Towards Post-Coronial Futures: COVID-19, Rapid Digital Transformation and University Responsiveness

Dramatic COVID-19-inspired changes – upended economies, exacerbated job losses, inequalities, major social deprivation and accelerated digital transformation – occurring in the structure and scope of higher education institutions have put a premium on responsiveness to change. As open systems, universities are affected by contingencies in their environment, including complex demands, which they have to respond to in order to enhance their adaptability and societal relevance. This paper examines the dramatic changes occurring in the external environment of universities in the context of COVID-19, especially accelerated digital transformation, and maps various response trajectories and reconfigurations by universities as they reposition for the yet unknown post-pandemic era.

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Introduction

COVID-19, which was declared a global pandemic in March 2020 by the World Health Organization (WHO), has caused major societal disruptions. It has claimed many lives (more than 6 million deaths by the end of March 2022), upended economies, exacerbated job losses, inequalities, and caused major social deprivation (Wangenge-Ouma & Kupe 2021). Jayaram, Leke, Ooko-Ombaka & Sun (2020) predict that between 9 and 18 million jobs in Africa could be lost or made redundant due to COVID-19 and that 30 to 35 million jobs on the continent are at risk of a reduction in salary.

Before the pandemic, universities across the world were already grappling with challenges such as funding and institutional sustainability; widening participation for students from disadvantaged socio-economic backgrounds; providing innovative and flexible learning experiences; producing 'future-proof' graduates; advancing the public good; deepening connections with communities, industry, and civil society; producing research that addresses the world's pressing problems; and embracing rapid technological change. COVID-19 has heightened some of these challenges, exposed the lack of viability of some institutional systems and processes, and accelerated various incipient trends which were previously regarded as future challenges (Wangenge-Ouma & Kupe 2022).

Ongoing digital disruption, often referred to as the Fourth Industrial Revolution (4IR), is a key feature of the complexity and turbulence that circumscribe higher education. Prior to the outbreak of COVID-19, digital disruption was generally spoken about in futuristic terms. Whilst this remains largely the case, given the emerging nature of various digital technologies, the response to COVID-19 has speeded up these so-called futuristic developments. Similarly, the disruptions caused and heightened by the contagion of the pandemic have brought into sharp focus the role of technology in the advancement of society. The various digital advancements, their promises and perils, provide an important backdrop for imagining the ongoing transformation of society, the future of work and professions, and the evolving role of universities as knowledge institutions. As open systems, universities are affected by contingencies in their environment, which they have to respond to in order to enhance their adaptability. New demands, especially complex demands, require some form of reconfiguration in order to be more responsive and adaptable (Cohen 1999).

The COVID-19 pandemic has arguably produced a 'new' world whose contours we still do not comprehend fully, but to which both universities and societies at large have to adapt. It has aggravated the challenges that universities are called upon to respond to, for example, poverty, inequality, and overall societal well-being, and has accelerated the adoption of digital technologies. The health crisis has

thus produced a new context which requires that universities adapt and co-evolve accordingly. This is the focus of this paper. It is located in the broader context of the role of universities in the advancement of society given the interwoven nature of the broader challenges confronting society and the various digital transformations which have been accelerated by COVID-19. The next section provides an overview of the nexus between higher education and the advancement of society, followed by a section on COVID-19 and digital transformation. Then, the paper examines various adaptations by universities within the context of the ongoing digital disruptions and impact on society. The last section is the conclusion.

Higher Education and Societal Relevance

This section macro-contextualises the analysis. It highlights the societal relevance of universities, as a lead-in to understanding responsiveness by universities to external pressures characterised, inter alia, by the accelerating digital transformation in the context of COVID-19. It is impossible to discuss the societal relevance of universities without referring to ongoing technological advancements. The link between universities and the 4IR is intricate. Whilst universities, through their direct and indirect contributions to scientific and technological innovations, contribute to the burgeoning 4IR, the 4IR is simultaneously creating overarching conditions that have important implications for universities themselves and society at large. These include automation and its implications for jobs and the labour market, the demand for new skills and its implications for re-skilling and up-skilling, and the emergence of new industries.

