Chapter 3

Critical Considerations for Establishing a Link between Artificial Intelligence and Quality Assurance in Higher Education

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The history of AI is a history of fantasies, possibilities, demonstrations, and promise
(Buchanan 2005:53).

Introduction

AI (Artificial intelligence) has permeated the world and currently has an undeniable footprint in most areas of society. In relation to the HE (higher education) sector, AI is becoming a prominent feature. AI in HE is readily accessible through the use of 'intelligent tutoring systems, teaching robots, learning analytics dashboards, adaptive learning systems and human-computer interfaces' (Ishak & Jiang 2022:70). Pelletier, Robert, Muscanell, McCormack, Reeves, Arbino, and Grajek (2023:4) aptly highlight the impact that AI currently has on the globe and the need to consider it as a current trend in the HE sector. Huang, Saleh, and Liu (2021:206) similarly argue that it is indisputable that AI has infiltrated the education space. As modern science and technology progress, the advancement in AI has also progressed. Research indicates that AI, when applied to education, has resulted in positive effects which have aided toward teaching reform (Huang *et al*. 2021:206).

Two major areas which will be significantly impacted by AI in HE are curriculum offerings and enrolment areas (Dhawan & Batra 2020:13). Joshi, Rambola, and Churi (2021:2 of 13) further highlight that AI in education has drawn attention to the following:

- *Automation*: AI is beneficial in automating a number of tasks. These include assessment, classifying digital assets and schedules, and freeing up time for educators to interact with students as AI takes care of simple teaching tasks.
- *Acclimation*: In a digitally dominated world, AI will assist in equipping students with technological skills.
- *Integration*: An application to teach students is possible through the integration of AI solutions and other IT (information technology) initiatives such as intelligent technology.
- *Delineation*: AI can identify fundamental trends in education thereby directing stakeholders to make decisions about the curriculum which are topical and relevant in nature.

AI has gained traction in HE due to its ability to make a contribution by means of automating aspects of the teaching experience. Additionally, personalisation is a possibility through AI applications, as well as individualised feedback and identification of topics which require revision in class. This is made possible through the AI application detecting students' success in learning which is informed by identifying students' content knowledge and personal characteristics (Hinojo-Lucena, Aznar-Diaz, Caceres-Reche, & Romero-Rodriguez 2019:2). Aldosari (2020:147) explains that AI can make a contribution to education for all stakeholders: This is possible though managing the integration of a variety of types of human interaction and information and communication technology.

Amidst the pervasive presence of AI in HE, issues of the impact that AI will have on QA (quality assurance) in HE comes to the fore. QA refers to a mechanism to demonstrate that the practices in which IHEs (institutions of higher education) engage in are both professional and credible (Aluko, Krull, & Mhlanga 2022:7). Stanislav (2023:1056) cautions that AI could compromise

the core of HE and its mandate to create and disseminate knowledge in society. Dhawan and Batra (2020:15) further signal the use of AI as a technology which is fragile in nature thereby exposing universities to a range of risks and challenges. In this regard these authors argue that IHEs need to be cognisant of these potential risks so that they maintain the correct control of power.

Zawacki-Richter, Marín, Bond, and Gouverneur (2019:4) similarly highlights a number of risks and implications from an ethical perspective as AI continues to become more evident in HE. From the human resource space, HE staff (lecturers, tutors, student counsellors, and staff designated to the administrative space) may feel threatened by AI applications such as chatbots, online intelligent tutors, and other expert systems arguing that these commodities will replace them. Further, AI has the potential to accelerate the capabilities of learning analytics. However, systems of this nature require significant amounts of data which may include confidential information about staff and students thereby raising concerns from a privacy and data protection point of view. Bearman, Ryan, and Ajjawi (2023:370) state that AI is not just a matter for technological innovation but also represents a fundamental change in the relation between HE and broader socioeconomic interests. At this time of accelerated change, where the social shifts are as significant as the technological ones, IHEs need to set strong policies and research agendas that attend to AI and take account of ethical implications (Bearman *et al.* 2023:370).

In 2020, Aldosari (2020:147) has highlighted expectancies about what life would be like in 2024 with specific reference to educational technology development. These refer to pedagogy, learning approaches and models, and approaches to make these easier. With reference to the expectancies Aldosari (2020:147) highlights that the realities in 2024 would match these expectancies with AI being a notable technological development. In this context, the question arises as to whether institutions are ready for this type of unprecedented change. As such it becomes incumbent for IHEs to interrogate the use of existing technology as well as become deliberate about the implementation of new technologies, which will create the opportunity for increased teaching and learning opportunities which are flexible in nature

(Pelletier *et al.* 2023:10). This must be considered within the context of leveraging new technologies whilst assuring quality.

