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The Education Leadership Challenges for Universities in a Postdigital Age

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Abstract

The executive leadership of universities internationally faces significant uncertainty in how to respond to ongoing technological innovation in a postdigital age. The current rapid progress in generative artificial intelligence (GAI) is exacerbating their plight. This study uses emergent research on GAI in learning and teaching to problematise the challenges of university education leadership in the face of such disturbances to core academic work. Considering the benefits and risks associated with the design of GAI, its inclusion in learning and teaching, and how it is reconfiguring the design of degree programmes and the strategies of local leaders providing support services through university organisational structures, this paper offers a principled ecosystemic approach to leadership that considers key elements for effective strategy implementation. The interrelatedness of strategy, governance, policy, management, and investment are discussed and a way forward for effective education leadership in a context of uncertainty is offered.

Keywords Postdigital · Education leadership · Innovation · Ecological thinking · Generative artificial intelligence · GAI

Introduction

What are universities' postdigital educational challenges, where digital entanglement is recognised as part of everyday academic enterprise? One challenge currently creating much interest and angst in equal measures is generative artificial intelligence (GAI), partly because the technology has reached the stage where it can be cost-effectively scaled and made available throughout society and therefore has the potential to cause widespread disruption with currently limited understanding about what this disruption will entail. At this stage of the innovation hype cycle (McPherson and Bacow 2015), too often the debate can disintegrate into a false dichotomy of the technology being the

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solution to every problem or being an existential threat to our very being. The reality is more nuanced, incremental, and interesting than this (Bell et al. 2023), as a creative use of the technology in universities can have a range of outcomes which need to be evaluated in context. In this paper, GAI is used as the provocation for considering leadership challenges, but as the examples discuss, the principles that arise could be applied to any emerging technology at scale that has sufficient potential to warrant being embedded in university organisational design.

In our postdigital context, universities are facing a new stage of the Fourth Industrial Revolution (Velarde 2020), because GAI involves new levels of machine creativity and autonomy that need human oversight if socially responsible education and leadership are to be achieved. There are significant challenges for informed approaches to education and learning in an age where, for example, knowledge on the most obscure topics can be rapidly pulled together with the help of GAI, but where those responses require validation for truth, academic rigour, and societal benefit. Universities need a position on this, one that sustainably addresses the potential benefits and risks for their missions. As GAI is becoming ubiquitous, governments, industries, and families are looking to universities to provide leadership for both the discovery and dissemination of an applied knowledge of GAI for its effective use through partnerships and teaching for the betterment of society. What should universities be doing to ensure meaningful learning outcomes for university students in this context? What are the priorities for a university education in a postdigital age?

The Meaning of 'Postdigital' for University Education Leadership

In this paper, 'postdigital' is used to mean a phase of the development of society where engagement with knowledge ubiquitously involves humans and material objects like technologies, where there is a blurring of boundaries between the contributions of human and digital technologies as sources of knowledge, and where digital practice is normalised as a part of everyday academic life (Ellis and Goodyear 2019; Jandrić et al. 2018). It is further argued that technology is not an afterthought or bolted-on addition to existing strategies and accompanying university governance, policy, management processes, systems, and investment (Ellis and Goodyear 2019).

Technology as a constituent part of university education strategy has been around for decades, particularly since the development of personal technologies in the 1990s (Hooper and Rieber 1995). After some early unsuccessful attempts at fully online universities (Christie and Garrote 2007; Vignare 2009), these were largely abandoned for more integrated academic business models. Since the early 2000s, technology has featured as an innovative aspect of most universities' education strategies in the form of online and blended learning (Moskal et al. 2013), learning objects (Cohen and Nycz 2006), open academic content (Wiley et al. 2014), open-source educational software (Wiley 2006), and MOOCs (Yu et al. 2022). With each disturbance to the education ecology of universities, technology-enabled learning and teaching have become incrementally embedded and integrated in the way students learn and teachers teach.

