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Information Technology decision makers' readiness for artificial intelligence governance in institutions of higher education in South Africa

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Research Paper

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ABSTRACT

Artificial intelligence (AI) can enhance the educational experience for academics and students. However, research has inadequately examined AI ethics and governance, particularly in the higher education sector of developing economies such as South Africa. AI governance ensures that envisioned AI benefits are realized while reducing AI risks. Against this backdrop of huge research deficit, the current study reports on a qualitative exploratory study that investigates the state of readiness for AI governance and AI governance maturity in South African higher education institutions. Informed by the combination of the TOE framework, the traditional IT governance model and the adapted IT governance maturity assessment model, semi-structured interviews were conducted with academic and ICT decision makers from two public and three private higher education institutions in South Africa to determine their insights on the state of readiness and maturity of AI governance. Results reveal high proliferation of AI elements in higher education information systems. However, results revealed low levels of AI governance readiness by higher education institutions. The study recommends for recognition of AI risks and taking lessons from AI regulatory frameworks advanced in developed countries.

Keywords

Artificial intelligence, governance, nature and scope, readiness, higher education, South Africa.

INTRODUCTION

Artificial intelligence (AI) is transforming all facets of life including higher education. Accordingly, higher education has recently followed a technologically supported trajectory, with the majority of HE institutions already implementing artificial intelligence (AI) applications and adaptive learning technologies in academic operations as reported in the 2018 Horizon report (Educause, 2018). The report emphasised that AI in education was anticipated to grow exponentially by more 43% in the period

2018-2022. South African universities have started to consider AI and find areas where AI may help them move towards the 4IR. By integrating AI elements into institutional information communication technologies (ICT), HE institutions unlock exponential value in areas including students' application and enrolment, students at risk management, online examination proctoring, research, online teaching and learning. With the assistance of AI, learning can be tailored to suit specific needs of students (Kumar, 2019). In addition, AI driven libraries can assist in affording students better learning experiences in higher education (Cox et al., 2019). Students can interact with AI-enabled chatbots outside normal hours with accuracy (Chrisinger, 2019). These AI-powered systems can assist with predictive analysis, adaptive learning platforms, administrative decision-making as well as student admissions queries. In addition, the creation of "smart content" may benefit from the usage of AI technology (Kumar 2019). Furthermore, AI affords access to digitalised, customisable learning interfaces. With the ever-increasing massification of students in higher education, AI-enabled technologies become vitally important to easy academics' workload (Andrea et al., 2015).

However, AI is a transformative technology that affords great benefits as well as risks. It takes more than just being ready to install and purchase new ICTs to get HE institutions ready for AI. As such, HE institutions need a strategy to retool the pertinent existing processes, upskill or hire key staff, refine approaches towards partnership, and develop the necessary data and technical infrastructure to deploy these cutting-edge technologies to fully realize AI's potential to create value. Sensitive students' data is one of the critical elements of AI projects and needs to be handled in ethical ways.

Ominously, the rapid adoption and use of ICTs that are AI driven in African HE threatens to outpace the regulatory responses to AI concerns (Taeihagh et al., 2021). Attending to the potential risks of AI has increasingly become a mammoth task for HE ICTs decision makers. For proper management of AI risks, the pace of AI technological advancements and AI policy making ought to be matched. Despite having legislative frameworks such as the protection of personal information (POPI) act, the responsibility and accountability for adverse results from the use of AI remains ambiguous under various frameworks (Leenes et al., 2017; Xu & Borson, 2018). Leenes et al. (2017) reported that the beneficiaries of such AI systems do not suffer the consequences of AI risks, as these risks are transferred to the society (i.e., HE institutions). Consequently, HE institutions need to be cognisant of the ethical implications of AI integration in their institutional technologically supported operations, to design and implement mechanisms to deal with such challenges.

African contexts have been associated with rapid adoption of innovations "leapfrogging", without following necessary steps unlike developed contexts. Given the value-laden nature of the decisions automated by AI algorithms in numerous facets of society, AI systems may display behaviours that are at odds with societal values and conventions, raising worries about the potential ethical problems that can result from AI's rapid adoption. Given such rapid adoption of globally developed AI systems in African contexts, there is a risk of misalignment of local and international privacy laws, societal norms, ethics etc. In addition, most of the systems used in higher education are provided by third parties opening room for profiling of students and possibly surveillance. As argued by Sam and Olbrich (2023), the design and implementation of AI applications is closely tied to the social norms. Resultantly, the social norms, values must be considered in AI development and deployment. However, knowledge and attitudes of developers direct how AI is developed and its functionality (Sam & Olbrich, 2023), increasing the risks. Given the emergent nature of the adoption of these AI supported information systems, the phenomenon deserves scholarly attention from an AI governance standpoint. Effectual AI governance becomes imperative to maximise AI benefits and minimise AI risks in the HE environment.