This chapter serves as vantage point to establish the use of AI in HE, consider the opportunities and challenges for using AI in HE, and most importantly establish a link between AI and QA.

Approach Used for this Study

An approach adopted by Grassini (2023) is followed in this study, starting with the main research question of this study which is: *What is the link between AI and QA*? This research question was explored primarily through published literature. Google scholar was used as the primary search engine using the search strings 'artificial intelligence,' 'higher education,' and 'challenges and opportunities.' The literature was surveyed in a nonsystematic manner.

The years from 2019 to 2023 were included to represent a five year period, which is current and relevant in nature. The initial articles were surveyed and starting points with the snowball method were used to find additional articles. Additional articles were, for example, identified from the reference lists of the selected articles. This chapter uses the articles as informants for exploring the main research question. In the next section the definition of AI is explored to gain a better understanding of the term.

What is Artificial Intelligence?

'AI' is a term which dates back to the 1950s. It arose from the work of scientists who explored the idea of AI. Seminal developments include the creation of an AI programme referred to as ELIZA as noted by King (2023:2). This programme was made to copy human speech. As the time periods advanced so did AI developments parallel to the time periods. Later years saw the development of more advanced chatbots and other AI applications which had the potential to respond to and comprehend requests which were complex in nature (King 2023:2; Crompton & Burke 2023:2).

Buchanan (2005:54) explains that AI goes beyond robots and should be understood from the perspective of grasping the nature of intellectual thinking and behaviour using computers as experimental devices. During its determining years, AI was influenced by a number of disciplines (Buchanan 2005:56) including engineering, biology, experimental psychology, philosophy, mathematics, statistics, and linguistics. Buchanan (2005:56) highlights that a seminal paper published in 1950 by Turing in the philosophy journal *Mind*, acts as a turning point in the history of AI. Turing's paper sets a seminal discourse about the prospect of programming a computer to behave intelligently. Initial programmes in AI were limited by the technology of the time, nonetheless they demonstrated an impressive ability in answering problems that only people had been able to previously answer (Buchanan 2005:57).

There is a plethora of definitions for the term 'AI.' Kelly, Kaye, and Oviedo-Trespalacios (2023:2 of 33) highlight that providing a definition for AI at an academic, government, and community level poses a challenge. AI is a significantly contested concept and there has not been much consensus regarding its definition in the different fields in which it is used (Kelly *et al.* 2023:2 of 33). For the purposes of this chapter a few selected definitions are discussed below.

Kengam (2020) describes AI as a computer-based technology which has the ability to offer personalised, adaptive, and insightful educational experiences. The description of AI as put forward by Ocana-Fernandez, Valenzuel-Fernandez, & Garro-Aburto (2019:557) assume AI to be related to the design of intelligent systems which display the characteristics associated with human intelligence. Jain & Jain (2019:145) claim that AI is the impersonation of human comprehension and virtual decision making by robots and machines.

According to Chen, Chen, and Lin (2020:75265), AI is associated with a supercomputer which has in nature a massive processing potential. Functions which this supercomputer can execute, include adaptive behaviour whereby the inclusion of sensors and a range of capabilities provide the AI ability to mimic

humanlike thinking. Hinojo-Lucena *et al.* (2019:2) opines that AI is a technology which is aimed at the construction of computer systems. These computer systems display smart and adaptive behaviours with the capability to acquire information from their environments mimicking what humans can do. The ability of computers to behave in a similar manner as the human brain for the improvement of the world is the description brought forward by Dhawan and Batra (2020:12). Aldosari (2020:145) outlines that AI is a distinct and current application of information systems which has a vested interest in unpacking and understanding human intelligence and replications to create the current generation of smart computers. These smart computers require a significant degree of ability to accomplish tasks which require inference, deduction, and perception.

While the latter cited authors offer different descriptions of AI the overriding commonalties which emanate from these definitions is that AI denotes the use of computers to simulate human thinking. Figure 3.1 helps to demonstrate this.