Higher education contributes to the advancement of society mainly through human capital development, knowledge production, transfer and application. These roles have evolved over the years and are influenced by overarching societal mutations. Developing skilled labour (human capital) for both economic and social benefits is a role that universities have played since their inception, and studies have established a link between a country's higher education participation rates and levels of development (Muller, Cloete & Van Schalkwyk 2017; Pillay 2010). Factor-driven economies, for example, have lower higher education participation rates compared to efficiency-driven and innovation-driven economies. Factor-driven economies compete mainly through their unskilled labour and natural resources while innovation-driven economies are underpinned by sophistication and innovation factors. In other words, knowledge and technological innovation are their most important factors of production (WEF 2017a). With higher education participation rates averaging 5 per cent, most African countries are classified as factor-driven economies.

Knowledge is a key driver of economic growth. Several models and theories, for example, the endogenous growth model (Romer 1990; Acs et al. 2008), the triple/ quadruple-helix model (Etzkowitz & Leydesdorff 1995, 2000; Leydesdorff 2012), the entrepreneurial university model (Bercovitz & Feldman 2006), have illustrated the important contribution of knowledge to economic growth. By producing the knowledge required for technological innovation, universities have become key components of national and regional innovation systems. In the context of technological revolution, universities are expected to be central actors of scientific and technological change mainly by producing new knowledge and diffusing it (knowledge transfer). Universities, especially research universities, play an important role in embedding their countries in the global knowledge economy.

Yusuf (2007) details, in historical context, the important contribution of university research in several parts of the world. He gives the example of the role of German universities in the advancement of the chemical and pharmaceutical industries beginning in the late nineteenth century; the role played by the Massachusetts Institute of Technology (MIT) in the growth of industry in Massachusetts; and the contribution to agricultural development by land-grant universities in America. In his study on the link between higher education and economic development, Pillay (2010) shows how universities in Finland, South Korea and North Carolina in America play a crucial role in their regions' innovation systems. Overall, as Yusuf (2007) argues, the most economically beneficial technological innovations can be traced directly or indirectly to universities – through training highly skilled individuals, through knowledge spillovers, or through actual research conducted.

Generally speaking, in Africa, the university is an underutilised agent for research-driven economic competitiveness. There has, however, been a significant improvement in research productivity. An analysis by Mouton et al. (2018) shows that the number of scientific papers produced by African universities between 2005 and 2015 more than tripled: from 15,285 to 49,015. This rate of increase exceeded the world average over the same period, with the result that Africa's

share of world publication output nearly doubled from 1.5 per cent in 2005 to 2.8 per cent in 2015 (Mouton *et al.* 2018).

The emerging digital landscape has implications for universities and their role in society. A 2017 report by the Mckinsey Global Institute (2017), which measured the likelihood of automation in 54 countries and covered 78 per cent of the global labour market, showed that 50 per cent of current jobs in agriculture, forestry, fishing, and hunting, representing 328.9 million employees, are potentially automatable. For manufacturing, 64 per cent of current jobs are automatable, representing 237.4 million current employees. For retail trade, 54 per cent of current jobs, representing some 187.4 million current employees are automatable. A study of African countries by the World Economic Forum (WEF 2017b) estimates that 41 per cent of work activities in South Africa are susceptible to automation, compared with 44 per cent in Ethiopia, 46 per cent in Nigeria, and 52 per cent in Kenya.

This section has highlighted the broad pathways through which universities can demonstrate their societal relevance. The COVID-19 pandemic has caused and exacerbated significant social, economic, political, and technological disruptions, which have resulted in turbulence, uncertainty, and complexity which universities have to adapt and respond to. In other words, universities have to demonstrate their responsiveness and relevance in the context of the emerging milieu. The next section examines a key feature of this emerging milieu – rapid digital transformation, especially as it has been accelerated by COVID-19 and related trends – which call for adaptation and co-evolution by universities.

COVID-19 and Digital Transformation: A New Landscape

The world was in the throes of a technological revolution long before the outbreak of COVID-19. This revolution is regarded as the successor to three previous distinct phases of technological revolution. The first technological revolution (in the late eighteenth century) was characterised mainly by the harnessing of steam power for mechanical production; the second technological revolution (in the late nineteenth century) was characterised by new manufacturing technologies based on electricity, and the third industrial revolution (beginning in the 1970s) was powered by computerisation and web-based interconnectivity. All these technological revolutions had significant implications for higher education. The 4IR, the most recent technological revolution, is described by Schwab (2016:1) as 'characterised by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres'. The 4IR is powered by a wide range of technological breakthroughs which include artificial intelligence (AI), robotics, the internet of things (IoT), autonomous vehicles, 3D-printing, nanotechnology, the development of synthetic organisms, cyber-physical technologies, and biotechnology. Equally important are advances in fields such as genetic engineering, regenerative medicine and blockchain technology. In short, we are witnessing unprecedented advances in science and technology.