While there is plethora of literature around AI in different contexts, for example in the use of autonomous weapon systems (Bode et al., 2023), in human resources management (Dennis & Aizenberg, 2022), in medicine and healthcare (Durán et al., 2022; Grote & Keeling, 2022; Babushkina & Votsis, 2022) governance of AI especially in the African higher education context is still at its infancy stage and remains a grey area that deserves scholarly attention. Recognising a recent book titled "AI ethics in higher education: insights from Africa and beyond", published in 2023 as a notable milestone on the scholarly discussion around AI in higher education, this paper seeks to make further contributions and assist HE policy makers, researchers in AI and other stakeholders in AI to comprehend AI risks and readiness for AI governance in the South African HE environment. The discussion may trigger much needed debate for a holistic view of ethical AI use in educational contexts.

Specifically, this paper addresses the following two research questions: -

1) *What is the nature and scope of AI applications in the context of South African higher education?*
2) *What is the state of AI governance readiness in the context of South African higher education?*

Research context and justification of the study

The study is conducted in private and public higher education institutions in South Africa. Despite these institutions operating in different sectors, they are all governed by the higher education statutes and are registered under the Department of Higher Education and Training (DHET). These institutions have different governance structures that oversee development and implementation of academic policies, systems and procedures. Importantly, these higher education institutions (regardless of private or public) have witnessed emergent adoption of various AI embedded information systems for academic, research and administrative purposes being driven by the imperatives of COVID-19. Such AI-driven information systems cover library services, teaching and learning, tutoring, academic advising, admissions and enrolments queries through chatbots. Despite being in Post COVID-19 period, such information systems are still in use, as the African higher education trajectory has shifted. Consequently, the phenomenon of AI and AI governance readiness becomes of relevance for scholarly consideration as higher education institutions are proceeding with AI supported mixed modal education offerings.

LITERATURE REVIEW

AI in private and public sector

AI applications use has been documented in literature (Zheng et al., 2018; Chun & Wai, 2007, 2008; Sun & Medaglia, 2017; Kouziokas, 2017) as an innovation that enhances workflows, data management, decision and knowledge management in the public sector. Zeng et al. (2018) demonstrated that AI applications in the provision of public service increases proficiency and service provision quality. Separate studies by Chun and Wai (2007, 2008) reported that AI-based services reduced service times, the workload and improved workflow. However, for all of its benefits AI technology brings potential risks (Johnson 2015; Massaro et al., 2016; Quraishi et al., 2017). Under the same token, Quraishi et al. (2017), discusses the ethical dimensions of implementing or rejecting AI solutions with emphasis on the protection of humans from AI risks. Despite envisioned benefits of AI application in provision of public services, key considerations need to be made on AI responsibility, social and ethical issues which have the potential to threaten value delivery by agencies and service providers (Quraishi et al., 2017; Ransbotham et al., 2017).

Consequently, AI has ignited conversations around its social and ethical implications (e.g., Bartlett, 2017; Johnson & Verdicchio, 2017; Mehr et al., 2017; Quraishi et al., 2017), including privacy issues regulations and responsibility (e.g., Boyd & Wilson, 2017; Scherer, 2015). AI ethical concerns have been raised (Dafoe, 2018), including accountability and responsibility issues (Dignum, 2018), undesirable outcomes from AI (Russell, 2010). Russel and Norvig (2010) raised concerns in their artificial intelligence book, "All AI researchers should be concerned with the ethical implications of their work" (p. 1020). With the growth of AI, comes increased public scrutiny and emphasis on AI regulations and legislative frameworks (Cihon etal., 2020), demonstrating appreciation of the probable AI risks (Dafoe, 2018). AI systems learn through data, rules and machine learning. As such, unforeseen scenarios that the AI system may not have been trained to manage can result in unexpected risks for its users (He et al., 2019; Lim & Taeihagh, 2019), such as unethical outcomes (Huq, 2019; Firlej & Taeihagh, 2021). Attending to the real root of the above problems points to the need for effectual AI governance, discussed in the next section.