The current epoch of GAI, defined in this paper as large language models (LLMS, dealing with vast amounts of text) and multimodal foundation models (MFMs, dealing with multimodal sources of information), is argued to be relatively more of a significant shift in creativity and autonomy of technologies than an incremental advancement. By way of analogy, the invention of the lightbulb led to the electricity grid, the invention of the steam engine led to railways, and the invention of the computer mainframe led to way to the Internet (Bell 2021; Bell and Euchner 2022) can be regarded as similar significant shifts in technology that led to widespread change. Some are hoping to achieve the same improvements in learning for hundreds of students as one-on-one teaching can achieve (Bloom 1984) by using GAI personal tutoring assistants like Khanmigo (Kshetri 2023). It is too soon to clarify exactly where GAI will lead a university's approach to education (Sabzalieva and Valentini 2023), but its potential seems to be of a similar magnitude to the impact of the other inventions if you consider the evidence and opinions of existing experts (Bell et al. 2023; Walsh et al. 2019).

What is not too soon to articulate in the face of the promise of GAI at scale are the benefits that might be missed, and the risks to the learning and teaching experience, if we do not imagine a university organisational design concept which leverages the opportunities and minimises the harm of that technology. To do so, we need renewed ontological concepts, methodologies, and epistemologies (Bell and Euchner 2022; Ellis and Goodyear 2019) suitable for university planning and communities that are appropriately informed by GAI. In coming to consensus on what those concepts and epistemologies might be, we need to be careful to not overreach or miss the purpose of a university in Humboldtian terms (Fuller 2023) or those invoking themes such as academic freedom suggested by scholars like Mill (Mill 1867), or eastern views of the purpose of universities (Li 2020). However, part of the thesis pursued in this paper is that being able to appropriately integrate innovative technological developments that underpin knowledge and understanding in society into the design of universities will only help them achieve their mission.

In pursuing this topic, it is worthwhile for the reader to acknowledge the position from which I come to it. As a senior executive in a large comprehensive university, I have a vested interest in adopting methodologies that are likely to bring disparate views together into a cohesive, productive way forward. My approach is also influenced by social scientific approaches to qualitative and quantitative research, which analyse ideas through concepts of social structures, rational thought, qualitative differences, individual decision-making, and acknowledging the diversity of individual experiences. However prospective these approaches might be, they still represent a type of bias in research approach which is helpful to bear in mind when considering suggestions for an appropriate approach to dealing with GAI. The remainder of this paper discusses what 'appropriate' might include in the context of GAI for university education leadership.

The Challenges of a Postdigital Environment for University Education Leadership

Another way to express the thesis motivating this paper is that universities will not flourish in a postdigital environment if they do not adequately meet the leadership challenges created by technologies like GAI. So what are the key challenges university education leaders need to grapple with?

Definitions of Education Leadership in Universities

One of the first challenges is what constitutes an appropriate definition of education leadership for universities in the current environment. Part of the answer lies in the ontological and epistemological position on learning, teaching, and education that is adopted. In this paper, the position adopted is one that builds on well-known arguments about the extent of connectedness of mind and body. This argument can be expressed as to whether learning is predominantly a cognitive exercise where the mind and body are separate entities *á la* Descartes (Alanen 2009) or whether it simultaneously involves awareness of perception, emotional, and haptic connections of the individual in context (Ellis and Goodyear 2019; Prosser and Trigwell 1999). The answer to this question has implications for how leadership is best conceived of, and achieved, and has implications for an ecosystemic approach.

At the risk of over-generalising, if learning is predominantly in the mind of the individual and knowledge and understanding are the outcome of intellectual reason and not context-dependent, then it should be possible to educate a student without considering the context of knowledge or the learner (Alanen 2009). But focusing on cognition has been found to be only part of a holistic learning experience (Neumann 2014), and the context of learning is key to understanding why some students learn more deeply than others (Biggs et al. 2022). If learning is a matter of a simultaneous awareness of thoughts in the mind through interaction by the individual with persons and things in their environment (Ingold 2021), then leadership of effective experiences of learning is more likely to involve the orchestration of the education environment, designed to enable the learning outcomes being sought.

An effective education leader will work with leaders of *all* the parts of the learning environment with the intent that the understanding of students is more likely to be supported when they engage with learning, teaching, services, and support that have a unified purpose from strategy which clarifies responsibility and remit for each staff member, whether they are academic or professional. Such ecological thinking will help all local leaders in a university to.