The outbreak of COVID-19 and its disruption of businesses, supply chains, manufacturing, education, travel, workplaces, amongst others, has spurred on technological responses aimed at managing the disruption, including constraints to human interaction. These responses, characterised mainly by the use of digital technologies, communication platforms, and information systems and technologies, have resulted in the rapid adoption and maturation of new technologies across all sectors. Karr, Loh and Andres (2020) posit that the pandemic hastened the uptake of 4IR technologies that could automate certain jobs. The McKinsey Global Institute (2021) identifies the following three COVID-19 accelerated trends that could persist after the pandemic: hybrid remote work, e-commerce, and automation and AI. These trends have implications for the future of work, inter alia, the loss of jobs to automation, the need to switch occupations and job growth in in-demand skills (McKinsey Global Institute 2021; WEF 2020).

The pandemic's impact has catalysed the proliferation of digital technologies in the health sector, including expanded use of telehealth and virtual care, rapid advancement of artificial intelligence with regard to detection and diagnosis, monitoring the effectiveness of treatment, contact tracing, modelling of virus spread and mortality projections, increased application of 3D-printing in the production of personal protective equipment (PPE) and other medical equipment, and adoption of robots in health care (Clipper 2020; Attaran 2020; Ting, Carin, Dzau & Wong 2020). Similarly, business processes and practices have experienced major transformations, such as the use of digital communication platforms, transitioning to remote working, and adoption of productivity-enhancing technologies. A survey of businesses in the United Kingdom by Riom and Valero (2020) found that 60 per cent of firms adopted new digi-

tal technologies and around a third invested in new digital capabilities largely in response to COVID-19. The study also found that 90 per cent of the surveyed firms intended to continue with the digital innovations after the health crisis has subsided. Similar findings are reported in a study by McKinsey Global Institute (2020), which found that companies across the world had significantly accelerated the digitisation of their customer and supply chain interactions, internal operations and the share of digital or digitally enabled products in their portfolios.

Estimates by the UNESCO Global Education Coalition (2020) indicate that, globally, more than 1.5 billion learners, across all levels of learning, were affected by the closure of educational institutions. The closure of universities, and the consequent inability to continue with face-to-face teaching and learning, led to the adoption of large-scale online teaching and learning, which often required the expansion of existing infrastructure and new infrastructure as well. COVID-19 has made online learning a necessity and, as Dhawan (2020) postulates, the crisis will expose previously reluctant institutions to the positive aspects of online education, inter alia, use of modern technology. Perhaps more importantly, is the opportunity presented by the health crisis to scale up both pedagogical innovations and modes of delivery, including peer learning, the flipped classroom, the use of simulations and games, and various blended learning models (Salmi 2020; Wangenge-Ouma & Kupe 2020).

As Kamal & Choudrie (2020) point out, prior to COVID-19, digitalisation was being encouraged, but now there seems to be rapid adoption of digital technologies in every sector – manufacturing, services, aviation, operations and supply chains, retail, leisure and tourism, education, health care, transportation, and social enterprises – and in society in general. Whilst it might be argued that the COVID-19-inspired acceleration of digital transformation may slow down once the pandemic has been curbed, the evidence suggests that the momentum will persist and these changes will be long-lasting as digital transformation increasingly pervades every aspect of the economy and society (WEF 2020; McKinsey Global Institute 2020; Riom & Valero 2020). The continued adoption of digital transformation post-COVID-19 will also be driven by changing consumer preferences for digital technologies, increasing familiarity of digital technologies, and increasing business confidence in digital technologies (Coombs 2020).

Towards Post-Coronial Futures

The dramatic changes occurring in the structure and scope of organisations has put a premium on responsiveness to change (Cohen 1999; Grobman 2005; Pinheiro et al. 2015). New demands, especially complex demands, require some form of reconfiguration in order to be more responsive and adaptable (Cohen 1999). The COVID-19 crisis, coupled with its complex consequences, such as accelerated digital transformation, can be described as a game-changer for university responsiveness given the need for robust strategies to deal with the emerging landscape and reposition for the yet unknown post-pandemic era. Universities have historically enacted reforms aimed at, amongst others, responding better to external pressures, and enhancing their relevance, quality, competitiveness and vitality (Pinheiro *et al*. 2015). This section highlights key adaptations and reconfigurations by universities to the emerging social, economic and technological milieu.