AI governance

This paper draws on existing literature on IT governance (de Haes & van Grembergen 2009; Peterson, 2004; Schneider et al., 2022) to evaluate the considerations of AI governance as a branch of IT governance. Schneider et al. (2022:5) proposed AI governance as "a structure of rules, practices and processes used to ensure that the organisation's AI technology extends and sustains the organisation's strategies and objectives." In agreement with Abraham et al. (2019), Schneider et al. (2022) emphasized on AI governance as a strategic asset that fosters collaborations across organisational functions, enables formalisation of AI management with the aid of a framework, defining AI decision making rights and ensuring compliance to policies, procedures and standards. Being informed by proposals on IT governance (De Haes & Van Grembergen, 2009; Peterson, 2004), institutions, organisations and other establishments that use AI can apply structures, processes and relational mechanisms to govern their AI.

AI governance structures

Borgman et al. (2016) suggested the need for structures which are comprised of governing bodies with roles, responsibilities, decision making authority and accountable to such AI decisions. Setting up of structures of chief data officer (CDO) and chief information officer (CIO) has been encouraged (Ho et al., 2019). Furthermore, establishment of AI hubs (Fountaine et al., 2019), AI centres of excellence (Kruhse-Lehtonen & Hofmann, 2020), and AI governance council (Reddy et al., 2020) has been encouraged. In addition, to advance AI governance, Pumplun et al. (2019) advocates for the establishment of an executive sponsor and a dedicated AI budget.

AI governance processes

Processes ensure that AI supported information systems operate as expected, in a secure and safe manner, meeting the institutional requirements as well as satisfying external regulatory compliance demands. For example, policies have been set through the white paper on AI by the European Commission (2020), best practices as suggested by Alsheiabni et al. (2020). Serban et al. (2020) suggested for the documentation of AI features on information systems as one of the best practices for AI governance. Due to the complexity of AI, audit processes to determine AI compliance with institutional policies, industry standards and the regulatory framework have been suggested e.g., (Brundage et al., 2020). Different perspectives have arisen on the governance of AI, Clarke (2019) suggested for classical approaches to AI risk management, while Sidorova and Rafiee (2019) initiated discussion on the application of business process management and AI agency risk.

AI governance relational mechanisms

Relational mechanisms foster relations and mutual understanding between stakeholders. They involve communication (Serban et al., 2020), collaboration, training and coordination between AI and non-AI activities. Communication is key, as it demystify the perception that AI may replace the labour force (Kaplan & Haenlein, 2019), potentially leading to resentment and resistance to the technological innovation. Training may involve skilling, reskilling or upskilling individuals to be competent to leverage AI while reducing its risks. For example, Kaplan and Haenlein (2019) reiterate that training of employees is vital as it might save their roles and responsibilities being taken over by AI. The succeeding section discusses AI governance in the African context.

AI governance in higher education

Despite the sudden increase on HEIs dependency on AI embedded information systems for administrative, community engagement and academic business, there is a dearth on scholarly conversations around AI governance especially in the higher education environment in developing economies. It is evident that most of these discussions are concentrated in developed economies in the private sector (Mehr et al., 2017). In view of the foregoing, this paper proposes that comprehension of the readiness and maturity of AI governance in South African HE is of vital importance. It is opined that there exist pivotal props to be considered as HE institutions embark of the necessary initiatives of governing AI. These important aspects form an important link between the strategic goals of the HE institutions and the metrics that are conditional for effectual AI governance in the HE context. This proposition is grounded in the combination of the TOE framework and the traditional IT governance model as discussed below.

THEORETICAL UNDERPINNINGS

This study is informed by the adapted TOE framework (Depietro et al., 1990), fused with the traditional IT governance model by De Haes and Van Grembergen (2009) and the adopted IT governance maturity model (ITGMM). To the best knowledge of the researcher, this is the first study to adapt the TOE framework, integrate with the ITGMM model and apply it to study AI governance readiness in HE. According to Depietro et al. (1990), the TOE framework suggest that the adoption and implementation of information systems (IS) is influenced by the technological, organisational and the environmental contexts in which the concerned organisation flourishes. For this study, the technology environment is adapted and defined as the availability and characteristics of AI which has an influence and is pertinent to HE institutions. These AI elements need governance considerations for HE institutions to derive benefits from AI. In addition, factors in the organisational context are adapted by borrowing constructs from the traditional IT governance model. These factors include existence of AI structures, processes and relational mechanisms (De Haes and Van Grembergen, 2009). These factors need to set up, exist and properly function within the internal organisation's settings for organisations to be deemed ready for AI governance to flourish. Lastly, the external factors allude to the external HE operational environment and its characteristics, which include AI technology support infrastructure and government regulation on AI which all have an impact on AI governance in HE. This research paper proposes that the TOE framework is suitable for determining AI governance readiness in the South African HE context.