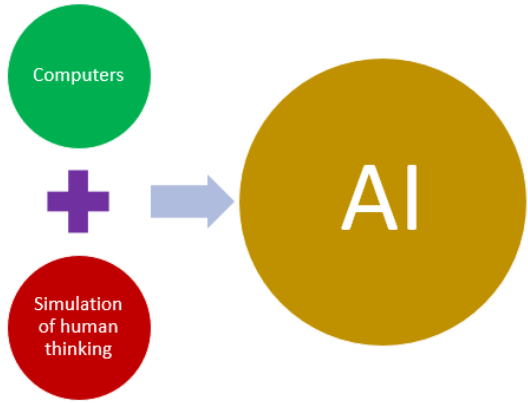

Figure 3.1: Artificial intelligence defined. (Source: Personal archive)

According to Kaul, Enslin, and Gross (2020:808), there are four different subfields of AI which can be distinguished:

- *Machine learning* relates to the identification of patterns and analysis. Machines have the capability to improve with experience from provided data sets.
- *Deep learning* is made up of multi-layer neural networks which provide the ability for machines to learn and make independent decisions.
- *Natural language processing* involves a process whereby computers are able to take data from human language and make a decision based on the data.
- *Computer vision* consists of images and videos which are used for a computer to gain comprehension and information.

While it is important to delineate the different subfields of AI, this chapter will not focus on a specific subfield but instead on AI in its general context.

How AI is used in Higher Education

To establish the manner in which AI is used in HE the work of Crompton and Burke (2023) is referred to. These authors have conducted a systematic review of AI in HE from 2016 to 2022. A summary of their findings highlight five areas for the use of AI in HE, which will be discussed in the sections below.

Assessment/Evaluation

Crompton and Burke (2023:14) highlight that AI is used in various ways for assessment in HE. These include automatic assessments like the use of assessment of subjective questions, grading of thesis statements, essay grading, and critique of free text. AI applications are also used to create assessments of varying types. Feedback on a group and personalised level is also facilitated through AI. The reviewing of online activities is also cited in terms of AI applications being used to review student interactions, reflections, and community identity among others. Finally, the evaluation of educational resources is also cited by Cromptom and Burke (2023:14) in terms of AI applications having been used to evaluate textbooks and educational resources.

Predicting

Predicting in terms of HE data proved to be an affordance made possible through the use of AI. Crompton and Burke (2023:15) assert that HE data are utilised in the AI space through making predictions regarding academic performance, dropout, and at risk students, satisfaction, career decisions, and the future of HE among other types of data.

AI Assistant

Crompton and Burke (2023:16) highlight that AI assistants are used in HE to offer students assistance in different mediums e.g., chatbots, virtual assistants, and learning agents. These assistants offer an array of support which include offering students out of class support, scaffolding, answering of questions, and student outreach, to mention a few.

Intelligent Tutoring Systems

ITSs (intelligent tutoring systems) refer to systems that entail the use of educational methods and AI techniques. Within an ITS personalisation is possible as the system adapts activities and strategies based on the individual student needs (Crompton & Burke 2023:16). In large classes where the instructor may experience a challenge in keeping up with the volume and pace of student queries, ITSs may be useful in responding to students and providing immediate feedback and instruction (Crompton & Burke 2023:17).

Managing Student Learning

Crompton and Burke (2023:17) explain that university staff members access AI to manage student learning. In this regard AI could be utilised to analyse the effect of teaching, to cluster students, to sequence the curriculum, to profile personalities, and a range of other facets related to managing student learning. Figure 3.2 summarises the use of AI in HE as described by Crompton and Burke (2023).

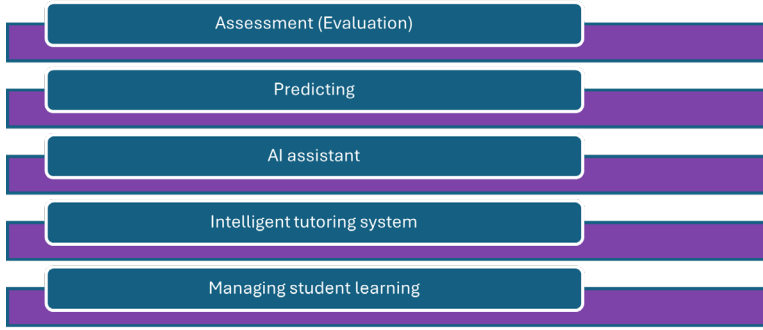

Figure 3.2: Use of AI in HE. (Adapted from Crompton & Burke 2023:14-17 of 22)

From the information above we can conclude that there is a definite potential for the use of AI in HE. The sections below look further into the opportunities and challenges for the use of AI in HE.

Opportunities for the Use of AI in HE

The literature (cf. Grassini 2023; Pelletier *et al.* 2023; Dhawan & Batra 2023) presents an array of opportunities for the use of AI in HE. Grassini (2023:3 of 13) highlights that Gen-AI (generative artificial intelligence), for example ChatGPT (chat generative pre-trained transformer), offers the advantage of creating lesson plans and presentations which engage recipients and a range of educational resources. New and innovative teaching methods are also an added opportunity as educators will have more support available through AI thereby creating time and space for more engaging teaching resources and environments. Additionally, Kengam (2020), as well as Chatterjee and Bhattacharjee (2020:3444) present the aspect of customisation in the learning space. In this regard learning environments can be tailored to suit the individual learning needs of students. Regarding assessment, automated grading alleviates the workload of the educator thereby creating space for them to utilise the saved time on the development of students.