- Understand that the *purpose* of a university's education ecosystem can usefully rest for its mission on a concept of *learning*, a concept which can enfold research, teaching, and service to society;
- Become *self-aware* of their role and what it takes to maintain their contribution to balancing the ecosystem's processes and outcomes on learning;

- Gather *continuous feedback* on the extent of the effectiveness of their actions to provide teaching, services, and support for learning in all forms; and
- Deal with disturbances to the education ecosystem through *self-correction* based on the continuous feedback so that each part is able to maintain a focus on learning in the face of ongoing shifts, whether they be significant or incremental, to ensure the whole ecosystem maintains balance.

It is this epistemological position that is adopted in this paper (Ellis and Goodyear 2013). In a university context, leadership of education will require the simultaneous coordination of key parts of the education ecosystem, such as the university education strategy, its related governance, policy management of learning, teaching, curriculum, and investment. Research has shown that the extent of connection amongst these elements is related to the capacity of a university to achieve desired educational outcomes (Ellis and Goodyear 2019). Consequently, leadership involves coordinating multiple parts of a system to work together for a united purpose, rather than a single individual being held responsible to control how the parts act (ANU School of Cybernetics 2022; Ellis and Goodyear 2013). In this concept, education leadership is more akin to a conductor of an orchestra, a leader of a multi-disciplinary research laboratory, or a leader of similar innovative and creative communities.

If knowledge and understanding is about the learner interacting with their environment in context, orchestration of the environment to maximise the outcomes of education activity is required from effective education leadership. Consequently, educational leaders benefit from conceiving of, and designing, the education environment as an ecosystem, one whose parts are continuously interacting and rebalancing around a purpose of ensuring that learning goals and outcomes at all levels of a university are achieved. For each part of the ecosystem to play their role in supporting learning activity, their local leaders need to be sufficiently self-aware of their area's role and remit, seek feedback or evidence about the extent of success in achieving their remit, and engage in self-correction in relation to their purpose. In short, education leadership is not so much the responsibility of an individual person, but an action by a group of stakeholders (Gould et al. 2022) enabled by participative leadership (Coleman 2014; Owusu-Agyeman 2021) who all share a common purpose that helps them to continuously and productively interact to achieve the goals of their common purpose.

In the context of GAI innovations being introduced to the education ecosystem of a university, this concept of leadership suggests that a university executive and its education leaders will need to be sufficiently AI literate to interact meaningfully to maximise outcomes and minimise risks. While they probably do not need to know about the new strain of mathematics which is informing solutions for parallel processing of information in transformer AI models exponentially increasing their potential, their leadership capabilities will be enhanced if they *do* understand the basic concepts of LLMs and MLMs, how they work and how students are using them in productive and non-productive ways. Such understanding will also involve how teachers and administrative staff can use them to improve quality, efficiencies, and relevance in curriculum design and services, teaching, assessment, and marking: and it should also involve issues such as what the ethical and data privacy issues are,

what strategic partnerships may be of value to a university, and what investment is required for their effective use to enable their university's mission.

Leadership Challenges Arising from the Design of GAI

Unsurprisingly, perhaps one of the most challenging features of GAI for university leadership is the nature of the technology's design. At the risk of oversimplifying, and while noting that GAI can be comprised of many different elements such as adversarial, neural, or transformer networks, it is useful to conceive of the technology as comprising of a set of algorithms, each of which is a type of building block or set of instructions for the computer. GAI software like ChatGPT, Ernie Bot (Bell et al. 2023), or DALLE-2 (Aktay 2022) has the criteria for managing users' requests for information decided on by the owners and designers of the software. At the present time, the criteria and the transparency of the design of algorithms of proprietary software are often not open for inspection or scrutiny. There have been cases already where algorithms have bias and other problematic ethical stances which could easily be in contradiction to the mission of a university (Bahroun et al. 2023), including a misuse of data in the face of privacy laws (Michel-Villarreal et al. 2023). Consequently, universities will need to establish some type of monitoring and oversight of GAI applications used in the case of discriminative, ethical, or moral problems.