However, the researcher argues that application of the TOE framework as a standalone framework does not provide a complete picture of the study's considerations. The study therefore extends the TOE framework to include the adapted ITGMM to comprehend the insights on AI governance level of readiness through determination of the maturity of governance mechanisms. The maturity assessment

adapted and used in the current study was proposed by Simonsson et al. (2010) in relation to assessment of IT governance maturity. According to Simonsson et al. (2010), the maturity assessment is ideal for "monitoring, enhancement and management of existing governance structures and processes", (p.1277). Despite the assessment method mostly being quantitatively applied (Simonsson et al., 2010), the current study is based on decision makers' insights, thus subjective reflections on their AI governance readiness and maturity being informed by the assessment tool.

The ITGMM is based on six levels (level 0 to level 5). Level 0 pertains to a scenario where there is an absence of AI governance awareness, monitoring and documentation. Level 1 relates to a situation where there is some awareness of AI governance, however, with no monitoring and documentation. Level 2 describes a scenario where individuals have knowledge about AI governance, however, still with zero monitoring and documentation. Level 3 denotes a situation where concerned personnel is trained on AI governance, however, with no monitoring but documentation and activity improvement are performed. Level 4 involves training of concerned personnel, monitoring is done, documentation is done, and AI governance is under constant improvement. Lastly, level 5 is characterised by training of personnel on AI governance, monitoring and documenting AI governance activities, and AI governance improvement plans. The above metrics forms the basis of determining HEI's AI governance maturity. The holistic, integrated and summarised variables of interest that guide this study are presented in Figure 1.

Figure 1

The research framework
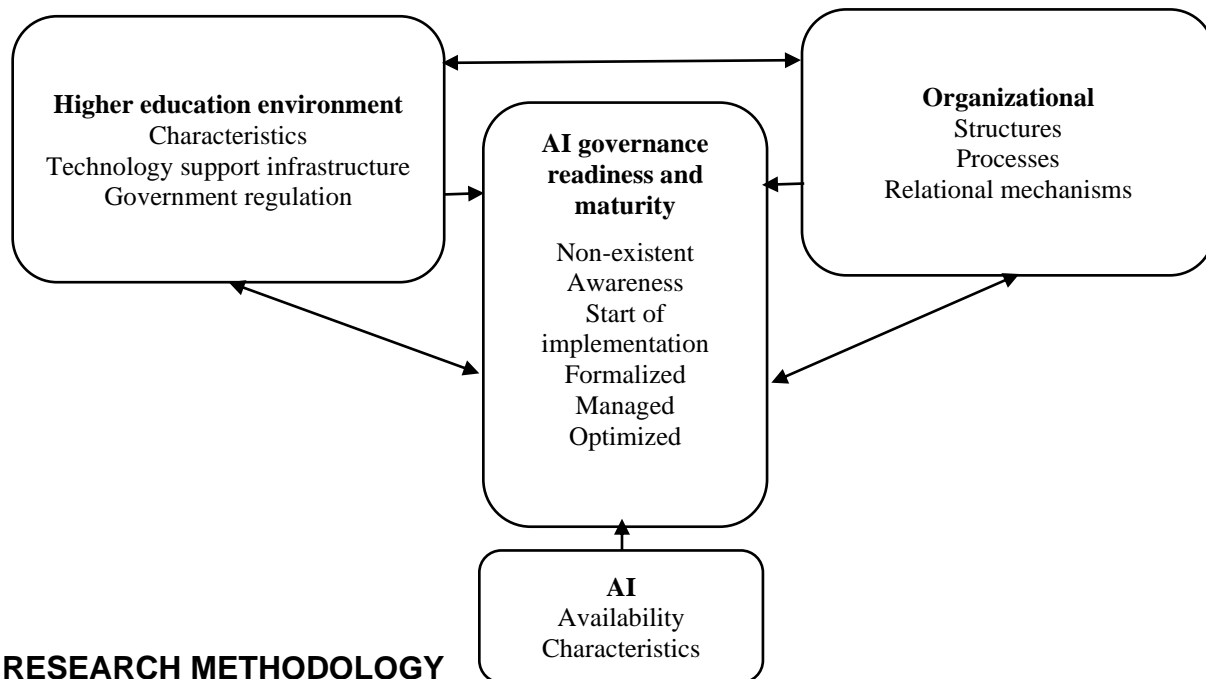
RESEARCH METHODOLOGY