ITSs, which facilitate the process of using automated tutors to teach different disciplines and human NLP (natural language processing) systems are examples of AI in HE which have had positive impacts. Ocana-Fernandez *et al*. (2019:562) highlight that these systems create an opportunity for diverse classrooms with the potential to individualise the learning experience. Pelletier *et al*. (2023:10) further discuss the impact of AI on HE. In this regard, AI can assist the educator with the creation of teaching content and automated grading. This creates the opportunity for educators to have additional time to focus on higher order pedagogical tasks thereby creating new knowledge for their students. The use of avatars and the metaverse for example, also creates engaging opportunities and personalisation for students. With the help of AI universities around the world are enrolling an increased number of students due to an increased flexibility and speed (Jain & Jain 2019:146).

Customisation of the learning experience as discussed by Dhawan and Batra (2020:17) is possible through AI, where a 'one-size-fits-all' approach can be altered to suit the needs of each individual student. Owing to the range of factors that influence learning, some of which include the knowledge that the student brings to the learning encounter, the rate at which students learn and absorb knowledge, and cultural views, AI can serve as a mechanism to accommodate different learning styles. Dhawan and Batra (2020:17) provide the example of *emotion AI*, which makes it possible to study behaviour which is non-verbal in nature. *Emotion AI* has the ability to respond to cues such as fear, happiness, and anger and deliver lessons and establish how engaged students are in the lesson. AI can further equip students with 'tech-savvy' skills necessary for the working environment.

Virtual assistants can be of great benefit in terms of responding to student queries. Additionally, virtual assistants can help with the enrolment, monitoring drop-out rates and retention, and prompting university staff to intervene accordingly. From a research perspective AI can be useful in managing structured and unstructured data, processing data, and suggesting new models with the potential to revise research practices in disciplines which are traditionally defined. AI can additionally assist administrators

in education regarding decision-making in terms of the development of courses, pedagogical design, and transformation in the academic space (Ouyang, Zheng, & Jiao 2022:7895).

Kuleto, Ilić, Dumangiu, Ranković, Martins, Păun, & Mihoreanu (2021:7 of 16) highlight that AI can offer IHEs a number of benefits. Key processes such as student enrolment, curriculum planning, the creation and offering of personalised lessons, and mitigating high dropout numbers can be assisted *via* AI. As these processes can be challenging to manage, IHEs may consider using AI to manage them. Specifically learning analytics can unearth student data for the management of these processes. Chatbots and virtual tutor assistants can also assist. Repetitive tasks which are time consuming in nature can also be supported by AI, thereby offering an improved learning experience (Kuleto *et al.* 2021:7 of 16). AI is further beneficial in the curriculum space enabling personalised learning experiences through the use of virtual reality and robotics, among others.

AI has the ability to provide instruction, guidance, and feedback which are prompt in nature. In this manner time delays are avoided and unlike humans who may become tired due to large volumes, this will not present a challenge to AI (Crompton & Burke 2023:17). Table 3.1 below summarises the opportunities for the use of AI in HE.

Table 3.1: Summary of opportunities for the use of AI in HE

Author	**Key Opportunity**
Grassini (2023)	Lesson plans. Presentations. Educational resources. Innovative teaching methods.
Kengam (2020); Chatterjee and Batacharjee (2020)	Customisation. Individual learning needs. Automated grading. Additional instructional time.
Ocana-Fernandez *et al.* (2019)	Individual learning experience.

Author	Key Opportunity
Pelletier *et al.* (2023)	Creation of teaching content. Automated grading. Added instructional time equals additional time for higher order thinking. Personalised learning.
Jain and Jain (2019)	Increased student enrolment.
Dhawan & Batra (2020)	Customisation of learning experience. Accommodation of different learning styles. Equip student with 'tech-savvy' skills.
Ouyang *et al.* (2022)	Virtual assistants respond to student queries, assist with student enrolment, monitor dropout rates, and retention. Managing research. Assist in decision making, development of courses, pedagogical design, and transformation.
Kuleto *et al.* (2021)	Student enrolment. Curriculum planning. Personalised lessons/learning. experience. Mitigating high dropout rate. Chatbots and virtual tutor assistants.
Crompton and Burke (2023)	Instructional guidance. Prompt feedback provided to students. Respond to queries on a mass scale.

