

Exploring how values are embedded in technology, and its influence on society: A study of the post-school education and training sector in South Africa

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Abstract

Technology is advancing rapidly towards the point of technological singularity, beyond which machines will outsmart humans. However, technology's embedded values designed to influence society, raise ethical concerns and spark calls for greater transparency around what and whose values are embedded; and how to protect data that technology collect and use.

This study explored how values embedded in technology are selected and influence society, within the South African post-school education and training (PSET) sector. Furthermore, what influences the choice of values; who selects them; and once selected, could they be changed? The answers to these questions are important to capacitate society to make informed decisions about how to engage with technology.

The research followed a social constructivist ontology and interpretivist epistemology research paradigm, with an inductive approach to theory development using a qualitative research method. Sixteen PSET eLearning managers and specialists chosen through purposive sampling, participated in this cross-sectional study, using an interview protocol with semi-structured interview questions. Data was analysed using qualitative content thematic analysis.

The PSET sector uses technologies in teaching and learning. This study proposed student-centric evaluation criteria for selecting technology platforms, and found that institutions are transparent about stakeholders they consult. Once values are embedded in technology, they can be changed. However, it is not clear who makes the final decision about which values to select. Data security can be improved, and although PSET institutions collect big data, data is under-utilised. This study further found that society benefits from using technology for instantaneous access to information. Embedded values build 21st century skills for the workplace, but technology's negative influences should not be ignored. This study also contributes a conceptual framework linking values, technology and society, which is a first-of-its-kind in this sector.

This study provides several insights and highlights areas for further research that educators, governments, businesses and researchers may find useful. The study was restricted to the PSET sector in South Africa, and excluded participants from other countries and sectors. While the research covered technology's influence on society, the reverse relationship (society's influence on technology) fell outside its scope, and is therefore a gap for future research.

Key words

Values; technology; student-centric; transparency; eLearning

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Philosophy in Business Management, specialising in Corporate Strategy, at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

25 November 2024

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Chapter 1: Introduction

1.1 Introduction

Technology has advanced to the point of it developing and improving itself through machine learning (Bednar & Welch, 2020), and all sectors of society and business can no longer afford to ignore the possibilities that technology presents. Humans are quickly adapting their behaviour to embrace the opportunities presented by evolving technologies (Grewal et al., 2021), and soon, humans and technology will unite the powers of “human intelligence working in tandem with cognitive computing” to develop more advanced products and service offerings (Bednar & Welch, 2020, p.288) and new business opportunities (Haesevoets et al., 2021). Currently, there are no educational theories or models in the field of AI-driven e-learning, and most research focus on studying phenomena like using AI for assessments and to improve student journeys (Zawacki-Richter et al., 2019; Zhang & Aslan, 2021) .

The benefits of technology point towards a bright future filled with opportunities (Bednar & Welch, 2020) such as improving efficiencies in the workplace, and enhancing the student’s learning experience through virtual reality and simulations (Doğan & Şahin, 2024; Zawacki-Richter et al., 2019) ; however, they may have blinded business leaders to its potential risks such as using personal data for targeted marketing (den Hond & Moser, 2023) , technology addiction (Busalim et al., 2019) , mental health issues (Crawford et al., 2024) , and spreading misinformation (Gimpel et al., 2021; Unfried & Priebe, 2024) .

Technology has embedded values (Klenk, 2021; van de Poel, 2020) that sways society’s thoughts and behaviours in a particular direction (den Hond & Moser, 2023). These embedded values are not public knowledge, which puts society at risk as they are unaware of what the implications of their use of technology might be (Heyndels, 2023; Klenk, 2021; van de Poel, 2020) .

This research study answers the conceptual question: How are the values that are embedded in technology selected, and how does it influence society? Even though this question was posed in a business setting (den Hond & Moser, 2023) , this research study will answer the question using the research setting of the post-school education and training in South Africa.

1.2 Background to the research problem

Technology is our future, with the 5th Industrial Revolution (5IR), artificial intelligence (AI) and digital disruptive technologies at the forefront of business innovation (Bednar & Welch, 2020; Chhillar & Aguilera, 2022; Figueroa-Armijos et al., 2023) . Since the turn of the century, technology has advanced exponentially to produce technology with the capacity to out-

perform humans (Vesa & Tienari, 2022). In recent years, technology has revolutionised retail shopping, bringing business, technology and society together (Noble et al., 2022). Disruptive technologies have brought about greater efficiencies and innovations by introducing new products and services, that impact society's lifestyle and behaviours, and sometimes create services for public good (Audretsch et al., 2019).

Innovative business strategy drives technological innovation (Ringberg et al., 2019). At the heart of technological innovation is datafication, which is collecting and assimilating enormous amounts of data that allow for personalised targeting, thus creating business competitive advantage and the potential for greater profits (Noble et al., 2022). The act of collecting an individual's data highlights ethical concerns about data privacy, consent and the lack of transparency in the data collection process (Flyverbom et al., 2019). Large amounts of data (big data) are also collected in the education sector, and this research considers how this data is protected and used, while preserving data privacy.

Technology has embedded values (Klenk, 2021; van de Poel, 2020) intended to sway society towards a particular way of thinking and behaving, to achieve a particular outcome (den Hond & Moser, 2023). These embedded values are known only to developers and owners of this technology, which puts society at risk as technology may be used differently from its original design intent, resulting in unpredictable and unexpected outcomes (Heyndels, 2023; Klenk, 2021; van de Poel, 2020). With the rapid advancement of technology, businesses may overlook or ignore these risks (den Hond & Moser, 2023). As AI technology evolves and becomes intertwined with society, questions arise about businesses' responsibility for greater transparency about the ethics and values embedded in technology during its design phase of development (den Hond & Moser, 2023; Martin et al., 2019).

The collection of personal data, with or without an individual's consent, is used, not only to influence society's buying habits, but also their social and political views (Martin et al., 2019). Algorithms embedded in machine learning technology, can make biased and discriminatory decisions (Martin et al., 2019). Businesses must therefore be accountable for their technologies in their interactions with society; for the personal information collected from individuals; and for the outcomes of the values embedded in these technologies (Vesa & Tienari, 2022). With the growing importance of technology in business and society, research into whose values is being promoted, and technology's influence on society are burning issues (den Hond & Moser, 2023; Heyndels, 2023; van de Poel, 2020). This research explores these issues in the context of the post-school education and training sector in South Africa.

1.3 Definition of the research problem

Global concern over new technologies that are rapidly penetrating all sectors of business and society, has led to the passing of UNESCO's "Recommendation on the ethics of artificial intelligence" by 193 member countries on 23 November 2021 (UNESCO, 2024, p.5) . UNESCO is concerned about the effect that AI and technology have on democracy and human rights. Also, UNESCO (2024) argues that most AI development and rollout lies in wealthier nations, which widens the digital divide with poorer nations. AI is also developed with specific populations in mind, and therefore do not cater for different languages and cultures (UNESCO, 2024) . This year (2024) is significant for debates around technology and democracy as many countries hold elections. UNESCO's concern is with how AI technology is used to influence the outcome of elections through the manipulation of information and spread of disinformation (UNESCO, 2024) .

The issue of ethics with using technology in education, is a question faced by all countries of the world (UNESCO, 2021) . UNESCO sees how important it is to have ethical standards for AI in education since the education sector should prepare young people for socio-economic activities like civic responsibility and labour market participation, through "new educational practices, ethical reflection, critical thinking, responsible design practices and new skills" (UNESCO, 2021, p. 4) . These ethical standards are a set of values that UNESCO recommends embedding into technology platforms, however, these standards of one of numerous other ethical standards and guidelines ((Heyndels, 2023) in the public domain, and using a single set of guidelines for the world may not work (Nguyen et al., 2023) .

In its "Recommendation on the ethics of artificial intelligence" published in 2021, UNESCO encourages institutions around the world to empower its citizens through education, to join the digital economy, and benefit from AI technologies. UNESCO also encourages countries to conduct research into the ethical use of AI in eLearning (UNESCO, 2021) . UNESCO's document stems from the principles of international human rights and acts as a guide to countries to strengthen their own AI ethics policies. If the world heeds UNESCO's call to empower societies to participate in the digital economy, through education, then societies around the world should have a better understanding of the values that are embedded in technology platforms, and the values that will be embedded into eLearning programmes used to prepare society for the digital economy.

This research will contribute to the theoretical debate by exploring how values are embedded in technology, and its influence on society (Dafoe, 2015; D'Cruz et al., 2022; den Hond & Moser, 2023; Noble et al., 2022) , within the post-school education and training

sector in South Africa. This study can shed some light and offer a way forward for other countries to better understand how these embedded values are selected, and influence society, which may help countries be better informed as they heed UNESCO's call for a digitally literate world.

1.4 Research setting

The research setting chosen for this study is the post-school education and training sector in South Africa. The PSET sector is an appropriate setting for this research, and South Africa is a good choice for the study, because education is the vehicle that will create 21st century skills for a digitally literate workforce, and South Africa, having both first-world and third-world characteristics, is a good setting in which to explore this research question.

1.4.1 Choice of South Africa

South Africa is geographically positioned at the southern tip of the African continent, and therefore provides a Global South and an African perspective. It has the highest GDP in Africa (\$US 373 bn), followed by Egypt and Algeria (Galal, 2024) , making it relevant to both Africa and the rest of the world. It also has both first-world and third-world characteristics, which is evidenced by a populous urban province like Gauteng with 15 million people (Statistics South Africa, 2024a) , compared to its neighbouring rural province Limpopo with 6.5 million people (Statistics South Africa, 2024b) . Approximately 10% of the population in Limpopo have completed a post-school qualification, while 14% have no formal education (Statistics South Africa, 2024b) . This is compared to Gauteng where 16.4% of the population have a post-school qualification, and 3.9% have no formal education (Statistics South Africa, 2024a) . South Africa is therefore a good setting for this study.

1.4.2 Choice of the post-school education and training sector

The post-school education and training (PSET) sector, as defined in the National Plan for Post-School Education and Training is a “grouping of education and training institutions by objectives and purpose” (Department of Higher Education and Training, 2023a, p. 7) , which includes institutions that operate within the Higher Education (HE); Technical and Vocational Education and Training (TVET); and Community Education and Training (CET) sectors. These institutions are led by the Department of Higher Education and Training (DHET). The actual sites where teaching and learning takes place are at:

Education and training institutions that include universities, private higher education institutions, technical and vocational education and training (TVET) colleges, private colleges, community education and training (CET) colleges and private skills development providers. These are established, declared or

registered by any law assigned to the Minister of Higher Education and Training (Department of Higher Education and Training, 2023a, p. 6) .

South Africa’s PSET sector represents approximately 2,1 million young learners enrolled at 342 PSET institutions (Department of Higher Education and Training, 2023b) . The table below shows the distribution of learners across these institutions.

Approximately 1 million (50.4%) learners were enrolled at a public university; 232 915 (11%) learners enrolled at a private university (higher education institutions); 589 083 (27.8%) learners were at public TVET Colleges; 143 031 (6.8%) learners enrolled at a public CET College; and 85 787 (4%) learners were at private TVET or CET colleges.

Table 1: Overview of student enrolment at PSET institutions, 2021

	Universities / HEIs			Colleges				Total
	Public	Private	Total	TVET	CET	Private	Total	PSET
Number of institutions	26	124	150	50	9	133	192	342
Number of students enrolled	1 068 046	232 915	1 300 961	589 083	143 031	85 787	817 901	2 118 862

Source: (Department of Higher Education and Training, 2023b, p. 6)

The training component of formal education takes place in the work-place through internships and learnerships. Learnerships, such as apprenticeships, form part of the qualification learning programme, and internships are structured work experience components, of registered (through the South African Qualifications Authority) and accredited (through the Quality Council on Trades and Occupations) occupational qualifications offered through TVET Colleges (Department of Higher Education and Training, 2023b) .

Preparation for the workplace is a function of Sector Education and Training (SETA) institutions. In addition to funding internships and learnerships, SETAs also fund employed and unemployed individuals to enrol for accredited and registered skills development programmes, to improve their skills for employment and upward mobility (Department of Higher Education and Training, 2023b) .

In 2021, SETAs enrolled and funded 71 921 learnerships; 9 598 internships; and 48 745 individuals on registered and accredited skills development programmes (Department of Higher Education and Training, 2023b) . Of the 130 264 individuals who benefitted from funding through SETAs in 2021, 79 050 (61%) were unemployed (Department of Higher Education and Training, 2023b) ; so, the PSET sector includes young learners at institutions of learning; or at places of work who are training to enter the world of work;

young unemployed individuals looking for employment; and young employed individuals who are looking for upward mobility in their current jobs. The youth represent a significant proportion of society with approximately 10,3 million youth (15 to 24 years old), representing 16.6% of the South African population (Statistics South Africa, 2023) . PSET institutions have a responsibility to prepare these young people to contribute to the economy and to play their role in society.

Figure 1 is an extract from DHET's high-level log frame for the PSET sector. It shows that the PSET sector is a demographic representation of the South African population; and through the PSET's 1st and 2nd level, and final outcomes, it aims to create social transformation by improving young people's participation in developing society and the economy. One of the focus areas of quality education provision, is to ensure that teaching and learning is ICT-driven; and uses a variety of eLearning platforms to provide content.

The combination of face-to-face and online teaching and learning, known as blended learning, which requires the application of a variety of teaching and learning techniques, and digital tools (McKenzie et al., 2022) , is becoming entrenched in higher education, with positive results (Buhl-Wiggers et al., 2023) .

1.5 Research questions

This research specifically addresses the issues of how the values embedded in technology are selected, and what influence it has on society. While this research touches on technology's influence on society, the reverse relationship (relational agentic nature of technology) falls outside its scope, and is therefore a gap for future research.

This research is a response to Den Hond and Moser's (2023) invitation to examine more closely the "value-laden" (p. 94) nature of technology; to understand how values are embedded in technology, and who are the decision-makers who decide on which values to embed. The research also explores how these values can be changed once they have been embedded.

Conceptual question: **How are the values that are embedded in technology selected, and how does it influence society?**

Technology, embedded with values, can influence a particular ideological agenda (Purtik & Arenas, 2019) . Technology has inherent moral and political values that exist for the life of the technology, and may only be visible by carefully examining its consequences (Miller, 2021) . Klenk (2021) argued that technology can change its embedded values to suit a particular environment, which emphasizes the importance of understanding its embedded values, to better predict its responses in a new environment.

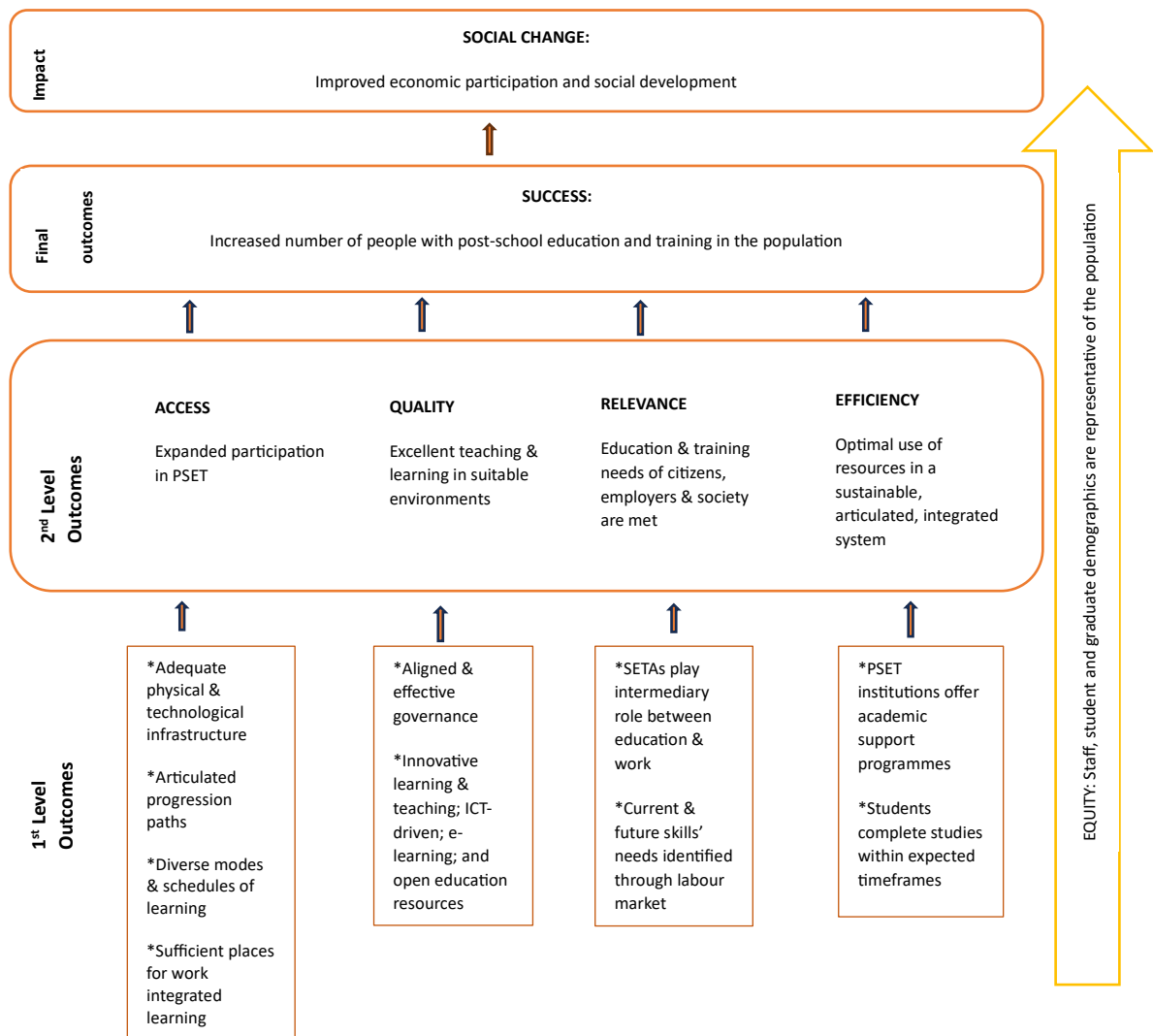


Figure 1: Partial high level log frame of the PSET System

Source: Adapted from (Department of Higher Education and Training, 2020, p. 36)

Greater understanding comes with transparency around which stakeholders chose the set of values embedded in the technology, why, and what the expected result would be (den Hond & Moser, 2023) . Businesses and developers of technologies should be transparent about the values embedded in technology, to allow society to understand it and make informed choices about its use (den Hond & Moser, 2023) . An example of transparency in AI development is a set of principles called Constitutional AI (CAI) developed by Anthropic through public participation, for its large language model Claude 3.5, to minimise harm while maximising helpfulness, and providing greater transparency into how the AI operates (Anthropic, 2023) . This technology is leading the way in showing businesses that transparency is possible if technology developers are willing to do so.

Question 1: How are the values that are embedded in technology, selected?

The research will focus on establishing what set of values are embedded in technology; how were these values selected; which stakeholders were consulted; and how could these values be changed? The questions are designed to delve deeper into which stakeholders have vested interests that lead to the social construction of technology (den Hond & Moser, 2023) .

Question 2: To what extent does technology influence society?

This question is included to investigate the agency of technology, its scope of influence on society, and how it achieves its purpose (den Hond & Moser, 2023) . Technology is both beneficial and detrimental, and society has the right to challenge the negative traits embedded in it (den Hond & Moser, 2023) .

Chapter 3 discusses the research questions in greater detail.

1.6 Research aims

The aim of this study was to explore how values embedded in technology platforms are selected, and how it influences society. This included beginning with an understanding of how the education sector understands the embedding of values into eLearning platforms hosting eLearning programmes, and how these values influenced students, and society in general. The research further aimed to look at how these values were selected, who selected them, and once they were selected, could they be changed. The research also aimed to explore what factors influenced the choice of values. Lastly, the research aimed to use this information to give stakeholders in the education and training sector, a framework to guide the choice of values selected to embed in new technologies that are being adopted.

1.7 Research contribution

The research added to the body of existing knowledge by proposing a set of values for embedding into eLearning programmes and platforms; clarifying the role of technology in education; differentiating between the development of face-to-face and eLearning programmes, especially concerning the values that are embedded in each; recommending that eLearning on technology platforms be investigated as a cost-effective alternative for increased cohort size; making public a list of stakeholders who are consulted during the development of new eLearning technology platforms and programmes; linking graduate attributes as contributors to 21st century skills; adding assessments-on-demand as a student-centric design criterion; adding storytelling as a tool to instil values in students; and providing a conceptual framework that shows how

values are selected for embedding in technology platforms and eLearning programmes, and how these values influence society.

The research also extended the understanding of several concepts like the differentiation between embedding values into eLearning platforms and eLearning programmes, which is central to this research. It also extended the understanding of how values embedded in technology platforms and eLearning programmes can be changed; that the education sector has access to vast amounts of data that are under-utilised; that there's a negative side to technology such as addiction, mental health risks, and misinformation; that there are gaps in the capabilities of AI; and that technology is rapidly advancing, and humans should figure out its role in a technologically-driven society.

1.8 Research scope

The research was set within the post-school education and training landscape in South Africa, and involve participants who are eLearning managers or specialists within post-school education and training organisations.

The post-school education and training (PSET) sector was chosen for this study for the following reasons:

- The PSET sector provides a wider net than just higher education, since post-school includes learners enrolled at universities, technical and vocational colleges, and community education and training colleges (Department of Higher Education and Training, 2023b) .
- The sector represents 2.1 million learners who are generally between the ages of 18 and 24 years (Department of Higher Education and Training, 2023b) .
- The Covid-19 pandemic forced post-school educational institutions to use digital technologies for continuity when physical classes could not take place (Adedoyin & Soykan, 2023; Moja, 2021; Lovino, 2023; Jensen et al., 2020) .
- Digital technologies are expected to become the new norm in education in the next decade (De Nito et al., 2023) .
- Educational institutions are grappling with appropriate AI policies that encourage the use of digital technologies to improve the student journey, while preventing plagiarism and cheating, and ensuring that students still develop their critical thinking and writing abilities (Chan, 2023) .
- Education is one of the sectors of concern for UNESCO, in terms of ensuring equal access to technology, and protecting human rights (UNESCO, 2023) .
- All the literature seems to consider value-laden technology from a business perspective. By conducting the study within the PSET sector, a socio-economic perspective will be explored.

This study explores how technology becomes value-laden, and how it influences society. Its focus is on understanding which stakeholders are involved in the development phase, and who decides on the final set of values. Finally, the study looks at how technology influences society. The study does not look at the relational agentic nature of technology (how technology is influenced by society), but only the uni-directional influence of technology on society.

Chapter 2: Literature review

2.1 Introduction

2.1.1 Definition of technology

There are many definitions of technology, depending on which field of interest one looks to. Technology can include “sociotechnical systems, such as the Internet, as well as specific artifacts, standards, routines, and beliefs that make up these systems” (Dafoe, 2015, p. 1051) . McOmber (1999, p. 137) considers “technology-as-instrumentality, technology-as-industrialization, and technology-as-novelty” as three constructs, which he viewed collectively as being independent of culture. To better understand how technology is viewed today, one must understand the historical perspective so that we appreciate how we have progressed over time.

Den Hond and Moser (2023) , building on the work of fellow researchers, refer to technology as instrumental (McOmber, 1999) ; technology as value-laden (Miller, 2021) ; and technology as relationally agentic (Orlikowski & Scott, 2008) , which they see as a progression from one to the next, to accommodate for the former’s blind spots. They argue that simply looking at technology as an instrument that creates greater efficiencies and efficacies “is overly simplistic and therefore has limited potential for scientific inquiry” (p. 89) . I use these three perspectives of technology in this research study, to give a historical view with the first perspective, and recommend the third perspective for future research, while I focus this research on the second perspective of technology being value-laden (Miller, 2021) .

More recent debates focus on technology as being disruptive because of its ability to influence public perceptions, thus creating a strong relationship between technology and society (Vesa & Tienari, 2022) . This study considers the influence of technology on society, and therefore the work of Vesa and Tienari (2022) has relevance.

This research builds on Den Hond and Moser’s (2023) views, with emphasis placed on the second construct: technology as value-laden (Miller, 2021) . It explores how values are embedded in technologies that are used in education, and how these values influence students in the post-school education and training (PSET) sector, and society in general, in South Africa.

Figure 2 below shows the construction of this chapter, beginning with an introduction (2.1) and ending with a conclusion (2.7).

2.2 Technology as a tool

2.2.1 The evolution of technology

The growth observed during industrialisation from the mid-18th century to the turn of the 21st century, provides a good backdrop in which to consider technological evolution,

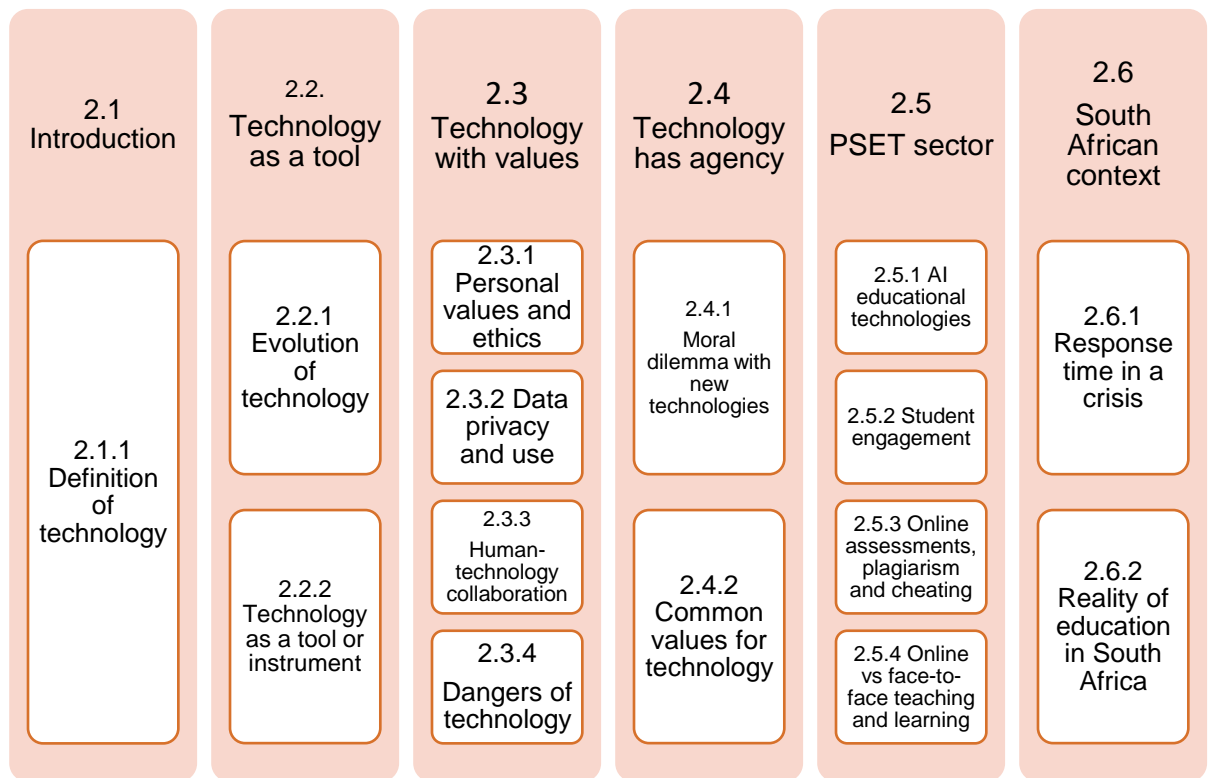


Figure 2: Mapping of literature review

Source: Researcher’s formulation

when technology developed from simple tools to complex machines capable of travelling in space and beaming back pictures of distant galaxies (Noble et al., 2022) . Audretsch et al., (2019) argued that the impact of technology can be experienced through greater efficiencies and innovations, some of which have the potential to be disruptive and transform a sector. Noble et al., (2022) demonstrated how disruptive technologies transformed retail shopping by introducing “smart shelves, augmented and virtual reality, avatars and robots” (p. 200) , thus bringing business, technology and society closer together. Similarly, distance education institutions use new web-based technologies, that require teachers and lecturers to capacitate themselves on the latest technological trends, to be able to include multiple technologies in teaching and learning (De Nito et al., 2023) .

Ringberg et al., (2019) claim that technological innovations arise from innovative business strategy; the more innovative the business strategy, the more radical and revolutionary is the resulting technological innovation. An example is the adoption of augmented reality, virtual reality and the metaverse in the retail sector (Noble et al., 2022) . In contrast, the education sector is slow to respond, even though there is substantial evidence to show that augmented reality positively impacts education (Garzón & Acevedo, 2019) . The metaverse can provide “personalized and adaptive learning thanks to its immersive and interactive capabilities”, however challenges such as network

connectivity, meeting educational standards, and recruiting staff with specialised skills, facing the education sector hamper progress (Onu et al., 2024, p. 8893) . An important consideration is the ability of internet companies to provide access to the IOT to billions of people globally, because managing access is a problem. However, new technologies like blockchain, make access control of such large numbers of users possible (Novo, 2018) .

This discussion is relevant to this study because public education does not run on business principles, and therefore public educational institutions in particular, take a more cautious approach to transformation, resulting in a skills gap as students are inadequately prepared for the world of work. This research hopes to highlight the need for the South African government to change education policies and deal with resource challenges, to bring education into the 21st century. If distance education institutions can adopt new technologies successfully (De Nito et al., 2023) , then traditional educational institutions should be able to follow suit.

2.2.2 Technology as a tool or instrument

Early impressions were that technology was simply a tool (Heidegger, 1977) designed to assemble useful information to serve a specific purpose (Mesthene, 1969) , which sparked improvements in business process efficiencies and effectiveness, thus creating competitive advantage (den Hond & Moser, 2023) . Technology comprised three parts: the actual tool (hardware); human skill and effort; and knowledge systems (Orlikowski & Scott, 2008) . McOmber (1999) maintained that technology lacked any intrinsic morals or values. Mesthene (1969) thought that even though technology was viewed as autonomous of culture, it evoked cultural change as society capitalised on new opportunities, or put another way, technology may drive cultural change (McOmber, 1999) .

The argument of technology being merely a tool that is independent of culture, begins to weaken as newer technological advancements vary in autonomy and ability to shape society (Dafoe, 2015) , to the point when technology appears “as both autonomous from and dependent upon the values of the society that produces it” (McOmber, 1999, p. 139). This contradiction exposes the gap between technology seen simply as a tool or instrument that may influence societal behaviour and values, and technology as having intrinsic or embedded values. Even though many researchers believe that society has moved beyond this view of technology being merely a tool (Dafoe, 2015; den Hond & Moser, 2023; Klenk, 2021; van de Poel, 2020) , the education sector is slow to adopt technology, and this study shows that some in this sector still view technology as a tool.

2.3 Technology has embedded values

Values, for the purposes of this research, are “what is good or desirable” (van de Poel, 2020, pp. 87–88) , “varying in importance, that serve as guiding principles” (Schwartz, 1994) . Values therefore drive our individual choices. One school of thought believes that to really understand values in relation to technology, one should hone in on embedded values (Klenk, 2021; van de Poel, 2020) instead of the “intended value” (van de Poel, 2020, p. 89) , as technology may be used in ways for which it was not designed, thus producing unexpected and inconsistent positive or negative results (Heyndels, 2023; Klenk, 2021; van de Poel, 2020) . Miller (2021) argues that technology has moral and political values embedded in its design, which has long-term implications, and these values should be carefully considered when designing new technology.

Furthermore, technology has “response-dependent properties (affordances)” that allow it to change its embedded values to suit different circumstances (Klenk, 2021, p.533) , and continue to influence society until it ceases to exist (Miller, 2021) . These values comprise “particular social, cultural, or political interests” that triumphed after stakeholders competed to influence the choice, with some being more successful than others (den Hond & Moser, 2023, p. 89) . Technology therefore, should not be evaluated on its physical attributes only, but also on its “function and intention” (Heyndels, 2023, p. 74) or purpose. Abernethy et al., (2024, p. 2) point out that despite the acknowledgement of technology having values, it is only in the present-day that AI technology is promoted on its ability to “embody values such as safety, dignity, fairness, meritocracy, harmlessness, and helpfulness” while also boasting about AI’s “performance, such as speed, scalability, and accuracy”.

One could argue that by assigning human values to technology, technology developers and owners create services or products to delight customers, exceed societal expectations and gain acceptance. This is very different from viewing technology as an instrument or tool (McOmbler, 1999) , devoid of cultural values, that simply improves efficiencies. By embedding human values in technology, society sees recognisable qualities with which to identify, and hence adopt it (Giroux et al., 2022) .

The arguments about technology having embedded values are relevant because this study tries to better understand the values that are embedded in eLearning programmes offered through eLearning platforms in the South African PSET sector, and, considers which stakeholders are involved in the programme and platform design, and who makes the final decision about which values to include. How would technology platforms being used for teaching and learning delight students and lecturers, exceed societal expectations and ensure acceptance?

2.3.1 Personal values and ethics

The inter-relationship between personal values and ethical decision-making influences Society's decisions, behaviours and actions (Weber, 2019) . If values influence ethical decision-making, and technology has embedded values, then there should be greater transparency around whose values are being propagated, whose values are being ignored or suppressed, and what is the expected outcome (den Hond & Moser, 2023) . Furthermore, "how can it be contested, disrupted, and changed?" (den Hond & Moser, 2023, p. 112) . Dafoe (2015, p. 1050) questions how and under what circumstances, can specific stakeholders "shape their sociotechnical systems", which reiterates the point that a select group of stakeholders' values influence technology's development, at the expense of other stakeholders. The arguments of Weber (2019) , den Hond and Moser (2023) , and Dafoe (2015) form the basis of this research, as it attempts to respond to the questions raised by den Hond and Moser (2023) listed above, from the perspective of the South African PSET sector.

Proponents of the 5th Industrial Revolution (5IR) suggest that stakeholders should comprise society, businesses, employees and customers (Noble et al., 2022) , and not just shareholders. The identity of stakeholders associated with digital technologies should be transparent. Businesses should build these technologies with stakeholders' values in mind, so that all stakeholders are beneficiaries of the technology (D'Cruz et al., 2022) . When applied to the education sector, stakeholders comprise society, represented by regulatory bodies; businesses, represented by industry and professional bodies; employees, who are educational institution staff and lecturers; and customers who are students. Following on the argument of D'Cruz et al., (2022) the question about whether all stakeholders are involved in the development of eLearning programmes offered on eLearning platforms, and in particular students, is answered through this research.

Hagendorff (2020) studied 22 sets of ethical guidelines for AI, and concluded that despite the existence of these guidelines, developers of AI were either oblivious or ignored these guidelines during development. Some ethical considerations for AI use in education, include "privacy and data protection; bias and fairness; transparency and accountability; informed consent; and pedagogical impacts" (Rawas, 2024, pp. 6902–6904) . Despite all the work done with technology in education, "the guiding ethical principles for AIED are yet to be set in stone" (Nguyen et al., 2023, p. 4235) , meaning that there is no clarity about how technology is developed, whose values are embedded in these technologies, and how technology influences learners. Nguyen et al. (2023) further argued that despite UNESCO publishing its universal framework of values for AI ethics, a single-solution

approach will not suffice. Holmes et al., (2022) proposed a draft framework for the ethics of AIED, but stressed that even the unknowns identified because of the overlaps between the main areas of education; data and computational approaches, was not sufficient for a complete framework, because there were still unknowns that were unaccounted for. Furthermore, once a framework was established, there was still work to be done on how best to implement this framework.