The research questions were approached by analysing qualitative data gathered from semi-structured interviews with 5 institutions, comprising of 3 public and 2 private higher education institutions in South Africa. The case institutions were intentionally chosen through theoretical sampling, a strategy aimed at maximising the usefulness of the results. This method afforded cross case analysis and within case

analysis to be made. The case organisations represent institutions at varied levels of AI adoption and implementation within their education management systems. The inclusion of private higher education institutions enabled comparison of between public and private higher education sectors. Detailed summary of the case institutions is provided in Table 1. The study institutions represented interesting cases, as they are driven by differing statutes that determine their establishments. However, the challenges brought by COVID-19 drove all institutions of higher education to advance the adoption of information systems for academic purposes regardless of the sector they fall. AI-driven information systems represent the backbone of higher education delivery in the 21st century.

Table 1

Study institutions

	Institution A	Institution B	Institution C	Institution D	Institution E
Institution type	Private	Private	Private	Public	Public
Interviewees	1 IT manager 2 Network administrators Systems analyst 2 Programme managers 1 Head of academic operations 1 Information specialist	2 Head of academics 1 Academic operations administrator 1 Programme manager 3 ICT support administrators	1 Senior ICT support 1 Programme coordinator 1 Academic monitoring and evaluation specialist 2 ICT support specialists 1 Academic operations officer	1 Chief risk officer 1 Chief information officer 1 Business owner (strategic planning and facilitation) 1 Data manager 2 Deans 2 HODs	1 IT manager 1 Head of School 1 Deputy vice chancellor academic 1 Finance director

DATA COLLECTION

Purposive sampling that enabled selection of knowledgeable interviewees on the AI and AI governance phenomenon was used to intentionally identify senior ICT and academic decision makers from the universities' websites and organograms. Semi-structured interviews enabled eliciting of information from ICT decision makers regarding governance of AI. Semi-structured interviews enabled capturing of the process nature of the phenomena, affording rich information in real life situations (Wiander, 2007). Preliminary interviews were telephonically conducted to obtain an initial appreciation of the extent of AI applications use, their awareness of AI governance and AI governance practices in their institutions. An interview guide clearly explaining the objectives of the study was send to the participants. Importantly, the informants were requested for their willingness and availability to participate in the study. Once targeted interviewees accepted participation in the study, interview appointments were made lasting between 30 to 45 minutes. For convenience, most interviews were conducted online while a few were conducted on a face-to-face basis. The first interviews were done with Institution A, transcribed and analysed. Initial analysis enabled refinement of the interview guide for subsequent interviews.

DATA ANALYSIS

Qualitative content analysis was used to analysed collected data (Mayring, 2015). Retrodictive coding involved a continuous back and forth process between the research data and the research theory, reducing huge data text into its manifest's components. The NVIVO qualitative data analysis program was used to analyse the imported semi-structured interview transcriptions, and the coding procedure was guided by the methods advised for qualitative data analysis. The simultaneous application of inductive and deductive techniques was followed, which was guided by critical realism philosophy's tenets. In accordance with Saxena (2019), a straightforward coding technique was used to apply first-level codes to a section of text. All open codes were subsequently allocated to one of the before described constructions of the study framework based on their occurrence, conforming the deductive part of the data analysis process. Resultantly, open codes were consequently developed across three settings linking the data with the research framework. Open codes within each context were then examined and grouped jointly based on their similarity. It was considered that each context's degree of readiness was either shaped by artificial intelligence, by institution, or by the environment. The extent of the illumination they provided was used to guide the examination of the readiness and related codes for revision. Inter-coder reliability enforced content analysis reliability (Krippendorff, 2004).

FINDINGS AND DISCUSSION

The findings revealed the scope of AI applications in higher education in South Africa. Overall, findings support previous findings on the status and readiness for technological innovations governance in developing economies contexts. In addition, the findings are discussed in relation to findings from literature, by relating AI governance as a branch of IT governance. Furthermore, the study discusses new and emerging readiness and maturity factors currently absent in formal AI governance practice literature, as detailed below.

Answering research question 1: What is the nature and scope of AI applications in higher education institutions in South Africa?

Research question one seeks to determine the areas and the extent of use of AI applications in supporting and sustaining higher education academic and administrative operations. Literature supports that AI and adaptive learning technologies continue to be important educational technologies (Educause, 2018; Contact North, 2018). The findings in this section are primarily based on how participants envisage AI in their academic and administrative business within their institutions. For anonymity, interviewees are identified by use of pseudonyms for example, IPV1 for interviewees from private institutions, IPB1 for interviewees from public institutions. Findings reveal that institutions are driven by the global imperatives such as internationalisation of the curriculum and the changing African higher education trajectory. In this context, interviewees expressed that:

"Artificial intelligence applications help students in big classrooms move through their learning experience successfully to reach desired results, conducting evaluations, and giving constructive, individualized comments." ---IPV1.