Automation and Jobs of the Future

As technology eliminates the need for routine labour, it is expected to open up new opportunities, especially in industries that leverage creativity and innovation (Araya & Lamb 2017). According to Araya & Lamb (2017), AI-driven society will entail, amongst others, teaching skills that will augment and complement AI to meet the impact of machine automation. Given the limitations of machine learning, especially with regard to managing challenges associated with judgement, decision-making, and interpretation, the humanities have an important role to play in the 4IR alongside the STEM (science, technology, engineering and mathematics) disciplines. Thus, fusing technology with the humanities is critical for navigating the 4IR. This is perhaps better manifested by the STEAM (science, technology, arts and mathematics) movement, which seeks to encourage students to combine STEM and art subjects at secondary school and university, and the growing demand for the arts and humanities in STEM fields (Burnard, Colucci-Gray & Sinha 2021). Araya & Lamb (2017) predict that new disruptive technologies like 3D-printing and robotics will provide significant opportunities for artists and designers who are innovative and have an understanding of human experience.

The displacement of especially low-skilled jobs has profound implications, particularly in Africa where unemployment levels remain high and university participation rates are low. Research shows

that employment possibilities are strongly influenced by education. Thus, the challenge for Africa is to significantly increase participation rates. Probably the greater challenge for African universities is to 'robot-proof' students both in terms of the programmes they enrol in and the attributes that will put them in good stead to thrive in a 4IR-shaped post-COVID-19 society. It is in this context that Aoun (2017:xvii) makes the point that 'to ensure that graduates are "robot-proof" in the workplace, institutions of higher learning will have to rebalance their curriculum'.

The phenomenon of graduate unemployment, which is pronounced in many African countries (British Council 2016), suggests that the immediate challenge for African universities is simply to produce employable graduates, irrespective of automation. As enrolments have grown, so is the widening skills mismatch. A 2011 International Labour Organization (ILO) report cited in Oanda and Sall (2016) indicates that Egypt's private sector firms could not fill 600,000 vacancies yet the country had 1.5 million unemployed graduates. Oanda and Sall (2016) also cite a study by the Inter-University Council of East Africa (IUCEA) (2014) which shows that about half of the graduates from universities in East Africa lack employability skills, technical mastery and basic work-related capabilities. It should, however, be emphasised that the problem of graduate unemployment in Africa cannot be attributed solely to a skills mismatch, but a convergence of factors, including pervasive informality, structural inequalities that shape access to stable employment, and the structure of African economies which do not provide expanded opportunities for highly skilled work (Fox *et al.* 2020).

Curriculum Transformation and Graduate Attributes

The envisaged pervasiveness of automation puts a premium on the need to educate students to fill needs in society that even the most sophisticated artificial intelligence agent cannot fill. While AI agents work like human beings, they do not, as yet, have the ability to invent, to create and to discover (Aoun 2017). The realisation of these important attributes is linked to pedagogical approaches that engender active learning. In other words, rote learning is an outmoded form of education because machines are more adept at memorising information. In this regard, blended learning, digital pedagogies, project-based pedagogies, and other pedagogies that stimulate creativity, working in teams (collaborating with people and intelligent machines), and social perceptiveness, among others, are critical.

Aoun (2017) identifies the following three literacies (graduate attributes) as vital for navigating the 4IR: data literacy, technological literacy, and human literacy. Students require data literacy to make sense of big data and information flowing from their devices; technological literacy to know how their machines work and navigate disruptive technologies, and human literacy – the humanities – to function as human beings. The last one – human literacy – is particularly important. With the automation of work, AI experts have observed that 'it is that which makes us human, our emotional intelligence and creativity, that will be in demand when this transition to automation is complete' (Gleason 2018:147).

The humanities and social sciences have an important role to play in realising the emotional intelligence and creativity required to thrive in the workplace. They are also crucial with regard to thinking, writing and communication skills. The tendency globally, however, is to de-emphasise the humanities and social sciences, ignoring not only their contribution to societal well-being, but also the increasingly fluid boundaries between natural sciences and the humanities as research increasingly becomes inter- and multidisciplinary. In Africa, where higher education enrolments are concentrated in the humanities, studies on employability and graduate attributes (see for example, IUCEA (2014) cited in Oanda & Sall (2016); British Council 2016) suggest that the humanities have not achieved their promise in terms of students acquiring the skills associated with the humanities, for example, communication skills, interpersonal skills and team work.