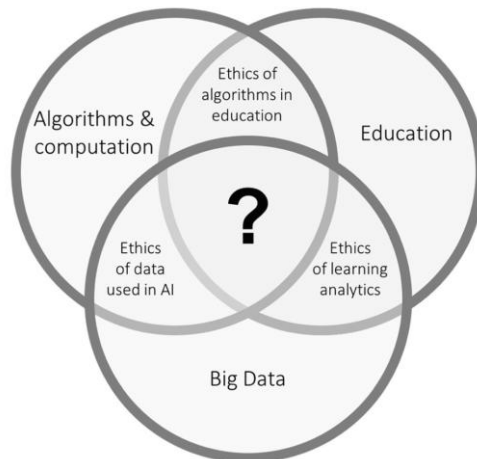


Figure 3: A “strawman” draft framework for the ethics of AIED

Source: (Holmes et al., 2022, p. 521)

From the above, it is clear that the debate about ethical guidelines for AI is far from over (Holmes et al., 2022; Nguyen et al., 2023) , despite already having several guidelines available (Hagendorff, 2020), and one of the reasons for this lack of clarity, is that one set of guidelines will not apply to all (Nguyen et al., 2023) . These arguments are relevant in this study because it focuses on values embedded in technology platforms, and AI guidelines are the values that are embedded into AI technology platforms. This study considers the use of AI in the South African PSET sector, and so these arguments are weighed against the study’s findings in Chapter 6.

2.3.2 Data privacy and use

Datafication is the new goldrush, as businesses race to collect and assimilate ginormous amounts of data (Noble et al., 2022) to be used to create competitive advantage. Flyverbom et al., (2019) argues that data privacy, consent and the lack of transparency in data collection raises ethical issues, which Noble et al., (2022) argue, businesses largely ignore in their quest to personalise product advertising to customers, and to increase profitability. Noble et al., (2022) and Flyverbom et al., (2019) raise relevant arguments for this study because it considers data protection and the ethical use of student data. Datafication is governed by South African legislation such as the Protection of Personal Information Act (POPIA). There is a wealth of information generated through

e-learning platforms in the education sector. This study investigates how student data collected through eLearning platforms, are protected and used.

Algorithms embedded in machine learning technology, can make biased and discriminatory decisions, (Martin et al., 2019) , and businesses should be held accountable for their technology and the autonomous choices that they make. This begins with an evaluation of digital technologies' decisions through its embedded values; the criteria that determines whether a technology is functioning appropriately; the data that it collects and uses for decision-making or outcomes; and the assumptions underpinning technology development (D'Cruz et al., 2022) .

Martin et al., (2019) raise arguments about bias and discrimination, which are technology's negative attributes, and D'Cruz et al., (2022) highlight technology's underlying or intrinsic properties that influence its decision-making process. These arguments apply to AI used in education, and are therefore relevant to this study. Student data contained in the eLearning platform, can be manipulated to predict student performance using machine learning to initiate early interventions (Gray & Perkins, 2019; Riestra-González et al., 2021) . However, Lim et al., (2022) show that there are variances in the perspectives and understandings among educational institution staff and students, about how learning analytics is used, and they require much more education and support to align their perspectives.

Educational institutions house vast amounts of data, and their challenge is to embrace AI while maintaining "core principles and values" (Bates et al., 2020, p. 10) . Liu et al., (2022) showed that US higher education institutions, when faced with a crisis, relied on their principles and values to plot a way forward through the global pandemic, so the importance of values as a moral compass cannot be over-stated. This study therefore asks about how institutions decide on which values to include in eLearning programmes on eLearning platforms.

Daniel (2019) cautioned about the inadequate privacy and security that big data systems provide, resulting in student data protection being compromised. He further argued that using student data for research purposes without proper consent, raises ethical issues, even if it involves using student data stored in technology platforms to track performance and predict student outcomes, as it may lead to unintended consequences. Institutions therefore need data governance models and policies that determine the conditions under which student data can be used. With data being stored in the cloud, data privacy is more at risk, "necessitating the establishment of global ethics and moral obligations to use educational data" (Daniel, 2019, p. 109) . Daniel (2019)

also cautioned against third parties using student data because educational institutions do not have student consent to transfer data to third parties.

Data security and use form part of this study, which questions how educational institutions protect student data, and how is this data used.

2.3.3 Human-technology collaboration

The 5th Industrial Revolution, beginning at the turn of the decade, focuses on human-technology collaboration, with each harnessing the strengths of the other (Noble et al., 2022) , sharing common values (den Hond & Moser, 2023) to create more optimal outcomes. It is an era when humans will combine their creativity and intelligence with the computing power of technology to produce personalised products to meet customer demands (Bednar & Welch, 2020) . This insight is important for the education sector because it produces the next generation of employees and entrepreneurs who will be collaborating more intimately with technology.

Similarly in education, if generative AI tools like ChatGPT are adopted, it can assist students to produce “educational innovations” (Romero-Rodríguez et al., 2023, p. 333) . For AI to co-exist with educators, lecturers should consider assigning the tasks of presenting, managing and testing content to technology, and focus their efforts on developing students’ skills, as well as providing emotional support that technology is incapable of doing (Bates et al., 2020) . The role of the lecturer is therefore being re-focused, which may require re-training or capacity development to change educators’ mindsets.

However, while educational institutions debate the ethics of AI; the threat that AI poses to educator jobs; and the opportunities that AI offers, they should also not lose sight of global technology companies using them to collect huge amounts of data to train their generative AI (Bates et al., 2020) . This is important to keep in mind because of the ethical implications, as well as data privacy policies that may be infringed.

2.3.4 Dangers of technology

Addiction to technology is a negative that should not be ignored, and Suárez-Perdomo et al., (2022) showed that there were differences in procrastination behaviour among students who had low, medium or high addiction levels to social networks, but there was no evidence to suggest that their addictions had any effect on their academic performance. In contrast, Busalim et al., (2019) showed that students who are addicted to Facebook® and who have low self-esteem perform worse academically than students who are not addicted, and students who have high self-esteem. An argument exists for social networks like Facebook® to be good eLearning tools, but Busalim et al., (2019) caution about it potential negative effects.

Mental health is another negative consequence of technology use, which Cai et al., (2024) argued that while using technology positively affected students' learning, it negatively affected their mental health. Crawford et al., (2024) supported this argument and showed that while AI chatbots designed to provide information has a positive relationship with student performance, when psychosocial factors like student wellbeing and loneliness were combined with information provision, then AI had a negative effect on student performance as a whole. Chakraborty et al., (2021) also supported this argument by showing that not only did students find learning online stressful, but they also saw it as negatively impacting their social lives.

Cyber-bullying is a negative consequence of technology use. Zhu et al., (2024) found that there was a relationship between tolerance levels for peer-aggressive humour and cyber-bullying; when tolerance levels were high, students became frustrated and responded with cyber-bullying. The converse was also true. Educational institutions would do well to take cognisance of this finding and include a value about peer-aggressive humour and cyber-bullying in their student codes of conduct.

Fake news has the potential to sway society to think in a particular way. Gimpel et al., (2021) showed that society is more likely to report fake news when reminded about social norms and what societal expectations were. If more members of the public reported fake news to social media platform administrators, then we could reduce the incidence of fake news. Unfried and Priebe, (2024) showed that misinformation about health than any other type of information, is more likely to be spread, and most misinformation is spread by unsuspecting individuals who trust the source of the information.

While anecdotal evidence suggested that AI would have a negative effect on physical, mental and psychological wellbeing, there is now evidence to support these claims. This literature has bearing on the research study, which also considers the influence of technology on society.

2.4 Technology has agency

There is a strong correlation between technology being value-laden and having agency. Relational agency is about technology's ability to intentionally (or unintentionally) influence social behaviour, and be influenced by society and culture (den Hond & Moser, 2023). Purтик and Arenas (2019) argue that businesses influence society to change their behaviours to favour certain beliefs, practices, values, etc., through all phases of the technology development process, thus demonstrating technology's power to influence society's values and behaviours. Technology, therefore has agency in that it can influence society's thoughts and behaviours. Audretsch et al., (2019) add that technology's influence on society straddles different facets from economic and lifestyle

choices, to new products and service innovations, and beyond to inspiring deeper community value for public good, and it therefore stands to reason that the business that controls technology, controls the narrative.

den Hond and Moser, (2023) make the point that society and technology share a reciprocal relationship, with each influencing the other. This study only focuses on one part of that relationship, i.e. technology's influence on society, to narrow the scope of research. However, I believe that an investigation into how society influences technology would contribute new knowledge to the current body of knowledge. Part of that investigation would consider Bates et al's., (2020) argument in 2.3 about technology companies using societies' information to train AI.

Purtik and Arenas, (2019) and Audretsch et al., (2019) both show how technology influences society, which is relevant to this current study.

Jafari (2024) showed the positive effect of using human-centred AI (HAI), i.e. AI with ethical and human values embedded in its design, that can connect on a personal level with students, by recognising and understanding negative human emotions and feelings in a learning environment, thus improving AI's role in teaching and learning by changing its approach to suit the student's needs. The algorithm driving the AI is therefore programmed with human values and ethics that students recognise and respond to. Developers are encouraged to be transparent about the algorithms driving the AI so that society, and in particular students and educators, can understand its reasoning and decision-making process (Flyverbom et al., 2019; Jafari, 2024) . This study has a direct bearing on the research as it acknowledges the embedded values in technology that influence society, which is what this study is about.

2.4.1 Moral dilemma with new technology

Technology is not all created equal, as technology that closely resemble humans are held to a higher ethical standard than their counterparts, but not to the same standard as other humans (Giroux et al., 2022) . A case in point is the introduction of autonomous vehicles (AVs). The "Moral Machine Experiment" (Awad et al., 2018) showed that people are more willing to allow the AV in which they were travelling, to knock over a pedestrian to protect themselves, than if they were driving the vehicle themselves. This finding is important to keep in mind as we move closer to technologies such as generative artificial intelligence (AI), that include ChatGPT, Bing and Co-Pilot, which students and the business sector are rapidly adopting (Chan, 2023) .

While the moral dilemma for humans themselves is high, they do not hold technology to the same moral standard; so, it is therefore important to consider the views and

perspectives of all stakeholders, and not just those of a few, when designing technology (Gill, 2020) . Shank et al., (2019) showed that while AI have greater freedom to make decisions, they were assigned less blame than humans for making wrong decisions. Similarly, humans who monitored the activities of AI were assigned less blame for the same violations, than their counterparts who supervised people. “AIs are always perceived to be less at fault than the humans” (Shank et al., 2019, p. 659) .

Giroux et al., (2022), Awad et al., (2018), Gill (2020), and Shank et al., (2019) all point toward a moral dilemma. As AI develops more and more human characteristics, society must find a way to co-exist with AI. Crawford et al., (2024) showed that young people with fewer friends turned to AI for social support, and the AI-human connection led to social withdrawal of these young students, with increasing reliance on AI, and decreasing connectedness with friends and family. The dilemma for educational institutions is whether to assign social support to AI chatbots or not, even though AI can perform the function.

2.4.2 Common values for technology

New digital technologies should have a common set of values for humans and technology, even though technology is not able to read the nuances of inner conflicts and cultural differences that influence human decision-making (Awad et al., 2018) . For example, “beneficence; non-maleficence; autonomy; justice; and explicability (as an enabler)” (Floridi et al., 2018, p. 696) could comprise AI ethical principles for operating in a good society. Educational institutions, on the other hand, would do well to share the following values: “developing the capacity to avoid bias and to ensure diversity; protect privacy; develop transparent data policies; integrate regular ethical data impact assessments of the systems adopted; and treating personal data as a fundamental right” (Bates et al., 2020, pp. 10–11) .

However, some researchers like Nguyen et al. (2023) and Holmes et al., (2022) argue against a “one-size-fits-all” approach to developing ethical guidelines for AI, because of the many unknowns. Hagendorff (2020) pointed out that despite the existence of numerous sets of guidelines, developers of AI were either oblivious or ignored these guidelines during development. It is possible that none of the guidelines apply to a specific technology, and each new platform developed required new guidelines (Nguyen et al., 2023) .

Consideration of a common set of values for technology is important for this research because ethical guidelines outline the intrinsic values embedded in technology, which influences society. The advantage of having a common set of values would make the values known, which researchers like den Hond and Moser (2023) are encouraging. If

values are made more explicit, whether it is common to all technology platforms or specific to one, then its influences on society can be better understood.

While the agentic nature of technology falls outside the scope of this research, technology's influence on society and students, is considered and discussed in later chapters.

2.5 The post-school education and training (PSET) sector

Online learning has been around for many decades, but it was not until the Covid-19 pandemic that its critical importance was realised globally as technology became a necessity for continued learning during lockdown, forcing PSET educational institutions to adopt digital technologies in strategies to reshape the delivery of post-school education (Adedoyin & Soykan, 2023; Moja, 2021; Lovino, 2023; Jensen et al., 2020) . The researchers argue that the pandemic had many negative effects on society, but it had a positive effect on the PSET sector globally because it forced a shift to online learning.

Haleem et al., (2022) argue that the United Nations Sustainable Development Agenda 2030 supports the provision of quality education for all, and digital tools is a means to meet this goal, but it requires a shift in mindsets about education, as technology can provide and create knowledge; mentor students; and assess progress. De Nito et al., (2023, p. 596) predict that with web-based technologies becoming the new norm in teaching and learning, “Technology Enhanced Learning (TEL) and Technology Enhanced Teaching (TET)” will require lecturers to be knowledgeable about a variety of different technologies and devices to ensure successful teaching and learning. This is an important point because if lecturers are not capacitated for TET, then TEL will not be possible, as also pointed out by Zhang and Aslan (2021) .

2.5.1 AI educational technologies

AI (technology) tools are used in education to perform various functions: intelligent tutoring systems (ITS) provide students with individualised tutoring; AI can support collaborative learning by facilitating and summarising online discussion forums; and intelligent virtual reality (IVR) can simulate classroom scenarios through game-based learning environments (Zawacki-Richter et al., 2019) . Zhang and Aslan (2021) suggest that there are a variety of AI tools with innovative applications and functions available (see Figure 4) like chatbots, expert systems, intelligent tutors, machine learning, personalised learning systems, visualisation, and virtual learning environments with application for teaching and learning. Students can experience AI through software that personalises their individual learning journeys (i.e. with adaptive software), while lecturers use AI tools for automated assessments; plagiarism detection; etc (Zawacki-Richter et al., 2019) . With the popularisation of generative AI like ChatGPT, PSET

institutions are scrambling to develop AI policies that encourage the use of such technologies to improve the student journey, while preventing plagiarism and cheating, and ensuring that students still develop their critical thinking and writing abilities (Chan, 2023) .

Most of the studies involving AI in education focus on what data says about phenomena like using AI for assessments of supporting students, but “there is very little evidence for the advancement of pedagogical and psychological learning theories related to AI driven educational technology” (Zawacki-Richter et al., 2019, p. 22) . In other words, there is an “absence of educational theories and models, as found in AI-enabled e-learning research” (Zhang & Aslan, 2021, p. 1) .

There is a significant gap between the capabilities of AI technology and what is being implemented in the educational sector (Bates et al., 2020) . Zhang and Aslan (2021) , like Zawacki-Richter et al., (2019) argue that the education sector is slow to adopt technology, which will enrich students’ learning experiences, and assist teachers and administrators to better understand each student’s learning journey. However, there are challenges that must first be resolved before many of these technologies can be implemented. For successful implementation, hurdles such educators’ lack of technological expertise; lack of implementation policies and guidelines; ethics and privacy issues; and the associated costs of technologies, as well as institutions’ abilities to scale implementation, must be addressed (Zhang and Aslan, 2021) .

Bates et al., (2020) argue that the PSET sector has barely scratched the surface of using artificial intelligence for teaching and learning, because educational institutions have not embraced this new technology. For artificial intelligence to co-exist with educators, lecturers should leave the tasks of presenting, managing and testing content to machines, and focus more on developing students’ skills, as well as providing the emotional connection that machines are incapable of doing (Bates et al., 2020) . Jafari (2024) also found that despite evidence to support implementation, educational institution staff were reluctant to introduce new technologies into teaching and learning. However, there are pockets of good practice already being implemented, like using virtual reality to mimic a clinical set-up in pharmacy education (Doğan & Şahin, 2024) .

The discussion on AI technologies for education is an important one because AI is the current disruptor in education, and South African educational institutions are looking at ways in which to incorporate AI into teaching and learning.

2.5.2 Student engagement

Bond et al., (2020) using earlier research, theorised on nurturing student engagement in a digital environment. They define student engagement as “the energy and effort that students employ within their learning community” (p. 3) , driven by their relationships within the learning community; the activities associated with learning; and their environment. Students’ level of engagement within their learning communities is comparable to their learning outcomes. The indicators “participation/ interaction/ involvement, achievement and positive interactions with peers and teachers” (Bond et al., 2020, p. 13) were the most common indicators used to measure student engagement, and digital platforms like “text-based tools; knowledge organisation and sharing tools; and multimodal production tools” (Bond et al., 2020, pp. 15–16) are all associated with supporting student engagement. Trinh et al. (2023) showed that an interactive reading tool like Perusall® elevates a student’s reading and comprehension experience. Without a reading tool, students are expected to read copious amounts of literature, digest the information, and pass a quiz to prove that they understood the material. A reading tool like Perusall® allows students to take notes on the platform itself, communicate with their lecturers for further clarity, and share ideas with fellow students, thus supporting student engagement.

Hill (2019) argued that the use of an expert system like Blackboard Learn® as an e-learning platform, not only allows for teaching and learning to be more student-centred, but it also promotes higher-level thinking and problem-solving, while satisfying students’ needs for social and intellectual interactions through its chat and online forums. However, a study conducted at a South African university among first-year students who use the Moodle® platform, found that students preferred using a more informal platform like Whatsapp® for their class discussions (Mpungose, 2020) . Jensen et al., (2020) reported a similar finding of an external collaboration tool being required in addition to the eLearning platform, and they found that students influenced the decision of which collaboration tool to use.

Al-Samarraie et al (2018, p. 2003) further argued that once students and educators are engaged in eLearning, then five core factors, namely “information quality, task–technology fit, system quality, utility value, and usefulness” must be satisfied for them to continue their engagement. They believed that user continuance was a key indicator for eLearning success. Both students and lecturers rated the quality of information on the eLearning platform as the most important criteria for continued use of the platform. Continued engagement is a requirement for student success.

Roski et al., (2024) describe the Universal Design for Learning (UDL) as a framework that caters for all learners, irrespective of their physical or mental challenges or abilities, and enables all learners to choose and take responsibility for their own learning journeys. UDL supports changing the learning environment to suit individual students, regardless of their circumstances, instead of trying to change learners' learning preferences. Some of the elements included in the Universal Design Learning Guidelines include "customisable interface; read-aloud function; glossary; simple language; device independent; tasks with or without help; and self-assessments" (Roski et al., 2024, p. 4) . Roski et al. (2024) showed that by following the Universal Design Learning Guidelines in designing learning platforms, students can choose their own learning pathways, and once chosen, they tend to stick to what works for them.

Student engagement is an important aspect of teaching and learning, and is a determinant of student success. It is therefore an important consideration in this research. Public education in general, seems to be slow to adopt technologies. This study considers how adopting expert systems (learning management systems) in the PSET sector in South Africa, supports student engagement, with a view to linking it back to the values embedded in the technology platform.

2.5.3 Online assessments, plagiarism and cheating

Ruth et al., (2024) argued that taking a learner-centred approach to online assessments will decrease the incidence of cheating. According to the results of their study, students were less likely to cheat when the online assessments and tasks directly linked to their aspirations about their choice of professions; and if lecturers gave them feedback on their assessment performance. If students' needs and the relevance of online assessments to future careers were addressed, Ruth et al. (2024) believe that the incidence of cheating will decrease. This may be one way of reducing the need for proctoring tools, which Lee and Fanguy (2022) opposed based on its' assumptions about the equity, fairness and authoritarian approach to education. The assumption that all students are potential cheaters negatively impact student engagement and relationships among peers and educators, resulting in an educational system that discourages innovation. Lee and Fanguy (2022) further argue that fairness required consideration of each student's social and academic circumstance, and that students should be part of the conversation about educational fairness.

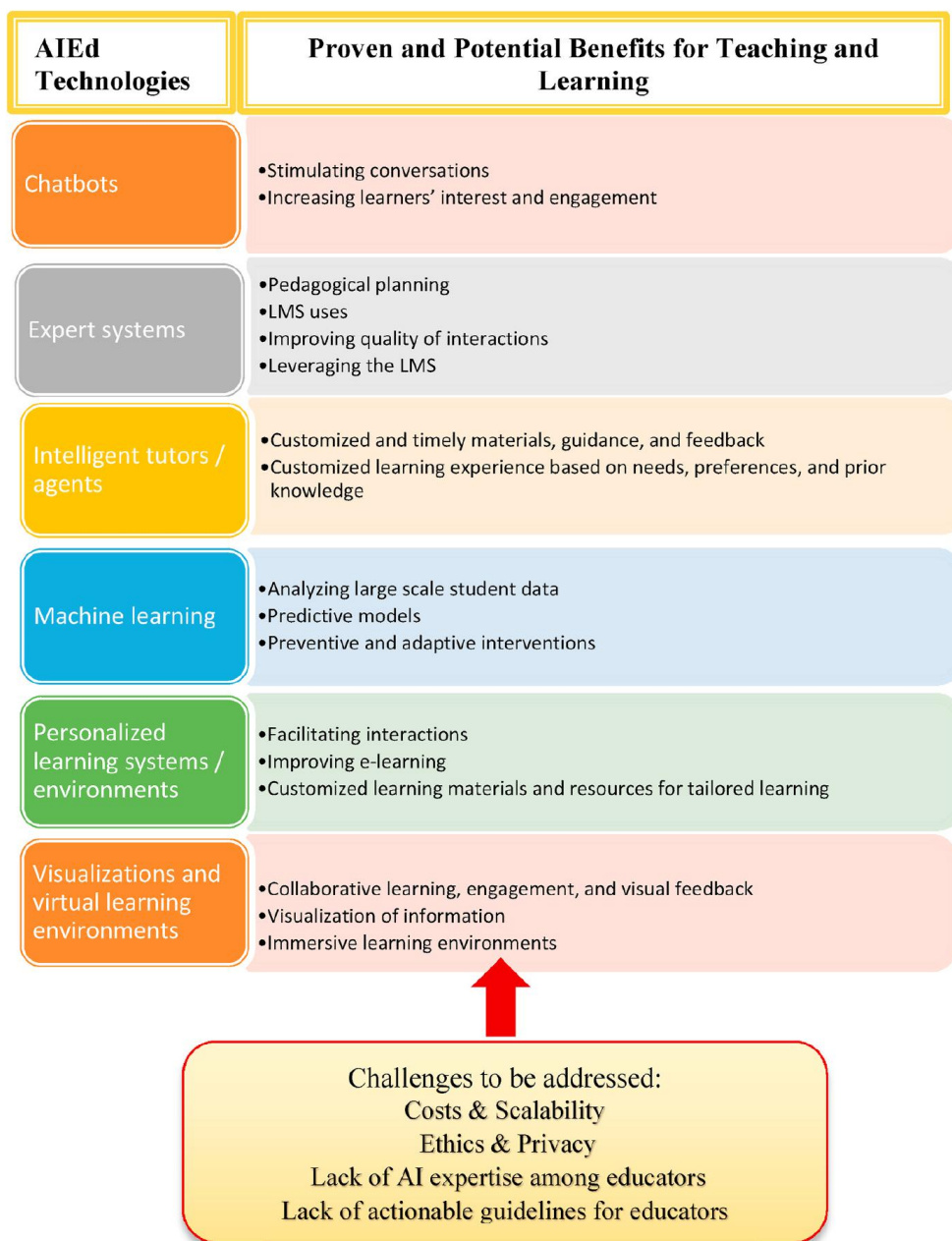


Figure 4: Proven and potential benefits of AI technologies

Source: (Zhang & Aslan, 2021, p. 8)

Assessments, plagiarism and cheating all relate to values associated with teaching and learning, that are included in eLearning programmes offered on technology platforms. It is therefore relevant to this study. The use of proctoring tools during assessments, for example, is practised by many institutions, of which Lee and Fanguy (2022) question the fairness and impact on student engagement.

2.5.4 Online versus face-to-face teaching and learning

Jensen et al., (2020) in their study of higher education teachers on their perceptions of differences between on-campus and online teaching and learning, found that new advances in technology influenced changes to the eLearning environment; and students

or lecturers drove these changes. Lecturers' experiences of their relationships with students varied, depending on the type of activities in which they were involved, with some lecturers feeling that they had better student relationships in class, while others saying that student relationships online were better. Furthermore, lecturers were divided on their preference of face-to-face to online teaching and learning. This reflection is important for this study as it considers how values are selected and embedded in eLearning technology.

Jensen et al., (2020) unpacked how eLearning platforms evolved to accommodate new technological developments; students' responses to the eLearning platform; and lecturers' teaching needs. For example, when the eLearning platform was sub-optimal for performing certain functionalities, they introduced other platform add-ons to optimise the functionality that they needed. If one considers the difference between online and face-to-face teaching and learning, then the question of which is better for student engagement should be considered.

Orhan (2024) showed that problem-based eLearning is more effective than face-to-face learning in terms of reading with understanding, and student attitudes, but both modes are equally effective in teaching and learning critical thinking skills. Feubli et al., (2024) conducted a study of a hybrid class, where students had the option of attending lectures in person or online. About a third of all students preferred each of the options of attending lectures online; attending lectures in person; and having the option to choose between the two each time. Some of the factors influencing the students' decisions included their distance from campus; whether they had jobs; the level of difficulty of the work; and which year of study or semester they were in. Chakraborty et al., (2021) found that students at an Indian university preferred face-to-face classes and attending MOOCs online, although online education served its purpose during the pandemic. These students found online learning stressful and it affected their social lives. These studies shed light on student preferences, and the difference between face-to-face and online learning. It is an important consideration when looking at how values that are embedded in eLearning programmes offered on eLearning platforms, are selected and how they influence students.

Each of the researchers above show that personal preferences are at play, as there is no clear choice between which mode is better. Both face-to-face and eLearning have their strengths and weaknesses, and it comes down to choice for the educational institution. Both Jensen et al., (2020) and Feubli et al., (2024) reference student preference in decision-making, and this is an important factor to consider in a student's journey towards success. Orhan's (2024) contribution showed that face-to-face and

eLearning modes have their strengths, so, the challenge is to strike a balance between the two for the optimal student journey.

2.6 South African context

2.6.1 Response time in a crisis

The Covid 19 pandemic and resultant lockdown hugely impacted the education sector. In Italy, which was the second country after China to go into lockdown, all classes moved online within a few weeks, because the universities already had the infrastructure and funding in place to implement online teaching and learning (Agasisti & Soncin, 2021) . Hong Kong had already been providing online classes because of the closure of educational institutions due to student protests in 2019, so the pandemic did not create the same anxiety with moving to online teaching and learning, as experienced in many other countries (Jung et al., 2021) . In South Africa, however, only 12 of the 22 universities had commenced with online teaching and learning six weeks into the lockdown, as many students did not have devices such as laptops, and data, and university staff lacked the expertise to run online classes (van Schalkwyk, 2021) . Van Schalkwyk (2021) observed that in a country like South Africa with a high inequality ratio, any attempt to implement new technologies and open resources, will further increase the current inequalities. He went on to predict that the better resourced educational institutions will adopt online teaching and learning post the pandemic, while other educational institutions will return to face-to-face classes.

The comparison of Italy, Hong Kong China, and South Africa shows that South Africa is further behind other countries in adopting online technologies, in terms of access to technologies, as well as lecturer expertise in implementing these technologies.

2.6.2 Reality of education in South Africa

According to Sutherland (2020, p. 233) South Africa's poor education system has not produced the skills needed for technology-driven jobs involving "3D-printing, artificial intelligence (AI), big data, industrial Internet of things (IIoT) and robotics". South African educational institutions therefore face a huge challenge of enrolling students from different socio-economic backgrounds with different levels of access to technologies, and educating these students for jobs in a technologically-driven economy. Deciding on the best approach to teaching and learning is a balancing act for institutions.

Lembani et al., (2020) showed that under-graduate students had significantly different levels of access to computers in their homes, based on where they lived (i.e. in urban, peri-urban or rural areas of the country). While accessibility was important, students' success also depended on their ability to use technology, and these two factors were inter-linked. They conclude that a single teaching and learning policy for all does not

work in the South African context, given the ICT challenges of access and connectivity, and South African educational institutions should take note of this reality when planning online learning.

Even a country like the UK showed significant differences in the results between students from advantaged and disadvantaged backgrounds, with the largest gap existing when teaching and assessments were online, while the most effective pedagogy was when teaching was in-person and assessments were online (Summers et al., 2024) . The problem is therefore not a South African problem, but a global one. However, South Africa is particularly affected because of access to technology, data connectivity, and digital literacy. These insights are relevant to this study, which is based on the PSET sector in South Africa.

2.6 Conclusion

Progression from the 1st to the 5th Industrial Revolutions has seen technology advance from being a mere tool to having embedded values and agency. Technology also has affordances, and through these response-dependent properties, may change its embedded values in changing circumstances or environments. These embedded values should be considered together with technology's function and intention, since technology used for off-label uses may result in unpredictable or undesirable results. The final set of embedded values in technology represent the social, political or cultural interests of select stakeholders. Researchers are therefore calling for greater transparency to understand which stakeholder values were prioritised over other values. New technologies like AI have ethical guidelines, which are largely ignored during the development phase, so it is important to know how the final values embedded in generative AI like ChatGPT for example, was determined.

Technology also has agency, and with agency comes responsibility. It is therefore advisable to have full transparency around technology's embedded values, as businesses deal with issues of data privacy, and discriminatory decisions of technology. Business leaders should be striving for greater stakeholder involvement in the development of technology, and a known set of stakeholder values embedded in technology, as we move forward with integrated human-technology innovations.

With technology advancing at breakneck speed, businesses may overlook the risks associated with these developments, which Den Hond and Moser (2023) raise.

Which values and whose interests does a technology embody? How does it stabilize the status quo? How does its material agency operate? And, importantly, how can it be contested, disrupted, and changed? (p. 112) .

When applied to education, the adoption of technology is much slower as educational institutions must balance technology advancements with the realities of the digital divide among advantaged and disadvantaged students. Globally, but especially in South Africa, access to technology and network connectivity constrain educational institutions from adopting technology in teaching and learning. Furthermore, lecturers and educational institution staff require capacity development to be able to incorporate new technologies into teaching and learning.

This research is a response to den Hond and Moser's (2023) invitation above, and specifically focuses on the 2nd perspective of technology having embedded values within the PSET sector in South Africa. Furthermore, all other studies considered value-laden technology from a business perspective (den Hond & Moser, 2023) . This study considers value-laden technology from a social perspective investigated through post-school education and training. While the research touched on technology's influence on society, the reverse relationship (society's influence on technology) falls outside its scope, and is therefore a gap for future research.

Chapter 3: Research questions

This chapter covers the research questions.

3.1 Research questions

This research is a response to Den Hond and Moser's (2023) invitation to examine more closely the "value-laden" (p. 94) nature of technology. They saw a gap in current literature around the values that technology embeds, and questioned whose values and which values are embedded. They further enquired about "how can it be contested, disrupted, and changed?" (den Hond & Moser, 2023, p. 112) .

This research specifically focuses on the 2nd perspective of technology that considers technology as having embedded values. While the research covers technology's influence on society, the reverse relationship (relational agentic nature of technology) falls outside its scope, and is therefore a gap for future research. The reason for excluding this part is because of time constraints, and the research goal is to achieve depth rather than breadth in the research.

The literature review in Chapter 2 showed further gaps that expanded the research questions and sub-questions.

Conceptual question

How are values that are embedded in technology selected, and how does it influence society?

Entities should be transparent about the values embedded in technology, so that society can make informed choices about its use (den Hond & Moser, 2023) . Research has shown that businesses, through technology, influence society to change their behaviours in favour of certain ideologies (Purtik & Arenas, 2019) . While the moral dilemma for society is high, technology is not held to the same moral standard; so, the interests of all stakeholders, and not a select few, should be considered when designing technology (Gill, 2020) .

The relationship between values and ethics influences how society acts, behaves and makes decisions (Weber, 2019) . It is therefore important for society to know which stakeholders decided on the set of values embedded in the technology, why, and what the expected result would be (den Hond & Moser, 2023) . Miller (2021) argues that even if values are not deliberately selected, technology has inherent moral and political values that exist for the life of the technology, and while identifying these values may be difficult to do, it may be possible to recognise these values by scrutinising its consequences. Technology should therefore be evaluated on its physical attributes, the function that it serves, and its intended purpose (Heyndels, 2023) .

Klenk (2021) further pointed out that technology can change its embedded values to be more responsive to a different environment, which amplifies the need to understand its embedded values, and to predict its responses in a different environment.

Question 1: How are the values that are embedded in technology, selected?

The research will focus on establishing the purpose that technology serves within the post-school education and training (PSET) sector, to investigate a possible link between the intrinsic values of technology; and its function and intent (Heyndels, 2023; Miller, 2021) . The research further investigates the set of embedded values in technology; how were these values selected; which stakeholders were consulted; who was the final decision-maker; and how could these values be changed? The questions are designed to delve deeper into the interests of different stakeholders that led to the social construction of technology (den Hond & Moser, 2023) . Within the PSET sector, the research looks at values embedded in eLearning platforms and eLearning programmes offered through eLearning platforms, and questions what are these values; how were they selected, which stakeholders were consulted; how could these values be changed; and who was the final decision-maker.

Stakeholders should comprise society, businesses, employees, shareholders and customers (Noble et al., 2022) . In the PSET sector, customers are the beneficiaries (students); businesses are the funders and industry bodies; employees refer to the educational institution staff; and shareholders are government and the regulatory authorities. Technology companies should develop technologies with stakeholders' values in mind, so that all stakeholders benefit from technology (D'Cruz et al., 2022) . There should be transparency around the identity of stakeholders associated with digital technologies. Furthermore, transparency should extend to which stakeholder values were prioritised and who had the final say (den Hond & Moser, 2023) .

This research inquires if there are policies and processes in place to change the values embedded in technology, if different environments warranted a different set of values (den Hond & Moser, 2023; Klenk, 2021) . Was it possible to change the values embedded in technology after it had been finalised, and how easy/difficult was it to change within the South African PSET sector?

Technology's hidden intent is to collect individuals' data (Noble et al., 2022) and use it to gain competitive advantage. Issues of data privacy, consent and the lack of transparency in data collection raises ethical issues (Flyverbom et al., 2019) which businesses must address. Data collection, privacy, consent, and data use is investigated in the context of student data collected through eLearning platforms.

Lastly, Question 1 probes if there are criteria in place to evaluate if technology achieved its intended purpose (D’Cruz et al., 2022) . In the PSET sector, technology refers mainly to eLearning platforms, and the research looks at how these platforms are evaluated to determine if they are fit for purpose.

Question 2: To what extent does technology influence society?