Notwithstanding, the existence of such challenges in the design of GAI software, the potential for advancement in informed decision-making with careful use, and efficiencies in process design is so promising that universities are positioning their education systems to leverage any benefits it offers for them to achieve their missions. The following highlights some of the key challenges for education leadership in universities looking to benefit from a strategic use of GAI in their approach to education.

Challenges for Student Learning

One of the key learning challenges for students when using GAI is how to effectively and critically evaluate the quality and accuracy of outcomes of LLMs and MFMs in the context of their own research, learning, and assessment activities. Critical evaluation of the output of GAI, particularly being able to detect what is truth and what is not, what is real and what is fake, will become an explicit aspect of graduate attributes (Bearman and Luckin 2020), a requirement for effective professional practice on graduation, and an essential skill for participation in civic processes such as voting (Kreps and Kriner 2023). Effective critical evaluation skills students need to develop are often discipline-specific. For example, learning to train the diagnostic interpretation of a MLM about the existence of a cancerous area on a medical image is a different skill that health students may need to develop, compared with the cross-referencing of facts and citations that a humanities student will require when evaluating the written text produced by a LLM.

Depending on the type of sources of knowledge arising from their research including large data sets, metrics, and infographics from GAI, the students' ability to integrate and synthesise their ideas will increasingly rely on digital scientific skills such as data wrangling and interpretation, on algorithm literacy (the ability to understand the inherent biases and worldviews of GAI models and interpret and critique the decisions they make), and an ability to communicate their views in written, numerical, and visual forms. These new digital literacy skills are inextricably intertwined with learning in a postdigital environment (Jandrić et al. 2018; Jandrić 2019). Our efforts with all cohorts of students, particularly those in equity categories, need to be informed and shaped to ensure the development of such knowledge and skills are not impeded by issues of access, opportunity, and equity (Kember et al. 2023).

Indiscriminate inclusion of GAI in the learning activities of students is already influencing the way some students behave with unfortunate outcomes. Passing off the output of GAI software as their own work or using the output in part without acknowledging its inclusion has created alarm regarding academic integrity in many universities (Kumar et al. 2023). Universities have started to put in place policies, codes of conduct, and education programmes to help students understand their rights and responsibilities when it comes to the use of GAI in their studies (Michel-Villarreal et al. 2023). This will be an ongoing issue for universities, particularly in areas such as assessment. National regulatory bodies and the universities themselves will want to be able to assure stakeholders that only students who have legitimately demonstrated their knowledge and skills without artificial help have been credentialed (Farrelly and Baker 2023).

There are also many open questions driving current research into the benefits and risks of integrating GAI into university student learning which will generate useful insights in the not-too-distant future. These include, for example, cross-disciplinary issues such as the effectiveness for learning outcomes of scaffolding student design of GAI prompts (Hutson and Robertson 2023; Smolansky et al. 2023), the use of GAI in university writing (Sirisathitkul 2023), student perceptions of GAI avatars in learning (Vallis et al. 2023), its differential risk impact to assessment design (Farrelly and Baker 2023), and how to use GAI developed images to avoid copyright issues in online education (Aktay 2022). They also include disciplinary-specific foci such how GAI can inform student understanding in areas like radiology (Adams et al. 2023), imaging for the education of nursing students (Reed 2023), its potential in the undergraduate science student experience (Liu 2023), and its value students studying art and their enhanced creativity (Hutson and Cotroneo 2023). More research is required in this area, particularly research designs that focus on the differences in the student *use* of learning technologies like GAI that relate to qualitative variation in the learning outcomes (Ellis and Goodyear 2013; Han et al. 2020; Watermeyer et al. 2023). An understanding of qualitatively different uses of GAI will help students to graduate with a mastery relevant for their professional practice.

The examples of research into student learning discussed here are not really the point being made, but rather the variation amongst their foci that emphasises issues that education leaders will have to deal with sooner rather than later. To manage such challenges for the student learning, teachers and university education leaders will need to rethink many of their approaches to their university's learning and teaching system if they want to avail themselves of any benefits, as well as manage

the risks to academic integrity, educational relevancy, and the trust society places in universities for graduates who can make a difference.

