.

Scottish Government (2018): *Safe, Secure and Prosperous: A Cyber Resilience Strategy for Scotland.* Learning & Skills Action Plan for Cyber Resilience 2018-20. Available at: https://www.gov.scot/publications/learning-skills-action-plan-cyber-resilience-2018-20/.

Scottish Government (2017): *Realising Scotland's full potential in a digital world: a digital strategy for Scotland.* Available at: https://www.gov.scot/publications/realising-scotlands-full-potential-digital-world-digital-strategy-scotland/pages/5/.

Scottish Funding Council (SFC) (2020): *Universities and Higher Education Institutions we fund.* Available at: http://www.sfc.ac.uk/funding/universities-we-fund.aspx.

Servoz, M. (2019): The future of work? Work of the future! On how artificial intelligence, robotics and automation are transforming jobs and the economy in Europe. *AI Report*, Vol. 44, 160pp. https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=58918.

Siemens, G. (2005): Connectivism: a learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning*, Vol. 2, pp.1-8, http://www.itdl.org/Journal/Jan_05/article01.htm.

Skills Commission (2014): *Still in Tune? The skills system and the changing structures of work.* Available at: https://www.policyconnect.org.uk/sites/site_pc/files/report/602/fieldreportdownload/skillsc ommission-stillintune.pdf.

Sun, J. (2016): Multi-dimensional alignment between online instruction and course technology: A learner-centered perspective, *Computers & Education*, Vol. 101, pp. 102-114. https://doi.org/10.1016/j.compedu.2016.06.003.

Thomas, R. and Gunson, R. (2017): *Scotland Skills 2030: The future of work and the skills system in Scotland*, IPPR Scotland. Available at: http://www.ippr.org/publications/scotland-skills-2030.

Tazzyman, S., Bowes, L., Choudhury, A., Moreton, R., Stutz, A., Nathwani, T. and Clarke, M. (2019): *Understanding effective part-time provision for undergraduates from under-represented and disadvantaged backgrounds.* A report for the Office for Students by CFE Research and HESA. Available at: https://dera.ioe.ac.uk/32968/1/understanding-effective-part-time-provision-for-undergraduates-from-under-represented-and-disadvantaged-backgrounds.pdf.

UK Commission for Employment and Skills (UKCES) (2014): Forging Futures – Building Higher Level Skills Through University and Employer Collaboration, UKCES: London. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/356749/FF_FinalReport_Digital_190914.pdf.

UK Research Office (UKRO) (2020): *Public Consultation on new Digital Education Action Plan.* Available at: https://www.age-platform.eu/sites/default/files/AGE_response_consultation_digital_education_action_plan_2020.pdf.

Universities UK (UUK) (2018): The Economic Case for Flexible Learning: Main Findings and Policy Recommendations. 6pp. Available at: https://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2018/the-economic-case-for-flexible-learning.pdf.

Vance, A. and Tucker, J.W. (2016): School surveillance: The consequences for equity and privacy, *Education Leaders Report*, Vol. 4, No. 4. Available at: https://www.nasbe.org/school-surveillance-the-consequences-for-equity-and-privacy/.

Warhurst, C. and Hunt, W. (2019): *The Digitalisation of Future Work and Employment. Possible impact and policy responses*, JRC117404, European Commission: Seville. Available at: https://www.econstor.eu/handle/10419/205265.

Webb, A. (2020): *State of the Art Review of Higher Education Institutions/Universities Responses to Digitalization - Scotland Country Report*, Report for the ERASMUS project. Available at: https://escalate.projects.uvt.ro/.

Webb, A. and McQuaid, R. (2018): Utilising Skills Demand Opportunities to Overcome the Low Professional Status and Attractiveness of a Sector: The Early Learning and Childcare Sector in Scotland. In: Larsen, C., Rand, S., Schmid, A. and A. Dean (eds): *Developing Skills in a Changing World of Work.* Rainer Hampp Verlag: Munich, pp. 241-258.

Webb, A. and McQuaid, R. (2020): Recruitment and workforce development challenges in low-status sectors with high labour demand – childcare work, *CIPD Applied Research Conference 2020, The shifting landscape of work and working lives.* Available at: https://www.cipd.co.uk/learn/events-networks/applied-research-conference/2020-papers.

Webb, A., McQuaid, R. and Rand, S. (2020): Implications of Covid-19 for Employment in the Informal Economy, *International Journal of Sociology and Social Policy*, Vol. 40 No. 9/10, pp. 1005-1019. https://doi.org/10.1108/IJSSP-08-2020-0371

Weller, S. (2016): *Academic Practice: Developing as a Professional in Higher Education.* Sage: London.

Williamson, B. (2017): *Big Data in Education: The digital future of learning, policy and practice.* Sage: London.

Williamson, B. (2020): *The Automatic University - A review of datafication and automation in higher education.* Report for University and College Union, London. Available at: https://www.ucu.org.uk/media/10947/The-automatic-university/pdf/ucus_the-automatic-university_jun20.pdf.

Appendix 1:

Topic Guide. Given the potential and likely impacts of digitisation and artificial intelligence on jobs and work:

1. Do you think enough is happening nationally to improve digital skills in society?
    (This question explores the participant's views and knowledge beyond their own institution)
2. Are you aware of particular national policies that are driving university activity in this area?
    (Explores their in-depth views and knowledge on policies they consider particularly relevant)
3. Do you think University senior leaders are well-informed about these changes?
    (Considers the institutional context)
4. How can HEIs better identify future labour market needs, and make sure that all students gain the digital skills they need in their curricula e.g. humanities students?
    (Explores views on future labour market needs)
5. Do you know of any interesting examples of how universities are providing students with the digital skills they need?
    (Identifies cases of good or interesting practice relate to a focus of the research)
6. Are you aware of any particular good practice in other areas?
    (Identifies and explores good practice)
7. Are Degree Apprenticeships part of a possible solution?
    (Considers one particular policy relevant to the topic)
8. Where are the gaps? i.e. who is slipping through the current provision of digital skills both in HEIs and more broadly in society?
    (Explores potential digital divide issues)
9. Covid-19 has catalysed the pace of change of digitalisation across most sectors. Is this driving the rate of take-up and expansion of delivery of digital skills?
    (Exploring the effects of Covid-19 on digitalisation)
10. Have you anything else to add and would you like to be kept informed of this piece of research?
    (A 'catch up' question on issues important to the participant that were not covered)

Biography:

Dr Aleksandra Webb is a lecturer in the School of Management at the University of Stirling, and a Fellow of the Higher Education Academy. She has carried out research and evaluation for national and supra-national bodies, such as the Scottish Government, the Scottish Trades Union Congress, Creative Scotland and the European Commission. She has been involved in a number of international research projects and written reports on work, skills, career and employment related issues, cultural leadership, and most recently, on digitalisation in Higher Education and online learning.

Ronald McQuaid is Professor of Work and Employment at the University of Stirling. He has a long-time involvement in teaching and related issues, including online teaching. He has carried out applied research for many regional, national and supra-national bodies, such as the European Commission, UK, Scottish and Northern Ireland Governments, UK Commission for Employment and Skills, and various agencies and employers in the fields of employment, unemployment, skills, partnerships and economic development and associated evaluations and strategy. He has written over 100 academic publications, as well as many reports on employability, employment, sustainability and related issues. He was the Director of the Employment Research Institute at Edinburgh Napier University for over 12 years.

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