This question is included to investigate the agency of technology, its scope of influence on society, and how it achieves its purpose (den Hond & Moser, 2023) . Technology is both beneficial and detrimental, and society has the right to challenge the negative traits embedded in it (den Hond & Moser, 2023) . Understanding the purpose of technology and its influence on society, in its attempt to change perceptions, attitudes and behaviours (den Hond & Moser, 2023) is a first step towards understanding the trajectory of technology into the future.

There are benefits to using technology. Technology’s influence on society may be widespread, from economic and lifestyle influences; to the adoption of new products and services; to greater community value creation for public good (Audretsch et al., 2019) . Similarly, technology may be detrimental in some ways. This research looks at the benefits and negative attributes of eLearning technology in the PSET sector, and in society in general as far as students are part of the society in question.

The reverse relationship of how society influences the growth and development of technology, i.e. its relational agentic nature, (den Hond & Moser, 2023) falls outside the scope of this study, and is an area for further research.

Chapter 4: Methodology

This section covers the aims, assumptions; research strategy; research design; criteria for sampling; level and unit of analysis; data gathering process and research instrument; data analysis approach; and research quality and rigour.

4.1 Research paradigm

Ontology is about what we assume reality to be (Bell et al., 2019) , or our assumptions about the nature of reality (Saunders et al., 2016) . Reality can exist whether there is an observer to its existence or not (objectivism); or society and culture can be viewed as actively and continuously influencing each other, thus altering the nature of reality, which is known as social constructivism (Bell et al., 2019) . Social constructivism is about a perceived reality based on a person's history, language and culture, weighed against environmental conditions (Willig, 2001) .

Epistemology are the assumptions we make about how knowledge is created, within a particular ontology (Bell et al., 2019) . It involves our perceptions of what is “acceptable, valid and legitimate knowledge” (Saunders et al., 2016, p. 127) and how we choose to communicate this knowledge to others. The epistemology underpinning social constructivism is interpretivism, which is about extracting meanings from what people say and do (Schwandt, 1998) . It is about “understanding human behaviour” (Bell et al., 2019, p. 15) and interpreting its meaning.

This research is about understanding how values are embedded in technology, and its influence on society. It is based on participants' perceptions that are rooted in their history, culture and language, and therefore lends itself to a social constructivist ontology. I, as the researcher, interpreted the participant responses gathered through semi-structured interviews. I presented my interpretation of the participants' constructions (Schwandt, 1998) of their experiences, that are based on perceptions influenced by their language, culture and historical background (Willig, 2001) . It was therefore important for me to acknowledge how my own values, beliefs, historical and cultural norms may influence my interpretations of participants' responses (Creswell, 2007; Saunders, 2016) , and adjust my stance to prevent bias in my data as far as possible. As a subjectivist, interpretivist researcher, my role was to understand participants' different realities, and to articulate “their motives, actions and intentions” meaningfully (Saunders et al., 2016, p. 131) . I therefore chose a social constructivist ontology and interpretivist epistemology as the research paradigm.

I adopted an inductive approach to theory development, as it best suited the interpretivist philosophy. This approach involves building theory through “a naturalistic and emergent research design” further enhancing an existing theoretical perspective (Saunders et al.,

2016, p. 168) . Researchers who use an inductive approach to reasoning place emphasis on the context in which phenomena being studied, occur (Saunders et al., 2016) . I began my research by collecting data through semi-structured interviews to explore the views and opinions of selected participants within the context of the South African post-school education and training sector. I then coded the data using Atlas ti software, identified patterns in the information gathered and categorised these patterns, and then developed themes, which I analysed to build a conceptual framework (theory). For this reason, an inductive approach for my study is appropriate.

4.2 Methodological choice

“A research design provides a framework for the collection and analysis of data” (Bell et al., 2019, p. 38) , and the design should therefore fit the research question and aims of the study (Braun & Clarke, 2021) .

Research may use quantitative, qualitative or a mixed method (Bell et al., 2019) . Qualitative research is about “words and images” (Bell et al., 2019, p.19); it is inductive; focuses on theory building; embodies interpretivism; and sees reality as constantly changing and emergent. Qualitative research is concerned with “participants’ meanings and the relationships between them, using a variety of data collection techniques and analytical procedures, to develop a conceptual framework and theoretical contribution” (Saunders et al., 2016, p. 168) .

This research is exploratory, and follows an interpretivist epistemology, with an inductive approach to developing a conceptual framework. Exploratory research asks “What” and “How” questions, is flexible and adaptable, and tends to narrow its focus as the research progresses (M. Saunders et al., 2016) . A qualitative research method therefore suits this research design. Qualitative research is about “developing a depth of understanding rather than a breadth” (Boddy, 2016, p. 430) . It requires a set of assumptions to be stipulated; considers the participant’s view of the world; and suits a research question that enquires about the meaning ascribed by individuals to a particular social problem (Creswell, 2007) . The researcher must build trust and rapport with participants in their natural setting, to get the best possible responses from them (Saunders et al., 2016) . Based on the description of qualitative research, this method suited my explorative study on how values are embedded in technology, and its influence on society, where I interviewed participants from the South African post-school education and training sector and asked for their personal opinions on my topic.

For this study, a mono method qualitative methodology was used, with a corresponding analytical procedure. This involved collecting data through semi-structured interviews,

and analysing the data using a single analytical method of comparison and cross-comparison of grouped participants' data.

The study used an adaptation of a narrative research strategy, where participants shared their own knowledge and experience. I conducted a cross-sectional study as a snapshot of participants' perceptions and experiences. This entails data collection from more than two participants within a defined period (Bell et al., 2019) . Due to time constraints for the study, the cross-sectional approach was selected.

4.3 Level and unit of analysis

Bell et al., (2019) place the level of analysis at either individual; organisational; group or societal level. This research study is at organisational level within the PSET sector, as the participants are from institutions operating in the post-school education and training sector, and conclusions are applicable to these institutions.

The unit of analysis is the individual as individual participants were interviewed about their personal knowledge and experience related to the study. Each participant's data was collected and analysed separately.

4.4 Sample method, size and sampling criteria

Participants were selected from organisations in the PSET sector. These organisations include the national department of higher education; universities; TVET Colleges; SETAs; private higher education institutions; and PSET regulatory bodies. Heterogeneity of the organisations operating within the PSET sector that are selected for the sample "helps provide evidence that findings are not solely the preserve a particular group, time or place", which could assist in determining if a theoretical framework conceptualised within one context, can apply to other contexts (Robinson, 2014, p. 27) .

Chapter 3 outlines the reasons for choosing the PSET sector in South Africa for this study. The PSET sector is a demographic representation of the South African population; that aims to bring about social change, using (among other means) a variety of eLearning platforms to reach the youth (Department of Higher Education and Training, 2023b) . Furthermore, all other studies considered value-laden technology from a business perspective (den Hond & Moser, 2023) . This study will provide a different perspective by considering value-laden technology from a social perspective, through education.

The sampling frame included managers and specialists of eLearning from a South African institution in the PSET sector. The sample included academics; instructional designers; curriculum developers; and eLearning managers. The PSET sector is small enough, and eLearning is specialised enough for the community to know one another,

so I was able to verify and update my sampling frame, derived from Linked-In and PSET institution websites, with a few people within the PSET sector.

4.5 Sampling method

The sampling method must support the method of inquiry selected for this research (Creswell, 2007) . I therefore used a purposive sampling method, meaning that I selected participants based on their relevant experiences and circumstances that qualify them to provide valuable inputs in relation to the research problem (Creswell, 2007) .

The criteria that I used to select participants for this study were that they worked at a PSET institution; and they performed a function related to eLearning, such as curriculum development for eLearning programmes; instructional design of eLearning platforms; academics involved with eLearning research or offering eLearning programmes; or eLearning managers responsible for a function of eLearning, like quality assurance or assessments. The final determination of participants relied on participant availability. Of the 29 people invited to participate in this study, 16 indicated a willingness to participate within the interview window, whom I interviewed.

The limitation of this sample was the exclusion of technology partners who own the eLearning platforms on which teaching and learning takes place. This group may have brought a different dimension to the research. Their exclusion was for practical reasons of time constraints, and should be considered in future research. The decision to focus on eLearning managers and specialists from PSET institutions instead of eLearning managers or specialists from technology companies operating in the PSET sector, was that participants from PSET institutions would bring a new perspective to the debate about value-laden technology and its influence on society, which was currently mostly from a business perspective. Post-school education and training aims to transform society by developing the learner to participate in the economy (Department of Higher Education and Training, 2023b) , so the perspective of eLearning managers and specialists from PSET organisations would align to the Department of Higher Education and Training's objectives.

4.6 Sample size

Determining an appropriate sample size in a qualitative study depends of the “context and scientific paradigm” (Boddy, 2016, p. 430) of the study. The sample should not be too large to affect the depth of analysis, or too small to hinder the uncovering of “a new and richly textured understanding of experience” (Sandelowski, 1995, p. 183) . In practice, actual data saturation begins to show after six in-depth interviews, but is usually evident after twelve in-depth interviews (Boddy, 2016) .

While the original plan was to interview twelve to fourteen participants who met the criteria, I eventually interviewed sixteen participants since they had all agreed to be interviewed, and I thought it unethical to cancel these interviews. I was aware that I should be guided by the data saturation point i.e. when no new “strands within individual accounts” (B. Saunders et al., 2018, p. 1898) are being extracted from additional participants. However, I only calculated the data saturation point after I had concluded all interviews, since I decided to honour my commitment.

4.7 Research instrument

I used an interview guide (Creswell, 2007) during the conducting of interviews. The interview guide (Appendix 1) comprises orientating questions; boundary (open-ended) questions; clarifying questions; and a closing question (Josselson, 2013). I tested the guide in a pilot study, with an individual who was not part of the research study, but who was knowledgeable about eLearning in the PSET sector, and occupied a position that matched the sample.

4.8 Data gathering

Inquiry in qualitative research is unstructured and bound (Josselson, 2013) – meaning that the researcher is inquiring about a participant’s life experiences, in relation to the focus of interest. For this study, I used a semi-structured interview protocol as I was interested in understanding the reasons and rationale for the participants’ attitudes and decisions. My study used an adapted narrative inquiry strategy. Interviews were either in person, or online. I recorded all interviews and transcribed them using Microsoft Teams. It is important to have a quiet setting with no distractions during the interview (Creswell, 2007). Two important characteristics of a good interviewer is to ask open-ended questions, and to have good listening skills (Creswell, 2007). It was therefore important that I established rapport and trust with the participants so that they felt comfortable to respond fully and honestly. Appendix 2 contains my pitch to recruit participants for this study.

I edited the transcripts produced by Microsoft Teams, myself. Although it was laborious work, the process ensured that I familiarise myself with the data, and I could therefore efficiently code the data. I was also able to revert to the recordings to clarify any ambiguous points, which assured me of the data’s accuracy and integrity.

4.9 Data analysis

Qualitative data analysis is interactive, iterative and reflexive in nature (Saunders et al., 2016). Data gathering and analysis in qualitative research are interconnected in that I started to analyse and interpret data as I gathered it (Saunders et al., 2016). The data that I collected and analysed originated from words, which may have several different

interpretations, and was therefore carefully considered. Hence, it was necessary to toggle between data collection and data analysis “to allow meanings to be explored and clarified” (Saunders et al., 2016, p. 568) . This large collection of data was loaded onto Atlas.ti software, which helped me to code the data. Because I used a purely inductive approach, I coded all the data relevant to my research question, so that I could extract meanings from them. I labelled the codes according to what best described the unit of data that I was coding. Once coded, I classified the 132 codes into 26 categories, which I then linked to 10 themes, which helped me to make meaningful sense of the data.

There are different types of thematic analysis: “reflexive thematic analysis; qualitative content analysis; discourse analysis; interpretive phenomenological analysis; and grounded theory” (Braun & Clarke, 2021, p. 37). Thematic analysis is used “to search for themes, or patterns, that occur across a data set” (Saunders et al., 2016, p. 579) . Both inductive and deductive coding can use thematic analysis. I used qualitative content analysis as the thematic analysis tool for data analysis.

I calculated the data saturation point as the point when additional data did not generate any new codes. This happened after the 11th interview. For interviews 12 to 16, even though I gathered interesting and relevant data, I did not generate any new codes.

“Theory emerges from the process of data collection, analysis and interpretation” (Saunders et al., 2016, p. 570) . Since I used an inductive approach, I began my data collection without a theoretical framework, and built a conceptual framework based on the data collected, analysed and interpreted. After triangulating the findings with literature, I then refined the conceptual framework.

4.10 Access

I did not anticipate having any issues with access as I did not use any organisational data. My participants were from different organisations operating within the post-school education and training sector. I planned to interview individuals from these organisations, and I am interested in their personal opinions. I did not need permission from these organisations, as I was not interested in the organisational position on my area of interest, and neither were the organisations a subject of my research. However, I did experience problems of access at one public institution. The institution required a letter from Gibs, requesting permission to interview any of their staff. As I was not able to get this letter from Gibs, I removed the two individuals from my sample.

I did have access to some participants who met the criteria for my study, through my professional network. I used Linked-In and institution websites to source additional participants who were eLearning managers or specialists at a PSET institution, and I

used my network to confirm my sample. In this way, I had twenty-nine individuals who met the criteria for my study, in my sample. I approached all twenty-nine for interviews, and sixteen accepted my invitation.

4.11 Validation, quality and rigour

Qualitative research with an interpretivist approach, is not easy to validate. The approach lends itself to subjectivity merely from the way in which data is collected. What we understand to be the truth is our perceptions of a particular context that is based on our life experiences, and expressed through words (Angen, 2000) . To establish validation (instead of validity) in interpretivist research essentially becomes a moral question, that I must address throughout the research process (Angen, 2000; Creswell, 2007) . However, I must be able to defend the merits of my work for the community of researchers to take it seriously (Angen, 2000) . Validation of interpretive research is less about specific methodologies and more about the broad principles underpinning the research, that guide actions and decisions in each instance (Angen, 2000) . While validation is considered the only criteria by some interpretivist researchers, others still support the view that a researcher must measure quality and rigour through credibility; dependability; transferability; and confirmability.

4.11.1 Credibility

Bell et al. (2019) list two ways of establishing credibility: by sharing the research findings with participants; and by triangulation. Triangulation would have involved using a multi-modal data collection process, which was not part of my research design. I could have asked participants to validate the accuracy of the account of their interviews, but my fear was that they may not have the time; they may change the essence of what was said in the interview; or they may add more than what was shared at the time.

Another way to ensure credibility was to ensure that I did not bias the recording of analysis of what participants said by expressing my views on the outcomes of the research. I also reviewed the recordings carefully to ensure that participants views were accurately reflected. My values and morals (Angen, 2000) are important to establishing the credibility of my research. The way I documented the entire research process, and interpreted what participants said, demonstrated transparency and openness that supports the credibility of this research.

4.11.2 Dependability

This quality check is about establishing that the study is reliable. To meet this criterion, all supporting documents, transcripts, recordings, etc. for the study have been saved for an audit, and will be kept for no less than ten years.

4.11.3 Transferability

I have provided “a full description of the research questions, design, context, findings and interpretations” (Saunders et al., 2016, p. 206) of my work so that other researchers can determine if this research study is transferrable to another setting or not.

4.11.4 Confirmability

This measure is about ensuring that the research is credible, plausible and persuasive. I preserved all supporting documents for the audit and subsequent use, for at least 10 years. I stored data in a protected folder in the cloud, and a second copy on a separate hard drive. I removed all participant identifiers to protect participants' confidentiality. I coded interview recordings and transcriptions such that there are no identifiers for specific individuals or organisations within the report.

4.11.5 Researcher bias

I am aware of the potential for researcher bias, and therefore took conscious steps to prevent it, by for example, not asking leading questions, but probing in a more generic way. I also reminded myself before each interview, to remain neutral and give assurances to the participant that his/her identity will be protected. I develop and implemented a moral and ethical set of principles to underpin this research.

4.12. Ethical considerations

Some of the principles underpinning the ethical behaviour of researchers include “beneficence, do good; nonmaleficence, do no harm; respect for autonomy, self-determination; and equity, treat fairly” (Reid et al., 2018, p. 70) .

Ethical considerations in a qualitative study, span the entire duration of the study from ethical clearance until close-out and dissemination of the report, resulting in ethical considerations that may arise in the moment, may involve the procedures to be followed for the study, may be about the relationship between researcher and participant, or about the ethics around closing out the study (Reid et al., 2018) . When responding to ethical dilemmas that may arise, my own “motivations, assumptions and interests” (Reid et al., 2018, p. 70) are tested, so I was transparent about my own biases and assumptions to help fellow researchers evaluate the quality of my research study.

Respect for all participants and the site of research is of utmost importance (Creswell, 2007) . In this study, I respected all participants and treated them as individuals, instead of aggregating them into categories (Creswell, 2007) . I, as the researcher, acknowledge my own bias and my power as the researcher, and therefore ensured that all participants were put at ease, and shown respect as they shared their experiences with me. I endeavoured to actively listen and acknowledge that the experiences shared belonged

to the participants (Creswell, 2007) . I respected the confidentiality of experiences shared, and the anonymity of all participants.

Research only began after ethical clearance had been granted.

4.13. Conclusion

This research study attempts to answer the conceptual question: How are the values that are embedded in technology selected, and how does it influence society? I chose a social constructivist ontology and interpretivist epistemology research paradigm for this study. I adopted an inductive approach to theory development with a qualitative research method. I used a purposive sampling method to select participants for the study. The level of analysis was organisational and the unit of analysis was at an individual level. Participants were eLearning managers or specialists from the post-school education and training sector. This study followed a cross-sectional strategy. I used an interview protocol with semi-structured interview questions to prompt participant responses. Based on the research question, the most appropriate analysis method was qualitative content thematic analysis. I conducted the study in a manner that ensured data quality, validation and rigour.

Chapter 5: Results/Findings

5.1 Introduction

Chapter 5 discusses the findings in relation to participant responses to questions outlined in Chapter 3. The sample comprised 29 participants, of which I interviewed 16 participants, using a semi-structured interview guide (Appendix 1). All participants were managers or specialists in e-learning within the South African post-school education and training sector. Table 2 shows the distribution of participants by institution type.

Table 2: Distribution of participants by PSET institution type

PSET Institution type	Number	Participant ID
Public and private Universities and Universities of Technology (UoT) (Abbreviated to UNI in Analysis)	6	HEI-1-01 UNI-1-01 UNI-2-01 UNI-2-02 UNI-3-01 UNIT-1-01
Skills development providers (SDPs) (Abbreviated to SDP in Analysis)	6	SDP-1-01 SDP-1-02 SDP-2-01 SDP-3-01 SDP-4-01 SDP-5-01
Government and regulatory bodies (Abbreviated to PSET in Analysis)	4	PSET-1-01 PSET-2-01 PSET-2-02 PSET-3-01

Source: Author's own analysis

Participants in the UNI group comprised four from public universities, one private higher education institution (university) and one public university of technology. Six eLearning managers/specialists from public and private skills development providers were interviewed. The third group comprised four e-learning managers from national government and regulatory bodies in the PSET sector. While the gender of the participants plays no role in the analysis, it was coincidental that there was an equal split of participants by gender. The table below shows the roles of the different participants within the field of eLearning. One participant was an eLearning curriculum development specialist; seven participants were instructional designers; four participants were academics responsible for eLearning; three participants were involved with quality assurance of eLearning programmes; and one participant was responsible for e-assessments. While most participants' focus was on the youth at educational institutions, four participants were involved with continuous professional development (CPD) for adult professionals who were part of the workforce.

Table 3: Roles of participants

Role of participant	Number	Participant ID
eLearning Curriculum developer	1	SDP-1-01
Instructional designer	7	UNI-2-01 SDP-1-02 UNI-3-01 SDP-3-01 SDP-2-01 UNI-2-02 HEI-1-01
eLearning academic	4	UNI-1-01 PSET-1-01 UNIT-1-01 SDP-5-01
eLearning manager: QA	3	PSET-2-01 PSET-2-02 SDP-4-01
eLearning manager: Assessments	1	PSET-3-01
Continuous Professional Development (CPD)	4	PSET-1-01 UNI-3-01 SDP-3-01 SDP-4-01

Source: Author's own analysis

Table 4: Participant by role and institution type

Participant	CPD	eLearning academic	eLearning Curriculum developer	eLearning manager: Assessments	eLearning manager: QA	Instruct. designer	Pub & priv. univ. & UoT	SDPs	Nat. Govt. & regulat. bodies
SDP-1-01									
PSET-2-02									
HEI-1-01									
SDP-4-01									
PSET-2-01									
UNIT-1-01									
UNI-2-02									
PSET-3-01									
SDP-5-01									
UNI-1-01									
UNI-2-01									
SDP-1-02									
PSET-1-01									
UNI-3-01									
SDP-3-01									
SDP-2-01									

Source: Author's own analysis

Table 4 shows each participant's role within eLearning.

Table 5: Statistics about interviews

Number of interviews	Total time of recordings	Total number of pages of transcripts	Total number of words	Number of quotes selected	Number of codes	Number of categories	Number of themes
16	722 min	239	88 515	916	171	26	10
	Av. = 45 min	Av. = 15 pages	Av. = 5 532				

Source: Research data

Table 5 above shows some statistics about the research. The 16 interviews conducted resulted in 722 minutes of recordings; and 239 pages of transcriptions. The wordcount for the interviews was 88 515. Nine hundred and sixteen (916) quotations were selected and captured in 171 codes. These codes were grouped under 26 categories, which in turn were linked to 10 themes.

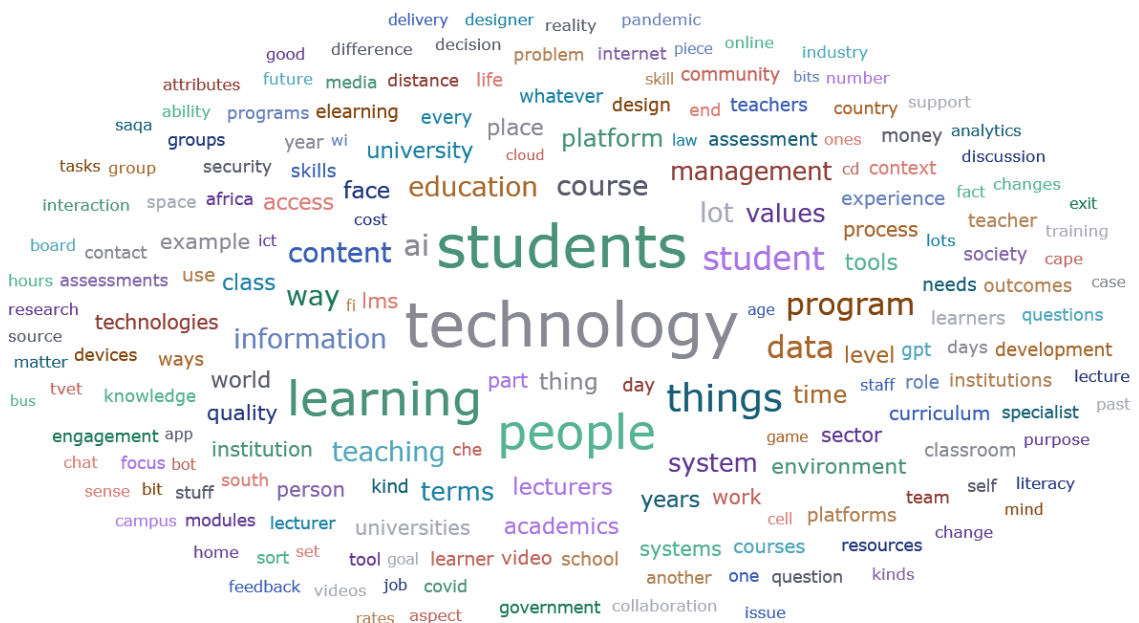


Figure 5: Word cloud generated from quotations

Source: Atlas.ti

Figure 5 above is the word cloud generated through Atlas.ti, from the 916 quotations. As expected, the words “students; technology; learning; and people” are the most prominent.

Table 6 below shows the categories linked to ten themes. A table of codes related to categories appears in Appendix 5. Table 7 shows how each theme relates to research questions and sub-questions. The discussion that follows links each theme

Table 6: Categories linked to themes

	Themes									
	Evolution of technology	Balancing online and face-to-face learning	Platform design and criteria influencing student journey	Data protection and ethical considerations	Access and equity of e-learning	Choosing a suitable technology platform	Role players in determining values and regulatory oversight	Technology as an Enabler of 21st Century Skills	Artificial intelligence and education	Technological advancement vs societal values
Category										
Technological evolution	✦ (34)									
Technology as a tool	✦ (18)									
Influence of e-learning platforms on teaching and learning		✦ (40)								
Modes of learning		✦ (59)								
Factors affecting technology adoption in PSET		✦ (6)								
Online platforms supporting teaching and learning		✦ (19)								
Student learning journey			✦ (4)							
Online platform design considerations			✦ (25)							

Assessments			✦ (8)							
Data protection				✦ (33)						
Use of student data				✦ (29)						
Accessing student data				✦ (19)						
Accessing information through technology					✦ (19)					
Navigating the digital divide					✦ (34)					
Criteria for evaluating e-learning platforms						✦ (98)				
Stakeholders consulted							✦ (70)			
Final decision-maker							✦ (32)			
Possibility of changing values after registration							✦ (29)			
Regulatory controls over e-learning platforms							✦ (8)			
Values associated with e-								✦ (52)		

learning platforms										
Graduate attributes								✦ (30)		
Preparation for work environment								✦ (30)		
Technology in the future									✦ (26)	
AI in the PSET sector									✦ (50)	
Technology's influence on society										✦ (99)
Negative effects of technology use										✦ (27)

Source: Author's own interpretation of data on Atlas.ti

Numbers in brackets represent the number of codes in that category, related to a particular theme.

Table 7: Themes linked to questions

	Evolution of technology	Balancing online and face-to-face learning	Platform design and criteria influencing student journey	Data protection and ethical considerations	Access and equity of e-learning	Choosing a suitable technology platform	Role players in determining values and regulatory oversight	Technology as an Enabler of 21st Century Skills	Artificial intelligence and education	Technological advancement vs societal values
Question 1: How are the values that are embedded in technology, selected?		🔔	🔔					🔔		
1.1 What purpose does technology serve?	🔔	🔔							🔔	
1.2: Which stakeholders were consulted in its development?							🔔			
1.3 How were the final values for the technology selected?							🔔			
1.4: How could these values be changed?							🔔			
1.5: How is the data gathered through technology, used and protected?				🔔						
1.6 How is technology evaluated?						🔔				

2. To what extent does technology influence society?										
2.1: How does technology influence society?										
2.2: How does society benefit from the use of technology?										

Source: Author's own interpretation of how themes link to research questions and sub-questions

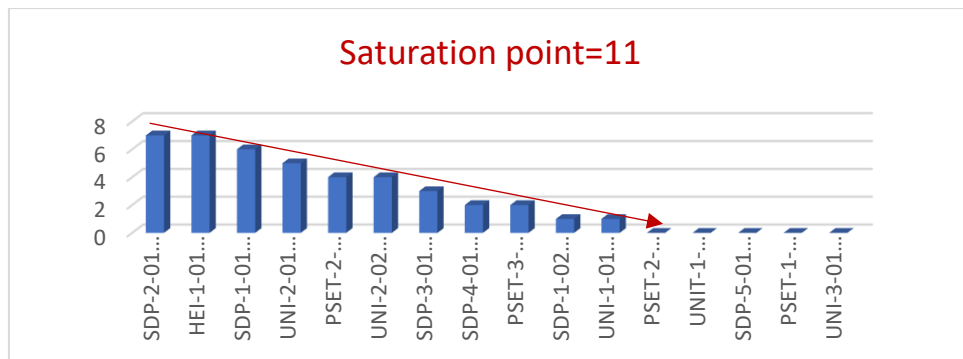


Figure 6: Graph showing saturation point

Source: Researchers own work based on data from Atlas.ti

Saturation point was reached after 11 interviews as the data did not require any new codes thereafter.

to the research questions. The analysis considers each research question followed by sub-questions, which relate to the relevant themes.

Figure 6 above shows the data saturation point, which was reached after 11 interviews. Even though participants provided valuable insights, I did not create any new codes for the last five interviews.

5.2 Analysis of findings

5.2.1 How are the values that are embedded in technology, selected?

(i) Platform design and criteria influencing student journey

This theme considers how values are embedded into eLearning platforms, during the design phases, thus influencing the student journey. This theme is important in unpacking the hidden values and possible biases associated with eLearning platforms.

Table 8: Evidence to support theme: Platform design and criteria influencing student journey

Participant	Quote
UNI-3-01 Student journey	You can build pathways for students and help them through meaning making, which is really one of the benefits of it.
UNI-2-01 Designing for people with disabilities	One thing that was lost during the pandemic was that in the rush to go online, students with disabilities were sort of forgotten. So, what we have strongly developed or pushed forward is a universal design for learning. It basically says rather than design learning experiences for specific students or for students with disabilities, design a learning experience for all students. For example, if you have a video, ensure that it has captions. Ensure that it has a transcript for students who would prefer it. Whether the student is disabled or not, the student may want to read the text rather than watch the video or want to read and watch the video.
UNI-2-02 Student journey	All that you need is Internet access and a technology device.
UNIT-1-01 Assessment	You can set a digital multiple-choice test that randomises the questions, randomises the answers and that students can do as often as they like.
SDP-1-02 Design	If I know that there are simulations available about the specific thing, what type of simulation would you bring in? What would be video ensuring that all these things again aligned to international best practices, that they are accessible for students with disabilities. It is not just physical disabilities like being deaf or blind, but it could be learning disabilities. Address all those things in your planning and throughout the module development.
Student journey	E-learning provides access: access to education, access to a better life, access to a new job, access to being able to earn a living while studying at your own time at your own pace after hours.
SDP-3-01 Design	The disadvantage is that often people drop out. Completion rates could be terrible. You need a retention engagement management strategy. You are not going to get 100% buy-in, but how about we aim for 75%? Let us work to get 75%, and we will give data. We will give incentives. We will call students for get-togethers. Often that is great too. People get freebies. People get free lunches and it helps.

Assessment	We want to get to assessment on demand, but we need the empirical evidence behind it. And obviously it will be with the use of technology. We are going to make things more seamless and technology can definitely assist with it without compromising on quality, or on achieving competencies at the required level. When you finish the course, there is a downloadable certificate. A lot of courses also incorporate badges throughout the course.
SDP-1-01 Design	I would first of all make a mind map or a picture of the student who's going to be using it, and obviously there's diverse students so maybe make 10 and then I'll make a combination of everybody. So, it'll be one picture. It is like an image of who is your user going to be.
SDP-2-01 Assessment	Proctoring tools, assessments. Are they still being fair and, providing quality assessments?
PSET-2-02 Design	It can over time reduce costs because you develop these materials up front and they have a life of five years or so and you don't have to do it every year. It can reduce costs depending on how you design it, it might not, so you might have to design it for better cost efficiency and it's really important to make sure that the quality is there.
PSET-2-01 Design	I don't think there is a perfect learning management system. I think a learning management system can be designed and customised to suit the needs for the programme.
PSET-1-01 Design	The context of the student as well as the values that we would try to embed is not a technology thing that determines that it's for me. It's the teacher; it's the lecturer; it's the subject specialist that does that.
PSET-3-01 Assessment	When it comes to a learner, showing that he or she is worthy of that qualification, they have to prove their competencies and we do the competency model assessment. We will therefore make sure that all your exit level outcomes that are in the qualifications are linked to occupational standards and tasks, and if they can complete those occupational standards successfully in whatever format the assessment takes place, it will prove that they have competently achieved the exit level outcomes, which makes them worthy of that certificate, which means they'll be able to do the job one day.

(ia) Case analysis

In the case analysis of the UNI group, UNI-3-01 suggested that the platform design should consider the student journey by allowing for the development of learning pathways, which enhances teaching and learning. UNI-2-01 expresses this sentiment as follows: *“So, what we've ... pushed forward is a universal design for learning. It basically says rather than design learning experiences for specific students or for students with disabilities, design a learning experience for all students”*. UNIT-1-01 pointed out that the student journey is enabled through access to a technology device such as a computer, and internet access. Online multiple-choice assessments further enhanced the student journey by testing the student's knowledge while still being integral to the learning process, as it allows for multiple attempts until the student has gained the necessary knowledge and skill-set to move on. The three instructional designers in the

group held similar views about implementing a universal design, while the academic (UNIT-1-01) focused on assessments to test learning outcomes.

One instructional designer in the SDP group (SDP-1-02) saw the e-learning platform as providing flexible access to education, which in turn gives a student access to the world of work. The curriculum developer in the group (SDP-1-01) emphasized the need for a student-centric design, placing the student at the centre, and really knowing and understanding who this student is. The idea of a universal design and international best practice expressed by SDP-1-02, comes through with accommodating students with all forms of disabilities, and being creative in using other forms of media like simulations and videos to enhance teaching and learning. However, SDP-301 pointed out that student success rates with e-learning are concerning, and therefore the student journey design on the platform is very important. A possible solution to increasing success rates was to offer incentives. It was also important to manage expectations around student completion rates. SDP-3-01 had this to say: *“We want to get to assessment on demand, but we need the empirical evidence behind it. And obviously it will be with the use of technology”*. SDP-3-01 felt that assessment on demand was a step forward that face-to-face teaching and learning could not offer. However, the integrity of proctoring tools (used as a proxy for invigilators during assessments) employed during assessments was questioned by SDP-2-01 as it may influence the quality of assessments. SDP-2-01 had this to say: *“Proctoring tools, assessments. Are they still being fair and, providing quality assessments?”* There were no significant differences of opinions expressed within the SDP group, which included opinions of three instructional designers and a curriculum developer (SDP-1-01). All four participants focused on making e-learning more about the student experience.

The academic in the PSET group (PSET-1-01) did not see technology as having an influence on student values; the lecturer played that role. This view differed from the other participants in this group. Two of the participants (PSET 2-01 and PSET-2-02) held similar views about technology being a cost-effective means for teaching and learning, and although not perfect, it could be customised to fit the purpose. PSET-3-01 felt that assessments served a particular purpose to determine competency for the job market, and should be designed to assess exit level outcomes and meet the required assessment standards for a particular qualification. The e-learning platform therefore had to meet these criteria.

(ib) Cross-case analysis

Participants in the UNI and SDP groups had expressed opinions about e-learning being student-centric, which did not surface in the PSET group. Both groups also expressed

opinions about having a universal platform design to accommodate all students, while participants in the PSET group had raised the point about no platform being perfect, but it could be customised to fit the objectives of the institution. The participant in the PSET group emphasized the purpose of assessments as a measure of meeting the assessment standards for a particular qualification, while the academic in the UNI group felt that e-learning platforms allowed the flexibility of offering multiple attempts at assessments, as part of the student’s learning journey. The participant in the SDP group took the argument a step further by suggesting the introduction of assessment on demand, meaning that an individual student can take an assessment at any time, and not wait for a scheduled assessment set for the entire cohort of students. However, a participant in the SDP group also questioned the fairness of using proctoring tools during assessments. The most striking difference of opinion was expressed by a participant in the PSET group who puts the teacher and lecturer front and centre as the influencer of the student journey, rather than technology.