Challenges for Curriculum Design and Teaching

The debate about what should be taught in university curricula and how it should be designed has been going on for centuries (Powell 1965), in part influenced by profound developmental stages of society such as the industrial revolution, digital economy, knowledge society, and postdigital stages (Aitken and Jones 2023). Debates involve what should be included in a university student education if they are to be well-equipped to help society, who gets to determine the content, who is allowed to design it, and who is allowed to teach it. At the risk of over-simplifying the debates, much of this context is shaped by the idea that knowledge is something that disciplines own and protect and that this guardianship is more important than student learning and what graduates can contribute to society.

Shifts away from teacher-centred, knowledge-transmission views of education towards student-centred views of learning are most visible towards the end of the twentieth century. A number of national higher education (HE) systems have adjusted structural aspects such as what criteria are required to be a university, as well as student-informed legislation, policy, funding, and ministerial responsibilities (see Barr and Crawford 1998; Harman 2005). In addition to privileging the use of key learning and teaching performance indicators to drive funding for higher education policy, governments have also emphasised the importance of relationships with industry if intractable problems of society are to be addressed. Despite this direction not always sitting well with the academy (Owen-Smith and Powell 2001), an emphasis on student-centred and industry-engaged higher education policy continues to be a contemporary theme in many national HE systems today (Knox 2020; Maryanti et al. 2020; Yang and Gu 2021).

As a consequence of the ongoing refinement of the role of universities in society, the question of who are the legitimate stakeholders in determining the content and design of degree programmes is constantly renewed, and a contested space (Ellis and Goodyear 2013), which in a postdigital era, can include non-human actors (Jandrić 2019), albeit with educational oversight. In the current climate, the thesis of this paper is that if universities are to make the most of innovations such as GAI, particularly in a context of its nascent understanding, then the recognition of teaching teams and translational developers as part of curriculum design gains even more traction (Kift 2023; Metzger 2015; Shibley 2006). If the knowledge and skills society requires to solve intractable problems are discovered, disseminated, synthesised, and applied using technologies such as GAI, then our universities need interdisciplinary teaching teams who are ahead of where the potential benefits and risks of GAI actually are, so that our degrees and student experiences help our graduates be ready for what is to come.

The way teaching teams work, the way they interact through interdisciplinary connectedness, and the way they think about curriculum design, student learning,

and approaches to teaching, all become reconfigured in relation to each other when GAI is in the mix. For example, the importance of algorithm literacy, critical evaluation of sources, data wrangling, and interpretation takes on new meaning and values if extended abstract thinking is to involve technological innovation appropriately (Biggs and Collis 2014; Baidoo-Anu and Ansah 2023). These concerns will require existing degree programme and course designs to be rethought in increasingly interdisciplinary ways, along with new programmes from disciplinary areas which are yet to exist but are emergent (Smolansky et al. 2023).

While much is unknown at present, there are already some strategies being used for *curriculum design*, including how to manage risks caused by involving GAI. The technology is being used to improve core teaching activities such as the rapid creation of assessment rubrics for learning activities (Thanh et al. 2023), using GAI to write hundreds of multiple choice questions to secure their use for assessment through randomisation (Kurdi et al. 2020), and providing a first-pass on feedback on students' written text and highlighting problem areas for tutors to provide more individualised responses to students through text training (Baidoo-Anu and Ansah 2023). GAI is being used to create video-based lessons for delivery online (Leiker et al. 2023), as well as to write whole lesson plans and even the first draft of a whole curriculum (Michel-Villarreal et al. 2023).

To manage risks created by GAI for assessment, programmatic approaches to its design are being developed in order to assure the completion of assessment activities by students depending on the risk arising in the different types of activities (Smolansky et al. 2023). Software companies are already claiming that their text-matching platforms detect misuse of the output of GAI platforms with varying degrees of success (Perkins et al. 2023). Such claims need to be carefully evaluated as too often using technology to solve problems caused by technology can be the result of not looking at the real issues creating the problem, such as little awareness of the needs of stakeholders using the technology (Teräs et al. 2020).