Challenges for the Use of AI in Higher Education

The progression in AI has raised 'deliberations around academic integrity, accuracy, fairness and equity' (Pelletier *et al.* 2023:10) in the HE space. Further concern has been highlighted in terms of whether AI supplies output which is accurate and unbiased in nature. Outputs for example could refer to automated grading which can be questioned in terms of its accuracy. Developments in Gen-AI (e.g., ChatGP) are designed to generate answers for students. This automated generation of answers threatens the potential for students to meet learning aims of the module as they do not engage in the formulation of their own answers (Stanislav 2023:1057) and higher order thinking skills.

Concerns of ethics is also associated with the use of AI. In the HE space, the behaviour of all stakeholders is regulated and underpinned by ethics. This includes teaching, development of assessments, marking, and the manner in which students and staff interact and communicate with others. AI could pose a challenge to ethical behaviour in terms of thinking on behalf of the human being. Engaging in critical thinking and the ability for students to be innovative has a distinct link to economic and social effects as well as the ability of IHEs to compete with their counterparts (Stanislav 2023:1057).

Huang *et al.* (2021:212) highlight that in developing countries the use of new technologies can exacerbate a division between people. Basic infrastructure and technology must be in place for AI to provide equal opportunities for all to mitigate a situation where the digital divide is widened. Issues of safety and ethics also become a challenge in the AI space when data are collected, used, and shared. AI applications require of educators to master digital skills as the programmes which offer teaching and learning are built on applications which do require a range of digital literacy skills. The deterioration of students' social and communication skills also poses a challenge in the AI environment. If students primarily communicate via machines, a lesser requirement of human communication is needed. As such, AI therefore poses a challenge in terms of communication skills (Huang *et al.* 2021:213). Hutson, Jeevanjee, Vander Graaf, Lively, Weber, Weir, Arnone, Carnes, Vosevich, Plate, and Leary (2022:3969) highlights alarming ethical concerns for the use of AI in education, with bias and privacy noted as the most prominent AI concerns.

Ouyang *et al.* (2022:7908-7909) narrate that AI faces a number of challenges in the education space. Questions regarding how to meet the learning needs of students, what to provide to them, and the mechanism to provide them with the correct degree of agency are some of the challenges facing AI. A range of systematic reviews indicate a common challenge in terms of the use of AI in education. This common challenge depicts a lack of a link between AI practices and implementation, and theoretical frames of reference (Ouyang *et al.* 2022:7908-7909).

A summary of the challenges for AI in HE is highlighted in Table 3.2.

Table 3.2: Summary of challenges for the use of AI in HE

Author	Key Challenge
Pelletier *et al.* (2023)	Academic integrity. Accuracy. Fairness. Equity.
Stanislav (2023)	Accurate unbiased output. Generation of automated answers. A lack of higher order thinking skills. Concern regarding ethics. Thinking on behalf of humans. A lack of thinking among students could impact IHEs' competitiveness.
Huang *et al.* (2021)	Widening of digital divide in developing countries. Requirement for educators to have digital skills. Deterioration of student communication skills.
Hutson *et al.* (2022)	Ethics: Privacy and bias.
Ouyang *et al.* (2022)	What to provide to students. How to provide resources to students. Providing students with the appropriate degree of agency. A break in the link between AI and theoretical frames of reference.

Establishing the Link between AI and QA

To establish a possible link between AI and QA the work of Mohee (2019) is referred to. Mohee (2019) highlights that QA within the HE space needs to factor in the following: Programme design, learner support systems, materials development, student assessment, infrastructure, and facilities. The author of this chapter uses Mohee's factors of consideration and relates them to the opportunities and challenges of AI (as highlighted in Tables 3.1 and 3.2). Both these tables are used as a point of reference to establish the possible link between AI and QA.

Table 3.3 presents the key QA factors as highlighted by Mohee (2019) and the possible link they have to the key opportunities as highlighted in Table3. 1.

Table 3.3: Establishing the link between AI opportunities and quality assurance factors

Author	Key opportunity	Link to Mohee's QA factors
Grassini (2023)	Lesson plans. Presentations. Educational resources. Innovative teaching methods.	Programme design. Learner support systems. Materials development. Student assessment.
Kengam (2020) and Chatterjee and Batacharjee (2020)	Customisation. Individual learning needs. Automated grading. Additional instructional time.	Programme design. Learner support systems. Student assessment.
Ocana-Fernandez *et al.* (2019)	Individual learning experience.	Learner support systems.
Pelletier *et al.* (2023)	Creation of teaching content. Automated grading. Added instructional time. Additional time for higher order thinking. Personalised learning.	Programme design. Learner support systems. Materials development.
Jain and Jain (2019)	Increased student enrolment.	Infrastructure and facilities.
Dhawan and Batra (2020)	Customisation of learning experience. Accommodation of different learning styles. Equip student with 'tech-savvy' skills.	Student support systems.