(ic) Conclusion

Participants supported the popular view that eLearning platforms should be designed with the student at the centre. This meant adopting a universal design that could accommodate the needs of all students, including those with disabilities. The choice of e-learning platform seemed irrelevant if it could be customised to meet the objectives of the institution. While assessments served the purpose of determining student competency against specified standards, eLearning platforms offered opportunities to think about assessments differently through offering multiple opportunities for assessments as well as assessment on demand, which supports the notion of eLearning offering students flexibility in their student journeys. However, not everyone shared these views. One participant believes that the role of the teacher and lecturer is still central to the student journey.

(ii) Balancing online and face-to-face learning

Table 9: Evidence to support theme: Balancing online and face-to-face learning

Participant	Quote
UNI-2-02 Values	<p>We're so focused on the knowledge to be taught. This is the skills to be learned that there isn't that thinking about the values. We think of it as the overall program, but we don't always enact that in individual modules.</p> <p>There's a general level of values, and then there's also a program-specific ones. There's a disconnect between the overall values, the values of the program and then how we actually teach in specific modules.</p>

UNI-3-01 Values	<p>I'm not sure we can separate the values of online or online education from the values of face-to-face education or I like the phrase these days, land-based education.</p> <p>I mean that's quite a complex question about the values of online learning so I don't think we can divorce it from what is the values of face-to-face learning. In the old-fashioned scenarios, distance learning is the values of education.</p>
SDP-5-01 Values	<p>Too often we just dive directly into the content so the values are not clarified, so we need to say at a course level, these are the values which I'd like you to live out.</p> <p>I think values should be embedded in stories and I think we do much too little values at the moment. Outcomes are positioned in very boring ways and students skip them.</p>
SDP-3-01 values	Capacitation of teacher development is the value here at the end of the day which obviously trickles down to the learners who benefit.
SDP-1-01 Values	<p>I'm sure we change values and we develop new values; they're definitely not static.</p> <p>Sometimes values do get watered down, and it might not always be the values that the students want.</p>
SDP-1-02 Values	When you develop a program the information that you present and that you create will adhere to your own values.
PSET-2-02 Values	Some people think that you can't instil values in an online learning setting, which is of course not true. You can instil values in an online setting and some of which are directly related.
PSET-1-01 Values	When you're doing an online course, for example, what you try and do in most instances is to keep it as generic as possible. The reason for that being the context of the student is always going to be very, very different. Whether we're in Northern Cape, whether we're in Western Cape, whether we're in KZN, context is very important because it doesn't just come with a geographical environment, but also comes with traditions and values because of the different cultures that you have. When you bring videos, you would bring the South African context in the video.
PSET-2-01 Values	It brings with it a lot of opportunity, a different mindset that students will leave with different graduate attributes.

Within this theme, the question of values embedded into eLearning platforms was raised.

(ii) Case analysis

UNI-2-02 said that there was not a deliberate thought process dedicated to values, but that learning programmes had embedded values. UNI-2-02: *"We're so focused on the knowledge to be taught. This is the skills to be learned that there isn't that thinking about the values"*. However, there was a disconnect between the values embedded in programmes, and in individual modules, and the way these modules were taught. UNI-3-01 felt that the values embedded in eLearning programmes could not be separated

from those of traditional or land-based learning, and there once was a time when distance learning was considered an embedded value. UNI-3-01: *"I mean that's quite a complex question about the values of online learning so I don't think we can divorce it from what is the values of face-to-face learning"*. Both participants were instructional designers, so it is interesting that neither of them noticed the values that were already embedded in the eLearning platform.

SDP-5 felt that values were not clarified upfront for each programme, and perhaps this should be done more deliberately. An innovative way was to embed values in stories, which would increase student engagement around them. SDP-5-01: *"I think values should be embedded in stories"*. SDP-1-01 said that values are fluid and subject to change, but are not always aligned with learner needs. SDP-3-01 felt that values were associated with the capacitation of teachers, who in turn influenced learners, while SDP-1-02 said that the values embedded in learning programmes should resonate with the personal values of the programme developer. There were differences of opinion within this group. The academic (SDP-5-01) and the curriculum developer (SDP-1-01) seemed to have clear thoughts about values being incorporated into learning programmes, while the two instructional designers (SDP-3-01 and SDP-1-02) had very different ideas about how values were embedded. The former placed values at the level of teacher capacitation, while the latter placed it with the curriculum developer.

PSET-2-02 was confident that values were embedded in eLearning platforms: PSET-2-02: *"Some people think that you can't instil values in an online learning setting, which is of course not true"*. PSET-2-01 said that these embedded values influence the student mindset, and contribute to the graduate attributes with which they exit. PSET-1-01 said that the embedded values should be generic to allow for regional cultures and norms of people located within different geographic areas. The values should therefore resonate at a national level. The PSET group were the regulatory authorities, and it seems that these participants were clear on linking values to eLearning platforms, and stating that these embedded values influenced graduate attributes (the attributes with which students exited once attaining the qualification).

(iib) Cross-case analysis

There were similarities between the opinions of the instructional designers within the UNI and SDP groups, as they seemed to grapple with how values were embedded into eLearning platforms. However, one instructional designer did point out that it was difficult to separate the values of eLearning from traditional learning. The academic and curriculum developer in the SDP group had stronger arguments for linking online programmes with embedded values, but both pointed out that it was not being done

effectively. The two quality assurers in the PSET group made the link between embedded values in eLearning platforms, and graduate attributes, while the academic in the group talked about keeping eLearning embedded values generic so that they could resonate with learners' cultural values and norms.

(iic) Conclusion

It was suggested that the values associated with face-to-face and eLearning programmes were similar. However, two participants expressed that there is a link between embedded values and graduate attributes. One participant said that values are subject to change, but may not always prioritise learner needs, and another participant felt that we could do better at conveying values through storytelling. One participant said that the embedded values should be generic so that it can resonate with learners' own cultural values.

(iii) Technology as an enabler of 21st century skills

This theme responds to the question of how values are selected by considering the values that are embedded in eLearning programmes designed to produce learners with skills for the 21st century, hosted on eLearning platforms.

Table 10: Evidence to support theme: Technology as an enabler of 21st century skills

Participant	Quote
UNI-2-02 Values	<p>The values are also then again different depending on the purpose of the program. For example, in law, the values would be around what does it mean to be a legal practitioner operating in the South African context?</p> <p>Acting in an ethical manner, respecting privacy of clients. Being critical thinkers, being good communicators, acting in responsible ways.</p>
HEI-1-01 Values	<p>Accessibility. It's available to a broad audience regardless of location, socio-economic backgrounds, physical ability etc. The affordability of that programme.</p> <p>People are talking a lot about plagiarism and students utilising AI. You cannot give them AI and not train them and tell them about the benefits of AI.</p> <p>Equity of racial provision.</p> <p>Ethical considerations, you know, ensuring that the program is designed with a respectful learner to oversee and non-bias as well. Non biased development of content.</p> <p>Flexibility: how flexible is this program. Am I confined to a strict time to complete the course work or does this work on my own schedule? Can I adapt the course to my own schedule?</p> <p>Quality of the content maintaining high academic standards and that's based on curriculum development, qualified instructors, industry alignment.</p>

	Engagement innovation, a student centeredness in the learning development.
UNI-3-01 Values	<p>Integrity. I think that is discipline- based. You don't have to be in a classroom where an attendance register is taken, you do have to spend those two or three hours in the evening while juggling family responsibilities and maybe not going out to a party because you have your studies.</p> <p>It's more difficult to create a learning community when you know somebody sitting Lusikisiki and Cape Town and Polokwane and Joburg, than it is, if you have a learning community in the class, you know, everybody gets their designated two hours and you can do stuff face to face to build that community. With distance education you need to be very deliberate and really the only way that I can see it working is through technology.</p> <p>Curiosity, and adversity. If you're not a curious student then you're not a student.</p>
UNI-2-01 Values	<p>Academics feel that in online spaces or teaching online, there's more chances for students to cheat. We can't say we're not using it because we feel that it creates more opportunities for cheating.</p> <p>What does that mean for us in our learning environment, but also to acknowledge what does it mean for the working environment? Because you need to take whatever you learn into the learning environment and we don't want a student to create and their assessment or an essay on Chat GPT and submit it and not think about the consequences. And I'm thinking about is this cheating or not? So, embedding those things into a learning environment is a challenge.</p> <p>When we design online learning environments, we make things very student centred.</p>
UNI-1-01 Values	Student learning comes first, giving them the best learning experience ever and then trying to make that experience efficient, cost effective, and pain free for lecturers would be the second goal. It's always about the student and the learning.
SDP-1-02 Values	I think that values of the engineering module may be a bit different from that of a financial or auditing or accounting programme.
SDP-1-01 Values	<p>Building confidence for me is probably one of the biggest values that can come from using technology.</p> <p>Collaboration on the platform, if it's a good platform, is really one of the most important parts of learning.</p>
SDP-3-01 Values	Teachers love incentives to work. We give data as an incentive. You give data and suddenly you find your numbers go up.
PSET-2-02 Values	<p>So the whole idea around assessment and cheating and integrity around your own work as opposed to work that you've googled or whatever comes into play.</p> <p>Discipline as well and it's embedded in the process. You don't have to teach students values that happens through the process other than, for example, the integrity around data, around teaching and plagiarism and so on, which you have to overtly teach.</p>

	<p>Autonomy and agency. There's a lot more autonomy and agency that the student has to learn, that's embedded in the process.</p> <p>Teaching things like protocol and how to write an email for example, and how to behave in an online meeting, camera and microphone protocols, just being polite around those issues. So those are some of the sort of low-level skills that have to do with digital literacy, but those are values because it speaks to respect and to respecting other people and the situation as well.</p> <p>We cannot produce students that are not tech savvy anymore that are not just digitally literate, but digitally competent. Being digitally literate and competent, also speaks to a kind of maturity, about how you behave, and how you manage yourself.</p> <p>In an online and distance setting the student has to learn self-management. Responsibility for their own learning. Time management.</p>
PSET-3-01 Values	<p>Reliability Transparency for all role players concerned.</p>

(iiia) Case analysis

UNI-2-02 pointed out that the values embedded in eLearning programmes on eLearning platforms would differ, depending on the programme itself, as there were generic values that applied to all programmes (like being ethical, respectful, responsible, critical thinkers, good communicators, etc) but there were also values specific to a profession. HEI-1-01 raised the issue of using AI, and said that the risk of plagiarism should not be a reason not to use it. UNI-2-01 raised a similar issue, and pointed out that excluding AI from the platform would be detrimental to learners once they entered the workforce, as AI is being used there. HEI-1-01 said: *"People are talking a lot about plagiarism and students utilising AI. You cannot give them AI and not train them and tell them about the benefits of AI"*; and UNI-2-01 said: *"Academics feel that in online spaces or teaching online, there's more chances for students to cheat. We can't say we're not using it because we feel that it creates more opportunities for cheating"*.

In addition to adding to the list of values that should be included, HEI-1-01 also added values of social justice like equity, accessibility, and affordability. UNI-3-01 added integrity, curiosity and adversity to the list of values, and commented on the self-discipline needed for eLearning, and the difficulty with creating online learning communities when learners are geographically scattered. UNI-2-01, UNI-1-01 and HEI-1-01 all commented on designing eLearning with the student at the centre. The UNI group recognised the values that should be embedded in eLearning programmes on eLearning platforms, but two participants seemed to be grappling with how to incorporate AI into this environment.

UNI-2-01 had this to say:” ...we don't want a student to create their assessment or an essay on Chat GPT and submit it and not think about the consequences. And I'm thinking about, is this cheating or not? So, embedding those things into a learning environment is a challenge”. Three participants clearly placed the student at the centre of all planning around programme and platform development.

SDP-1-02 felt that each profession will have a different set of values embedded in the eLearning programme. SDP-1-01 added confidence and collaboration to the list of values that should be embedded. SDP-3-01 found that if incentives were an embedded value, then student responses and completion rates were higher, and said: “*Teachers love incentives to work. We give data as an incentive. You give data and suddenly you find your numbers go up*”. The SDP group had little to say about embedded values in eLearning platforms. The idea of including incentives to improve student completion rates, is innovative especially among skills development providers who operate outside of traditional universities and colleges.

PSET-2-02 raised the issue of cheating, plagiarism and integrity, and how these concepts should perhaps not just be embedded, but overtly taught: “*You don't have to teach students values; that happens through the process other than, for example, the integrity around data, around teaching and plagiarism and so on, which you have to overtly teach*”. PSET-2-02 also added autonomy, agency, and digital literacy as important values. Time management and responsibility for one's own learning were also mentioned. PSET-3-01 added reliability to the list of embedded values and stated that there should be transparency among all role players.

Participants contributed towards a list of values that should be embedded in eLearning programmes and platforms (Table 13a). The list of values also varied, depending on the requirements of a particular profession. Participant UNI-2-02 clarified what this meant: “*The values are also then again different depending on the purpose of the programme. For example, in law, the values would be around what does it mean to be a legal practitioner operating in the South African context?*”

(iiib) Cross-case analysis

The UNI group participants had much more to say on this topic, than participants from the other groups. There were similarities in the UNI and PSET groups since participants from both groups raised the issue of cheating and plagiarism in relation to the adoption of AI. Participants from the UNI and SDP groups also pointed out that embedded values were specific to professions. Unique insights from the UNI group included the long list of values that should be embedded in eLearning programmes and platforms; figuring out how to embed AI into eLearning; and placing the student at the centre of programme and

platform development. The SDP group had a unique perspective on including incentives as an embedded value, to motivate learners to complete their eLearning programmes. The unique perspective from the PSET group was to take the values of plagiarism, integrity and digital literacy beyond just embedding them in the eLearning platform, but to overtly teach these values. One participant from the PSET group also pointed out that role-players should be transparent.

(iiic) Conclusion

Table 10a below summarises the values mentioned by participants, that should be embedded in eLearning programmes and platforms.

Table 10a: Summary of values associated with e-learning platforms

profession-specific assessment	accessibility	accreditation	affordability
	integrity	autonomy & agency	confidence & creativity
critical thinking	data security	respect	digital literacy & digital competence
discipline	equity	ethics	flexibility
reliability	quality	student centredness	transparency

The PSET sector was still uncertain about how to embed AI into eLearning programmes. While the list of values was long, some values such as plagiarism and digital literacy had to be prioritised. The list of values also varied, depending on the requirements of a particular profession. The offering of incentives should be considered to motivate students to complete their studies. Students should be at the centre of eLearning programme and platform development, and role-players should be transparent about their role in the eLearning programme and platform development.

5.2.1.1 What purpose does technology serve?

(i) Evolution of technology

This theme highlights the purpose of technology in teaching and learning, as it evolved over time.

Table 11: Evidence to support theme: Evolution of technology

Participant	Quote
UNI-2-02 AI	The use of generative AI tools such as ChatGPT have just come into the space less than two years ago and that's also giving us pause for consideration of how do these tools integrate into learning and teaching?
Technology	The initial wave was the advent of the Internet in the 90s and that made the possibility of thinking about using technology and learning and teaching in different ways.

Tool	<p>In the middle 2000s, saw the advent of social media and things like Facebook and Twitter and a lot of lecturers, were interested in coopting aspects of those. Later on tools such as WhatsApp became quite a popular platform for engaging learning and teaching and communicating.</p> <p>We have specific tools that we use for assessments.</p>
UNIT-1-01 Smart classrooms	<p>Every university had a room with a smart board inside it, and they still got those rooms and the smart board has now been turned into a regular white board because, good Lord, where are you still able to get thermal paper that you could print what was on the board and besides which you just take a photograph of it with your smartphone now. I do not need one board in one corner of a class where I can touch and make it zoom et cetera, et cetera, because I can get every student to bring their device into the class and I can cast to their devices and I can get them to cast their devices to each other etcetera.</p>
Technology	<p>The lowest level of the taxonomy would be a repository, so lecturers would store their notes on some form of digital platform and they will archive their lectures there and they would put their PowerPoints down and that is a very, very, very old tradition. Then there would be the level of automation, lecturers would put computer based tests there so you would then be able to have lecture material and then test that lecture material.</p>
HEI-1-01 Tool	<p>It's probably used as a supplementary aid.</p> <p>We are quickly advancing to this not becoming the supplementary aid but more of the core, and your facilitation becoming supplementary. it is supplementary to face to face delivery, to face to face engagement, to synchronous engagement.</p>
UNI-1-01 Tool	<p>The purpose is to support. It's not meant to ever be an outcome. It's meant to support the outcomes. It's meant to be a driver towards a goal.</p>
Technology	<p>It brings us productivity, it brings us efficiency, it brings us collaboration. It brings us participation. It opens the world for us.</p>
Tool	<p>For the majority of the sector, it would be just a vehicle by which you can improve effectivity, productivity, communication, collaboration.</p>
SDP-4-01	<p>Technology is used as a mediating tool. It is not the technology that teaches. Technology only facilitates an institution or individual to use the preferred pedagogical approach in order to meet their teaching and learning standards.</p>
SDP-2-01 Tool	<p>It was used as a dumping site for content.</p> <p>Technology is just a vehicle that needs to facilitate what we have planned, and what needs to be executed using the technology.</p> <p>Technology is really a tool and it's a platform, but it will also show us where the gaps are and where the needs are, and if we are doing the things as we should, because technology is not going to work if things are not in place.</p>
SDP-5-01 Tool	<p>So the technology must not interfere with the learning; technology should support the learning ends.</p>

SDP-3-01 Tool	It's a tool and at the end of the day, used to meet your objective. The tool is not the objective. The purpose is that it must serve as a tool to meet your learning objectives.
PSET-2-02 LMS Technology	<p>All the public universities in South Africa have fully fledged learning management systems that they used to communicate with students, to schedule learning, even if it's contact teaching, and students have to submit assessments on the learning management system. They also even do some of the quizzes and assignments and so on, and even send some of the study material.</p> <p>When you talk about open distance learning, they talk about five waves of using technology, starting with things like handwritten letters with pens posted to students, then going to typed letters and printing material and then going through different media.</p> <p>In South Africa when I first started, we used tapes and tape recorders and then we went to CD and CD players and then obviously as the Internet came online, it went to using emails and technology.</p> <p>From there we went to what we commonly now know, as blended online learning and some of the things that happen in that space have its origins in distance education.</p>

(ia) Case analysis

UNI-2-02 highlights how the emergence of the internet and social media platforms that followed, influenced how technology is used in teaching and learning, including assessments. The introduction of generative AI like ChatGPT has disrupted teaching and learning as the PSET sector define its place in teaching and learning. UNIT-1-01 describes how technology was initially used as a repository for lecturer notes, and with the introduction of automation, online assessments were introduced. HEI-1-01 pointed out that technology served as a supplementary aid to face-to-face teaching and learning, but this scenario is changing as more teaching and learning is moving online, with less lecturer facilitation. HEI-1-01 explained: *“It’s probably used as a supplementary aid. We are quickly advancing to this not becoming the supplementary aid but more of the core, and your facilitation becoming supplementary”*. SDP-3-01 further explained: *“It’s a tool at the end of the day, used to meet your objective. The tool is not the objective. The purpose is that it must serve as a tool to meet your learning objectives”*. UNI-1-01 sees technology as a support tool that improves productivity, efficiency, and collaboration. Technology itself is not the outcome, but it supports the achievement of learning outcomes. UNIT-1-01 illustrates the point of how quickly technology evolves by citing the example of smart classrooms. While this was quite popular a few years ago, it has become obsolete with the introduction of newer technologies and greater student access to these technologies. UNIT-1-01: *“The lowest level of the taxonomy would be a repository, so lecturers would store their notes on some form of digital platform and they will archive their lectures there and they would put their PowerPoints down and that is a*

very, very, very old tradition. Then there would be the level of automation, lecturers would put computer-based tests there so you would then be able to have lecture material and then test that lecture material". All the above participants shared similar views about how the evolution of technology shaped the adoption of technology in teaching and learning. All participants had similar views about technology being a vehicle that enabled and supported teaching and learning, although UNI-2-02 pointed out that the role of generative AI like ChatGPT still had to find its place in teaching and learning. UNI-2-02 observed: *"In the middle 2000s, saw the advent of social media and things like Facebook and Twitter and a lot of lecturers, were interested in coopting aspects of those. Later, tools such as WhatsApp became quite a popular platform for engaging learning and teaching and communicating".* UNIT-1-01 illustrated how technology can be used collaboratively and collectively in the classroom. Technology is also used in face-to-face teaching and learning, as observed by HEI-1-01: *"It is supplementary to face-to-face delivery, to face-to-face engagement, to synchronous engagement".*

SDP-4-01 saw technology as a tool that enabled teaching and learning. SDP-2-01 described technology as a dumping ground for information, and cautioned that if proper processes were not in place, then technology will not function effectively, because the flaws in the system will be exposed. SDP-5-01 viewed technology as a support function. SDP-3-01 described technology as a tool that supported the meeting of learning objectives. All participants in this group shared similar views about the purpose of technology being a tool and a support structure for teaching and learning. SDP-2-01 had an interesting view about having governance structures in place for technology to perform its support function effectively.

PSET-2-02 gave a detailed account of how the use of technology in teaching and learning has evolved with technology. Currently, all universities use eLearning platforms to varying degrees, but at minimum to schedule learning, communicate with students, and for submission of assessments. Some institutions also use it to provide access to learning resources and have online assessments. Some institutions also use blended learning, which is part contact and part online teaching and learning.

(ib) Cross-case analysis

Participants in the UNI and SDP groups shared similar ideas about technology being a tool or an aid in teaching and learning. Participants in the UNI and PSET groups gave several examples of how technology has evolved, and how the use of technology in teaching and learning has evolved parallelly. The UNI group participant pointed out that newer technologies like ChatGPT is still finding its place in teaching and learning. A participant in the UNI group also gave a unique insight about how quickly technology

becomes obsolete as it is replaced by newer technologies, such as the smart classrooms in teaching and learning, and how newer technologies can be used collaboratively in the classroom. A participant in the SDP group had a unique perspective on technology often being used as a dumping site for content. A participant in the UNI group described this function as a repository for information, but the point that the participant in the SDP group was making is that without proper governance structures and documentation, a repository is quickly transformed to a dumping site. The participant in the PSET group summarised the use of technology in the PSET sector, and alluded to its use even in contact teaching and learning.

(ic) Conclusion

From the comments above, it seems that participants in the PSET sector see the purpose of technology as a tool or an aid to teaching and learning. As technology evolves, so does its use in teaching and learning, albeit at a slower rate. An example is the introduction of generative AI such as ChatGPT that has had rapid adoption globally, but role players in the South African PSET sector are still trying to find its place in teaching and learning.

(ii) Balancing online and face-to-face learning

This theme answers the question of the purpose of technology by considering the factors influencing online and face-to-face learning.

Table 12: Evidence to support theme: Balancing online and face-to-face learning

Participant	Quote
HEI-1-01 Modes of learning	There's a study done by Harvard University that talks about 60% of universities that are now developing material for online and are moving away from contact and there's a reason behind it because it's available and students are comprehending and they're growing up in a digital world.
UNI-2-02 Flexible & self-paced How students learn	The other nice thing for universities is that for people who are working, it provides opportunities for part-time study. When people talk about curriculum in universities or higher education, they focus on what students are learning. In other words, what is it that we are teaching? But there's also another equally important part of curriculum, and that is how students are learning.
UNI-2-01 How students learn	It's becoming more about students learning experiences rather than the teaching experience.
Modes of learning	So, we really shifted away from separating technology from learning. We're moving away from training on technologies, to training academics on the pedagogical value of technologies. What we see with blended learning is the appropriate and meaningful use of technology for learning and teaching that enables the student to learn and the lecturer to teach in an effective way.

	With blended learning our strategy is that it's not about technology or about teaching or so forth, but it's about learning and how do we enable the student to learn as best as possible and taking into account the various strategies of teaching and the various stages of using technologies.
UNIT-1-01 Student / lecturer interaction	And I also often with my students, have meetings without them, so if a student wants me to read a piece of their thesis, then I would set up a zoom meeting with myself, share the screen, record it, and then discuss the paper and send the student the link to my comments.
SDP-2-01 flexible & self-paced student / lecturer interaction	<p>You want to have that flexible learning opportunity somewhat self-paced, self-directed where they take on the responsibility to learn on their own more with guidance of course.</p> <p>If I just look at the learning management system, it is to help lecturers to be in contact with the students, even if on face to face, but I can still send messages through technology to students before class. I can still let students do something online before they get to class or during class. It provides a platform where we can connect if we are not face to face on the campus, but it also provides access to content.</p>
SDP-1-01 Cohort size	I mean, look how many students each university turns away each year. You offer your degrees completely online.
SDP-1-02 Flexible & self-paced Technology use	<p>It's enabling anyone to be able to enrol in a programme and complete it at their own pace. It enables just in time learning. It enables part time learning for those who are working.</p> <p>technology actually enables continuous editing, building, revising, changing which face to face doesn't really do.</p> <p>Most universities, and I'm not just talking SA, but even UK and other countries, all the courses are poorly designed because lecturers still tend to want to replicate what they do in the classroom and just put it online. And that is where the problem lies. That's why student success is not always as effective online.</p>
PSET-2-02 Flexible & self-paced Cohort size Student / lecturer interaction	<p>Students are different. Some will do better online; some can do better in person. It does give that kind of flexibility that you can have synchronous and asynchronous learning options. It allows for learning beyond the traditional learning years, as it has that continuous lifelong learning potential.</p> <p>Universities could eventually save on infrastructure. So, if your biggest lecture hall has 400 seats, you can never have a class that's got more than 400 students. But in the online environment, you can have classes as big as 30,000 or more.</p> <p>If it's done well, it can actually give the student a better experience because of this intentional design, and because of the quality assurance in place.</p> <p>I don't think it's possible to teach in higher education without using technology, even if you are in a contact university.</p> <p>Distance education and online learning has always had to justify itself whereas people take contact learning as the norm.</p>
PSET-1-01	Students learn differently. Some are visual learners, some are text-based learners, and so technology allows you to bring a richness to your learning and experience.

How students learn	There's always going to be a need for that face-to-face element to be there.
Modes of learning	In some instances, it's just quicker to do a 3-minute video to get the conceptual understanding of a very difficult term or very difficult calculation than for the teacher to stand there and try and explain it over two or three days.
Teaching innovation	
PSET-2-01	
Diversity of views	You can communicate with anyone across the world in different sectors in different continents, in different countries, in different languages. You are exposed to global resources, not just to South Africa. It gives you that global perspective.

(iia) Case analysis

HEI-1-01 mentioned a study done at Harvard University which shows that educational institutions are moving towards eLearning as the youth are growing up in an era of technology. HEI-1-01 said: *"There's a study done by Harvard University that talks about 60% of universities that are now developing material for online and are moving away from contact, and there's a reason behind it because it's available and students are comprehending and they're growing up in a digital world"*. UNI-2-01 and UNI-2-02 both mentioned eLearning as being student centric, with a focus on how students are learning. UNI-2-02 mentioned the flexibility of eLearning for part-time learners, while UNI-2-01 talked about blended learning, which is a mix of eLearning and face-to-face learning. UNI-2-02 who said: *"...for people who are working, it provides opportunities for part-time study"*. UNIT-1-01 talked about the use of technology in student-lecturer interaction, especially when giving feedback on an assessment. The participants in this group held similar views on eLearning platforms providing flexibility for learners, and two participants mentioned student-centric models for eLearning, not only looking at what students learned, but also how they learned. One participant gave an example of using technology for communication in an effective way that suited both lecturer and student.

SDP-2-01 and SDP-1-02 both commented on technology allowing for flexible and self-paced learning. SDP-2-01 also mentioned the communication capabilities of the eLearning platform that benefitted learners enrolled for eLearning of face-to-face programmes. SDP-2-01 explained: *"If I just look at the learning management system, it is to help lecturers to be in contact with the students, even if on face to face, but I can still send messages through technology to students before class. I can still let students do something online before they get to class or during class. It provides a platform where we can connect if we are not face to face on the campus, but it also provides access to content"*. SDP-1-01 raised the point that eLearning offered the capability of increased class sizes, which allowed more learners to be enrolled in education. SDP-1-01: *"I mean,*

look how many students each university turns away each year". SDP-1-02 pointed out that student success online is affected by the design of eLearning programmes, since some academics replicate the face-to-face programme online, without re-designing it for the online environment. SDP-1-02 said: *"Most universities, and I'm not just talking SA, but even UK and other countries, all the courses are poorly designed because lecturers still tend to want to replicate what they do in the classroom and just put it online. And that is where the problem lies. That's why student success is not always as effective online"*. SDP-1-02 also pointed out that eLearning programmes allow for continuous improvements and editing, which face-to-face programmes may not offer.

PSET-2-02 and PSET-1-01 held similar views about students being different and responding differently to learning material, and eLearning provides an opportunity for flexible and self-paced learning. PSET-2-02 added that eLearning provided continuous life-long learning opportunities. PSET-1-01 said that there will always be a need for face-to-face interactions, so it is about knowing when to use technology, and when face-to-face teaching and learning is more appropriate. PSET-2-02 talked about eLearning platforms accommodating a large cohort of students, which could save institutions money in infrastructure investment. PSET-2-02 said: *"Universities could eventually save on infrastructure. So, if your biggest lecture hall has 400 seats, you can never have a class that's got more than 400 students. But in the online environment, you can have classes as big as 30,000 or more"*. Students also get a better learning experience because eLearning programmes are intentionally designed for better quality learning. PSET-2-01 pointed out the advantage of learners gaining a global perspective by interacting with learners from across the globe.

(iib) Cross-case analysis

All three groups mentioned the advantage of flexible and self-paced learning with eLearning programmes. One participant in the SDP and one in the PSET group talked about increased cohort size offered by eLearning programmes, and a participant in the PSET group mentioned the global exposure offered through eLearning as learners could be located anywhere in the world. Participants from the UNI and PSET groups noticed the concept of how students learn with the latter mentioning the intentional design of eLearning programmes. A unique view from the SDP group was that academics sometimes used the programme designed for face-to-face teaching and learning, online, which negatively affected the quality of teaching and learning online and student success. A participant in the SDP group said that eLearning programmes could be continuously edited and updated, while the PSET group participant said that eLearning platforms allowed for continuous and life-long learning. A participant in the UNI group

shared a unique perspective about a recent study suggesting a trend towards eLearning as younger learners are more accustomed to using technology.

(iic) Conclusion

The purpose of technology from an eLearning and face-to-face perspective, is to support teaching and learning irrespective of its mode. In face-to-face teaching and learning, technology platforms are still used for communication, collaboration, and sharing learning materials. In eLearning, the platform can be customised to improve success rates through intentional design and continuous updates. eLearning platforms also allow for flexible and self-paced learning for any number of learners, located anywhere in the world, and the growing global trend is towards eLearning.

(iii) Artificial intelligence and education

This theme answers the question of the purpose of technology by considering the role of AI in education.

Table 13: Evidence to support theme: Artificial intelligence and education

Participant	Quote
UNI-1-01 Technology	We never look at technology on its own, we always look at it as an integrated whole.
AI	<p>I always want to be one of those people who, if there's something new, I want to try it out and play around with it, to make up my mind. And then to see if there's an educational application that we can bring in and how can we use this. For the first time ever, I'm a little bit concerned. I am still a very big proponent of let's use it. Let's not ban anything. But I think we are not realizing how big a change this is and how big the influence is going to be of AI in the higher education sector.</p> <p>I can suddenly do all of that in split seconds that we would have taken hours and hours and months to do. Now the question is, do we still teach students how to do those things? Or do I change the world of learning so significantly that we need to rethink what education means now?</p> <p>Do we need to remember that or do we use technology to remember it and we free up our brains to do other things?</p>
UNI-2-02 Technology	It is very difficult to keep up because there's new stuff coming out all the time and you often don't know whether something that seems great in the short term, will be great in the long term and what does it mean for teaching and learning and, there may be issues around data privacy.
AI	<p>I think part of what we need to do is make sure that technology is not seen as something separate, but it becomes embedded in terms of what we do and how we design and teach programmes, and how we engage with students.</p> <p>How we can use technology to improve learning and teaching and what are the tools that we can have to assist our students? AI tools can be</p>

	<p>potentially useful in the future when it comes to things like personal tutors.</p> <p>We're not very good at stopping and asking ourselves the deeper questions around the purpose, and I think AI tools force us to think about that.</p> <p>University lecturers are saying what does AI mean for us and what does it mean for how we teach given that these tools are available and students could be using them in ways that they shouldn't be using them.</p>
UNI-2-01 Technology	Technology is going to be embedded into learning in such a way that we won't feel it's presence.
AI	Technology is part of learning. But we think of generative AI, as something separate. Generative AI technologies, will become part and parcel of the learning environment.
HEI-1-01 AI	<p>We are creating video tutorials using AI. So initially our creation time for the five-minute video is probably about 3 days. Right now, our creation time for a 5-minute video is probably about 30 minutes.</p> <p>We've got a 24/7 online tutor. So that's benefiting students. It's predictive analytics the same predictive analytics where I'm able to use AI to predict success rates, pass rates, dropout rates, so I'll catch them early rather than catching them later.</p>
SDP-5-01 Technology	The next step where I stand is having the learning available on WhatsApp. People don't want to log into a learning university anymore. They don't want to log into a website. It takes them too long. The new generation wants to go on WhatsApp.
AI	So last year when I built a course, I would put in videos and asked the students to build a podcast and create the video. By that time, they could do it. This year everyone used ChatGPT to write the script for their video and I had to bring them in on zoom sessions where they chatted to each other so that I could measure their skills. So, my role as an educator is to be able to find new stuff. Otherwise, I use Chat GPT to build the course. You use ChatGPT to answer the questions. That ChatGPT is playing ping pong with ChatGPT on the other side and what is it that we want to achieve?
SDP-3-01 AI	There was no AI two years ago, and look at it now, it's everywhere.
SDP-2-01 AI	If you got a crisis, are you going to talk to the bot? Students will ask questions to the point that they realize that the bot is now giving them generic answers. So, they won't ever talk to the bot again. But if it's intentional, it's using your content, it's within the context and it can help in your environment and in your course, then go ahead.
PSET-2-01 technology	These days in the health programmes, a lot of the learning happens through simulations, virtual reality, and there are certain courses that students can do using technology or mixed reality. Yes, they do need to have the physical practical experience, but certain things can be practised using technology and many institutions are starting to teach that way.

PSET-2-02 Technology AI	Many academics have started to use AI to develop the courses. You get many apps that actually assist teachers to develop course outlines
PSET-3-01 AI	We are busy developing an AI DB and assessment databank which has the occupational standards up front that are against the exit level outcomes.

(iiia) Case analysis

UNI-1-01 and UNI 2-02 commented that technology should be viewed as being integrated with teaching and learning. UNI-2-02 said: *“I think part of what we need to do is make sure that technology is not seen as something separate, but it becomes embedded in terms of what we do and how we design and teach programmes, and how we engage with students”*. UNI-2-01 expressed a similar view and commented that even AI will be integrated into the learning environment in time. AI has been such a drastic disruptor in education that UNI-1-01 is questioning whether what is taught should be re-thought since AI can perform functions in seconds that takes humans days or weeks to perform. UNI-1-01 is questioning whether learners still need to learn these basic skills if AI can produce results in seconds, and expressed concern about the impact of AI on education. UNI-1-01 said *“I think we are not realizing how big a change this is and how big the influence is going to be of AI in the higher education sector”*. UNI-2-02 expressed similar concerns about the availability of AI tools to support students, which may be used in ways that undermine the current education system. UNI-2-02 felt that AI tools force educators to think more deeply about purpose. HEI-1-01 gave examples of how AI is being used in teaching and learning. The UNI group held similar views about technology and teaching and learning being an integrated system. Two participants expressed concern over the disruption caused by AI, and independently suggested that educators think long and hard about the purpose of education considering AI. HEI-1-01 gave examples of how AI assists both students and educators.