Innovative and risk management activities are also emerging in *approaches to teaching*. GAI is being used to provide synchronous polling code to insert into web-conferencing platforms (Tan 2023), provide individualised feedback on student submissions (Farrelly and Baker 2023), and provide individualised tutoring feedback to students (Kshetri 2023). A key challenge with these types of approaches to teaching is the extent to which they can be disseminated. At present, many of these approaches are not a strategy that can be introduced at scale by all universities, but are an indication of the direction to which some might go.

Some risk management strategies being used by teachers include explicitly framing the use of GAI as part of the preparation and planning for learning activities and helping students to understand the difference between finding ideas from multiple sources and then integrating them into their own personal understanding and arguments. To assure the authenticity of the students' work, the submission of student assignments is sometimes being augmented by additional elements such as an oral component which requires the student to demonstrate depth of understanding without aid, or the submission of a type of learning journal that describes the learning process of the students and how they came to the positions and outcomes that they submitted (Boscardin et al. 2024).

Implications for University Education Leadership

When we think about GAI in the learning and teaching system of a university, the challenges described can be considered through a lens of two key questions in order to harness its impact and recognise its risks. How does the potential contribution of GAI to disciplines, students, and teachers suggest we need to manage it within the learning and teaching system and mission of a university? What does the answer to this question mean for leaders responsible for the ongoing refinement of the system and its underlying academic business model so that they are able to continue to meet their mission statements?

One useful way of answering these questions from the perspective of a university executive team is to consider the extent of interconnectedness amongst key elements which are fundamental to the organisational design and ongoing leadership of universities. In this context, key parts of the education ecosystem have been identified as the university education strategy, its governance, policy, management processes, and investment. The extent of connectedness of these elements has been shown to be closely related to institutional capacities to deal with disturbances to university education ecosystems (Ellis and Goodyear 2019). While they are certainly a focus for a deputy vice-chancellor/provost of education or similar, they are sufficiently wide in scope to be of strategic importance to all the university executive of a university.

Implications for University Education Strategy Refinement

As with any disturbance in the HE sector sufficiently important to warrant a review of strategy, the inclusion of concepts of GAI in university education strategy will at first be subjected to the level of understanding amongst leaders in the university, particularly the university executive. GAI literacy is part of a larger knowledge area of digital literacy which has been a part of executive professional identity for the last couple of decades (Moskal et al. 2013). In the current context, levels of GAI literacy amongst leaders in universities will involve professional development investment and opportunities, developing a shared language and concepts that make sense in the context of the university, and partnerships with internal and external specialists in GAI.

A university education strategy would typically include sections devoted to the quality of the student experience, to the quality of teaching, and to the quality of the degree programmes offered. Even at this emergent stage of the sector's understanding of GAI, the initiatives in each of these sections could be enhanced to deal with the positive and negative challenges of GAI, such as those described in the previous section of this paper. However, in the international context such as the present one, in which the higher education sector is still coming to terms with the implications of GAI for stakeholders, managing *innovation* is a particularly important aspect of an effective university education strategy, but its emphasis can create problems.

Innovation in the context of university strategy can be a two-edged sword in the context of quality assurance of learning and teaching. In improvement terms, innovation with GAI may, for example, solve problems having to do with student feedback,

assignment marking, assessment, and examination at scale. However, if the innovations are introduced by individuals in unintegrated ways from a university's ecosystem, and not accompanied with solutions that can be sustained for thousands of students, they can lead to more harm for a university's reputation and student education than any benefit (Ellis and Goodyear 2019). To counter this, university education leaders will benefit from using a quality assurance lens through which to use and uncover beneficial GAI innovation that can be disseminated responsibly at scale, and avoid some of the infelicities of enthusiastic, but ultimately misguided attempts to innovate. For example, staff wishing to innovate with new approaches to GAI can be supported in one or two courses to assess both its benefits and disadvantages, before a university decides to roll out the innovation to thousands of students.