Author	Key opportunity	Link to Mohee's QA factors
Ouyang *et al.* (2022)	Virtual assistants respond to student queries, assist with student enrolment, monitor drop-out rates and retention. Managing research. Assist in decision making. Development of courses, pedagogical design, and transformation.	Infrastructure and facilities. Programme design. Student support systems. Materials development.
Kuleto *et al.* (2021)	Student enrolment. Curriculum planning. Personalised lessons/ learning experience. Mitigating high dropout. Chatbots and virtual tutor assistants.	Infrastructure and facilities. Programme design. Materials developments. Student support systems.
Crompton and Burke (2023)	Instructional guidance. Prompt feedback provided to students. Respond to queries on a mass scale.	Student support systems. Student assessment. Infrastructure and facilities.

Table 3.4 presents the key QA factors as highlighted by Mohee (2019) and the possible link they have to the key challenges as highlighted in Table 3.2.

Table 3.4: Establishing the link between AI challenges and quality assurance factors

Author	Key challenge	Link to Mohee's QA factors
Pelletier *et al.* (2023)	Academic integrity. Accuracy. Fairness. Equity.	Student assessment.

Author	Key challenge	Link to Mohee's QA factors
Stanislav (2023)	Accurate unbiased output (automated grading). Generation of automated answers. A lack of higher order thinking skills. Concern regarding ethics. Thinking on behalf of humans. A lack of thinking from students could impact IHEs' competitiveness.	Student assessment. Programme design. Student support systems. Materials development. Infrastructure and facilities.
Huang *et al.* (2021)	Widening of digital divide in developing countries. Requirement for educators to have digital skills. Deterioration of student communication skills.	Infrastructure and facilities. Programme design.
Hutson *et al.* (2022)	Ethics: Privacy and bias.	Infrastructure and facilities.
Ouyang *et al.* (2022)	What to provide to students. How to provide resources to students. Providing students with the appropriate degree of agency. A lack in the link between AI and theoretical frames of reference.	Programme design. Infrastructure and facilities.

An evaluation of Tables 3.3 and 3.4 highlights that each of Mohee's factors (i.e., programme design, student support systems, materials development, student assessment, infrastructure, and facilities) features across the cited AI opportunities and challenges. This implies that the opportunities presented by AI can have a positive impact on QA.

Lesson plans, presentations, educational resources, and innovative teaching methods as cited by Grassini (2023) link

to programme design, student support systems, materials development, and student assessment. In this regard AI opportunities could have a positive impact on QA in terms of programme design, student support systems, materials development, and student assessment. Kengam (2020), as well as Chatterjee and Batacharjee (2020:3444) highlight customisation, individual learning needs, automated grading, and additional instructional time as AI opportunities. These in turn link to programme design, student support systems, and student assessment QA factors implying a positive impact in this regard. Individual learning experiences (Ocana-Fernandez *et al.* 2019:555) have a direct link to student support systems, while the creation of teaching content, automated grading, added instructional time, and personalised learning (Pelletier *et al.* 2023:10) can contribute positively to the QA factors of programme design, student support systems and materials development. Increased student enrolment (Jain & Jain 2019:146) is a positive QA factor made possible through infrastructure and facilities.

The customisation of the learning experience, accommodation of different learning styles, and equipping students with 'tech-savvy' skills link to the QA factor of student support systems, indicating a positive connection in this regard. Virtual assistants by way of responding to student queries, assisting with student enrolment, monitoring dropout rates and retention, managing research, and assisting in decision making through the development of courses as well as pedagogical design and transformation (Ouyang *et al* 2022:7895), have a direct link and positive contribution to the QA factors of infrastructure and facilities, programme design, learner support systems, and materials development.

Student enrolment, curriculum planning, personalised lessons/learning experience, mitigating a high dropout rate and the use of chatbots and virtual tutor assistants (Kuleto *et al.* 2021:7 of 16) on the other hand link to and have a positive impact on the QA factors of infrastructure and facilities, programme design, student support systems, and materials development. Finally, instructional guidance, feedback promptly provided to students, and responding to queries on a mass scale (Crompton & Burke

2023:17) positively influence the QA factors of student support systems, student assessment, and infrastructure and facilities.