SDP-5-01 suggested that Whatsapp is the preferred learning platform for students. SDP-5-01 also gave examples of how teaching and learning has changed within the space of a year, with the introduction of Chat GPT, and suggests that if we do not change the method of teaching and learning, then Chat GPT will “play ping-pong” with itself as it both sets and responds to assessments, and the objectives of education will be lost: *“I use Chat GPT to build the course. You use Chat GPT to answer the questions. That Chat GPT is playing ping pong with Chat GPT on the other side”*. SDP-3-01 reminds us of how quickly AI has proliferated everywhere, including the education sector. SDP-2-01 cautions about using AI to superficially respond to learner queries. An AI bot can be an effective tool if it is able to contextualise its responses. The SDP group support the notion

of the disruption of AI and its proliferation everywhere, including the education environment.

PSET-2-01 spoke about using simulations and virtual reality in education that helps learners gain practical experience: *“These days in the health programmes, a lot of the learning happens through simulations, virtual reality, and there are certain courses that students can do using technology or mixed reality”*. PSET-2-02 spoke about the many AI tools available to educators to develop modules and learning programmes, and educators are beginning to use these tools. *“Many academics have started to use AI to develop the courses”*. PSET-3-01 mentioned an AI database and assessment bank that is being developed for the PSET sector in South Africa. Participants in this group are from regulatory authorities, who are well informed about AI and how it is being used within the South African PSET sector.

(iiib) Cross-case analysis

Participants in the UNI and SDP groups had expressed concern over the disruption of AI in the South African education sector, and suggested that educators think about the purpose of education considering AI. A participant in the SDP group shared a similar concern. Participants in the PSET group seemed quite positive in their comments about the use of AI in education. All three participants gave examples of how AI is currently being used in the PSET sector in South Africa. The UNI group unique perspective emphasized integrating technology with teaching and learning. A SDP group participant pointed out that if left with no intervention, AI will make a mockery of education objectives.

(iiic) Conclusion

In response to the question on the purpose of technology, participants pointed out that technology is integrated with teaching and learning and should be viewed in unison. AI has disrupted the education sector, and educators should re-think the purpose of education and what is being taught, considering AI. AI is already being used in education, particularly in health programmes that make use of simulations and virtual reality to practise skills.

5.2.1.2 Which stakeholders were consulted in its development?

(i) Role players in determining values and regulatory oversight

This theme aims to respond to the question of which stakeholders are consulted during the development of eLearning programmes offered on eLearning platforms.

Table 14: Role players in determining values and regulatory oversight-stakeholders consulted

Participant	Quote
UNI-2-02	<p>We do encourage academics to reach out to partners or industry stakeholders, alumni, it's students. That's not always done well; sometimes that happens, sometimes it doesn't.</p> <p>I think we should look at that more strongly going forward to get both current and past students' viewpoints.</p>
UNI-1-01	<p>Lecturers are the subject matter experts, but they need to have that close link with their industry or their profession because it's what happens there that dictates what we want to teach our students.</p> <p>Universities or colleges or TVETs would have a unit or people dedicated nowadays to technology integration, either in the form of educational consultants; educational technologists; instructional designers; or learning designers.</p>
UNI-3-01	<p>So, the consultation processes would start at a departmental level where you have to consult with stakeholders in your specific sector. You have a look at what other universities are doing. You'd have a look at what employers are looking for. Then the consultations would go further into the university itself, through various layers of the immediate level and of a school or a college consultation and with and approvals at that level. And then with the academic planner and then to Senate to decide, and then from there it goes to the various country role players like SAQA and CHE for their approval.</p>
HEI-1-01	<p>Industry is probably one of the key stakeholders that you got to consult with and understand their needs.</p> <p>On the flip of that, you could do it yourself and say I know best and roll it out and you realize very soon that was not what you intended to do.</p>
SDP-1-02	<p>Engaging the subject matter expert, guide, and the instructional designer working with that subject matter expert.</p> <p>You need to engage with industry to find out and ensure that the need of the country, the industry is met during your programme.</p>
SDP-1-01	<p>I think when you do a curriculum for me the big thing that nobody seems to listen to, is you need to involve students. You need to ask what they want to learn and what they don't want to learn and why they want to learn what they want to learn.</p>
SDP-3-01	<p>Instructional designers and subject matter experts. Those two have to work the closest and then over lapping into there somewhere would then be your graphic artists, your media specialists, or your video production companies.</p>
SDP-2-01	<p>Quality assurance person, the assessment person responsible for that programme, then instructional designer who is going to help to build what goes online; education consultant who needs to understand the educational part, and the technology so that the golden thread runs through the system, the subject matter expert and then the project sponsor or a programme owner. The project sponsor doesn't necessarily get involved in the day-to-day things, but they ultimately ensure that everything is going smoothly, looks at what is going wrong and asks for feedback on why something is not aligning; so that person needs to have oversight over everything while there are people</p>

	responsible and allocated to do these different functions like consultancy, instruction design, content creation, curriculum assessment.
PSET-1-01	It needs to be a process that the curriculum specialist and the E learning specialist needs to engage in.
PSET-2-01	<p>Someone involved in policy of course, because that has to be in place also.</p> <p>But a big part of that is also related to your quality councils. If it's going to be a short learning program the QCTO has their criteria, and if it's going to be a higher education qualification, you have CHE's criteria. Now obviously it would need to be linked on your SAQA list of criteria.</p> <p>Depending on the type of qualification you'd also need approval from professional bodies so as much as you have some freedom as an institution to work on the values and the attributes that you want your graduates to have, you all need to consider the relevant guidelines and criteria.</p> <p>Also looking at articulation from this programme to another programme for students that want to study further and international comparability.</p>

(ia) Case analysis

UNI-2-02 indicated that even though academics are encouraged to consult widely, they don't always do: *"I think we should look at that more strongly going forward to get both current and past students' viewpoints"*. Students are not consulted. UNI-1-01, like UNI-2-02, indicated that the academics should have close links to their industry and professional bodies: *"We do encourage academics to reach out to partners or industry stakeholders, alumni, it's students. That's not always done well; sometimes that happens, sometimes it doesn't"*.

Many universities also have an internal body of cross-functional individuals who get involved in programme development. UNI-3-01 described the internal consultation process ending with the Senate before the quality council and SAQA are consulted. The UNI group did not seem to place the student at the centre of programme development, as students seem to be missing from the consultation process. Most consultation is within the institution itself, and consultation with industry bodies seem to be optional. HEI-1-01 said that consultation with industry is key to success.

SDP-1-01 stated that first and foremost, students should be consulted: *"I think when you do a curriculum for me the big thing that nobody seems to listen to, is you need to involve students. You need to ask what they want to learn and what they don't want to learn and why they want to learn what they want to learn"*. SDP-1-02 and SDP-3-01 held similar views that subject matter experts and instructional designers were central to the

development of eLearning programmes, with SDP-1-02 adding that industry bodies were critical to the consultation process. SDP-3-01 then suggested including graphic artists, media specialists and video production companies into the process. SDP-3-01 said: *“Instructional designers and subject matter experts. Those two have to work the closest and then over lapping into there somewhere would then be your graphic artists, your media specialists, or your video production companies”*. In addition to the above, SDP-2-01 added the quality assurance expert; assessment expert; project sponsor or programme owner; and education consultants to the list of stakeholders to be consulted: *“The project sponsor doesn’t necessarily get involved in the day-to-day things, but they ultimately ensure that everything is going smoothly, looks at what is going wrong and asks for feedback on why something is not aligning; so that person needs to have oversight over everything”*. One participant in this group introduced the idea of the project owner or sponsor influencing the process.

PSET-1-01 said that it is the curriculum or programme specialist and the eLearning specialist who are the main drivers of programme development. PSET-2-01 said that the policy expert as well as the regulatory bodies CHE, QCTO and SAQA, and the professional body would be consulted, as these bodies’ inputs would focus on qualification standards that allow progression from one qualification to another; industry standards; and international comparability of the qualification. The participants in the PSET group had different responses as to who should be consulted.

(ib) Cross-case analysis

Participants in the UNI group seem to suggest lengthy and wide consultation within their respective institutions, with little to no student consultation. In contrast, a participant in the SDP group was emphatic about student consultation. Likewise, a participant in the UNI group believed that consultation with industry was critical. The SDP group participants felt that subject matter experts and instructional designers were central to eLearning programme development, with a variety of media; quality assurance; and assessment specialists also playing a role. An interesting comment from a participant in the SDP group was the involvement of the programme sponsor or owner in the consultation process. Two participants from the UNI and PSET groups both suggested that after internal processes have been completed, the regulatory bodies QCTO; CHE and SAQA; as well as the professional bodies are consulted. A participant in the SDP group also mentioned industry bodies.

(ic) Conclusion

Table 14a shows the array of stakeholders that are consulted during the development of an eLearning programme.

Table 14a: Stakeholders consulted during programme development

academics	partners	Industry stakeholders	alumni
students	Subject matter experts	Industry (professional) bodies	Consultants or technologists
Instructional designers	Specific department	Other universities	employers
Senate	CHE/QCTO/SAQA	Policy specialist	Graphic artists
Media specialists incl. video production company	Quality assurance specialist	Assessment specialist	Project sponsor / programme owner

The subject matter expert and instructional designer seem to be the main stakeholders in this development process. Other stakeholders may be consulted, depending on the institution or academic involved. One participant said that industry consultation was critical, and another stressed the importance of student consultation. In the skills development space, the project or programme owner/sponsor plays a role in programme development. Even though programmes are designed to be student centric, little or no student consultation takes place.

5.2.1.3 How were the final values for the technology selected?

(i) Role players in determining values and regulatory oversight

This theme considers who the final decision-makers are with respect to the values embedded in eLearning programmes offered on e-Learning platforms.

Table 15: Role players in determining values and regulatory oversight- Final decision-maker

Participant	Quote
UNI-1-01	<p>If we don't touch base with what the industry does or the profession does out there, academics might have the feeling that they want to have the final say, but their own knowledge might be outdated and old.</p> <p>It's like a spider where all sorts of different elements give input and the final decision can never be a single person. I think it has to be a combination of what profession wants, what the learner needs, what the academic knows, what researchers of new knowledge have already, what the latest thinking is, and then a combination of that needs to be the final decision making.</p>
UNI-3-01	<p>The final say, I think lies with SAQA and with if you have some sort of Council that needs to approve it.</p>

SDP-3-01	Firstly, stakeholders that are involved in this programme in my specific area, it's government. We have to bring the Department of Education on board, they, in fact, they're the only people who can actually convince the subject heads in a school. Your chief education specialists and your school management teams, if we don't have the government holding hands and we don't work collaboratively in this process, then it's doomed for failure.
SDP-2-01	It will often happen even in a programme if there are 12 modules, I often find that the programme needs are not accommodated and the person responsible for that has a really big job because every module (owner) thinks that their module is the most important, most critical, and they decide what's the content, what's the activities, what the assessment looks like and how do we teach?
SDP-1-01	So, it can be very difficult and I think sometimes you must ask yourself, is this stakeholder (project sponsor) really worth having as a stakeholder? Do we really need the money? Can we not maybe have less money but keep our integrity and morals?
SDP-5-01	The final call was made by the students and the lecturer and it's a conversation we had in one of our zoom sessions.
SDP-4-01	The values are determined by the provider
PSET-3-01	It is the skills development providers' responsibility and he's accountable for the programme he puts in place to conduct eLearning. It's the Quality Council who is the final decision-maker.
PSET-2-01	The final decision maker would be the combination between the institution, the Quality Council, and the professional body.
PSET-2-02	In the final analysis, it's the academic who's responsible, and that faculty signs off on the final product.

(ia) Case analysis

UNI-1-01 said that industry inputs were critical to ensure that the latest information is being used in the programme: *“what the profession wants, what the learner needs, what the academic knows, what researchers of new knowledge have already, what the latest thinking is”*. The final decision was taken by a team who consider *“what profession wants, what the learner needs, what the academic knows, what researchers of new knowledge have already, what the latest thinking is”* before deciding. UNI-3-01 said that the final decision was made by SAQA and the institution's senate of council. The participant views in the UNI group differed from each other.

SDP-3-01 saw government as the final decision-maker, while SDP-2-01 said that the subject expert was the final decision-maker. SDP-1-01 said that the project sponsor was the final decision-maker and questioned the ethics of this practice: *“So, it can be very difficult and I think sometimes you must ask yourself, is this stakeholder (project sponsor) worth having as a stakeholder? Do we really need the money? Can we not maybe have less money but keep our integrity and morals?”* SDP-5-01 said that the final decision-

maker was the academic in consultation with the students, and SDP-4-01 said that the skills development provider made the final decision. All participants responded differently to this question, and there were no similar responses.

PSET-3-01 said that the skills development provider is accountable for the programme, and the Quality Council is the final decision-maker. PSET-2-01 said that the institution, professional body and Quality Council would jointly make the final decision. PSET-2-02 said that the final decision-maker is the academic and the responsible faculty within an institution. There were differences of opinions among the regulators as to who made the final decision.

(ib) Cross-case analysis

Each participant had a unique response to this question. There were no similarities.

(ic) Conclusion

Table 15a below summarises the participant responses in terms of who makes the final decision. Each participant gave a unique response, which suggests that the decision-making process is not well understood; the process is wide enough to allow for different decision-makers; or institutions are making decisions about values without proper consultation.

Table 15a: Final decision-maker of values embedded in eLearning programmes

Team decision	SAQA	Council/Senate	government
Subject expert	Project sponsor	Lecturer & students	SDP
Quality Council	Institution	faculty	academic

5.2.1.4 How could these values be changed?

(i) Role players in determining values and regulatory oversight

This theme responds to the question about changing values in an eLearning programme on an eLearning platform, after it has been approved.

Table 16: Role players in determining values and regulatory oversight- Changing values

Participant	Quote
UNI-2-02	Some universities are better than others, like UNISA, because their whole way of running courses is very different. They probably do have more of a focus on that upfront design and revision of things, whereas at our institution, because we're a traditional contact institution the notion of having to spend time redesigning things, updating things is often seen as we'll get there when there's time or seen as more of an admin job rather than an important aspect of ensuring that the programme is fit for purpose.

	<p>There's a lot of interest put into the design of a new programme. There isn't always that same emphasis for keeping that programme up to date, or making sure that the programme stays up to date and maintaining or enhancing or revising things as they happen.</p>
UNI-1-01	<p>There's a Tsunami now in Taiwan. You want to bring that in and talk about the economic devastation that it has in a class on economics, you can do that overnight because of technology. You don't need the textbook anymore, and the two-year process to get it published, you can immediately tonight quickly go in, add a video clip, ask a few burning questions, and have a really hot debate tomorrow about all of the very recent matters. So quick and easy changes is possible.</p> <p>A complete overview is of course also possible depending on the scope and I know regulatory wise it has to be within 50% of the learning outcomes or the purpose of the programme still needs to be the same. And you can make all sorts of changes internally.</p> <p>In my field educational technology, if you go back five years and we still teach what we taught, then we'd be setting our students up for failure. They would have some of the basics and the fundamentals, but they wouldn't make a worthwhile contribution to society with five years old knowledge.</p>
UNI-3-01	<p>Everyone doesn't have to be consulted. Everyone doesn't have to have a voice. I think the significant voices are important, so that would be my first question: what is the stakeholder status within the broader community and how important is that and how valid are the points that they bring to it because they might be important but what they want is not valid or is not perceived to be valid by the community at large. They might also have valid points, but it doesn't fit in with the programme itself. Not everything can be incorporated. There's limited time, limited scope, as it should be, because otherwise instead of a 120-credit programme we could have a 240-credit programme very quickly.</p>
SDP-1-01	<p>We were in a group and we were on the final edit and after lunch when everybody was really full and sleepy, I snuck in an extra assessment standard talking about respecting animals and caring for your pets as was for intermediate phase and nobody noticed.</p> <p>So sometimes I cheat when I have a value that I feel is really important.</p> <p>But if you are smart, you can still push things through because often they don't really have time to go through everything in great detail, so you just don't make a big heading out of it, but you can actually add things according to your values or what do you think or what you've been told by the students.</p>
SDP-5-01	<p>I don't think you can have a course nowadays and just leave it as is because the world changes too fast outside the course.</p>
SDP-3-01	<p>So far in the work that I do, my answer would be No. After you've created something, getting someone to now use that is very difficult or buy into that is very difficult. particularly when we work with corporates, because the CSI rules are very stringent. It needs to be just them and no one else. That kind of thing because of branding, marketing, and their CSI KPI. So, my answer to that one is its very difficult. It's very rare, that's why also we try to work with the government so they already know what you're doing, and often then if it's with them, then we can take an existing programme and maybe rework it with a different target</p>

	audience and different cohorts. But I'll be honest with you even then, it doesn't happen.
PSET-2-02	The academic or the team of academics should have the last say about what goes into the curriculum and even what's presented in the final analysis, they are responsible for that course and so they should have the final say.
PSET-1-01	The lecturer and the subject specialist in the classroom in this instance, determines how to address values, norms, and all of those things that work in that particular lesson.

(ia) Case analysis

UNI-2-02 suggested that the appetite for changing values once a programme has been implemented, is very low: *"...because we're a traditional contact institution the notion of having to spend time redesigning things, updating things is often seen as we'll get there when there's time or seen as more of an admin job rather than an important aspect of ensuring that the programme is fit for purpose"*. UNI-1-01 said that small changes can be implemented immediately on the eLearning platform, and that regulations allowed for up to 50% of the programme to be changed without involving the regulatory body, and that these updates were critical for staying abreast of industry changes: *"A complete overview is of course also possible depending on the scope and I know regulatory wise it has to be within 50% of the learning outcomes or the purpose of the programme still needs to be the same. And you can make all sorts of changes internally"*. UNI-3-01 questioned the motivation for making changes, and stated that not all stakeholder opinions needed to be included in a programme: *"Everyone doesn't have to be consulted. Everyone doesn't have to have a voice. I think the significant voices are important, so that would be my first question: what is the stakeholder status within the broader community and how important is that and how valid are the points that they bring to it"*. The inputs had to be relevant and ensure that the programme sticks to its credit allocation. The views within this group were quite different from reluctance to making changes, to questioning the motivation of the stakeholder requesting the change, to being able and willing to make changes overnight to keep the programme content updated and relevant.

SDP-1-01 said that the subject expert had the authority to make changes, with or without anyone else's knowledge or consent. SDP-5-01 said that eLearning programmes had to be regularly updated to keep up with world events: *"I don't think you can have a course nowadays and just leave it as is because the world changes too fast outside the course"*. SDP-3-01 said that changes after programme implementation may be possible, but improbable because of government and corporate funders' expectations: *"After you've*

created something, getting someone to now use that is very difficult or buy into that is very difficult, particularly when we work with corporates, because the CSI rules are very stringent". There were similarities with the views of two participants, while the third participant had the opposing view.

PSET-1-01 and PSET-2-02 held similar views on the academics making the final call on changing values.

(ib) Cross-case analysis

One participant in the UNI group and one in the SDP group held similar views about not changing values after programme implementation, but for different reasons. The former was because of a lack of motivation to make the changes, and the latter was because of pressure from stakeholders. While one participant in the UNI group questioned the motivation of stakeholders wanting to make changes, two participants in the SDP group supported the notion of changing values to keep abreast of world changes. The PSET group said that it was up to the institution or provider to decide on changing values, and one participant from the UNI group pointed out that the regulations allowed for up to 50% of the programme to be changed before it had to go back to the regulators.

(ic) Conclusion

In response to the question on how could the programme values be changed, most participants indicated that it was possible to make up to 50% of changes, and the academics or subject specialists would make that decision to implement the changes. However, the changes had to be relevant. Two participants were not keen on making changes – one because of a reluctance on the part of academics, and the other because of the stringent rules of project sponsors like government and corporates.

5.2.1.5 How is the data gathered through technology, used and protected?

(i) Data protection and ethical considerations

The theme data protection and ethical considerations aims to address the question on how data gathered through technology platforms, is protected and used.

Table 17: Evidence to support theme: Data protection and ethical considerations

Participant	Quote
HEI-1-01 Data protection	In our environment that we're working right now via the POPIA agreement, we should not be sharing it because our students are 18 years old. And even if the mom and dad come to us and say "I want to see it", our response is "No" because it is an adult that we're dealing with right now. I think POPIA has opened our eyes to what we can and can't do.
UNIT-1-01 Data protection	That's protected by the system and there are layers of permissions so I can see my class, but nothing more. The administrator can see

Data use	<p>everybody's classes, etcetera, and the student can see only their own grades or their own work.</p> <p>Catching the early identification of potential dropouts, I think is the most important use of that data.</p> <p>Student success figures at the end of the year, the students who passed, how many students failed and then at a higher level, to identify areas of difficulty, student problematic areas, retention.</p> <p>Identify areas that students are struggling with and then identify students who are struggling. It's then used in redeveloping the curriculum.</p>
UNI-1-01 Data protection	<p>High level cyber security measures need to be put in place and then policy decisions about what is protected and what is not. So, security wise, that's why the technology people need to be on it, because otherwise you get hacked and that would be detrimental if the data gets out.</p> <p>Well, each institution would have its own rules and regulations about student data. Our institution has taken the whole POPI Act very, very seriously.</p>
Access to data	<p>That's nice thing about LMS learning management systems is that it's got massive data banks at the techie end, so every click that a student takes would give you data and now especially with AI and big data being the next big move is everything can be analysed.</p>
Data use	<p>The problem is that often our lecturers don't go into the data. But if you're a good lecturer, you would go through all your exam questions and you would look at the results and you would analyse it and nowadays with AI you can ask AI to give you which distractors are good and why, and which ones are bad and why. And it will actually give you a full report on your assessment.</p> <p>We often have research projects based on discussions that happen on the LMS. That's our primary source of data then, but you can never do it without informed consent.</p>
UNI-3-01 Access to data	<p>I was talking to a friend at a different university where they got informed that their servers with their data leaked and their personnel data leaked. I just have this suspicion that our data is not as safe as it should be.</p> <p>It depends on your access to that kind of data institutional wide which is dependent on your level. ICT staff would have access to certain data and Deans to a different set of data. So, you might have access to your departments data, but as a lecturer for example you don't have access to all of this institutional data and that's usually put on protected servers.</p>
Data use	<p>There are certain types of data that is used institution-wide from their learning management system, and it's mostly about tracking things like how many assignments still needs to be marked and has the exam results been released.</p> <p>In my university there is a lot of data available in our and eLearning platform. It's not as widely used as I think it should be, and that is so institutionally you could be building data analytics programs to support students you could be using it to improve teaching, but actually it doesn't happen.</p>

SDP-4-01 Data protection	<p>Clearly defined policies on the ethics of using students' data and information which is found on eLearning platforms.</p> <p>But I also think it is important for students themselves to be familiar with those ethical issues relating to e-learning.</p>
SDP-1-02 Data protection	<p>Most of these systems, especially the biggest systems, are well protected with the necessary security in place. And they are monitored very closely by big institutions globally, so they are usually pushed to have the latest and the greatest security features in place.</p>
Data use	<p>Anytime that information is used for anything other than it was intended to, then it's not legitimate.</p>
SDP-3-01 Data protection	<p>Security is very important and it's also a frustrating thing for our users. The teacher out there, one of the biggest problems we actually have is that I've forgotten my password and then how do I reset the password? It's a great challenge for many out there. So that's why it's so important to use an established known platform.</p>
Data use	<p>The monitoring and evaluation specialists when they are writing their massive reports, they do baseline midline and endline so then they need that information to write their reports. Helping us understand, gauge the variation of the audience and also data driven insights today are so important, we can use this for the future.</p>
SDP-2-01 Data protection	<p>There is a data security policy, in any learning management system. There are partnerships with people that are housing our platform in the cloud like AWS Microsoft that have their own data protection policies. We have policies and procedures in place that protects the data of the students.</p>
SDP-1-01 Access to data	<p>It's the same with the focus groups. I tell them what they say is confidential and that's why I never added names to what they say without their permission. But you know, I mean, a lot of people attend these and they bring the AI minute takers with. So, I always have them removed because then the meeting is confidential.</p>
PSET-2-02 Data protection	<p>Most institutions would now have to have policies and practices around POPIA and I think that's basically the guiding principles.</p>
Access to data	<p>Institutions should have policies around how to use data and how to use the learning analytics on the platform. Some of these analytics are racially and gender biased and you have to be really careful that you don't create a kind of bias against students based on this.</p> <p>Students would have to sign, for example, that the information can be used for their study purposes and so institutions really have to put measures into place to preserve the integrity of the student data.</p>
Data use	<p>In a learning management system, there's a lot of module level data that is available for learner analytics and so the academics can track the students' progress through the modules.</p> <p>The institution has to submit that to the DHET for their funding and to the CHE. The CHE then submits that information to SAQA for the National Learner Records database and that is what SAQA uses to verify that students have completed qualifications.</p>

	<p>The CHE also uses the information for different kinds of research, and so on, but we don't publish personal data. Obviously, it's anonymized and processed and so on for research purposes in terms of tracking.</p> <p>The information is used in different ways for student administration systems that handles the registration for the programme and for each one of the modules, the marks and so on. Once they've completed the programme, there's usually a student system which has all of that sort of higher-level data on it.</p>
PSET-2-01 Data protection	<p>We have the POPI act that's there but I suppose there can always be some kind of clause where you know students agree or disagree to how their information is used. Of course it has to be within legal parameters. You know you can't just take learner information and expose it if it's used for research purposes. They would need to give consent to that.</p>
Data use	<p>All institutions submit data to HEMIS (DHET), you know, or there is the National Learner Records database (SAQA). we use it for statistics.</p> <p>We use it to inform us to make improvements, but not to expose or go against any legal barriers.</p>
PSET-1-01 Data protection	<p>The problem again with that is sometimes they put security in safety first before they think of navigation and accessibility and all of those types of things.</p>

(ia) Case analysis

With respect to data protection, HEI-1-01 indicated that the university subscribes to the Protection of Personal Information (POPI) Act, while UNIT-1-01 said that the eLearning platform had layers of protection with different access rights: *"...there are layers of permissions so I can see my class, but nothing more. The administrator can see everybody's classes, etcetera, and the student can see only their own grades or their own work"*. UNI-1-01 talked about cyber security measures to prevent hacking and abiding by the POPI Act: *"Our institution has taken the whole POPI Act very, very seriously. High level cyber security measures need to be put in place and then policy decisions about what is protected and what is not. So, security wise, that's why the technology people need to be on it, because otherwise you get hacked and that would be detrimental if the data gets out"*. UNI-3-01 gave a real example of another university's data being hacked and raised concerns about the security measures in place to protect data, and talked about different levels of access to information, based on your role. The UNI group were confident about data protection measures, but one participant felt that these measures were not sufficient.

UNIT-1-01 said that data was used to track student progress, and identify areas for improvement. UNI-1-01 said that while data was available, academics seldom used it. However, the university did use this data for research purposes. UNI-3-01 expressed a similar sentiment to UNI-1-01: *"In my university there is a lot of data available in our*

eLearning platform. It's not as widely used as I think it should be. ... institutionally you could be building data analytics programmes to support students. You could be using it to improve teaching, but actually it doesn't happen". It seems that among the UNI group, not all institutions use student data to track the student journey and identify problems like early drop-outs before they happen.

All the participants in the SDP group talked about data security policies and having big data companies like Amazon Web Services protect the data. SDP-1-01 used a practical example of how AI minute-takers can also be a breach of confidentiality in a closed focus group where student identities were hidden. SDP-4-01 said that students should understand the data usage policies of the institution, and SDP-1-02 said that student data should only be used for the stated purpose and nothing else. SDP-3-01 gave an example of how student data is used, and said that data analytics was important for future planning. Participants in the SDP group were clear about data security policies to protect student data, and participants felt that data should only be used for the stated purposes, with transparency being important. One participant showed how easy it was to breach confidentiality by allowing an AI bot to take minutes of a closed session. One participant said that using student data could assist with future planning.

Two participants in the PSET group mentioned the POPI Act for data protection. PSET-2-01 gave numerous examples of how student data from the LMS is used, not only by the institution, but also by the regulatory bodies where institutions load student information to the quality council, the Department of Higher Education and Training, and SAQA databases: *"All institutions submit data to HEMIS (DHET), you know, or there is the National Learner Records database (SAQA). We use it for statistics. We use it to inform us to make improvements"*. Anonymised student data is also used for research purposes. PSET-1-01 pointed out that sometimes data security measures hinder the student journey by making navigation and access difficult.

(ib) Cross-case analysis

Participants in all three groups mentioned the POPI Act as a guiding document for data security. The UNI group participants mentioned different levels of access to student data based on the role of the person. The impression from the UNI group is that while huge amounts of data was available, very little was done with the data. One participant did however, mention that student data was the main source of research at universities. This view differed from the PSET group where two participants detailed how student data was used by regulatory bodies, both for student tracking and research purposes. One participant in the PSET group also outlined how student data was used for reporting purposes, and for analytics that informed future planning. One participant in the UNI group seemed

concerned about the effectiveness of data security at institutions, which none of the other groups raised.

(ic) Conclusion

Student data is mostly protected under the POPI Act, and institutions have data security policies to prevent cyber-attacks. Universities seem to have levels or access to student data, based on the role of the person. Some institutions rely on third parties like Amazon Web Services to protect data hosted in the cloud. There was no mention of third-party access to student data. Some participants felt that transparency in data protection and use was important for students, whose data was at risk, and data should only be used for purposes for which student permission had been granted. While institutions have access to student data to track progress and identify issues before they arose, very few academics used that data for this purpose.

5.2.1.6 How is technology evaluated?

(i) Choosing a suitable technology platform

This theme responds to the question of how technology is evaluated by considering the criteria used to evaluate the eLearning technology platform.

Table 18: Evidence to support theme: Choosing a suitable technology platform

Participant	Quote
UNI-2-01	It must be cloud based. Being cloud based, it allows the system to be up and running consistently. The architecture of the systems should be the same. Universal design for learning.
UNI-2-02	Cost effectiveness of these tools. If you're not using an open source LMS like Moodle, they can be very expensive in terms of new licence fees per student etc One of the aspects of evaluating the LMS is whether it's meeting the learning and teaching needs of the university. I think the other aspect is also whether it's modern. Having said that, I worked a couple of different universities, and used a couple of different services. There isn't a perfect eLearning platform or LMS. Long term sustainability; speed As much as you have the LMS features and functionality, there's also how they are used. We have these tools, but we don't always use them well.
UNI-1-01	Cost effectiveness is often the most important one, sadly so because institutions have limited funds. Blackboard and those kinds of elements are quite expensive, but then there are open-source ones that like Moodle and so that can easily be acquired. Relevant ICT specialists who can support the thing. Specifications might change, but the functionality in most of these learning management systems are more or less the same.

	It makes sense to stay with what are people familiar with.
UNI-3-01	<p>In my opinion the problem is often that the stakeholders that make a decision about the eLearning platform are not the people that use it on the ground, and so they come up with a very different outlook. Their outlook might be more cost orientated versus usability.</p> <p>For me it would be openness and there's a couple of technology platforms that are open. So, they are open source and that means that, universities can run it themselves, they're not dependent on an outside company.</p> <p>It's not just South Africa, but everywhere that you see these huge exploitations, and I think there's lots of corruption in it as well. If it is an open-source platform, even if it is being run by an outside company, and you know all the implementation was done by an outside company, ultimately it is yours.</p> <p>Education is a public good, so there's this constant tension in my mind towards what educational entrepreneurs offer and what they think is needed, versus the actual needs of higher education as a public good. Not as a space where you can make money off students, not as a space where you can exploit students and the Academy itself.</p>
HEI-1-01	Student success rate. Student engagement is also a big indicator.
SDP-2-01	<p>The system needs to be designed in such a way that I can create individual learning paths. Must have communication capability across the platform.</p> <p>Look at the resources because you can bring in a Rolls Royce. We need to understand really very well what are the needs of the client before we sell technology.</p> <p>The people eventually that needs to implement and train and consult and work with the client are usually not in those discussions.</p> <p>Look at the partnership in the long term.</p> <p>There are guidelines and articles that speak of what makes a good learning management system.</p> <p>One point of truth of information that we get into the LMS.</p> <p>It's relevant to what we are doing and it is modern, it's interactive, it is engaging students and it's integrated.</p> <p>The ease of creating your courses online.</p>
SDP-3-01	<p>Onboarding, is as simple as you could ever make this thing.</p> <p>clean cut interface It's just understanding your target audience and their abilities and capabilities and making sure you meet those needs.</p>
SDP-4-01	To what extent can the learners use that eLearning environment to learn.

SDP-1-02	<p>If an LMS is able to provide you with easy navigation, easy to build all those components for everyone, then the LMS should be a good one.</p> <p>The other thing is uptime. The infrastructure on which the LMS sits should be very stable. You don't want when you have 1000 students writing exam, those system falls down.</p>
PSET-3-01	<p>You're getting value for money out of the system.</p> <p>User interface, particularly for the target audience you're dealing with</p>
PSET-1-01	<p>The user friendliness and navigation are crucial. You don't want the student or the lecturer to have to go through a whole course to navigate your platform. Remember, we are dealing with a country where people are at different levels of understanding.</p> <p>Make it as easy as possible for the person to access your system.</p>

(ia) Case analysis

UNI-2-01 said that the technology should be cloud-based, have a familiar architecture, and follow a universal learning design. UNI-2-02 talked about the cost of the technology; speed; whether it met learning and teaching needs; modern design; long-term sustainability; and if the university staff and students were able to use all the functionalities offered by the technology; and added that no eLearning platform was perfect: *"We have these tools, but we don't always use them well"*. UNI-1-01 also talked about cost effectiveness; having trained ICT staff to manage the technology platform; platforms shared common functionalities; and it was therefore good practice to stick with a familiar architecture. UNI-3-01 said that the platform should be open-source to ensure that the institution owns the technology. UNI-3-01 raised further concerns about the wrong stakeholders making the decision about which platform to use, with decisions based on cost rather than functionality; and that as education is a public good, big tech companies should not see the education sector as an opportunity for profiteering: *"... the problem is often that the stakeholders that make a decision about the eLearning platform are not the people that use it on the ground... Their outlook might be more cost orientated versus usability"*. HEI-1-01 added that student engagement and success rates were factors in deciding on a technology platform. Criteria mentioned by more than one participant included having a familiar architecture; cost; open source; and functionality; and that no eLearning platform was perfect.

SDP-2-01 mentioned that the eLearning platform should be able to plot individual learning pathways for students; have communication capability throughout the platform; meet the institution's needs; be a long-term solution; serve as one point of truth for information; modern design; and allows for easy creation of online programmes. SDP-3-01 said that onboarding should be simple and there should be a clean-cut interface.

SDP-4-01 made the point that learners should be able to use the eLearning platform to learn. SDP-1-02 talked about having easy navigation and uptime. SDP-2-01 raised the point of the users of the system not being around the table when the decision-makers decided on the eLearning platform: “...you can bring in a Rolls Royce. We need to understand really very well what are the needs of the client before we sell technology”. Participants in this group added different evaluation criteria form one another.