One area of innovation programmes informing university education strategy that will need to grow over the next 5 years is in the area of graduate student skills (Kelly et al. 2023). The future outlook for jobs and skills is a volatile one. It will be important that university education strategy incorporates innovative learning and teaching processes and educational goals that capture the nature of knowledge and skills required to ensure the relevancy of their offerings for the needs of students themselves, industry, and society (Ellingrud et al. 2023). Ultimately, however, a university and its education strategy will be served well if it integrates the quality assurance risks of innovation throughout the key aspects of the university organisation design such as governance and policy development, management and educational infrastructure design, and investment and funding decisions (Ellis and Goodyear 2019).

Implications for University Governance and Policy Development

Governance and policy development are important tools for university leadership in the management of the implementation of innovation through its education strategy. Helping a university community to understand the university's balanced position on innovations such as GAI is important as conflicting expectations and views could disrupt or dominate a university's approach. Governance structures, particularly the academic committee structure, can be usefully designed so that there is sufficient GAI literacy and awareness of the university's direction in this area to help inform the relevant debates and strategic projects. This will be important as the uncertainty around potential outcomes and the different perspectives on benefits and risks are unlikely to result in consensus and a nuanced, informed approach is warranted.

A policy-led approach to the appropriate use of GAI will also ally concerns of quality assurance issues. Excessive automation of learning and teaching processes without sufficient oversight can create unfortunate outcomes for a university which need to be avoided. The elaboration of existing policies on programme design, assessment, and learning and teaching to frame the university's position on the role of GAI in the student experience will be an important stage of embedding it sustainably in everyday academic enterprise.

To inform ideas for how to adjust governance and policy settings, there is a growing body of research on the challenges for governance and policy as GAI becomes part of the way organisations do business (for example, Engstrom et al. 2020; Eubanks

2018). This area of research recognises that distinctions amongst human and technology-driven activity become blurred as digital technologies become entwined with new ways to achieve outcomes. The nature of the integration of humans and technologies in organisations is a messy one which requires careful consideration of how decision-making occurs and by what regulatory framework it is guided. To get a sense of the issues, two case studies are referred to here.

Without a careful review of the decision-making of governance, GAI and the algorithmic culture they belong to have been shown to have problematic outcomes for equity in policing. One collection of studies (Eubanks 2018) reveals the impact on poor and low socioeconomic areas in America from opaque algorithms that are the basis for decision-making informing social services such as policing. For example, they are being used to surveil individuals' activity through data collection, but the fragmented nature of its collection and interpretation often leads to problematic outcomes through faulty decisions. Without effective governance and policy maturity, this case study demonstrated that a misuse of GAI was effectively limiting the individual rights of people.

Such problematic findings are not only restricted to services such as policing. In investigating more than 40 federal agencies in America, researchers at Stanford University and New York University revealed critical governance issues surrounding an embedded use of GAI. They highlighted a lack of oversight of core practice such as how staff use AI output in their decision-making for the allocation of public funds. Exacerbating these types of problems, they cited a significant lack of professional development required for staff to develop appropriate algorithmic literacy and unclear ethical boundaries between government interest and public privacy (Engstrom et al. 2020).

There are many emerging examples of irresponsible applications of GAI that have lessons valuable for universities (e.g. Walsh et al. 2019). It is easy to imagine similar problems as those described in the case studies happened in a university community without appropriate governance and policies shaping how GAI is used in all of its operations. Transparency of costs, legal issues, external validation initiatives like benchmarking (typically required by national regularity bodies), and insufficient AI literacy within universities are likely to be common emerging problems. These observations point to the importance of the education strategy clarifying the direction of innovations like GAI for the future to delimit risk through governance and policy and also through management of educational processes, systems, and goals.

Implications for Management of Educational Processes, Systems, and Goals

Given the potential of GAI-enabled processes, the technologies are likely to be integrated throughout the student lifecycle rather than just in one or two areas. This means it will be aiding decision-making, resource development, thinking, and strategising across student outreach and recruitment, onboarding, and familiarisation with the academic environment, progress, retention, and success in their studies. It also means that it will be used in the design and teaching of programmes and courses as well as being part of contextualised disciplinary content in those curricula as disciplines and industries come to understand how it.