Evaluating the link between Mohee's QA factors and the key AI challenges it appears that academic integrity, accuracy, fairness, and equity (Pelletier *et al.* 2023:10) could negatively influence student assessment in the HE space. Further accurate unbiased output (automated grading), the generation of automated answers, a lack of higher order thinking skills, concerns regarding ethics, thinking on behalf of humans, and a lack of thinking from students (Stanislav 2023:1057) could impact IHEs' competitiveness and have a negative effect on the QA factors of student assessment, programme design, student support systems, materials development, and infrastructure and facilities. A widening of the digital divide in developing countries, the requirement for educators to have digital skills, and a deterioration of student communication skills (Huang *et al.* 2021:212) are linked to the QA factors of infrastructure, facilities, and programme design. This implies that if there is not a proper infrastructure and facilities in place AI could widen the digital divide in developing countries, additionally a deterioration of student communication skills could negatively impact programme design.

Hutson *et al.* (2022) raise the challenge of ethics with specific reference to privacy and bias. If IHEs do not have competent infrastructures and facilities in place, ethics could be compromised.

Lastly, an AI application needs to make decisions in terms of what to provide to students, how to provide resources to them, and providing them with the appropriate degree of agency. If these decisions are not appropriately taken QA factors of programme design could be negatively impacted.

The discussions above provide an evaluation of the link between AI and QA from both a positive and negative lens. In terms of impact the positive links between AI opportunities and QA as highlighted above could then positively influence the QA factors mentioned. On the other hand, the negative links

between AI challenges and QA factors, as highlighted could impact negatively on QA factors as demonstrated in the discussion above.

What this implies is that IHEs need to carefully look at the challenges and opportunities that AI offers. Where AI opportunities can improve QA factors these must be carefully implemented. Conversely the challenges that AI presents should be carefully studied and strategies should be developed to mitigate these challenges from impacted negatively on QA factors.

Conclusion

This chapter aimed at establishing a link between AI and QA. To achieve this an introduction to AI was first offered. This was followed by attempting to define AI albeit the literature highlighted that there are various definitions for AI. Ultimately this chapter offered a definition for AI which refers to the simulation of human thinking through the use of computers. Next the use of AI in HE was discussed. This highlighted assessment (evaluation), AI assistance, intelligent tutoring systems, and managing student learning as key uses for AI in HE.

Following this the opportunities and challenges for the use of AI were presented. Key opportunities demonstrated are innovative teaching methods, customisation, automated grading, added instructional time, personalised learning, virtual assistants, and increased enrolment, among others.

The challenges for the use of AI in HE followed next which highlighted some of the following: Academic integrity, generation of automated answers, concerns regarding ethics, widening of the digital divide in developing countries, issues of privacy and bias, and a lack of connection between AI and theoretical frames of reference, to mention a few.

Lastly, a possible link between AI and QA factors was established. Quality assurance factors featured across both the cited challenges and opportunities. From this discussion it was highlighted that the opportunities AI presents link to QA factors and can improve QA factors. On the other hand, there was also a link between the challenges provided and QA factors. However,

it came to light that for QA factors not to be compromised the challenges presented by AI must be carefully mitigated.

As universities continue to traverse the changing HE landscape and specifically the pervasive nature of AI in HE, there must be constant reflection about strategies to best leverage the influx of persistent change associated with the HE landscape.

References

Aldosari, SA. 2020. The future of higher education in the light of artificial intelligence transformations. *International Journal of Higher Education* 9(3):145-151. https://doi.org/10.5430/ijhe.v9n3p145

Aluko, R., Krull, G., & Mhlanga, E. 2022. Shaping open, distance and e-learning in post school education and training: A call for a revised agenda. *Perspectives in Education* 40(1):1-17. https://doi.org/10.18820/2519593X/pie.v40.i1.1

Bearman, M., Ryan, J., & Ajjawi, R. 2023. Discourses of artificial intelligence in higher education: A critical literature review. *Higher Education* 86:369-385. https://doi.org/10.1007/s10734-022-00937-2

Buchanan, BG. 2005. A (very) brief history of artificial intelligence. *AI Magazine* 26(4):53-60. https://doi.org/10.1609/aimag.v26i4.1848

Chatterjee, S. & Bhattacharjee, KK. 2020. Adoption of artificial intelligence in higher education: A quantitative analysis using structural equation modelling. *Education and Information Technologies* 25:3443-3463. https://doi.org/10.1007/s10639-020-10159-7

Chen, L., Chen, P., & Lin, Z. 2020. Artificial intelligence in education: A review. *IEEE Access* 20:75264-75278. https://doi.org/10.1109/ACCESS.2020.2988510

Crompton, H., & Burke, D. 2023. Artificial intelligence in higher education: The state of the field. *International Journal of Educational Technology in Higher Education* 20:1-22. https://doi.org/10.1186/s41239-023-00392-8

Dhawan, S. & Batra, G. 2020. Artificial intelligence in higher education: Promises, perils, and perspective. *OJAZ Expanding Knowledge Horizon* 11:11-22.