PSET-3-01 said that the choice of eLearning platform should be based on the suitability of the user interface for the user group; and the cost. PSET-1-01 talked about user friendliness; navigation and access as criteria.

(ib) Cross-case analysis

More than one participant in the UNI group mentioned having a familiar architecture; cost; open source; and functionality; and that no eLearning platform was perfect. Participants in the SDP and PSET groups mentioned cost as a criterion. Participants in the UNI and SDP groups mentioned having a modern design and long-term sustainability. Participants in the PSET and SDP groups mentioned the clean-cut interface and ease of navigation. Participants in the UNI and SDP groups mentioned that the actual users of the eLearning platform were not consulted about which eLearning platform to choose. One participant in the UNI group had an interesting comment about education being a public good, and that big tech companies should not be making huge profits form technology in this sector.

(ic) Conclusion

Table 18a below summarises the evaluation criteria for an eLearning platform.

Table 18a: Evaluation criteria for an eLearning platform

cloud based	Familiar architecture	Cost-effective / value for money	Meeting stakeholder needs
Long-term sustainability	speed	Capability to use functions and tools	Open source
Student engagement & success rate	Communication capability across platform	Ability to create individual learning pathways	Relevant & modern,
Ease of creating online courses	One point of truth	Simple on-boarding & clean-cut interface	Usability & universal design
Easy navigation	uptime	Easy access	Engaging & interactive

These criteria respond to the question of how technology is evaluated, and provides insight into the considerations that influence decision-making. The participant suggested that the academics and support staff who use the eLearning platform at educational

institutions are often excluded from the decision-making process. There was also a question of open-source versus proprietary technology in terms of costs, and considering education being a public good.

5.2.2 To what extent does technology influence society?

(i) Access and equity of e-learning

This theme answers the question of the extent to which technology influences society by considering access to eLearning opportunities.

Table 19: Evidence to support theme: Access and equity of eLearning

Participant	Quote
HEI-1-01 Access	We are moving to the point where information is accessible to anyone, anywhere, anytime. If I want to learn something, I can learn it right now, with the whole facilitation moving from a teacher to a facilitator.
UNI-3-01 Access	You can go to one place; you can find the information.
UNI-2-02 Access	Geographic access of not only being able to study in a place that's close to you. If you wanted to study at WITS, you had to be based in Johannesburg or you had to move to Johannesburg. If you wanted to study here with online programmes, you can be anywhere in South Africa or even outside of South Africa.
UNIT-1-01 Access	The most important one is the ubiquitous presence of it that the platform is in their pockets and what we have to realize is that eLearning design is getting more and more into mobile design. So, it's in your pocket. And I think what needs to happen is a very quick redesign of the entire workplace towards mobile rather than desktop or laptop applications.
SDP-4-01 Access	Being able to access the large volumes of information and content independently of your teachers and of your institution. Smartphones have helped a lot in bridging the gap, but connectivity remains an issue in many places. It's not everywhere where people with smartphones are actually able to access Wi-Fi connections.
SDP-1-02 Access	It can open up access to those who cannot afford to live near an educational institution. It opens up access to those who are not able physically able to go to university. I mean it can be someone in a village or a little farm with a very poor Internet connection could have access.
SDP-1-01 Access	I think intellectually, socially and morally, technology can actually make a difference because it can also bring what is happening now to you.
SDP-3-01 Access	With technology, you have information the minute you want to know or verify something. So, technology in that sense is absolutely fantastic. People don't have time. People want quick chunks of information. People want quick learning. People want to know how to do something now in 2 minutes, 3 minutes, people want a resource.
SDP-5-01 Access	My kid's generation, they the digital natives.
PSET-1-01 Access	When you speak about a place, you can go on to Google Maps and zoom into the place it gives you that real life experience.
PSET-3-01 Access	My five-year-old granddaughter asked me a question and I said I'll have to check on that as I'm not sure. So, she says, "well, just ask Siri". They are growing up with technology as though it is the most normal thing. I

think the progress they're going to make with it at their fingertips is going to be great.
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(ia) Case analysis

HEI-1-01 said that information is accessible to society located anywhere, at any time, so learning opportunities are available to everyone. UNI-3-01 said that information is available from one place (the internet) so society can find what they are looking for. UNI-2-02 talked about how geographic barriers to learning has been overcome by eLearning by providing access to learners anywhere in and outside the country. UNIT-1-01 talked about having an eLearning platform on your mobile phone, and suggested that businesses should move to using mobile phones in the workplace instead of desktops and laptops. Three participants talked about technology bringing learning opportunities to society wherever they may be, while the fourth participant focused on how technology has evolved to provide pocket computers in the form of a smartphone. This participant believed that the workplace should adapt to smartphone technologies by building apps that would replace traditional desktop and laptop computers.

SDP-4-01 talked about being able to access information independently, but cautioned that not everyone with smartphones necessarily had connectivity. SDP-1-02 talked about overcoming the geographic barrier of access through online access: *"It opens up access to those who are not physically able to go to university"*. SDP-1-01 mentioned society's access to current information, and SDP-3-01 said that society wants a resource that gives them access to quick chunks of relevant information instantly: *"With technology, you have information the minute you want to know or verify something"*. SDP-5-01 described the younger generation as digital natives since they are growing up with technology. Gaining access to current information in large volumes or small chunks summarises most of the SDP group comments. However, there is still a caution about connectivity.

PSET-1-01 gave an example of how access to instantaneous online information can enhance learning, and PSET-3-01 illustrated how the younger generation takes access to information for granted and there is hope that this generation will make greater technological strides: *"My five-year-old granddaughter asked me a question and I said I'll have to check on that as I'm not sure. So, she says, "well, just ask Siri"*.

(ib) Cross-case analysis

Participants in the UNI and PSET groups gave examples of how access to technology influences society, with having a pocket computer in the form of a smartphone, and knowing at the age of five that an AI bot on the phone can provide answers to problems.

A participant in the UNI group described this young generation as digital natives. Participants in the UNI and SDP groups talked about bridging geographic barriers to learning by introducing eLearning. Participants in all three groups mentioned access to current and instantaneous information that enhanced learning.

(ic) Conclusion

The question about the extent to which technology influences society, unpacked how access to technology benefits society by providing instantaneous information that is current and can be accessed in large volumes or small chunks, to suit the individual's preferences. Technology has also provided opportunities for formal learning through eLearning platforms to individuals irrespective of where they are located. However, South Africa has not resolved its issues of connectivity yet, so access may be difficult in certain rural villages in South Africa.

(ii) Technological advancement vs societal values

This theme considers the question of the extent to which technology influences society, by considering technology's positive and negative effects on societal values.

Table 20: Evidence to support theme: Technological advancement vs societal values

Participant	Quote
HEI-1-01 Influence Negative effects	It opens up this world of knowledge for students. Students have ChatGPT. I don't know something so I punch in a text-based query and I'm now given everything I need to know about whatever topic. So that's absolutely great. Uh, but I think what it has done as well at the same time, is it's taking away the social engagement, so people are becoming secluded. They're becoming unsociable.
UNIT-1-01 influence	I believe technology has really become the great equalizer in society If you think of online relationships and connectivity, it changes the way in which we communicate through instant chat. I've been traveling through Europe now quite extensively in countries where I don't understand a word of their language, and I can get wherever I like because Google Maps tells me walk so many meters on the little blue dots and you will get to bus stop, take bus number 679, which will arrive in one minute and so suddenly I have become multilingual and sort of universally competent to get wherever I want to. Even the value of money has changed. In the past, you'd have to post a cheque. Now you just deposit money into an E wallet.
UNI-2-01 Influence	Your citizens need to be digitally fluent. And people must understand how technologies work in order to know how to manoeuvre the environment of living, and to become a prosperous economy.

Negative effects	<p>It's become so embedded now in our lifestyles, that it's part and parcel of everything we do and so forth.</p> <p>If you use ChatGPT, think about the consequences of using the software because it uses large amounts of water in the processing machines and I think Amazon has one already in Cape Town.</p>
UNI-2-02 Influence	<p>What happens in society with technologies infiltrates universities as well, although sometimes much more slowly in universities than it should be. In terms of universities, use of tools and research, then translates into ways that can affect society.</p> <p>The role of how cell phones have changed society in terms of the things that we can now do on our phones that we weren't able to do the past.</p> <p>In the past you used to have to go into a bank branch, if you wanted to do anything, now a lot of what you need to do in terms of banking can be on the app. However, that also means now that there's more options for fraud and people trying to get access to that information in different ways that then where possible.</p> <p>If I want to fly to Cape Town tomorrow, I just go on to my phone, onto the app and I book a flight, and that's done. So, from that perspective technology creates a whole lot of efficiencies for society.</p>
Negative effects	<p>There is also the downside in terms of social media and the spread of misinformation and disinformation that are challenges.</p> <p>A lot of these companies make money based on the data that they get and what they do with it.</p>
UNI-3-01 Influence	<p>Technology isn't even neutral and it can never be neutral because it's made by people; people aren't neutral.</p> <p>It's just to make life easier at the end of the day, because the world has changed.</p>
Negative effects	<p>We have lots of research on how technology, social media specifically is used to do social engineering, to stroke and tensions between people. It might seem a small thing, but it has a huge impact on South African society.</p> <p>Artificial intelligence has built in biases because it was built by people with biases, and those things are structuring society in little unnamed ways that we are still getting to know.</p>
UNI-1-01 Influence	<p>Even people who go on hikes in nature nowadays take their cell phones with them so that they can be found if there's a problem or they take a fit bit with them to check their vitals and monitor themselves. Health wise, financial wise, economy wise, love life wise, spiritually wise, learning wise, I think every sector of our lives or somehow to a lesser or greater extent is influenced by technology.</p> <p>It makes such a difference in terms of productivity and efficiency.</p>
Negative effects	<p>I also do think that we have to caution ourselves as a sector against not losing the bits that makes us human, and use the technology to create opportunities for connectivity, for connection with humanity.</p>

SDP-1-01 influence	<p>I think people wake up with technology. They see the news of the day, so they're much more informed. I think it makes us more intelligent in a way.</p> <p>I really think that technology is going to be the thing that brings the world a little bit closer together.</p> <p>Cyber-crime is huge. I feel very strongly that we need to help our students discern fake news.</p> <p>I think it's going to improve lifelong learning and I've seen many, many students from all over the world join in these free online programs. The collaboration and the communication and lifelong learning is really enhanced.</p>
SDP-2-01 influence	<p>I think it's easier for the younger people because they grew up now with technology. But for our older people and our elderly, I think it's a big adjustment and it's not necessarily to their advantage, but I think we as a society need to do more to help people, to educate them on the basic use of technology. We want to improve digital literacy for the elderly.</p> <p>Learning opportunities is now more available and accessible for those who previously would not have had access to that, especially if it's for free.</p>
SDP-5-01 Influence Negative effects	<p>They have blatantly become technology addicted. When I walk on the campus, 90% of the students are walking while looking at their phones. They've got earphones in. My generation people say hi to each other and ask each other how we are.</p> <p>Our health is being threatened by eLearning. I always told people sitting is the new smoking. We're going to have to make it more interactive. If we don't start moving. If we don't bring physical exercise into eLearning, we're going to set ourselves up for death, which is going to be really dangerous. How do we get active with E learning is the big challenge. We become robotic because we've got all the information, all the knowledge, but no physical fitness.</p>
SDP-4-01 Influence	<p>One may argue that societies have been driven by technology in the way we think about doing business, in the way we think of communicating, in the way we think of educating, in the way we think even of our banking processes. So, the way we do things is largely influenced by technology.</p> <p>The possibilities that have been opened up by technology, there are a lot of people now who prefer to have their children at home and they have tablets and they can access learning platforms and they can interact with their teachers from home. So, I think what we do, the way we do things generally is being largely influenced by technology.</p>
PSET-2-02 Influence	<p>It has made life easier in that certain tasks can be automated. Certain AI has the potential to relieve us of routine work by doing things like note taking for example or doing calculations so it can assist with routinized work giving us the potential to focus on more important and more strategic things because a lot of the bulk routine work has been taken care of through AI.</p>

Negative effect	<p>There are positives in that we are more connected, but the quality of the connection may not be the same if one isn't careful. You are meeting and talking in person online so you are able to be more connected across huge different spaces and geographically and in different kind of modes, whereas otherwise you would not be connected at all.</p> <p>But of course, technology is also abused such as social media. Cyber bullying becomes possible through technology.</p> <p>We create a lot of waste and technology waste because there's such a quick turnover in old phones, old laptops and so on. The physical, hardware gets updated so quickly.</p> <p>Addiction- people get so tied to their devices that they neglect meeting up in person socially, or even exercising as they struggle to manage their screen time. It has a negative effect on mental health. Mental Wellness in this age of technology has become a big issue.</p>
PSET-1-01 influence	<p>Health services, there lots of improvement that technology brings.</p> <p>When you look at issues earlier related to UK at the moment where there's lots of unrest, 10/20 years ago, there was one source of information you had to look at the TV and what was told in the newspapers. Now somebody with a camera can easily indicate but look, there's a different perspective on what's happening. So, we are very much well informed around what's happening around us, communication is much easier.</p>
PSET-3-01 influence	<p>Youngsters, nowadays have lost the art of being sociable. It's Facebook. It's Twitter. It's Tik Tok. I went out to eat the other night, there was a whole family at the table next to me. And their meals came and went, but they were all on their phones. There's no interaction. I don't even think they recognized the waiter taking something away and putting something else in front of them. It's a very sad thing to see.</p> <p>There's good information but there's also fake information and depending on a person's maturity level, I don't think they were able to sometimes discern between the two. if you're not discernible about your sources and the validity of what you're reading, then it's also dangerous.</p>

(iia) Case analysis

HEI-1-01 sees technology as a gateway to knowledge, but at the same time, it is affecting people's ability to socialise in person. UNIT-1-01 believes that technology is an equaliser in society and gave numerous examples of online dating; instant chat; travel assistance and how we transact, that illustrates how technology has influenced society. UNI-2-01 believes that society needs to be digitally fluent because technology has penetrated all aspects of our lives, and warns that we need to be wary of the effects of generative AI like Chat GPT on climate change. UNI-2-02 said that universities are a microcosm of society and what happens in the one space influences the other space. Smart phones have enabled society to perform functions like online banking and booking plane tickets,

while simultaneously providing new opportunities for fraud and spreading misinformation and disinformation via social media. UNI-2-02 also warns of tech companies who make money from the data that they collect through technology platforms. UNI-3-01 said that while technology makes everyday life easier, it is not neutral because humans built it: *"We have lots of research on how technology, social media specifically is used to do social engineering, to stroke tensions between people"*. There are biases in technology that influence society. Research supports the notion that social media is used for social engineering to intentionally influence society to one or other persuasion. UNI-1-01 gave numerous examples of how technology influences productivity and efficiency, and cautions against losing our human qualities. All participants in the UNI group described both positive and negative influences on society. The positives showed how technology has penetrated everyday life and introduced efficiencies that improved society's quality of life. However, the down side of technology saw biases embedded in technology platforms result in social engineering of media misinformation and disinformation. There is also the risk of new cyber-crimes and society losing its human qualities due to the influence of technology.

SDP-1-01 talked about technology enhancing collaboration, communication and lifelong learning. While technology keeps society informed about current affairs, cyber-crime is on the rise. SDP-2-01 talked about providing digital literacy for the elderly who are being exposed to technology for the first time, and mentioned that technology provides society with learning opportunities. SDP-5-01 talked about the youth being addicted to technology, and the health risks associated with technology: *"Our health is being threatened by eLearning. ... sitting is the new smoking. ...If we don't bring physical exercise into eLearning, we're going to set ourselves up for death"*. SDP-4-01 talked about society's actions being influenced by technology and used the example of parents deciding to home-school their children with the use of technology. Participant responses were varied, but again the idea of balancing positive and negative influences came through. Positive influences of technology on society included enhanced collaboration, communication, and lifelong learning; and informed society, while negative influences included cyber-crime; need for digital literacy to operate in the current environment; technology addiction; and health risks. SDP-1-02 said: *"Cyber-crime is huge. I feel very strongly that we need to help our students discern fake news"*.

PSET-2-02 listed the positive influences of technology as offering automation, completing routine tasks on behalf of humans; and enabling human connection over great geographic distances. The negative influences included cyber-bullying; e-waste; and addiction to technology resulting in mental health issues: *"Addiction- people get so*

...tied to their devices that they neglect meeting up in person socially, or even exercising as they struggle to manage their screen time. It has a negative effect on mental health". PSET-1-01 lists technology's positive influences as improvements in healthcare; and citizen reporting, which gives multiple perspectives of a story. PSET-3-01 raises the issues of technology addiction and fake news, which negatively influence society: *"There's good information but there's also fake information and depending on a person's maturity level, I don't think they were able to sometimes discern between the two. If you're not discernible about your sources and the validity of what you're reading, then it's also dangerous".* The participant responses in the group very different from one another, but there was a balance of both positive and negative influences. Automation, human connection over long distances; improvements in healthcare; and citizen reporting were seen as positive influences. Cyber-bullying; e-waste; technology addiction; and fake news were seen as negative influences in this group.

(iib) Cross-case analysis

Participants in all three groups gave examples of how technology has penetrated everyday life. The UNI group raised issues of AI bias and social engineering, which the other groups did not notice. Participants in all three groups talked about cyber-crime and cyber-bullying. A participant in the UNI group talked about society losing its human qualities because of the influence of technology. Participants on the SDP and PSET groups talked about addiction to technology and the health risks associated with using technology. UNI and PSET group participants talked about the influence of fake news, misinformation and disinformation on society. The unique perspectives in the PSET group included technological advancements in healthcare; automation; and e-waste production due to rapid technological advancements.

(iic) Conclusion

In response to the question of the extent to which technology influences society, participants considered technology's positive and negative effects on societal values. Participants gave numerous examples of how technology has penetrated everyday life like accessing banking services; making travel bookings; and automating routine processes. Technology also enhances communication, collaboration and provides opportunities for lifelong learning, while giving access to current news and information. One participant viewed universities as a microcosm of society, and what happens in one space influences the other. Another participant pointed that technology cannot be neutral because it was designed by humans, who are not neutral. As such, social media has been known to be socially engineered to influence society to a particular way of thinking or acting through misinformation and disinformation. Technology also has in-built biases,

which influence society. Participants also pointed out that technology has changed human-to-human interaction because the younger generation find it easier to communicate through technology and have not developed their social skills for in-person interactions. Cyber-crime and cyber-bullying are on the increase, and society, especially the older generation, need to be taught digital literacy to function in this technologically driven society. Technology brings automation and AI that can perform routine tasks, with advancements in healthcare, but also produces e-waste and uses natural resources like water. The new generation face health risks because of long hours spent using technology, and “sitting is the new smoking” risk that society must deal with. Addiction to technology is also a problem, and has been associated with mental health issues.

5.2.2.1 How does technology influence society?

(i) Evolution of technology

The theme of the evolution of technology aims to respond to the question of how technology influences society by considering the impact of two disruptors in the education sector, namely the Covid-19 pandemic and introducing AI while society was still emerging out of the pandemic.

Table 21: Evidence to support theme: Evolution of technology

Participant	Quote
UNI-2-02 AI	The use of generative AI tools such as ChatGPT have just come into the space less than two years ago and that's also giving us pause for consideration of how do these tools integrate into learning and teaching?
Pandemic	Another big factor was what happened in 2020 with COVID and forcing everyone to work remotely and not allowing physical contact, which means that lecturers and students who are reliant on virtual tools like Teams and Zoom which hadn't really been used by many contact institutions before.
UNI-2-01 Pandemic	The pandemic was a huge learning curve because we've been grappling with this issue of getting students to learn online or to embrace technologies, and to get academics to use technologies in learning and teaching spaces. But the pandemic sort of catapulted or pushed forward the opportunity that they were forced to embrace these technologies.
SDP-4-01 Pandemic	There is quite substantial use now of learning management systems within the South African context as well as outside South Africa within the Sub-Saharan African region. COVID helped in getting people to appreciate the role that technology can play, especially when people teach and interact virtually.
SDP-2-01 Pandemic	There's content, there's assessment and then there's engagement and collaboration, and I think what's happening in the education sector is that especially during after Covid, it speeded up. Opportunity for students to practise what they are being taught, but also to be able to provide evidence that they are achieving what we promised, that they're going to achieve. So, technology helps us to collect that evidence.

PSET-3-01 AI	We're dealing with students as humans, we have feelings who have off days, who have things happening to them and things like that. And AI will never be able to recognize that and help with that development of a person which is just as important as development of your knowledge and your skills. But I do think we have to be cautious of AI.
PSET-2-02	All the public universities in South Africa have learning management systems after the pandemic. The pandemic obviously really fast-tracked this whole thing. It was a forcible external factor which really made a big difference.

(ia) Case analysis

UNI-2-02 talked about how traditionally contact universities were forced to use technologies such as Zoom and Microsoft Teams in their teaching and learning during the pandemic, since in-person contact was prohibited, and UNI-1-01 said that there was a reluctance to move to technology before the pandemic, but the pandemic pushed institutions to use technology. UNI-2-02 added that generative AI tools like Chat GPT has been around for the last two years, but educational institutions are still trying to figure out its place in teaching and learning. UNI-2-01 said: *“The pandemic was a huge learning curve because we’ve been grappling with this issue of getting students to learn online or to embrace technologies, and to get academics to use technologies in learning and teaching spaces. But the pandemic sort of catapulted or pushed forward the opportunity that they were forced to embrace these technologies”*. The UNI group participants point out that a major event like the pandemic had a positive effect on the uptake of technology within education, because it provided an opportunity to continue teaching and learning.

SDP-4-01 pointed out that while technology platforms are popular at South African and Sub-Saharan educational institutions today, the pandemic influenced society’s thinking about the role that technology can play in teaching and learning. SDP-2-01 said that the pandemic sped up the adoption of technology as a tool for content; collaboration; engagement; and assessment. Technology allows students access to learning content and assessments, and the lecturer the evidence of assessments, which shows the student’s progress through the learning material. Participants in the SDP group both echoed the sentiment that the pandemic sped up the adoption of technology in teaching and learning.

PSET-3-01 pointed out that while AI may improve access to knowledge and skills, AI cannot assist with problems where human emotions and feelings are involved, and the human development of a learner is just as important as the development of that learner’s knowledge and skills: *“We’re dealing with students as humans, who have feelings, who have off days, who have things happening to them... AI will never be able to recognize*

that and help with that development of a person which is just as important as development of your knowledge and your skills”. PSET-2-02 said that the pandemic had been a catalyst for technology adoption in the education sector. The participants in the PSET group held different views, with one talking about the acceleration of technology adoption during the pandemic, and the other warning about the weakness in AI to deal with human emotional development.

(ib) Cross-case analysis

Participants in all three groups held similar views about the pandemic speeding up the adoption of technology platforms at educational institutions. A participant in the UNI group had pointed out that there was a reluctance to adopt technology platforms prior to the pandemic, but the adoption was quick during the pandemic as institutions had no other means of continuing teaching and learning. A participant in the UNI group mentioned the emergence of AI soon after the pandemic. The participant talked about the uncertainty about AI’s role in teaching and learning, while a participant in the PSET group warned about the gap in AI’s capability because it can play a role in the attainment of knowledge and skills, but it is not able to contribute to a learner’s emotional development, and all these elements are important for a learner to develop holistically.

(ic) Conclusion

In response to the question of how technology influences society, this theme’s contribution is that the pandemic sped up educational institutions adopting technology, and while institutions are still discussing how to adopt AI into teaching and learning, AI’s gaps in its capability must be considered before society adopts it.

(ii) Artificial intelligence and education

The theme of artificial intelligence and education aims to respond to the question of how technology influences society by considering the penetration of technology and AI into communities.

Table 22: Evidence to support theme: Artificial intelligence and education

Participant	Quote
UNI-1-01 Technology	We should make a significant mindset change in South Africa, in the world about how we assess students and what we value as learning in this very strange new world where AI has such a prominent role to play.
AI	We'll have to find out what it is that humans can do better than what computers can do, and find out how we balance it. So, if we are saying students are not allowed to use AI and we should restrict it, then we are going to end up with students who are unprepared for real life. If we are authentic and we say that we as a sector are

	preparing students for their careers and their professional lives, then we must prepare them to also use AI.
UNI-2-02 AI	I think the other aspect is the whole notion of generative AI and ChatGPT and tools like that. We're still in the very early stages of that, so we're not yet sure how that's going to pan out. Some people say you are fine as long as you know how to use these tools going forward. Other people say, maybe because of these tools in 10 years' time, there won't be a need for lawyers and accountants anymore, at least not as many as there are today, because a lot of that work will be automated.
UNI-2-01 Technology	Things are changing at such a fast pace. We need to be agile and be willing to learn.
UNI-3-01 AI	I think we all going into a space of deep contestations about the values that we want as a society, whether that's a South African society or a world society, which technology is used to kill Palestinians, you know, the same AI technology that I have fun with asking, for a recipe is being used to kill people and I think there's going to be a reckoning of some sort. The only way that we can get away from such a bleak future is if there are very tight controls and policies around technology which is the exact thing that tech giants don't want. The technology is not problematic, it is how it is regulated, and we need regulators that take it seriously.
HEI-1-01 AI	There are two camps of thought for ChatGPT and generative AI. One camp says it diminishes your ability to think, and the other one says it improves your ability to think. And my view is it improves your ability to think so you don't sit with writer's block and try to figure out what should I say. You can ask AI to give you ideas on how to enhance teaching and learning. AI will give ideas and then you embellish all those ideas, and you start working through those ideas.
SDP-5-01 Technology	Can you imagine when you start downloading certain stuff from your brain to make space for other stuff, or you start cloning certain things?
SDP-1-02 Technology	These little nuggets of knowledge and if I achieve them all, I am now perfectly suited for this career. I think we are moving to that stackable type of degree rather than everybody needs to have exactly the same degree.
SDP-2-01 AI	What's already disrupting is artificial intelligence and VR.
PSET-2-01 technology	These days in the health programmes, a lot of the learning happens through simulations, virtual reality, and there are certain courses that students can do using technology or mixed reality. Yes, they do need to have the physical practical experience, but certain things can be practised using technology and many institutions are starting to teach that way. Then they have a work integrated component where they do it practically, but the teaching and learning uses virtual reality.
PSET-2-02 Technology	So that's something we have to prepare students and staff for - this possibility of constant change that you can never quite be on top of things because there's always this new development. Ability for students and staff to be able to adapt quickly and to change how they think and how they do things very quickly will be very important.

(iia) Case analysis

UNI-1-01 talked about needing a mindset change to integrate AI into society, and added that it was important to distinguish between AI's capabilities and human capabilities and reach a balance between the two: *"If we are authentic and we say that we as a sector are preparing students for their careers and their professional lives, then we must prepare them to also use AI...We'll have to find out what it is that humans can do better than what computers can do, and find out how we balance it"*. HEI-1-01 said that there were two schools of thought on AI: one that believed AI improved society's ability to think; and the other who believed the opposite. HEI-1-01 said that if used correctly, AI can improve society's ability to think. UNI-1-01 made the case of incorporating AI into teaching and learning to prepare learners for their careers and professional lives. UNI-2-02 was still unsure about how to incorporate AI into teaching and learning, and pointed out two schools of thought: one that supported its adoption; and the other that worried about AI replacing humans in certain professions. UNI-2-01 pointed out that the world was changing at a rapid rate, and society had to be agile and willing to learn to adapt to change: *"Things are changing at such a fast pace. We need to be agile and be willing to learn"*. UNI-3-01 raised concerns about how technology was being used. The same technology can be used for good and bad outcomes, and regulators should play a more prominent role in regulating technology. The UNI group participants individually supported adopting AI into teaching and learning, but participants indicated uncertainty over how this should be done. A participant pointed out that there should be a distinction made between the capabilities of AI and those of humans, and these capabilities should be balanced off against each other. Another participant said that introducing AI into teaching and learning was essential to prepare the learner for the world of work, while another participant said that some people feared that AI will take over jobs and wipe out some careers.

SDP-5-01 spoke about a future reality where it was possible to download information from a human brain to make space for new information, and to clone one's brain. SDP-1-02 talked about changing the philosophy of teaching and learning considering AI, by providing small packets of learning relevant to a particular profession, and giving learners a stackable qualification comprising several small nuggets of learning. SDP-2-01 said that artificial intelligence and virtual reality are disruptors of education. The SDP participants have pointed society towards accepting AI and gave examples of future possibilities in an AI world.

PSET-2-01 talked about how virtual and mixed reality is used in teaching and learning on health programmes: *"These days in the health programmes, a lot of the learning*

happens through simulations, virtual reality, and there are certain courses that students can do using technology or mixed reality". PSET-2-02 talked about the need for agility in an environment of constant change. Both participants focused on different aspects, but both illustrated the change in thinking about technology.

(iib) Cross-case analysis

The UNI group seemed more cautious about adopting AI into teaching and learning. While this seemed like a good idea, the actual implementation was problematic. In contrast, the PSET group participants showed possibilities of a brighter future with AI, and the PSET group also gave examples of how AI was already being incorporated into teaching and learning on health programmes. Participants in the UNI and PSET groups talked about the need for agility in a fast-changing environment.

(iic) Conclusion

In response to the question of how technology influences society, this theme explored the penetration of technology and AI into communities. Participants individually supported the notion of AI penetration, but some participants grappled with the way AI should be integrated into teaching and learning, and hence society at large. While AI seemed to threaten livelihoods and certain jobs, some felt that society should strive for a balance between humans and AI by defining what each was good at, and using that as a launchpad. Some participants also felt that society had to be agile to respond to a fast-changing environment. Participants gave possibilities of a future with AI, while one participant gave examples of how AI and virtual reality was already being implemented in training healthcare professionals.

5.2.2.2 How does society benefit from the use of technology?

(i) Choosing a suitable technology platform

Choosing a suitable technology platform theme answers the question of how society benefits from using technology.

Table 23: Evidence to support theme: Choosing a suitable technology platform

Participant	Quote
UNI-2-01	One of the nice things about the LMS we have now, they have a Creative Commons for a community of practice for all users who have developed courses, to share it, so that the rest can just draw on it and use it if we want.
UNI-2-02	Often the aspect of the user experience or the student learning experience is not something that's always prioritized when it comes to the design of these systems. As much as you have the LMS features and functionality, there's also how they are used. We have these tools, but we don't always use them well.

UNI-3-01	<p>But it does then become a closed ecosystem, which doesn't necessarily benefit the community then, because they don't have access to their data unless they pay money. Even if you put things for free on YouTube or somewhere else, people still need data to access it. And so, you are excluding communities from that.</p> <p>In my opinion the problem is often that the stakeholders that make a decision about the eLearning platform are not the people that use it on the ground, and so they come up with a very different outlook. Their outlook might be more cost orientated versus usability.</p> <p>Education is a public good, so there's this constant tension in my mind towards what educational entrepreneurs offer and what they think is needed, versus the actual needs of higher education as a public good. Not as a space where you can make money off students, not as a space where you can exploit students and the Academy itself.</p>
SDP-2-01	The system needs to be designed in such a way that I can create individual learning paths.
SDP-3-01	You have to understand the target audience
SDP-4-01	Whenever you introduce e-learning, I think you have to have a very clear picture of the profile of your learners and be able to plan for those that are not able to operate effectively on the platform.
PSET-3-01	There are no ways you can do a cooking practical online, even if you take a video, where's your sense of taste and smell. So, eLearning cannot cover everything but where it can, it has to be strong.
PSET-1-01	<p>The user friendliness and navigation are crucial. You don't want the student or the lecturer to have to go through a whole course to navigate your platform.</p> <p>I must make it as easy as possible for the person to find the information so the navigation and the user friendliness is a big issue. Remember, we are dealing with a country where people are at different levels of understanding.</p>

(ia) Case analysis

UNI-2-01 spoke about the technology platform being able to offer a repository for all programmes that other lecturers can access and use. UNI-2-02 pointed out that the technology platform should consider the student journey in its design, and while the platforms may have several functions, users of the platform should be capacitated to use these functions. UNI-3-01 said that the community would benefit more from a free platform, and even if the platform is free, free access to data is also a requirement so that we are not excluding any members of society. UNI-3-01 further stated that the decision-makers are often not the users of the technology platform, and decisions are made based on cost rather than usability. UNI-3-01 also added that education is a public good, and there is a tension between what tech companies offer educational institutions

based on their profit margins, and what is needed: *“Even if you put things for free on YouTube or somewhere else, people still need data to access it. And so, you are excluding communities from that”*. The common themes coming through from participants in the UNI group are the selection of a technology platform based on its usability and user needs; ensuring the capacitation of users on functions in the platform; and the cost of the technology platform. One participant argued that the student journey should be at the centre of the design, while another talked about the narrow stakeholder involvement in the choice of platform. A participant also talked about the costs and the conflict between education being a public good, and big tech companies profiteering from the education sector.

SDP-2-01 wanted the platform to allow for individual learning pathways: *“The system needs to be designed in such a way that I can create individual learning paths”*; and SDP-3-01 said that the platform design should consider the user base. SDP-4-01 said that the learner profiles should be known so that learning experiences can be tailored to ensure optimal learning: *“...you have to have a very clear picture of the profile of your learners and be able to plan for those that are not able to operate effectively on the platform”*. All three participants in this group focused on the learner and pointed out the importance of understanding who this learner is to tailor learning to that learning through individual learning pathways.

PSET-3-01 said that the eLearning platform will not be able to meet all learning needs, but it should function optimally in instances where it can: *“There are no ways you can do a cooking practical online, even if you take a video, where's your sense of taste and smell? So, eLearning cannot cover everything but where it can, it has to be strong”*. PSET-1-01 said that navigation and simplicity of the system was crucial to accommodate for the different levels of digital literacy among society. The views in the PSET group were different from each other, with one focusing on navigation and user-friendliness, while the other talking about the platform having gaps in its ability to serve teaching and learning.

(ib) Cross-case analysis

All three groups talked about the student journey from a navigation perspective, or an ability to set individual learning pathways, or making the learner the centre of the platform design. While the UNI group also talked about user capacitation to utilise the different functions that the platform offered, the SDP group talked about optimal learning experiences; and the PSET group pointed out the gaps in the technology capability from providing an optimal learning experience. The UNI group also expressed an opinion on levelling the playing fields by offering society free technology platforms with free access

to data, and argued that education was meant to be a public good, which was currently being exploited by big tech companies.

(ic) Conclusion

In response to the question of how society benefits from using technology, the theme of choosing a suitable technology platform offered the following insights: Society would benefit from technology that took into account learners' individual journeys in their design; the platform cost was affordable or free where possible; the technology should be easy to navigate; society should be taught how to use the various functions offered by the platform; and data connectivity should be provided where possible.

(ii) Technology as an enabler of 21st century skills

The question of how society benefits from using technology is answered through the theme of technology as an enabler of 21st century skills, by looking at graduate attributes, skills and the world of work.