The rapid and far-reaching changes taking place in science and technology, especially in fields such as genomics, biotechnology, data science, AI, robotics and nanomaterials, have created the impetus for continually re-examining and updating the science, engineering and technology curriculum to ensure these remain aligned with rapid scientific and technological changes. The 4IR also has implications for curriculum change and innovation in the humanities, firstly, to grasp the evolution and manifestations of the phenomenon, but perhaps more importantly, to effectively examine its impact in political, economic, social, and environmental terms. It has been argued that the technologies and scientific advancements associated with the 4IR have the potential to intensify complex social challenges, for example, disruption of labour markets (technological unemployment), widening inequalities,

social dislocations, multiple ethical conundrums, and challenges to the fundamental ontological assumptions about human existence. These developments would have to be addressed in a new and decidedly inter-disciplinary curriculum, especially in the humanities and social sciences.

Life-long Learning, Re-skilling and Upskilling

The predicted redundancy of skills as a result of AI and the rapid proliferation of new technologies and industries make lifelong learning, re-skilling and upskilling essential elements for success in the era of digital transformation. Even before the outbreak of COVID-19, the WEF (2018) estimated that by 2022 over 50 per cent of all employees would require significant reskilling and upskilling. The quickly moving skills landscape, therefore, requires that learning continues beyond the initial qualification in order to adapt to these rapid changes. 'As machines continue to surpass their old boundaries, human beings must also continue to hone their mental capacities, skills, and technological knowledge' (Aoun 2017: xx). In this context, universities have to produce what Castells (2001) refers to as 'self-programmable' workers, that is, skilled individuals with the 'ability to change and adapt to many different occupations and new technologies all through one's professional life' (Cloete & Maassen 2017:98). This reality necessitates a shift in the delivery of education, mainly the provision of flexible life-long learning opportunities to enable people to continuously improve their knowledge, acquire new skills, enhance their working possibilities and improve their quality of life. The outbreak of COVID-19, and the need to overcome constraints to physical human interaction, has put a premium on a number of skills, amongst them, remote diagnostics, remote and online teaching, working with – as 'co-workers' - humanoid robots in areas such as care giving and healthcare; digital skills, and social skills required for non-face-to-face working. The intensive use of digital technologies during the COVID-19 health crisis and the continued utilisation of these technologies after the pandemic, coupled with unstable labour markets, are key drivers for re-skilling and upskilling with regard to digital competences. WEF (2018) estimates that by 2022, a significant number of companies would have expanded their adoption of technologies such as IoT, app-and web-enabled markets, cloud computing, machine learning, and augmented and virtual reality, and that 54 per cent of all employees will require significant re-skilling and upskilling. What this growing wave of new technologies means is that the skills required to perform most jobs is rapidly shifting, and universities and other tertiary institutions must respond equally rapidly.

Other than driving demand for new skills, technological advancements have also enabled multiple possibilities for rapid and flexible re-skilling and upskilling through, for example, online courses, flipped classroom and immersive learning. Many African universities offer various opportunities for life-long learning, through evening and weekend programmes (for example in Kenya, Uganda, Ethiopia, and Mozambique), Massive Open Online Courses (MOOCs) (for example, the University of Cape Town in South Africa and the National Open University of Nigeria), e-learning and short courses/capacity building programmes (mainly provided by business schools, campus companies and, increasingly, private companies), and through web-based learning resources such as Lynda.com (for example, the University of Pretoria in South Africa). The development of MOOCs and web-based learning in Africa can be described as nascent. This is mainly due to lack of access to the requisite technological infrastructure and facilities, and inadequate Internet connectivity.

Research

As already mentioned, whilst factor-driven economies compete on the basis of unskilled labour and natural resources, innovation-driven economies, in which rapid digital transformation is an important feature, are underpinned by knowledge and technological innovation. As is well known, knowledge has become a critical factor of production and a key driver of sustainable competitive advantage, and is linked with the idea of the knowledge economy (Pinheiro *et al.* 2015; Heng *et al.* 2012; Pillay 2010; Rooney *et al.* 2008), which is generally understood as an economy 'that is driven by the production, distribution and use of knowledge and information' (Heng *et al.* 2012:531). Knowledge is not only important for driving the economy but also for addressing societal challenges, some of which have been described as 'wicked' challenges, for example, climate change, poverty and the search for sustainable development.