Grassini, S. 2023. Shaping the future of education: Exploring the potential and consequences of AI and ChatGPT in educational settings. *Education Sciences* 13(7). 692. 13 pages. http://dx.doi.org/10.3390/educsci13070692

Huang, J., Saleh, S., & Liu, Y. 2021. A review on artificial intelligence in education. *Academic Journal of Interdisciplinary Studies* 10(3):206-217. https://doi.org/10.36941/ajis-2021-0077

Hinojo-Lucena, FJ., Aznar-Diaz, I., Caceres-Reche, MP., & Romero-Rodriguez, JM. 2019. Artificial intelligence in higher education: A bibliometric study on its impact in the scientific literature. *Education Sciences* 9(1):2-9. https://doi.org/10.3390/educsci9010051

Hutson, J., Jeevanjee, T., Vander Graaf, V., Lively, J., Weber, J., Weir, G., Arnone, K., Carnes, G., Vosevich, K., Plate, D., & Leary, M. 2022. Artificial intelligence and the disruption of higher education: Strategies for integrations across disciplines. *Creative Education* 13(12):3953-3980. https://doi.org/10.4236/ce.2022.1312253

Ishak, NA. & Jiang, CX. 2022. Research on the influence of artificial intelligence technology on the formulation of educational strategies. *International Journal of Intelligent Systems and Applications in Engineering* 10(2s):70-75.

Jain, S. & Jain, R. 2019. Role of artificial intelligence in higher education – an empirical investigation. *International Journal of Research and Analytical Views* 6(2):144-150.

Joshi, S., Rambola, RK., & Churi, P. 2021. Evaluating artificial intelligence in education for next generation. *Journal of Physics: Conference Series*. 1714 012039. 13 pages. https://doi.org/10.1088/1742-6596/1714/1/012039

Kaul, V., Enslin, S., & Gross, SA. 2020. History of artificial intelligence. *Medicine Gastrointestinal Endoscopy* 92(4):807-812. https://doi.org/10.1016/j.gie.2020.06.040

Kelly, S., Kaye, S-A., & Oviedo-Trespalacios, O. 2023. What factors contribute to the acceptance of artificial intelligence? A systematic review. *Telematics and Informatics* 77. 101925. 33 pages. https://doi.org/10.1016/j.tele.2022.101925

Kengam, J. 2020. Artificial intelligence in education. Available at: https://www.researchgate.net/publication/347448363_ARTIFICIAL_INTELLIGENCE_IN_EDUCATION. (Accessed on 23 January 2024).

King, MR. 2023. A conversation on artificial intelligence, chatbots, and plagiarism in higher education. *Cellular and Molecular Bioengineering* 16:1-2. https://doi.org/10.1007/s12195-022-00754-8

Kuleto, V., Ilić, M., Dumangiu, M., Ranković, M., Martins, OMD., Păun, D., & Mihoreanu, L. 2021. Exploring opportunities and challenges of artificial intelligence and machine learning in higher education institutions. *Sustainability* 13(18). 10424. 16 pages. https://doi.org/10.3390/su131810424

Mohee, R. 2019. Quality assurance: Good practices in ODL in Sub-Saharan Africa. Available at: http://hdl.handle.net/11599/3132. (Accessed on 14 April 2023).

Ocana-Fernandez, Y., Valenzuel-Fernandez, L., & Garro-Aburto, L. 2019. Artificial intelligence and its implications in higher education. *Propósitos y Representaciones* 7(2):536-568. https://doi.org/10.20511/pyr2019.v7n2.274

Ouyang, F., Zheng, L., & Jiao, P. 2022. Artificial intelligence in online higher education: A systematic review of empirical research from 2011 to 2020. *Education and Information Technologies* 27:7893-7925. https://doi.org/10.1007/s10639-022-10925-9

Pelletier, K., Robert, J., Muscanell, N., McCormack, M., Reeves, J., Arbino, N., & Grajek, S. 2023. *EDUCAUSE Horizon Report: Teaching and learning edition*. Boulder: EDUCAUSE.

Stanislav, I. 2023. The dark side of artificial intelligence in higher education. *The Service Industries Journal* 43(15/16):1055-1082. https://doi.org/10.1080/02642069.2023.2258799

Zawacki-Richter, O., Marín, VI., Bond, M., & Gouverneur, F. 2019. Systematic review of research on artificial intelligence applications in higher education – where are the educators? *International Journal of Educational Technology in Higher Education* 16(1):1-27. https://doi.org/10.1186/s41239-019-0171-0