Table 24: Evidence to support theme: Technology as an enabler of 21st century skills

Participant	Quote
UNI-2-02 Graduate attributes	<p>The important values of acting in an ethical manner, and respecting the privacy of clients.</p> <p>The one is the graduate attributes that we have at our university. So those are what we want to see from students who graduate from our programmes, the kinds of values that we want our graduates to enact.</p> <p>Being critical thinkers, being good communicators, acting in an ethical and responsible way. The aspect of looking out for the community or having a social consciousness or social awareness related to it.</p>
work	<p>Will we need lecturers in 20-50 years' time or will some of these tools come in and do a lot of the functions that currently lecturers do? Why is it, we do what we do and coming back to what's the purpose of higher education, why are we here, what's the role of the university?</p> <p>if you're an accountant, how is this going to affect accountancy? If you're a lawyer, how will AI affect lawyers? If you're an economist, how will it affect economists in the future, and I think lecturers are thinking about those things.</p> <p>The incorporation of technologies and tools into learning and teaching can also help you in terms of a future profession. There's an element also of technology alignment of the use of technology in the universities, with how that's being used in the professional world and the world of work.</p> <p>AI tools is the big buzzword. But there's also thinking about how AI is going to change some professions and some industries, and are we equipping our students with those skills?</p>

HEI-1-01 Singularity	We talk about something called Singularity, which initially was predicted for 2048, where the computer would be more powerful than the human brain. That timeline has moved to 2025. So, by next year we would have something that's smarter than the human brain. If we're not utilizing this in our daily lives, we will be left behind in the world of work.
UNI-3-01 Graduate attributes	It's more difficult to create a learning community when you know somebody sitting Lusikisiki and Cape Town and Polokwane and Joburg, than it is, if you have a learning community in the class, you know, everybody gets their designated two hours and you can do stuff face to face to build that community. With distance education you need to be very deliberate and really the only way that I can see it working is through technology. Creating these spaces where students can come onto technology and connect with one another connect with me, connect with the learning material that they're not sitting at home alone in their rooms or in their houses with a book and trying to figure it out themselves. I use WhatsApp, I use Telegram, I use the learning management system. I use Teams to connect my students with one another.
work	It's not about, ooh, look at these shiny new tool, although I have to admit I like shiny new tools. But it's really about how can we use these technology tools to enable learning for our students.
UNI-2-01 Graduate attributes	What we want our students to leave the institution with, what are those attributes we need to take into consideration and it's become a very important criteria for us that academics need to ensure, for example, one of the graduate attributes will be you must be able to work in a team, in a social context and so forth
work	Technology is not something separate. It's part of the learning because it also teaches students of the realities of the working world. If we're going to use generative AI, we're building students' competencies in using AI for the working environment.
UNI-1-01 Graduate attributes	So, the LMS is brilliant in the sense that it increases our productivity and it gives us information that we would otherwise never have been able to accumulate because of our limited scope.
UNIT-1-01 Graduate attributes Work	You need to design tasks that require the student to learn a skill , and if the student hasn't learned then that hasn't happened and that is a huge challenge because it requires a whole lot of creativity and requires retraining of academics to say, well, what is the task that will make a student learn to be able to do a specific task. That is the change that we require in our teaching philosophy to move from teaching to learning tasks, and design and facilitation of those learning tasks
SDP-1-02 Graduate attributes	Its impact is felt generations after that person. So, it's an enabler. It is a door opener. It opens doors to things that people never thought was possible and on their terms.
SDP-1-01 Graduate attributes	Collaboration on the platform, if it's a good platform, is really one of the most important parts of learning. I think it can help to build community . It teaches you so many things like self-discipline , learning skills and they can build community through their study groups and their WhatsApp groups and so on and so on.

<p>SDP-3-01 work</p>	<p>Micro learning that's also taking off rapidly. Teachers want smaller chunks of knowledge, small chunks of work, so a learning pathway or a single learning pathway that they want to be capacitated on.</p> <p>There's going to be a whole bunch of different careers that don't exist now. My career was unheard of maybe 20 years ago I've been in this field for about 10 years now.</p> <p>I'm an advocate for girls in STEM and one of the biggest questions I get when I face a group of young high school girls is, is AI and technology taking over the jobs?</p> <p>A lot of people are trying to put a portfolio of certificates together and online just makes it so easy.</p>
<p>SDP-5-01 work</p>	<p>When I wanted to learn photography, I had to go to the camera club and find an old woman who was willing to take me around and show me how a camera worked. Now, in many instances with MOOCs and those kinds of things, I can get a free course on photography, probably from one of the best photographers in the world.</p> <p>So, the next step in eLearning will be virtual reality, because the doctor needs to operate in some way before he physically operates.</p> <p>They've been using it for pilots for many years, simulating certain things, but with machines doing the operations in hospitals, the doctors will need to know what's going on.</p> <p>A friend of mine was in the hospital the other day and the doctor was doing his first operation and he asked him where do you think I should cut? You know, if I was a patient, I would have had a heart attack. But every doctor does do their first operation. Every photographer shoots their first wedding. Now if you just know they've gone through some virtual reality stuff, have some experience and you can see their pictures and how they handle challenges. It's much different than just saying OK, let me rather get a robot.</p>
<p>SDP-4-01 work</p>	<p>They can now learn driving virtually and sit in one place and learn how to drive, and that is being made possible by technology and I think the same thing happens with the training of pilots. Yeah, they can do a lot of simulations using technology, flying planes and a lot of that I think, will come on board in these training programmes in institutions.</p>
<p>PSET-2-01 Graduate attributes work</p>	<p>I think part of it comes from the institution with your graduate attributes relating to the mission and the vision and why you want to have this programme.</p> <p>For students to compete globally and to give them the skills that they need for being employed these days, they have to be technically literate, not just basic Microsoft Office, but some advanced skills.</p> <p>You look at virtual reality and artificial intelligence these days with certain occupations and the human is there to manage the process rather than do the process because the machine is doing it.</p>
<p>PSET-2-02 Graduate attributes</p>	<p>Even in higher education, you can collaborate across continents because of technology.</p> <p>Well, it's definitely here to stay and it will increase more and more specifically because technology is so pervasive and in everyday life, but</p>

work	also in the world of work. It'll be much more about skills and how you can apply those skills and how you can adapt and learn new skills in this technology driven future. Students need to be taught the kind of tools that they will be confronted with in the world of work.
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(iia) Case analysis

Participants in the UNI group offered the following graduate attributes as being important enablers for 21st century skills: behaving ethically; respecting privacy; critical thinkers; good communicators; acting responsibly; having a social conscience or social awareness; working collaboratively in teams of within society; using information effectively to improve productivity; and learning a skill. UNI-2-02 also mentioned that students should leave the university, having attained the graduate attributes identified by that university. In the context of 21st century skills and work, participants offered the following insights: UNI-2-02 talked about using technologies in teaching and learning that aligns with its use in the workplace, and pointed out that several professions could be affected by technology, so we should be preparing learners for the new reality. UNI-3-01 said that technology is there to enable learning for students, and UNI-2-01 said that technology is not something separate from the learning, it served to build learners' competencies to be able to use technology in the workplace: *"What we want our students to leave the institution with, what are those attributes ... that academics need to ensure"*. UNIT-1-01 said that the teaching philosophy should shift from teaching to learning skills: *"That is the change that we require in our teaching philosophy to move from teaching to learning tasks, and design and facilitation of those learning tasks"*. HEI-1-01 said that the timeline to reach the singularity point, when AI will be smarter than a human brain, has shifted from 2048 to 2025, so humans need to be working with technology and ensure that society is not left behind. Each participant had a unique point to make, but all participants showed why technology is important in teaching and learning, as a passage to the workplace. One participant pointed out the disruption that technology is expected to cause with certain professions, and said that learners should be prepared to operate in that new reality. One participant said that the approach to teaching should change to learning new skills, which would be more useful in the workplace.

The SDP group added the following graduate attributes to the list supporting 21st century skills: collaboration; community-building; self-discipline; and micro learning. In terms of technology's contribution to 21st century skills: SDP-1-02 said that technology was an enabler, that provided opportunities that would affect generations to come. SDP-3-01 talked about new careers created by the disruption of technology, and redundant jobs that disappear, and added: *"Teachers want smaller chunks of knowledge, small chunks of work, so a learning pathway or a single learning pathway that they want to be*

capacitated on". SDP-5-01 gave examples of how technology enables the learning of new skills for the workplace through free online courses and AI simulators. SDP-4-01 also gave examples of learning skills relevant to the workplace through simulations. The SDP group overall was positive about the contribution of technology to developing 21st century skills. Two participants gave examples of how technology helps develop 21st century skills through simulations and providing relevant knowledge in small packages. One participant did express uncertainty about the fear of jobs disappearing, but was more positive about the possibilities of new jobs created through technology.

The PSET group added the following graduate attributes as contributors to 21st century skills: digital literacy; collaboration across continents; and attributes determined by individual institutions. In the context of 21st century skills and work, participants said the following: PSET-2-01 said that AI and VR has already been implemented in some jobs, and the role of the human is to oversee the work. PSET-2-02 said that the influence of technology in the workplace will expand in the future, and society will have to adapt to learning new skills to function in a technology-driven future. Participants in the PSET group were positive about technology driving 21st century skills, and illustrated examples of how technology was already influencing teaching and learning through virtual reality and simulations.

(iib) Cross-case analysis

Participants in all three groups added graduate attributes that would contribute to 21st century skills. Collaboration was a common attribute mentioned by participants in all groups. Some participants in the UNI and PSET groups mentioned that institutions determine a set of graduate attributes with which learners should leave the institution upon graduation. The perspective from the UNI group included that the point of singularity has been sped up from 2048 to 2025, so by next year, technology will be as smart as the human brain. Society must therefore keep abreast of technological developments to ensure that we are not left behind. A participant in the PSET group echoed a similar sentiment by saying that society had to learn new skills to keep abreast of technological developments. Another perspective from the UNI group was that the mindset of teaching should shift towards learning skills to enable operating in a technologically driven world. A perspective offered by a participant in the SDP group was that students would move towards learning in small packets of information that was specific to a particular profession or job, and that these small nuggets of information could be stacked to accumulate towards a formal qualification. Also, technology was not separate from teaching and learning; it served to build competencies in learners so that they could function effectively in the workplace. Similarly, a view in the SDP group

was that technology was an enabler that would affect future generations. Participants in the UNI and SDP groups raised concern about technology making some jobs redundant, for which students should be prepared, but on the positive side, technology also created new jobs. Participants in the SDP and PSET groups gave examples of teaching and learning that included simulators and virtual reality to enhance teaching and learning, and a SDP group participant gave a real example of how this impacts the medical profession.

(iic) Conclusion

The question of how society benefits from the use of technology through the theme of technology as an enabler of 21st century skills, considered graduate attributes, skills and the world of work.

Table 24a below shows the graduate attributes that participants identified as being important for 21st century skills and work.

Table 24a: Graduate attributes for 21st century skills and work

Ethical behaviour	Respect for privacy	Critical thinker	Good communicator
Acting responsibly	Social conscience / awareness	Collaborative work	Effective use of information
Learning a skill	Community-building	Self-discipline	Micro-learner
Digitally literate	Embodying attributes determined by the individual institution		

Collaboration was mentioned by participants in all three groups. Some participants mentioned that educational institutions also have a unique set of graduate attributes that their learners should attain by graduation. These graduate attributes will assist the learner to function more effectively in the workplace. With respect to society benefitting from technology, benefits would be derived from using new technologies like virtual reality and AI to create simulations of real-life situations in the workplace, and society would benefit from practising through simulations to perfect skills such as learning how to fly a plane, or performing a particular medical procedure. Technology is not separate from teaching and learning, but an integrated part of it, so learning with technology helps society function with technology in the workplace. Another benefit to society was to overhaul the thinking around teaching and learning to focus on learning skills, and learning in small chunks of information that provide information pertinent to a particular skill of job. These nuggets of information could be stacked to fit into a formal qualification.

Society could then learn at its own pace, and focus on what is important to master a particular skillset.

On the negative side, technology has developed so rapidly that it is expected to be as smart as a human brain by 2025. This implies that beyond 2025, technology will be smarter than humans, and society must keep abreast of technological developments to be able to function in this technology-driven world. Technology will replace humans in many jobs, so society must figure out its role alongside technology.

5.3 Conclusion

5.3.1 How are the values that are embedded in technology, selected?

Eight of the ten themes featured in responding to RQ1 and its six sub-questions.

(i) Platform design and criteria influencing student journey

In response to the question of how values that are embedded in technology are selected, a popular view among participants is that eLearning platforms should have a student-centric design, which meant implementing a universal design that accommodates all students' needs, including those with disabilities. The choice of eLearning platform seemed irrelevant if it met institutional objectives. eLearning platforms offered opportunities to think differently about assessments by offering multiple opportunities for assessments as well as assessments on demand, which supports the notion of eLearning offering students flexibility in their student journeys. In summary, the values selected were influenced by a student-centric design; a flexible eLearning journey; and a flexible technology platform that accommodates new ways of thinking about teaching and learning.

(ii) Balancing online and face-to-face learning

When asked about the choice of values to be embedded in technology, participants suggested that the values associated with face-to-face and eLearning programmes were similar. A possible link between embedded values and graduate attributes was suggested, with a call to make values more explicit. Values could be explicitly taught through storytelling, and when values are changed, it should always prioritise learner needs. A participant felt that the embedded values should be generic enough to resonate with learners' own cultural values.

In summary, the values that are embedded in technology are similar to those incorporated into face-to-face learning; values should always prioritise the needs of the learner; it should be generic enough to resonate with all learners, irrespective of their cultural backgrounds; it embodies graduate attributes that an institution hopes to instil in learners by the time they exit the institution; it should be made explicit, good way of conveying values is through storytelling; and values are subject to change over time.

(iii) Technology as an enabler of 21st century skills

In response to the question of how stakeholders selected the values embedded in technology, participants suggested a list of values that could be embedded (Table 10a) to enable 21st century skills. The PSET sector was still uncertain about how to embed AI into eLearning programmes. Some values such as plagiarism and digital literacy held greater importance than others. Some values were also specific to a particular profession. Incentives should be considered to motivate students to complete their studies. Participants felt that platform developers should place students at the centre of eLearning programme and platform development, and role-players should be transparent about their role in the eLearning programme and platform development.

In summary, the selection of values to embed in technology should consider the learner first and foremost; while some values were generic, others were more specific to a particular profession, and some values were prioritised over others; role-players should be transparent about their contribution to the set of values; and incentives may be considered to motivate students to complete their student journeys.

5.3.1.1 What purpose does technology serve?

(i) Evolution of technology

In response to the question on the purpose of technology, participants view technology as a tool or a teaching and learning aid. As technology evolves, its use in teaching and learning also evolves, though at a slower pace. Generative AI such as ChatGPT has a global presence, but educational institutions are still grappling with how to incorporate it into teaching and learning.

(ii) Balancing online and face-to-face learning

Participants described technology's purpose, irrespective of whether it is eLearning or face-to-face teaching and learning, as a support tool. In face-to-face teaching and learning, technology platforms are still used for communication, collaboration, and sharing learning materials. In eLearning, the platform can be customised to improve success rates through intentional design and continuous updates. eLearning platforms also allow for flexible and self-paced learning for large cohorts of learners, located anywhere in the world, and the growing global trend is towards eLearning.

(iii) Artificial intelligence and education

In response to the question on technology's purpose, participants felt that technology platforms and teaching and learning were an integrated unit. AI has disrupted the education sector, and educators should re-think the purpose of education and what is being taught, considering AI. AI is already being used in education, particularly in health programmes that make use of simulations and virtual reality to practise skills.

5.3.1.2 Which stakeholders were consulted in its development?

(i) Role players in determining values and regulatory oversight

In response to the question on which stakeholders were consulted in the development of eLearning platforms and eLearning programmes, participants named role-players listed in Table 16a. The subject matter expert and instructional designer seem to be the main stakeholders in this development process. Other stakeholders may be consulted, depending on the institution or academic involved. Consulting industry and students were important, but sometimes overlooked. In the skills development space, the project or programme owner/sponsor was a key role-player. Even though programmes are designed to be student centric, other role-players decide what this means, as little or no student consultation takes place.

5.3.1.3 How were the final values for the technology selected?

(i) Role players in determining values and regulatory oversight

Table 17a summarises the role-players who are the final decision-makers. The decision-making process seems to vary per institution, and the process allows for different decision-makers; but some institutions unilaterally make decisions without proper consultation.

5.3.1.4 How could these values be changed?

(i) Role players in determining values and regulatory oversight

In response to the question on how could the programme values be changed, most participants indicated that it was possible to change up to 50% of the original content, and the academics or subject specialists would unilaterally make and implement the changes, if they were relevant. There was, however, a reluctance by some institutions to make changes either because academics were too busy to make changes, or because of the stringent rules of project sponsors like government and corporates.

5.3.1.5 How is the data gathered through technology, used and protected?

(i) Data protection and ethical considerations

Student data is protected under the POPI Act, and institutions implement data security policies to prevent cyber-attacks. Institutions have levels of access to student data, based on the role of the person. Some institutions rely on third parties like Amazon Web Services to protect data hosted in the cloud. There was no mention of third-party access to student data. There could be greater transparency in disclosing data protection and data usage policies to students, and data should only be used for purposes for which student permission had been granted. While institutions have access to student data to track progress and identify issues before they arose, few academics used data for this purpose.

5.3.1.6 *How is technology evaluated?*

(i) *Choosing a suitable technology platform*

Table 18a summarises possible evaluation criteria for an eLearning platform, in response to the question of how technology is evaluated. The criteria provide insight into the evaluation considerations that influence decision-making. The insight gained from participants is that the academics and support staff who use the eLearning platform at educational institutions are often not part of the decision-making process. There was also a point about open-source versus proprietary technology in terms of costs, and considering education being a public good.

5.3.2 *To what extent does technology influence society?*

Six of the ten themes were relevant in responding to RQ2 and its two sub-questions.

(i) *Access and equity of e-learning*

In response to the question about the extent to which technology influences society, the findings show that access to technology benefits society by providing current and instantaneous information that can be accessed in large volumes or small chunks, to suit the individual's preferences. Technology provides access to learning opportunities irrespective of where people are located. However, South Africa has not resolved its issues of connectivity yet, so access may be difficult in certain rural villages in South Africa, raising the question of equity.

(ii) *Technological advancement vs societal values*

In responding to the question of the extent to which technology influences society, the positive and negative effects of technology on societal values were considered. Participants offered numerous examples of how technology has penetrated everyday life like accessing banking services; making travel bookings; and automating routine processes. Technology also enhances communication, collaboration and provides opportunities for lifelong learning, while giving access to current news and information. Educational institutions are a microcosm of society, and what happens in one space influences the other.

On the negative side, there is a debate about whether technology can be neutral because it was designed by humans, who are not neutral. As such, social media has been known to be socially engineered to influence society to a particular way of thinking or acting through misinformation and disinformation. Technology also has in-built biases, which influence society.

Technology has changed human-to-human interaction with the younger generation finding it easier to communicate through technology, and not developing their social skills for in-person interactions. Cyber-crime and cyber-bullying are on the increase, and society, especially the older generation, need to be taught digital literacy to function in

this technologically driven society. Technology brings automation and AI that can perform routine tasks, with advancements in healthcare, but also produces e-waste and uses natural resources like water. The new generation face health risks because of long hours spent with technology, and “sitting is the new smoking” risk that society must deal with. Addiction to technology is also a problem, and has been associated with mental health issues.

In summary, findings show that technology has positive and negative effects on society.

5.3.2.1 How does technology influence society?

(i) Evolution of technology

In response to the question of how technology influences society, participants said that the pandemic sped up the adoption of technology, and while institutions are still discussing adopting generative AI into teaching and learning, and AI has gaps in its capability that must be factored into its adoption by society.

(ii) Artificial intelligence and education

In response to the question of how technology influences society, the penetration of technology and AI into communities was explored. While participants supported the adoption of AI, there were still unanswered questions about the way AI should be integrated into teaching and learning, and hence society at large. While AI seemed to threaten livelihoods and certain jobs, participants felt that society should strive for a balance between humans and AI and starting off by defining what each was good at. Society had to be agile to respond to a fast-changing environment. The future possibilities for AI are endless, and participants suggested looking at how AI and virtual reality have already been implemented in training healthcare professionals.

5.3.2.2 How does society benefit from the use of technology?

(i) Choosing a suitable technology platform

In response to the question of how society benefits from using technology, choosing a suitable technology platform offered the following insights: Society would benefit from technology that took into account learners’ individual journeys in their design; the platform cost should be affordable or free where possible; the technology should be easy to navigate; society should be taught how to use the various functions offered by the platform; and free data connectivity should be provided where possible.

(ii) Technology as an enabler of 21st century skills

The question of how society benefits from the use of technology considered graduate attributes, skills and the world of work as an enabler of 21st century skills. Table 27a shows possible graduate attributes supporting 21st century skills and work. Collaboration seemed to be the most prominent attribute. Educational institutions also have a unique

set of graduate attributes that their learners should attain by graduation. These graduate attributes will assist the learner to function more effectively in the workplace.

With respect to society benefitting from technology, benefits would be derived from using new technologies like virtual reality and AI to create simulations of real-life situations in the workplace, and society would benefit from practising through simulations to perfect skills such as learning how to fly a plane, or performing a particular medical procedure. Technology is not separate from teaching and learning, but an integrated part of it, so learning with technology helps society function with technology in the workplace. Another benefit to society was to overhaul the thinking around teaching and learning to focus on learning skills, and learning in small chunks of information that provide information pertinent to a particular skill. Students could learn at their own pace, and focus on what is important to master a particular skillset.

On the negative side, technology has developed so rapidly that it is expected to be as smart as a human brain by 2025. This implies that beyond 2025, technology will be smarter than humans, and society must keep abreast of technological developments to be able to function in this technology-driven world. Technology will replace humans in many jobs, so society must figure out its role alongside technology.

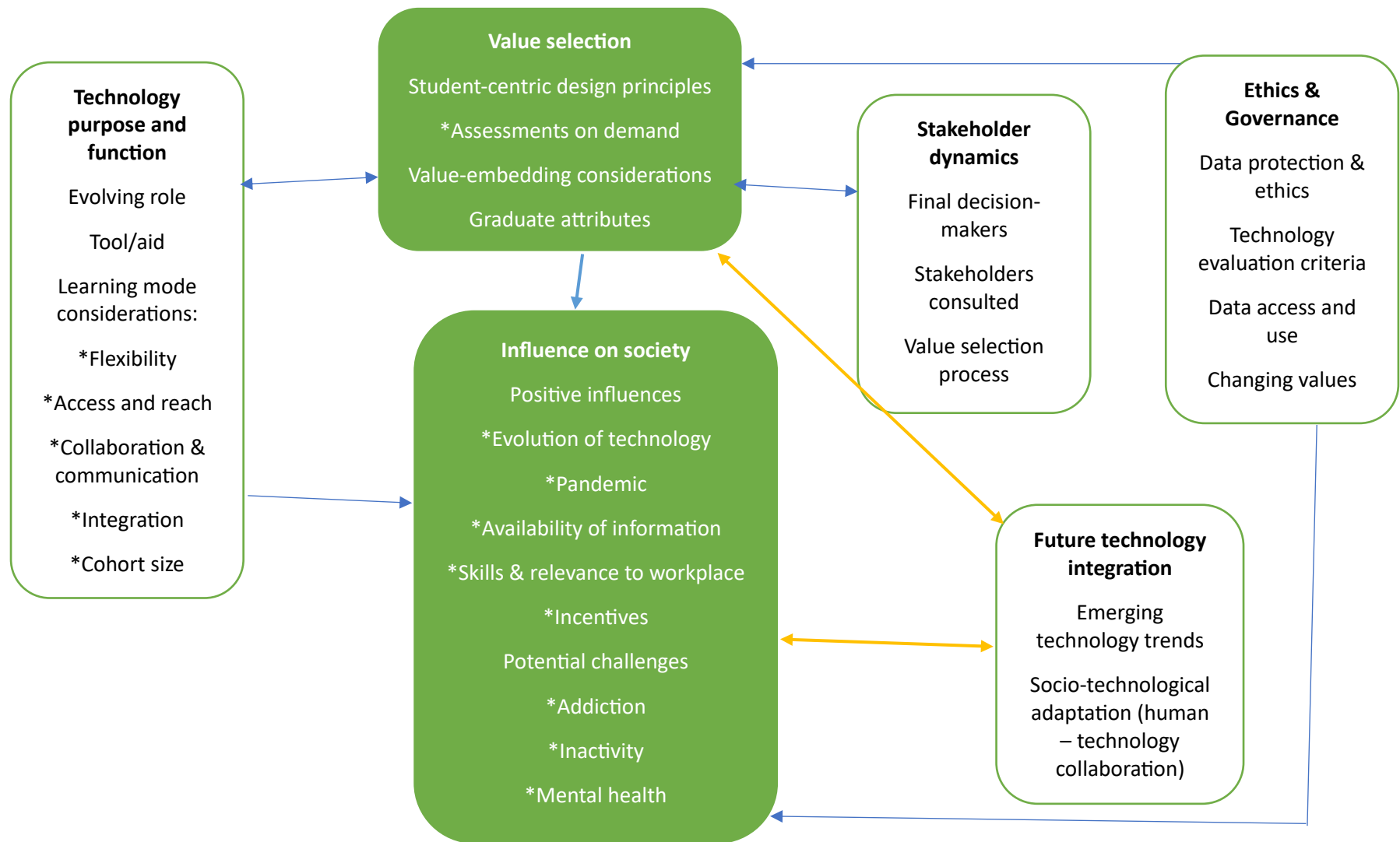


Figure 7: Conceptual framework based on research findings
 Source: Author's own work based on research findings

Chapter 6: Discussion

6.1 Introduction

This chapter compares the research findings documented in Chapter 5, with the literature located in Chapter 2. The 16 participants in this study were all eLearning managers or specialists from the South African PSET sector, who are academics; curriculum developers; instructional designers; managers of e-assessments; or managers of eLearning quality assurance. Chapter 6 follows the same structure as Chapter 5, which begins with a discussion by research question, sub-question and theme. This chapter's purpose is to triangulate research findings with extant literature, to find areas of similarities, differences or gaps. When I found a gap in the current literature, I conducted a further literature search to find relevant literature. I followed these steps:

- (i) Conduct a word search on relevant articles already included in the literature review. If unsuccessful, then go to step (ii).
- (ii) If no relevant literature was found after Step (1), then choose the top three journals and conduct a literature search, for articles published in the last five years. If unsuccessful, then proceed to step (iii).
- (iii) Step (iii) is the last attempt to find relevant articles. Use Google Scholar to find relevant articles according to a specified word search, in relevant suitably-rated journals, according to the AJG and Scopa ratings.

I discussed literature found during steps (i) to (iii) this chapter before I compared it to research findings. This exercise confirms if the findings in Chapter 5 were already documented in literature, or if this research had possibly contributed to the existing body of knowledge. If concepts appeared in literature, but not in the findings, then I included these concepts in the revised conceptual framework at the end of this chapter.

6.2 Comparison of research findings with extant literature

6.2.1 How are the values that are embedded in technology, selected?

(i) Platform design and criteria influencing student journey

This theme considers how values are embedded into eLearning platforms, during the design phases, thus influencing the student journey. It attempts to unpack the hidden values and possible biases associated with eLearning platforms.

(ia) Evidence to support platform design and criteria influencing student journey from findings

The research findings suggest that eLearning platforms should be student-centric with a universal design that accommodates all students' needs, including those with disabilities. Participant UNI-2-01 expresses this sentiment as follows: "So, *what we've ... pushed forward is a universal design for learning. It basically says rather than design learning*

experiences for specific students or for students with disabilities, design a learning experience for all students". The eLearning platform choice seemed irrelevant if it could be customised to meet institutional objectives. eLearning platforms should support different assessment offerings including assessment-on-demand, which supports the notion of eLearning offering students flexibility in their student journeys. Participant SDP-3-01 had this to say: *"We want to get to assessment-on-demand, but we need the empirical evidence behind it. And obviously it will be with the use of technology"*. However, educators should consider the fairness of using proctoring tools during assessments. SDP-2-01 had this to say: *"Proctoring tools, assessments. Are they still being fair and, providing quality assessments"?*

(ib) Evidence to support platform design and criteria influencing student journey from literature

Student engagement is an indicator of a learner's student journey, and the eLearning platform design should include student engagement in its design (Bond et al., 2020) . Trinh et al. (2023) argued that technology can make the learning journey much more interactive, interesting and supportive of student engagement. Hill (2019) made a similar point by showing that an expert system eLearning platform, provides a comprehensive set of functions for a smooth student journey. However, Mpungose (2020) argued that some eLearning platforms require additional add-ons to meet student needs. Another key indicator for a successful student journey is user continuance, meaning that students stick with their eLearning programmes until completion (Al-Samarraie et al.; 2018) .

Roski et al., (2024) argued that the Universal Design for Learning (UDL) provides learners with autonomy and responsibility for their own learning journeys, and by following the UDL Guidelines when designing learning platforms, students can choose their own learning pathways, and once chosen, they tend to stick to what works for them. Ruth et al., (2024) argued that taking a learner-centred approach to online assessments will decrease the incidence of cheating, because students were less likely to cheat when the online assessment linked to their future professions; the online tasks were directly relevant to their professional ambitions; and if lecturers provided feedback on their assessments. If students' needs are included in conceptualising online assessments, then the incidence of cheating will decrease. This may be one way of reducing the need for proctoring tools, which Lee and Fanguy (2022) opposed based on its' assumptions about the equity, fairness and authoritarian approach to education. The assumption that all students are potential cheaters has negatively impacted student engagement and relationships among peers and educators, resulting in an educational system that suppresses innovation. Lee and Fanguy (2022) further argue that fairness required

consideration of each student's social and academic circumstance, and that students should be part of the conversation about educational fairness.

There was no literature in Chapter 2, on assessment-on-demand; so, I conducted a literature search following the three steps outlined in the introduction. There are a few papers on assessment-on-demand, but none were found in acceptable journals. Essentially, by providing assessment-on-demand, the educator is handing over responsibility to students for managing their own learning journeys. It gives students the flexibility to plan their own journeys according to how they wish to learn. Educators are looking for evidence to show that assessment-on-demand works before implementing it. This is therefore an area for further research.

(ic) Comparative analysis of findings vs literature

The literature supports the findings of this study, and further expands on the explanations of the findings. Bond et al., (2020) explained the concepts of “student centric” and “student journey”, while Trinh et al. (2023) and Hill (2019) demonstrated how different technology platforms influenced the student journey. Al-Samarraie et al. (2018) added that a key contributor to eLearning success was encouraging students to continue their student journeys. Roski et al., (2024) made a case for using the UDL in platform design, which supported the findings of this study.

Ruth et al., (2024) argued that the incidence of cheating can be reduced by extending the learner-centred approach to assessments. This is an important contribution to the debate about the use of proctoring tools during assessments, which Lee and Fanguy (2022) point out, do not support fairness or equity.

The finding not mentioned in the literature was about assessments-on-demand as an extension of student-centredness, which is a contribution of this study, and should be an area for further research.

(id) Conclusion

The literature supported the findings that eLearning platforms needed a student-centric design to enhance the student journey, by proposing that platform designers use the UDL guideline when designing the platform (Roski et al., 2024) and that student engagement was needed for a successful student journey (Bond et al., 2020). Different eLearning platforms influenced the student journey differently (Hill, 2019; Trinh et al., 2023) , but irrespective of the choice of platform, eLearning continuance was key to student success (Al-Samarraie et al., 2018) . By extending the learner-centred approach to assessments, the incidence of cheating can be reduced (Rüth et al., 2024) , which could be an

important step towards reducing the need for proctoring tools during assessments, which raise questions about fairness or equity (K. Lee & Fanguy, 2022) .

Assessments-on-demand is an extension to the student-centric approach to platform design that promotes flexibility in the student journey, if implemented. This finding was not mentioned in the literature, and therefore contributes to the body of knowledge, as an area for further research.

(ii) Balancing online and face-to-face learning

(iia) Evidence to support balancing online and face-to-face learning from findings

Some participants seemed to grapple with the concept of how values were embedded into eLearning platforms. However, some said that it was difficult to separate the values of eLearning from traditional learning. Participants suggested that the values associated with face-to-face and eLearning programmes were similar. There was a strong argument for linking online programmes with embedded values, but it was not being done effectively in practice. Some participants said that there was a relationship between embedded values in eLearning platforms and graduate attributes, which educational institutions determined for each programme. One participant said that the values embedded in eLearning platforms should be generic so that they could resonate with learners' own cultural values and norms. A participant suggested that learners' needs should be considered before making changes to the embedded values. A participant suggested that we could do better at conveying values through storytelling.

(iib) Evidence to support balancing online and face-to-face learning from literature

Values, for the purposes of this research, are “what is good or desirable” (van de Poel, 2020, pp. 87–88) , “varying in importance, that serve as guiding principles” (Schwartz, 1994) . Values are therefore what drive us as individuals, to make choices. One school of thought believes that to really understand values in relation to technology, one should hone in on embedded values (Klenk, 2021; van de Poel, 2020) instead of the “intended value” (van de Poel, 2020, p. 89) , as technology may be used in ways for which it was not designed, thus producing unexpected and inconsistent positive or negative results (Heyndels, 2023; Klenk, 2021; van de Poel, 2020) . Miller (2021) argues that technology has moral and political values embedded in its design, which has long-term implications, and these values should be carefully considered when designing new technology.

Technology therefore, should not be evaluated on its physical attributes only, but also on its “function and intention” (Heyndels, 2023, p. 74) or purpose. Abernethy et al., (2024, p. 2) point out that despite the acknowledgement of technology having values, it is only

in the present-day that AI technology is promoted on its ability to “embody values such as safety, dignity, fairness, meritocracy, harmlessness, and helpfulness”.

There was no literature in Chapter 2, on storytelling; so, I conducted a literature search to find relevant literature. I followed all three steps outlined in the introduction. There are a few published papers, but only two relevant articles were found in acceptable journals. Literature shows that the use of digital storytelling (Liu et al., 2018) and story-bots (Bailey et al., 2020) positively impacted students' learning and creativity. This is therefore an area for further research, specifically in post-school education and training setting.

There was no literature to support the finding that face-to-face programmes and eLearning programmes had the same values. Most literature compared the mode of delivery between the two, but none considered the values associated with each mode of delivery, or if the learner gained the same values by engaging with either mode. This is an area for further research as it questions the role of the intrinsic values embedded in eLearning platforms that offers an eLearning programme versus a lecturer offering a similar programme physically in class.

(iic) Comparative analysis of findings vs literature

While participants grappled with the concept of values embedded in eLearning platforms, they did acknowledge that values are integrated with online programmes. Participant PSET-2-02 expressed the following: “*Some people think that you can't instil values in an online learning setting, which is of course not true*”. Abernethy et al., (2024) had insight that only current-day AI is promoted based on having embedded values. This argument may shed light on why there is confusion about eLearning platforms having embedded values. Traditional technology platforms have not consciously been associated with embedded values, even though Klenk, (2021) ; van de Poel (2020); Miller (2021) ; and Heyndels (2023) argue to the contrary. Some participants also said that it was difficult to separate the values of eLearning from traditional learning, as evidenced by UNI-3-01: “*I mean that's quite a complex question about the values of online learning so I don't think we can divorce it from what is the values of face-to-face learning*”.

Some participants said that there was a relationship between embedded values in eLearning platforms and graduate attributes, that educational institutions determine. This is evidenced by PSET-2-01: “*It brings with it a lot of opportunity, a different mindset that students will leave with different graduate attributes*”. Using van de Poel's (2020) and Schwartz's (1994) definitions of values, it is safe to say that graduate attributes are values that educational institutions hope to instil in all graduates.