"By use of chatbots, we can be reached by prospective students from anywhere across the globe to enquire about our courses at any time of the day, even after working hours and on holidays. Without assistance from people, we are able to respond to frequently asked questions." ---IPB2.

Interviewees expressed that their students receive individualized tutoring and learning has become self-paced through intelligent tutoring applications. Some interviewees noted:

"A computer acts as an individual tutor who can direct and oversee students' learning and involvement, and this happens at times that are convenient for our students. We are then able to address the needs of our diverse student body, given that our students are faced with varied challenges especially when it comes to internet connectivity, electricity load shedding." ---IPV2.

"Machine learning algorithms help students of all abilities in our campuses and to a certain extent, engage in complicated processing activities and human-like functions that can be used in teaching and learning, thus, our intelligent tutoring systems help us to navigate challenges in that space." ---IPV3.

"Utilizing cognitive science and artificial intelligence to deliver real-time, tailored tutoring we are happy with the investments we are making on intelligent tutoring." ---IPB4.

In some interviews, "personalised learning" was regarded as an affordance from the use of AI. Accordingly, several interviewees repeatedly noted that AI has become a key element in meeting students' diverse needs:

"AI applications has opened enhanced possibilities for teaching and design of educational experiences thus, personalizing our students' learning experiences." ---IPV6.

"Most our programmes are now offered on a blended learning mode, and some are purely online. Artificial intelligence enabled us to augment the learning interactions of all students in such virtual platforms. We can track students' engagements and provide the necessary support needed." ---IPB5.

Interviewees expressed that universities are now operating in a competitive zone, driven by the research and publication output that brings funding in addition to university rankings. As such freeing academics from classroom presence by use of teacherbots and smart content was necessary so that academics get ample time to conduct research.

"We encourage our lecturers to take advantage of the smart content in the classroom to support students and make learning more interesting." ---IPB3.

"Smart content makes education more effective, efficient, adaptable, and comfortable with the assistance of AI technology." ---IPB7

"For our blended delivery courses or completely online courses, we are adopting personalized learning using a teacherbots, or "cloud-lecturers." ---IPB6

Furthermore, interviewees expressed that their institutions were operating in online and blended modes. Accordingly, interviewees indicated that checking for authenticity of submitted assessments became vital especially given that assessments are conducted in the absence of invigilators and instructors.

"We use technological solutions such as learning management systems or IT solutions to detect plagiarism through Turnitin." ---IPB8.

"Some of our assessments are mostly conducted virtually, for assessment authenticity we use AI enabled proctoring software to supervise online examinations and assessments." ---IPV6

Summary

From the findings above, it is evident that AI applications have extended the capabilities in higher education institutions to meet different vital academic imperatives such as automated identification of at-risk students, identification of bottleneck subjects, remote enforcement of academic integrity, meeting students' diversity and inclusion demands. Furthermore, AI applications. In addition, AI applications have increased higher education institutions' capacity to enroll and handle large classes driven by higher education for all and massification trajectory in South Africa. Institutions can now offer a wide range of academic programmes as previously traditional processes such as query responses, marking, study material production, feedback, invigilation are automated. The table below provides examples of AI applications used in the institutions studied.

Table 2

AI applications in higher education institutions

Academic areas	AI applications	Examples
Teaching	Teacherbots, cloud lecturers, intelligent tutor systems, adaptive learning courseware, AI-assisted marking and feedback.	Gradescore Complete, Turnitin, Edgenuity, PTE Academic, Versant, Essay mills, CogBooks, CENTURY's AI solution, Microsoft Viva, Quizbot, Quillionz, Quillbot, AutoTutor, Watson Tutor, Holmes, Bialik, Fadel, Chatgpt
Research		CORE
Administration	Chatbots, digital assistants,	

Answering research question 2: What is the state of AI governance readiness in South African higher education institutions?

AI governance readiness was studied in the internal and the external contexts in which the higher education institutions operate, comprising of the nature of the AI technological innovations, the institutional arrangements and the characteristics of the higher education environment in which the institutions exist. This proposition is harmonised with De Haes and Van Grembergen (2004), who purported that IT governance can be deployed through a mix of institutional structures, processes and relational mechanisms and is contingent upon internal and external factors. In this study, IA governance readiness relate to the existence of such structures, processes and relational mechanisms against the maturity of AI governance which is based on the metrics in the adapted IT governance maturity model (ITGMM).