The COVID-19 pandemic can be described as a 'wicked' problem given the turbulence, uncertainty, and complexity that it has caused. The need to combat the spread of the disease, challenges in treating patients, the need to continue

vaccine development to deal with new variants, as well as the many challenges that have been exacerbated by the health crisis, such as widening inequalities and health and well-being of people, have not only reified the importance of research, as well as the need to build both basic and applied research capacity in critical research fields. The health crisis has several implications for the future of research. One of them is the pursuit of research that matters in transforming lives and communities and addresses complex societal challenges. Such challenges include health, the environment, climate change, food security, poverty alleviation, and all the challenges related to the United Nations' Sustainable Development Goals.

The inherent complexity of societal challenges such as COVID-19 has given great impetus to transdisciplinary research (Moradian et al. 2020; El-Hani & Machado 2020; Wangenge-Ouma and Kupe 2022). As reported by Moradian *et a*l. (2020), multiple disciplinary approaches are required to control the pandemic, manage its consequences and prevent the outbreak of similar pandemics in future. They give the example of mathematics and computer science as crucial for predicting, anticipating, and controlling present and future epidemics; physics, engineering and computer sciences in designing and designing PPE structure and function to inhibit the spread of the disease; biological sciences, especially molecular and computational biology, for providing a deeper understanding of complex pathogen-host interactions; and social and economic sciences for understanding the immense socio-economic implications of the pandemic.

The call for transdisciplinary research is not new. It has, however, been heightened by pressure to solve complex societal challenges as well as the participation of multiple stakeholder collaboration in research (including social actors) and team science (Klein 2015; OECD 2020). As O'Rourke, Crowley & Gonnerman (2016: 62) proclaim, 'meeting grand challenges requires responses that constructively combine multiple forms of expertise… it requires cross-disciplinary expertise'. The narrow scope of disciplines is simply inadequate to address complex societal challenges, especially those such as COVID-19 that are characterised by uncertainty and unpredictability. These challenges encompass multiple dimensions that disciplines handle separately (Klein 2015; OECD 2020). In other words, complex challenges have to be met with complexity in response (O'Rourke, Crowley & Gonnerman 2016). Some of the most impactful transdisciplinary research projects include the Human Genome Project, the Large Hadron Collider and the Square Kilometre Array.

The drive towards transdisciplinarity has similarly been intensified by the 4IR, whose main driver is the convergence of the physical, biological and digital sciences, leading, inter alia, to the emergence of new study fields such as bioengineering, green chemistry, neurotechnology and cognitive informatics. Transdisciplinarity has similarly been accelerated by both the development of 4IR technologies such as AI, big data analytics, deep learning systems, blockchain technology, robotics and IoT, and their deployment to address societal challenges such as sustainable food systems, climate change, epidemics and pandemics, widening inequalities, security, rapid urbanisation, and transportation.

Overall, COVID-19 has underscored the crucial need for multi-stakeholder scientific collaboration and partnerships, locally and internationally: international collaboration, trans-disciplinary collaboration, inter-university collaboration, and collaboration between universities, government, industry, business, and communities. Collaboration is not antithetical to competitiveness, institutional autonomy, or differentiation (Wangenge-Ouma & Kupe 2021); it is essential for post-pandemic reconstruction, research excellence, and an effective response to the various disruptive trends that have an impact on the ability of higher education and communities to navigate the complex, ever-evolving and, at times, contradictory relationship between higher education and its key publics.

Conclusion

COVID-19 has exacerbated various trends which require that universities adapt their roles and functions in response to the emerging landscape. This paper has especially focused on rapid digital transformation which has been accelerated by the pandemic. The paper argues that adapting to and optimising this rapid digital transformation is central to universities demonstrating their societal relevance. Universities have to adapt their roles and functions to accommodate the emerging external demands and expectations. As highlighted in the paper, the transformations associated with the 4IR, even though many of them remain unknown, require a revitalisation of higher education with regard to pedagogical approaches that engender creativity, innovation and team work, reform of curricula to align with the changes, and engendering of transdisciplinary research, amongst other reforms.

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