In managing the introduction of GAI into all the parts of an education ecosystem, each leader at the different levels of a university (course, programme, school, faculty, central service provider) will benefit from engaging in ecological thinking previously described but contextualised for their area. Key issues will include, but are not limited to, the extent to which a mindful use of GAI in their workplace processes can assist their area to achieve their remit and goals in relation to the university's mission; be accountable, providing evidence, about how, how much, and why they are using GAI in their area's activity; gathering regular feedback on the extent to which their use of GAI is meeting stakeholder needs; and sufficiently understanding the benefits and weaknesses of using GAI to engage in effective development of their processes, but in an approach which maintains a balance around their remit in relation to the university's mission. While these goals will deal with many of the key risks of GAI, a systemic challenge for universities arising from such a responsible approach is forward planning for related budgets.

Implications for Investment and Sustainable Funding

Envelopes of investment for the effective management of AI in universities at present are an unknown quantity. This is because the quantum of investment happening across multiple sectors in the creation and use of multiple AI platforms is in the billions of dollars (for a snapshot, see Bell et al. 2023). In a sense, we are in the middle of an AI boom, whose potential impact is still being discovered, and it will be some time before most sectors have leveraged much of its benefits and safeguarded against most of its risks.

In the short to medium term, the cost structure for managing AI in universities is likely to involve the following types of purposes. In the improvement and enhancement area, investment in piloting and trailling GAI technologies for education administration enhancements, curriculum design developments and supplementary online tutoring services are likely to be common elements. In the quality assurance area, investment will be required to demonstrate accountability for the quality of GAI-assisted services and outcomes, particularly those funded by government and public monies in universities (Engstrom et al. 2020). This will include evidence about how issues of intellectual property and GAI data are handled, along with managing assessment and examination processes to ensure that the results are from the students' own work.

Given the necessity of adequate GAI literacy amongst university leaders and all professional, teaching, and research staff, clearly, a sufficient envelopment of funding required by universities will be in the professional development area. Efficiencies can be achieved through train-the-trainer solutions to disseminate the GAI literacy required for its effective management and use across different levels of a university; however, given that its uses are still being discovered (Ellis and Goodyear 2019), the schedule and curriculum for developing GAI literacy in universities will be an ongoing requirement for the medium term.

Where to from Here?

The ongoing challenges for the mission of universities created by innovations such as GAI are not the only disturbances international higher education sector will face in the medium term. At the present time, however, they are sufficiently transformative at all levels of academic enterprise that universities need to position themselves today in ways that make the most of their benefits and minimises the risks they pose. For educational leaders such as myself, there is much work to be done to not over- or underestimate an appropriate role for GAI in the education ecosystem of a university. For the benefit of the educational outcomes of student learning and teaching, part of the solution is in refining the key aspects of education strategy with a deep understanding of GAI in mind and reconfiguring the related educational governance, policy, management, and investment in relational ways. If university education leadership can help local leaders (such as programme directors, heads of school, directors of central service providers) to understand their remit in relation to keeping the education ecosystem balanced around shared strategic goals, then such an approach will help with challenges which will come but are yet to be envisaged.

While acknowledging the benefits of the ecological thinking informing education leadership, there are some unique features of GAI that will shape the context of universities if they are to make the most of it. GAI intensifies decision-making and activity around an informed used of data. The design, collection, interpretation, and action arising from a data-driven approach will require universities to think differently about their core business including the way teachers teach and students learn. In reconfiguring the core processes, universities will have to make hard decisions about what to invest in to maintain and ensure they continue to successfully fulfil their education mission. This will include reimagining their disciplines in increasingly interdisciplinary ways as GAI becomes part of the required knowledge and skills of most industries.

As disciplinary bodies of knowledge change, so too will the academic workforce requirements of teaching staff, which will mean a rethink of the professional development, reward, and recognition provided to academics. To manage such fundamental change across higher education sectors, national regulatory bodies will require universities to be increasingly accountable for the way they are using and managing GAI in their core business. This will include evidence of the benefits and costs of investment in it, policies which reaffirm accountability, and ethics, as well as transparency of its design and use. In short, transformational innovations such as GAI require our university leaders to know what it means to lead responsibly with them for a socially just, civically responsible society, where we produce graduates and practices that will allow us to scale the benefits of GAI in safe, responsible, and sustainable ways.

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