Organizational factors

Structures

Structures pertain to establishment and existence of responsible IT functions such as IT executives and a diversity of IT committees (Peterson, 2004). IT governance literature recognises structures as an important element for IT governance implementation. De Haes and Van Grembergen (2004) emphasises that structures are of importance as effective governance of IT resources is determined by how the IT function is organised and the IT decision-making authority is positioned within the institution. PV1 from a private institution indicated the absence of relevant and adequate ICT structures that provide oversight on IT projects as hindering contemporary AI governance.

"*Management is of the view that the main business of the institution is provision of higher education, at a profit as well as covering the operational costs, establishment of the required IT structures comes at a significant cost as IT professionals are expensive to hire." Resultantly, in relation to your question, we do not have some awareness of AI governance and we also do not have mechanisms to monitor or document the processes ---PV1.*

Meanwhile, PB1 from a public institution reiterated the problematic nature of establishing and appointment of necessary IT executives in the university structures that are important for AI governance.

"*As an institution, have been on a drive to implement an enterprise resource planning (ERP) system that covers all areas of university operations. However, the process has been affected by the cost of such a huge project, structures need to be established and people must be appointed. We have made strides here and there, but I feel AI governance is one area that is going to be overlooked because of the overwhelming nature of other issues considered as critical. For now, AI governance is non-existent, we mainly focus on the potential benefits that our ICT systems bring. About the risks, its something that we may discuss soon." ---PB1.*

Meanwhile PB2 reiterated that "*We have some awareness of the risks that AI can impose on our institution and society in general. However, no AI monitoring mechanisms are in place this far. Obviously, there is no documentation of AI and this stems from the fact that AI issues are not formally represented by any committee, nor are they included as part of the agendas of the existing steering committees." ---PB2.*

As suggested by literature (De Haes and Van Grembergen 2008b; Webb et al. 2006; Weill and Ross 2004), structures such as steering committees composed of the senior IT decision makers such as IT directors, chief information officers, IT governance officers and possibly AI governance officer positions should be created to deliberate on AI issues. This demonstrates that the existence of relevant structures that take the AI roles and responsibilities are pivotal for readiness and successful AI governance.

Processes

Processes pertain to planning and strategic decision making of IT based on frameworks such as ITIL, COBIT to name some examples, in addition to tools and techniques for business/IT alignment (De Haes and Van Grembergen 2008b; Webb et al. 2006; Weill and Ross 2004). Literature affords ample evidence of processes as necessary for governance of technological innovations. IPV3 indicated that strides have been made around implementing processes that ensure that personal information is protected by third party service providers.

"*We have made a bit of progress around contract and service management with third parties that provide us with our systems, so documentation is being done. Our systems are mostly outsourced and provided by external organisations such as cloud service providers, we have just started implementing SAP a German ERP system. Handling of personal information is critical so that we do not violate the*

protection of personal information (POPI) act. However, monitoring is difficult at this moment, we are optimistic that it will be done together with setting up improvement plans in areas that are lacking" --- *IPV3.*

The results demonstrate that one institution is partially implementing AI governance processes, despite the role of process maturity and AI governance frameworks in AI governance not yet being widely covered in literature.

"These systems indeed have AI elements which are important as you know students may need to make enquiries via chatbots for example. So, we do have service level agreements, budget control mechanisms, charge back strategies to name a few, thus part of documentation. However, we may someday need to follow a given established framework that guide our AI governance, of which we are not having conversations around that at the moment." ---IPB4.

Relational Mechanisms

Relational mechanisms involve participation and engagement between IT and the academic business. According to De Haes and Van Grembergen (2008b), communication and knowledge sharing between IT and business is vital for shared understanding. The results reveal that institutions are at the initial stage of discussing and sharing AI governance knowledge.

"We have been having seminars and workshops to discuss the impact of AI on our operations as a university. Our senior management have been engaging with stakeholders on the use of AI embedded platforms such as ChatGPT in the classroom and how it influences academic integrity." ----IPB5

Environmental factors

The results revealed that the external environment's appetite for effectual governance has an influence on the internal governance mechanisms of the universities. In this context, the external environment denotes the government, bodies and entities that oversee higher education in South Africa. In addition, the external environment includes the different service providers that are involved in the AI network such as cloud computing service providers. Interviewees expressed that the level of AI governance readiness of such external organs has an impact on their readiness to govern AI. For example, one interviewee emphasised that *"AI governance is silent in the documented governance guidelines that we follow." ---IPV2*

Another interviewee expressed that there is no government regulation on AI, *"socially acceptable AI principles are still overlooked especially in the context of developing countries. We have accepted the situation and we look forward to some regulatory guidelines soon." --- IPB5*

AI technology factors

Results demonstrated that AI governance requires different skills set. Upskilling becomes imperative if IT governance is to be realised in higher education. In this context, interviewees expressed that: - *"Understanding AI and AI governance is a complex phenomenon. Sometimes management views IT governance as adequate, we always try to discuss and convince them that AI governance is a different phenomenon that deserves attention from a different perspective. The autonomous nature of AI is different from our normal IT systems where data is controlled by humans. Now when you talk of AI there is machine, autonomous learning which is beyond the hand of a human being. That's where the issue becomes complex." ---IPB2.*

Another interview expressed that misconception around AI governance and failure to distinguish IT governance from AI governance limits the governance of AI systems within their institution. *AI and its impact on our systems is not yet fully comprehended. We haven't yet appreciated the capability of these AI applications, and what they can do. I can safely say we are still at the initial stages of enquiry on AI governance. A lot of work needs to be done." --- IPB1*

In a different response another interviewee alluded to the fact that AI governance hasn't been officially recognised especially in developing countries where regulations of technological innovations are always lagging. "*We haven't had a formal framework or standard that speaks to AI governance. So, we are customising our own controls that addresses certain AI risks. However, the absence of formal AI governance frameworks, standards and solutions makes it difficult for us to progress towards full readiness for its governance.*" ---IPV4

The study seeks to answer two research questions through interviews with IT and business decision makers in the higher education environment. The first research question probed the nature and scope of AI use in the university environment. The second question probed on the state of AI governance thereof. From the qualitative study, findings reveal that higher education institutions use AI elements in one way or the other in their administrative and academic information systems. Findings revealed that the proliferation of AI based systems in higher education is increasing as in healthcare (Trocin et al., 2021), policing (Rezende, 2020) and finance (Hua et al., 2019). Furthermore, findings agree with previous authors for example Sun and Medaglia (2019), Taeihagh (2021) and Wirtz et al. (2019) who separately reported that AI systems are being adopted by both private and public sector actors to improve process efficiency, decision speed, and quality, and ultimately progress their corporate goals more successfully.

However, despite AI risks having been highlighted by previous scholars (Dignum, 2020; Fumagalli et al., 2022; Arrieta et al., 2020), South African private higher institutions studied indicated that AI governance was non-existent, and efforts were in place to raise AI governance awareness. While public institutions get financial support to set up needed ICT structures and management support, they may not have adequate structures that are knowledgeable about AI governance, leading to minimal institutional AI governance implementation. However, it is evident from the interviews that AI governance has passed the awareness phase. The results suggest that public institutions exhibit better readiness for AI governance in comparison to private institutions. This points to some contradiction to the arguments reiterating that governance in public sector is more complex. The differences in AI governance readiness may be attributed to that public higher education institutions are research intensive, leading to better comprehension of global AI issues and developments. Meanwhile there is one public institution that indicated start of implementation of AI governance processes and mechanisms, the regulatory environment hasn't yet addressed AI governance unlike in developed countries. Jobin et al. (2019), reported that recognition of AI risks has driven for its regulation in Europe for example the AI Act in Europe (European Commission, 2021).

Being guided by the adapted TOE framework, the findings revealed that the South African external environment such as stakeholders, higher education governance and policy frameworks are still silent on AI governance. This finding agrees with Minkkinen, et al. (2022) whose study concluded that stakeholders' awareness of governance issues in corporates remains limited.

CONCLUSION AND IMPLICATIONS

This paper aimed at analysing the extent of AI use in higher education institutions in South Africa. In addition, the paper determined the state of readiness for AI governance by the higher education institutions studied. Contradictions and parallels relating to this paper and literature were debated. The discussions from this paper have contributed to the knowledge gap around AI governance in higher education in developing economies by highlighting the significance of AI governance, the level of AI governance readiness in higher education contexts. Artificial intelligence embedment in higher education's information systems is on the rise, leading to improved provision of higher education services. However, for its benefits, artificial intelligence brings with it risks that need to be governed. The study further recommends establishment of AI governance structures, processes and mechanisms. By improving AI governance maturity levels, higher education institutions can manage AI risks and ensure that AI aligns to university strategies. Future research may concentrate on barriers to AI governance implementation and maturity using a longitudinal study. Furthermore, future studies may extend to include other higher education institutions to determine if results hold across institutional contexts.

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