The finding that face-to-face and eLearning programmes shared the same values could not be found in literature, as most literature comparing online, contact or even blended learning, focus on the mode of delivery, and not on the content development. This is an area for further research as it questions the role of intrinsic values embedded in eLearning platforms that offer eLearning programmes versus a lecturer offering a similar programme in class.

One participant raised a point about using storytelling to instil values in students. Participant SDP-5-01 said the following: *“I think values should be embedded in stories and I think we do much too little values at the moment”*. This is an interesting suggestion supported by studies on the use of digital storytelling (Liu et al., 2018) and story-bots (Bailey et al., 2020) that positively impacted students’ learning and creativity. However, both these studies were done at school level, and not in post-school education, and therefore should be further investigated in the PSET sector.

(iid) Conclusion

This study found that the concept of embedding values into eLearning platforms was better expressed by referring to values being embedded into eLearning programmes offered on eLearning platforms. Literature supports this confusion as it was only with the advent of AI that the association of values with technology has become more widespread (Abernethy et al., 2024). Although traditional technology platforms have not consciously been associated with embedded values, there is ample literature to support this view (Heyndels, 2023; Klenk, 2021; Miller, 2021; van de Poel, 2020). However, the finding that contact learning and eLearning programmes shared the same values could not be validated, and is therefore an area for further research as it questions the role of the intrinsic values embedded in eLearning platforms that offers an eLearning programme versus a lecturer offering a similar programme in class. The suggestion on storytelling as a tool to instil values in students, could also not be validated, and is also an area for further research, especially in relation to storytelling in the PSET sector. However, it is an interesting finding that could add to the body of knowledge of ways in which to instil values.

(iii) Technology as an enabler of 21st century skills

(iiia) Evidence to support technology as an enabler of 21st century skills from findings

This theme responds to the question of how values are selected by considering the values that are embedded in eLearning programmes hosted on eLearning platforms, that are designed to produce learners with 21st century skills.

Participants saw the issue of cheating and plagiarism in relation to adopting AI as an important consideration. This was evidenced by participant HEI-1-01 who said: *“People are talking a lot about plagiarism and students utilising AI. You cannot give them AI and not train them and tell them about the benefits of AI”*; and participant UNI-2-01: *“Academics feel that in online spaces or teaching online, there's more chances for students to cheat. We can't say we're not using it because we feel that it creates more opportunities for cheating”*.

Participants contributed towards a list of values that should be embedded in eLearning programmes and platforms (Table 10a). The list of values also varied, depending on a profession's specific requirements. Participant UNI-2-02 clarified what this meant: *“The values are also then again different depending on the purpose of the programme. For example, in law, the values would be around what does it mean to be a legal practitioner operating in the South African context?”* A participant suggested including incentives as an embedded value, to motivate learners to complete their eLearning programmes. Participant SDP-3-01 had this to say about the teacher cohort involved in continuing professional development: *“Teachers love incentives to work. We give data as an incentive. You give data and suddenly you find your numbers go up”*.

One participant suggested taking the values of plagiarism, integrity and digital literacy beyond just embedding them in the eLearning platform, but to overtly teach these values. Participant PSET-2-02 said: *“You don't have to teach students values; that happens through the process other than, for example, the integrity around data, around teaching and plagiarism and so on, which you have to overtly teach”*. One participant also pointed out that there should be transparency around who the role-players were. There was therefore a call for making values transparent, but also being transparent about which role-players had selected the embedded values.

Despite listing values that participants felt should be embedded in eLearning programmes and platforms, there was still uncertainty about how to use AI in eLearning programmes. Participant UNI-2-01 had this to say: *“...we don't want a student to create their assessment or an essay on ChatGPT and submit it and not think about the consequences. And I'm thinking about, is this cheating or not? So, embedding those things into a learning environment is a challenge”*.

(iiib) Evidence to support technology as an enabler of 21st century skills from literature

The relationship between personal values and ethical decision-making influences the decisions, behaviours and actions of society (Weber, 2019). If values influence ethical decision-making, and technology has embedded values, then there should be greater

transparency around whose values are being propagated, whose values are being ignored or suppressed, and what is the expected outcome (den Hond & Moser, 2023) . Educational institutions should make their data policies transparent (Bates et al., 2020) and entities should be transparent about the values embedded in technology, so that society can make informed choices about its use (den Hond & Moser, 2023) , by understanding its reasoning and decision-making process (Jafari, 2024) .

Hagendorff (2020) showed that the developers of AI did not use ethical guidelines when developing technologies. While Rawas (2024) suggested ethical guidelines for using AI in education, Nguyen et al., (2023) , argued that despite UNESCO publishing its universal framework of values for AI ethics, a single solution will not work. Holmes et al., (2022) proposed a draft framework for the ethics of AI in education (AIED), but conceded that the framework was incomplete because of unknowns. Furthermore, once a framework was established, there was still uncertainty about how best to implement it.

From the above, it is clear that the debate about ethical guidelines for AI is far from over (Holmes et al., 2022; Nguyen et al., 2023) , despite already having several guidelines available (Hagendorff, 2020), and one of the reasons for this lack of clarity insofar as AI ethical guidelines are concerned, is that one set of guidelines will not be applicable to all (Nguyen et al., 2023) . In the meantime, PSET institutions are scrambling to develop AI policies to improve learners' student journeys and skillsets, while preventing plagiarism and cheating (Chan, 2023) .

There is a significant gap between AI technology capabilities and AI implementation in the PSET sector (Bates et al., 2020) . Zhang and Aslan (2021) , like Zawacki-Richter et al., (2019) argue that the PSET sector is slow to adopt technology, which will enrich students' learning experiences, and assist teachers and administrators to better understand each student's learning journey. However, there are challenges that must first be resolved before implementing many of these technologies. For successful implementation, hurdles such as educators' lack of expertise of technologies; lack of implementation policies and guidelines; ethics and privacy issues; and the associated costs of technologies, as well as institutions' abilities to scale implementation, must be addressed (Zhang and Aslan, 2021) .

Bates et al., (2020) argue that the PSET sector has barely scratched the surface of using artificial intelligence for teaching and learning, because educational institutions have not embraced this new technology. Jafari (2024) also found that despite evidence to the contrary, educational institution staff were reluctant to introduce new technologies into teaching and learning.

Ruth et al., (2024) argued that a learner-centred approach to online assessments will decrease the incidence of cheating, since students were less likely to cheat when they saw personal benefits in the assessments. If students' needs were considered in the conceptualisation of online assessments, Ruth et al. (2024) believe that the incidence of cheating will decrease. This may be one way of reducing the need for proctoring tools, which Lee and Fanguy (2022) opposed based on its' assumptions about the equity, fairness and authoritarian approach to education. The assumption that all students are potential cheaters has negatively impacted student engagement and relationships among peers and educators. Lee and Fanguy (2022) argue that fairness required consideration of each student's social and academic circumstance, and consulting students.

The literature review in Chapter 2 did not include literature on incentives in education. I therefore conducted a literature search as per the three steps in the introduction, and found the following articles in top journals.

Lee and Yeung (2022) showed that students were more motivated to perform when they were offered refunds for completing courses, rather than getting the course for free. They also showed that adding a non-monetary cost into a free programme also attracted attention, and students were more likely to look for learning benefits of a programme when a cost was involved, whether it was monetary or non-monetary. Chevalier et al., (2018) demonstrated that the type of incentive offered to students matters. Merely offering an incentive does not encourage participation or completion of the programme. Mbiti et al., (2019) showed that in under-resourced areas with low teacher motivation, offering financial resources to the institution as well as incentives for the teachers yielded far better student results than offering either one individually. These researchers all support the notion of offering incentives to increase performance, noting the importance of choice of incentive and the synergistic effect of incentives.

(iiic) Comparative analysis of findings vs literature

Participants favoured using AI in education, but cheating and plagiarism were issues, although not deterrents to AI implementation. Ruth et al., (2024) showed that a learner-centred approach to online assessments will decrease the incidence of cheating, since students were less likely to cheat when they saw personal benefits in the assessments. If students' needs were considered in the conceptualisation of online assessments, then they were less likely to cheat. Lee and Fanguy (2022) argued that proctoring tools should be fair in its implementation, and students should be consulted about its use. These researchers provide possible solutions to dealing with cheating and plagiarism in online assessments, which PSET institutions should consider in their AI policies to prevent

plagiarism and cheating (Chan, 2023) . However, Bates et al., (2020) and Jafari (2024) argue that the PSET sector has barely scratched the surface of using AI for teaching and learning, and despite evidence to the contrary, educational institution staff were reluctant to introduce new technologies into teaching and learning.

Participants contributed to a list of values that should be embedded in eLearning programmes and platforms (Table 10a). The list of values also varied according to the requirements of a particular profession. The debate about ethical guidelines for AI is far from over (Holmes et al., 2022; Nguyen et al., 2023) , despite already having several guidelines available (Hagendorff, 2020), and one of the reasons for this lack of clarity as far as AI ethical guidelines are concerned, is that one set of guidelines will not be applicable to all (Nguyen et al., 2023) . Despite listing values that participants felt should be embedded in eLearning programmes and platforms, there was still uncertainty about how to embed AI into eLearning programmes. PSET institutions should therefore develop their own AI guidelines (Chan, 2023) while considering all existing guidelines. The list of suggested values to be embedded into eLearning platforms could also be considered in the development of these guidelines. Some institutions may consider deliberately teaching the values of plagiarism, integrity and digital literacy over and beyond just embedding them in the eLearning platform, as suggested by a participant.

One participant said that there should be transparency around who the role-players were, which den Hond and Moser, (2023) support. There was therefore a call for making values transparent, and being transparent about which role-players had selected the embedded values, which was supported in literature (den Hond & Moser, 2023; Jafari, 2024) . A participant suggested including incentives as an embedded value, to motivate learners to complete their eLearning programmes. This suggestion is supported in literature by Lee and Yeung (2022) ; Chevalier et al., (2018) ; and Mbiti et al., (2019) who all showed that offering the right incentives improve student success.

(iiid) Conclusion

The findings show that educational institutions were in favour of using AI in education, despite the potential for cheating and plagiarism. Literature provided ways of reducing the inclination towards cheating by making assessments more relevant to student needs and their future careers (Rüth et al., 2024) , making the use of proctoring tools fair (K. Lee & Fanguy, 2022) , and developing AI policies to deal with cheating and plagiarism (Chan, 2023) . Literature also shows a reluctance on the part of educational institutions to introduce new technologies (Bates et al., 2020; Jafari, 2024).

Participants contributed to a list of values that should be embedded in eLearning programmes and platforms (Table 13a). The list of values could vary according a profession's specific requirements. The list of suggested values to be embedded into eLearning platforms adds to the values found in existing AI guidelines (Hagendorff, 2020) , and could also be considered by educational institutions when developing their unique AI guidelines (Chan, 2023; Nguyen et al., 2023) . A participant suggested that some institutions may consider deliberately teaching the values of plagiarism, integrity and digital literacy over and beyond just embedding them in the eLearning platform.

Literature supported the call for greater transparency around the values embedded in eLearning platforms (den Hond & Moser, 2023; Jafari, 2024) and that institutions should consider offering relevant incentives to improve student motivation to complete their student journeys successfully.

Another finding was the inclusion of incentives as an embedded value, to motivate learners to complete their eLearning programmes, which was supported in literature by Lee and Yeung (2022) ; Chevalier et al., (2018) ; and Mbiti et al., (2019) who all showed that offering the right incentives improve student success.

6.2.1.1 What purpose does technology serve?

(i) Evolution of technology

(ia) Evidence to support the evolution of technology from findings

This theme highlights the purpose of technology in teaching and learning, as it evolved over time. Participants shared similar ideas about technology being a tool or an aid in teaching and learning. Participant HEI-1-01 explained: *"It's probably used as a supplementary aid. We are quickly advancing to this not becoming the supplementary aid but more of the core, and your facilitation becoming supplementary"*. SDP-3-01 further explained: *"It's a tool at the end of the day, used to meet your objective. The tool is not the objective. The purpose is that it must serve as a tool to meet your learning objectives"*. Participants gave several examples of how technology has evolved and how the use of technology in teaching and learning has evolved parallelly. UNIT-1-01 explained: *"The lowest level of the taxonomy would be a repository, so lecturers would store their notes on some form of digital platform and they will archive their lectures there and they would put their PowerPoints down and that is a very, very, very old tradition. Then there would be the level of automation, lecturers would put computer-based tests there so you would then be able to have lecture material and then test that lecture material"*.

While newer technologies like ChatGPT are still finding their place in teaching and learning, other technologies have been incorporated into teaching and learning.

Participant UNI-2-02 observed: *“In the middle 2000s, saw the advent of social media and things like Facebook and Twitter and a lot of lecturers, were interested in coopting aspects of those. Later, tools such as WhatsApp became quite a popular platform for engaging learning and teaching and communicating”*. A participant also explained how quickly technology such as smart classrooms became obsolete as newer technologies replaced them, and how these newer technologies can be used collaboratively in the classroom. Another participant said that technology was often used as a dumping site for content, meaning that little thought is given to how this content will be accessed and used, which supported the perspective that technology was a repository for information, but without proper governance structures and documentation, a repository is quickly transformed to a dumping site. Technology is also used in face-to-face teaching and learning, as observed by HEI-1-01: *“It is supplementary to face-to-face delivery, to face-to-face engagement, to synchronous engagement”*.

From the comments above, it seems that participants in the PSET sector see the purpose of technology as a tool or an aid to teaching and learning, irrespective of its mode of delivery. As technology evolves, so does its use in teaching and learning, albeit at a slower rate. An example is generative AI such as ChatGPT that has had rapid adoption globally, but role players in the South African PSET sector are still trying to find its place in teaching and learning.

(ib) Evidence to support the evolution of technology from literature

Early impressions were that technology was simply a tool (Heidegger, 1977) designed to assemble useful information to serve a specific purpose (Mesthene, 1969) . Technology comprised three parts: the actual tool (hardware); human skill and effort; and knowledge systems (Orlikowski & Scott, 2008) . Importantly, technology lacked any intrinsic morals or values (McOmbler, 1999) . The argument of technology being merely a tool that is independent of culture, begins to weaken as newer technological advancements vary in autonomy and ability to shape society (Dafoe, 2015) , to the point when technology appears “as both autonomous from and dependent upon the values of the society that produces it” (McOmbler, 1999, p. 139). This contradiction exposes the gap between technology seen simply as a tool or instrument that may influence societal behaviour and values, and technology as having intrinsic or embedded values. Many researchers believe that society has moved beyond this view of technology being merely a tool (Dafoe, 2015; den Hond & Moser, 2023; Klenk, 2021; van de Poel, 2020) .

Den Hond and Moser (2023) , building on the work of fellow researchers, refer to technology as instrumental (McOmbler, 1999) ; technology as value-laden (Miller, 2021) ; and technology as relationally agentic (Orlikowski & Scott, 2008) , which they see as progression from one to the next, to accommodate for the former's blind spots. They argue that simply looking at technology as an instrument that creates greater efficiencies and efficacies "is overly simplistic and therefore has limited potential for scientific inquiry" (p. 89) . More recent debates focus on technology as being disruptive because of its ability to influence public perceptions, thus creating a strong relationship between technology and society (Vesa & Tienari, 2022) .

The growth observed during industrialisation from the mid-18th century to the turn of the 21st century, provides a good backdrop in which to consider technological evolution, when technology developed from simple tools to complex machines capable of travelling in space and beaming back pictures of distant galaxies (Noble et al., 2022) . The impact of technology can be experienced through greater efficiencies and innovations, some of which have the potential to be disruptive (Audretsch et al., 2019) , and transforming a sector. The provision of distance education (a precursor to eLearning) has evolved to include new web-based technologies, thus requiring educators to be informed about the latest technological trends, and incorporate them into teaching and learning (De Nito et al., 2023) . The education sector is slow to respond, even though there is substantial evidence to show that new technologies positively impact education (Garzón & Acevedo, 2019) .

The metaverse can provide individual learning pathways, however physical constraints like network connectivity, meeting educational standards, and staff capabilities, hamper its implementation in the education sector (Onu et al., 2024) . If distance education institutions can adopt new technologies successfully (De Nito et al., 2023) , then traditional educational institutions should be able to follow suit.

(ic) Comparative analysis of findings vs literature

The literature contradicts participants' views about technology being merely a tool or supplementary aid. Participants seem to take the view of McOmbler (1999) that technology is instrumental, thus ignoring technology's properties of being value-laden (Miller, 2021) ; and yet acknowledging that technology does have embedded values, without recognising the role of those values in society. Technology seen simply as a tool that drives efficiencies is over-simplifying technology's role (den Hond & Moser, 2023) , and diminishing the richness of exploring technology's intrinsic properties and its influence on society (Vesa & Tienari, 2022) .

Participants gave several examples of how technology has evolved and how using technology in teaching and learning has evolved parallelly, yet at a slower pace. Literature supports this view. Distance education institutions make use of new web-based technologies, thus requiring educators to be informed about the latest technological trends, and incorporate them into teaching and learning (De Nito et al., 2023) . However, the education sector, is slow to respond, even though there is substantial evidence to show that new technologies positively impact education (Garzón & Acevedo, 2019) , and technologies can bring greater efficiencies and innovations, some of which have the potential to be disruptive (Audretsch et al., 2019) . However, while new technologies like the metaverse can disrupt the education sector, physical constraints like network connectivity, meeting educational standards, and staff capabilities, hamper its implementation in the education sector (Onu et al., 2024) .

(id) Conclusion

The findings of this study contradict the literature, in terms of how participants perceived the role of technology. While participants believe that technology is a tool (McOmber, 1999) , literature suggests that modern-day technology is value-laden (Miller, 2021) . Participants made a link between technology and values, but they struggled to see how values were embedded in technology (den Hond & Moser, 2023; Miller, 2021) and how these values influenced society (den Hond & Moser, 2023; Vesa & Tienari, 2022) , especially because they saw eLearning programmes and platforms as an integrated unit (see finding in 6.2.1 ii).

The findings show several examples of how technology has evolved and how using technology in teaching and learning has evolved parallelly, even though at a slower pace. Literature supports this finding. Even though distance education institutions incorporate new web-based technologies into teaching and learning (De Nito et al., 2023) , the education sector is slow to respond, despite substantial evidence that shows new technologies' positive impact on education (Garzón & Acevedo, 2019) , and the greater efficiencies and disruptive innovations that they bring (Audretsch et al., 2019) . Technology adoption in the education sector continues to be hampered by physical constraints like network connectivity; inadequate or no technology policies; and staff technological capabilities (Onu et al., 2024) .

(ii) Balancing online and face-to-face learning

This theme answers the question of the purpose of technology by considering the factors influencing online and face-to-face learning.

(iia) Evidence to support balancing online and face-to-face learning from findings

Participants shared the view about the advantage of flexible and self-paced learning with eLearning programmes. This is evidenced by participant UNI-2-02 who said: “...for people who are working, it provides opportunities for part-time study”. Participants talked about how eLearning programmes supported increased cohort size, and a participant mentioned that eLearning offered global exposure as learners could be located anywhere in the world. Participant SDP-1-01 pointed out the constraint of physical classes: “I mean, look how many students each university turns away each year”; and PSET-2-02 said: “Universities could eventually save on infrastructure. So, if your biggest lecture hall has 400 seats, you can never have a class that's got more than 400 students. But in the online environment, you can have classes as big as 30,000 or more”. Two participants noticed how students learn with one mentioning the intentional design of eLearning programmes to accommodate different learning styles. One participant said that academics sometimes used the programme designed for face-to-face teaching and learning, online, which affected the quality of teaching and learning online and negatively impacted student success. Participant SDP-1-02 had this to say: “Most universities, and I'm not just talking SA, but even UK and other countries, all the courses are poorly designed because lecturers still tend to want to replicate what they do in the classroom and just put it online. And that is where the problem lies. That's why student success is not always as effective online”. Two perspectives on the advantages of eLearning were that eLearning programmes could be continuously edited and updated, and eLearning platforms allowed for continuous and life-long learning. An interesting perspective from participant HEI-1-01 was “There's a study done by Harvard University that talks about 60% of universities that are now developing material for online and are moving away from contact, and there's a reason behind it because it's available and students are comprehending and they're growing up in a digital world”.

The findings therefore show that the purpose of technology from an eLearning and face-to-face perspective, is to support teaching and learning irrespective of its mode. In face-to-face teaching and learning, technology platforms are still used for communication, collaboration, and sharing learning materials. Participant SDP-2-01 explained: “If I just look at the learning management system, it is to help lecturers to be in contact with the students, even if on face to face, but I can still send messages through technology to students before class. I can still let students do something online before they get to class or during class. It provides a platform where we can connect if we are not face to face on the campus, but it also provides access to content”.

(iib) Evidence to support balancing online and face-to-face learning from literature

Roski et al., (2024) describe the Universal Design for Learning (UDL) as “a comprehensive framework that aims to shape the design of learning environments to be accessible and challenging for all learners” (p. 2) by providing learners with autonomy and responsibility for their own learning journeys and choosing their own learning pathways. The goal of the UDL is to offer flexibility in the learning environment that can be customised to suit individual students, regardless of their circumstances, instead of trying to change how learners prefer to learn. Once chosen, they tend to stick to what works for them (Jensen et al., 2020) .

Some lecturers felt that communication with students was better in class, while others felt that their relationships with students were better online, and lecturers were divided on their preference of face-to-face to online teaching and learning (Jensen et al., 2020).

When the eLearning platform in use did not suit the communication needs of students, lecturers would add a new communication platform to cater for student preferences. When lecturers found that the eLearning platform could not perform certain functionalities, they introduced other platform add-ons that would give them the functionality that they needed. It seemed that eLearning required much more planning, but gave more functionality (Jensen et al.,2020) .

Orhan (2024) showed that problem-based eLearning is more effective than face-to-face learning in terms of reading with understanding, and student attitudes, but both modes are equally effective in teaching and learning critical thinking skills.

Feubli et al., (2024) showed that where students could choose to attend lectures in person or online, about a third of all students preferred each of the options of attending lectures online; attending lectures in person; and having the option to choose between the two each time.

Each of the researchers above show that personal preferences are at play, as there is no clear choice between which mode is better. Both face-to-face and eLearning have their strengths and weaknesses, and it comes down to choice for the educational institution. Both Jensen et al., (2020) and Feubli et al., (2024) reference student preference in decision-making, and this is an important factor to consider in a student’s journey towards success. Orhan’s (2024) contribution showed that face-to-face and eLearning modes have their strengths, so, the challenge is to strike a balance between the two for the optimal student journey.

(iic) Comparative analysis of findings vs literature

Participants felt that eLearning programmes offered flexible and self-paced learning, which face-to-face learning did not offer, especially if the eLearning platform had been intentionally designed. By “intentional design” participants were referring to the Universal Design for Learning (UDL), which enable students to design their own learning pathways, and learn at their own pace (Roski et al., 2024) . Another finding was that academics sometimes used the programme designed for face-to-face teaching and learning, online, which affected the quality of teaching and learning online and negatively impacted student success. The UDL is deliberate in its design, and if followed, then the programme designed for eLearning should be different from the content used in the classroom. If educational institutions do not implement the UDL, then this is problematic for students who may find it difficult to navigate content that was designed for the classroom.

Participants felt that the purpose of technology from an eLearning and face-to-face perspective, is to support teaching and learning irrespective of its mode. In face-to-face teaching and learning, technology platforms are still used for communication, collaboration, and sharing learning materials. The literature shows that lecturers were divided on which mode of learning and teaching better supported communication; and unsurprisingly, they were divided on their preference of face-to-face to online teaching and learning (Jensen et al., 2020). Students too preferred online or in-person lectures, with some preferring to have the option of both (Feubli et al., 2024) . Orhan (2024) showed that both face-to-face and eLearning had their strengths and weaknesses, so it boils down to personal choice.

While participants mentioned cohort size, there was no literature in Chapter 2 to support this claim. After following the three steps outlined in the introduction, I did not find any literature on cohort size in any of the top journals. I extended the search to include the cost of eLearning, in the hope of finding a relevant article, but was unsuccessful. An investigation into eLearning platforms supporting increased cohort sizes is an area for further research. This idea could be extended to look at the cost implications of offering eLearning to large cohorts of students.

(iid) Conclusion

The finding that eLearning programmes offered flexible and self-paced learning, which face-to-face learning did not offer, especially if the eLearning platform had been intentionally designed, was supported in literature, which referred to the Universal Design for Learning (UDL) that enables students to determine their own learning pathways, and pace of learning (Roski et al., 2024) . Another finding was that academics sometimes used the programme designed for face-to-face teaching and learning, online, which

affected the quality of online teaching and learning, and negatively impacted student success. If educational institutions do not implement the UDL for eLearning, then students may have difficulty navigating content that was designed for the classroom. This finding offers a plausible explanation for a finding in 6.2.1.1(i) above where participants saw technology as a tool, and saw the values in programmes offered through face-to-face teaching and learning as the same as values in programmes offered through technology platforms. If educators are using the same learning material for both modes of delivery, then the finding makes sense, but if the UDL is followed for online eLearning, then there should be a difference in the embedded values.

Another finding of the study was that the purpose of technology from an eLearning and face-to-face perspective, is to support teaching and learning irrespective of its mode, since even in face-to-face teaching and learning, technology platforms are still used for communication, collaboration, and sharing learning materials. The literature shows that lecturers were divided on which mode of learning and teaching better supported communication; and were divided on their preference of mode of teaching and learning (Jensen et al., 2020). Students too had their preferences for online or in-person lectures, with some preferring to have the option of both (Feubli et al., 2024) , showing that both modes had their strengths and weaknesses (Orhan, 2024) .

Literature could not confirm the last finding on eLearning allowing for an increase in cohort size as a cost-effective alternative to educating large numbers of students. This finding therefore contributes to the body of knowledge about eLearning. An investigation into eLearning platforms supporting increased cohort sizes is an area for further research. This idea could be extended to look at the cost implications of offering eLearning to large cohorts of students through contact classes and eLearning as a comparative study.

(iii) Artificial intelligence and education

(iii a) Evidence to support artificial intelligence and education from findings

This theme answers the question of technology's purpose with respect to AI's role in education.

A participant had expressed concern over the enormity of the disruption that AI caused in the education sector, and suggested that educators think about the purpose of education considering AI. Participant UNI-1-01 said "*I think we are not realizing how big a change this is and how big the influence is going to be of AI in the higher education sector*". Overall, participants seemed quite positive in their comments about using AI in education, and gave examples to explain how AI is currently used in the South African

PSET sector. Participant PSET-2-01 explained: *“These days in the health programmes, a lot of the learning happens through simulations, virtual reality, and there are certain courses that students can do using technology or mixed reality”*; and participant PSET-2-02 commented: *“Many academics have started to use AI to develop the courses”*.

Participant UNI-2-02 emphasized the integration of technology with teaching and learning by saying: *“I think part of what we need to do is make sure that technology is not seen as something separate, but it becomes embedded in terms of what we do and how we design and teach programmes, and how we engage with students”*. A participant pointed out that if left with no intervention, AI will make a mockery of education objectives. Participant SDP-5-01 said: *“I use ChatGPT to build the course. You use ChatGPT to answer the questions. That ChatGPT is playing ping pong with ChatGPT on the other side”*.

In response to the question on the purpose of technology, participants pointed out that technology is integrated with teaching and learning and should be viewed in unison. AI has disrupted the education sector, and educators should re-think the purpose of education and what is being taught, considering AI. AI is already being used in education, particularly in health programmes that make use of simulations and virtual reality to practise skills. The education sector needs guidelines on using AI, to ensure that AI is used appropriately.

(iiib) Evidence to support artificial intelligence and education from literature

Abernethy et al., (2024) and Floridi et al, (2018) proposed ethical principles for AI operating in a good society. However, Nguyen et al., (2023) point out that despite all the work done there is no agreement on a common set of guidelines for AI. Hagendorff (2020) reported that although numerous sets of ethical guidelines for AI exist, developers ignored them, perhaps because a single solution will not work (Nguyen et al., 2023) .

AI technology tools are used in education to perform various functions, that create individual, personalised learning journeys for students, and give lecturers a choice of tools for automated assessments; plagiarism detection; etc (Zawacki-Richter et al., 2019) . With generative AI like ChatGPT becoming popular, PSET institutions are scrambling to develop AI policies that encourage using such technologies to improve the student journey, while preventing plagiarism and cheating, and ensuring that students still develop their critical thinking and writing abilities (Chan, 2023) . Management and administration staff also use AI tools to monitor the student life cycle of different cohorts of students across the institution (Zawacki-Richter et al., 2019) . However, there is a

significant gap between AI technology capabilities and implementation in the educational sector (Bates et al., 2020) .

Zhang and Aslan (2021) argue that despite a variety of AI tools being available (see Figure 2), the education sector is slow to adopt any of them, which Bates et al., (2020) blame on educational institutions not embracing new technology. For AI to co-exist with educators, lecturers should leave the tasks of presenting, managing and testing content to machines, and focus more on developing students' skills, as well as providing the emotional connection that machines are incapable of doing (Bates et al., 2020) .

(iiic) Comparative analysis of findings vs literature

A participant had expressed concern over the enormity of the disruption that AI caused in the education sector, and suggested that educators think about the purpose of education considering AI. Overall, participants were optimistic about using AI in education. Literature suggests that there is a significant gap between AI technology capabilities and implementation, as the PSET sector has barely scratched the surface of using AI for teaching and learning, because educational institutions have not embraced this new technology (Bates et al., 2020) . For AI to co-exist with educators, lecturers should leave the tasks of presenting, managing and testing content to machines, and focus more on developing students' skills, as well as providing the emotional connection that machines are incapable of doing (Bates et al., 2020) .

Some participants indicated that AI is already being used in the education sector, particularly in health programmes that use simulations and virtual reality. Some lecturers also use AI to develop learning programmes. Literature supports these findings. AI technology tools are used in education to perform functions such as intelligent tutoring; collaborative learning; and scenario simulations, while also personalising a student's learning journey (Zawacki-Richter et al., 2019) . Zhang and Aslan (2021) suggest that there are a variety of AI tools with innovative applications and functions (see Figure 4), but like Bates et al., (2020) , believe that technology adoption in the education sector is slow. Technology has the ability to enrich students' learning experiences, and assist teachers and administrators to better understand where each student is on his/her learning journey.

One participant emphasized that technology was integrated with teaching and learning, saying that technology cannot be separated from teaching and learning. Literature supports this view with Miller (2021) arguing that technology has moral and political values embedded in its design, which has long-term implications. Technology therefore, should not be evaluated on its physical attributes only, but also on its "function and

intention” (Heyndels, 2023, p. 74) or purpose. One could argue that integrating technology with teaching and learning follows the same logic, since values are instilled into learning programmes, which are offered on eLearning platforms.

(iiid) Conclusion

The study showed that education institutions in general supported AI’s adoption, but struggled with how to implement it. This finding is supported in literature with Zhang and Aslan (2021) arguing that despite the availability of a variety of AI tools (see Figure 4), the education sector is slow to adopt any of them, which Bates et al., (2020) blame on educational institutions not embracing new technology.

This study also found that AI is already being used in the education sector, particularly in health programmes that use simulations and virtual reality, and to develop learning programmes. Literature supports these findings. AI technology tools are used in education to perform functions such as intelligent tutoring; collaborative learning; and scenario simulations, while also personalising a student’s learning journey (Zawacki-Richter et al., 2019). Zhang and Aslan (2021) suggest that there are a variety of AI tools with innovative applications and functions (see Figure 4), but like Bates et al., (2020), believe that adopting technology in the education sector is a slow process.

Another finding of this study is that technology is integrated with teaching and learning, and cannot be separated from one another. Literature supports this view with Miller (2021) arguing that technology has moral and political values embedded in its design, which has long-term implications. Technology therefore, should not be evaluated on its physical attributes only, but also on its purpose (Heyndels, 2023). One could argue that integrating technology with teaching and learning follows the same logic, since values are instilled into learning programmes, which are then offered on eLearning platforms comprising intrinsic embedded values. eLearning programmes offered on technology platforms should be evaluated collectively on its physical attributes, function and purpose.

6.2.1.2 Which stakeholders were consulted in its development?

(i) Role players in determining values and regulatory oversight

(ia) Evidence to support role players in determining values and regulatory oversight from findings

This theme aims to respond to the question of which stakeholders are consulted during the development of eLearning programmes offered on eLearning platforms.

Some participants particularly from universities, seem to suggest lengthy and wide consultations within their respective institutions, with little to no student consultation.

Participant UNI-2-02 said: *“We do encourage academics to reach out to partners or industry stakeholders, alumni, it's students. That's not always done well; sometimes that happens, sometimes it doesn't”*. In contrast, a participant in the SDP group was emphatic about student consultation. Participant SDP-1-01 said: *“I think when you do a curriculum for me the big thing that nobody seems to listen to, is you need to involve students. You need to ask what they want to learn and what they don't want to learn and why they want to learn what they want to learn”*. While a participant from a university believed that consultation with industry was critical, participants in the skills development provider group felt that subject matter experts and instructional designers were central to eLearning programme development, with a variety of media; quality assurance; and assessment specialists also playing a role. Participant SDP-3-01 said: *“Instructional designers and subject matter experts. Those two have to work the closest and then overlapping into there somewhere would then be your graphic artists, your media specialists, or your video production companies”*. An interesting comment from a participant was the involvement of the programme sponsor or owner in the consultation process. Two participants said that the regulatory bodies QCTO; CHE and SAQA; as well as the professional/industry bodies are consulted after internal consultations had been completed.

Table 14a shows the array of stakeholders that are consulted during the development of an eLearning programme. The subject matter expert and instructional designer seem to be the main stakeholders in this development process. Other stakeholders may be consulted, depending on the institution or academic involved. One participant said that industry consultation was critical, and another stressed the importance of student consultation. In the skills development space, the project or programme owner/sponsor plays a high-level role in developing the programme. Participant SDP-2-01 said: *“The project sponsor doesn't necessarily get involved in the day-to-day things, but they ultimately ensure that everything is going smoothly, looks at what is going wrong and asks for feedback on why something is not aligning; so that person needs to have oversight over everything”*. Even though programmes are designed to be student centric, little or no student consultation takes place. Participant UNI-2-02 said: *“I think we should look at that more strongly going forward to get both current and past students' viewpoints”*.

(ib) Evidence to support role players in determining values and regulatory oversight from literature

If values influence ethical decision-making, and technology has embedded values, then there should be greater transparency around whose values are being propagated, whose

values are being ignored or suppressed, and what is the expected outcome (den Hond & Moser, 2023) . Dafoe (2015, p. 1050) questions how and under what circumstances, can specific stakeholders “shape their sociotechnical systems”, which reiterates the point that a select group of stakeholders’ values influence the development of technology, at the expense of other stakeholders.

Proponents of the 5th Industrial Revolution (5IR) suggest that stakeholders should comprise society, businesses, employees and customers (Noble et al., 2022) , and not just shareholders. The identity of stakeholders associated with digital technologies should be known. Businesses should build these technologies with stakeholders’ values in mind, so that all stakeholders benefit from technology (D’Cruz et al., 2022) .

(ic) Comparative analysis of findings vs literature

Some participants particularly from universities, seem to suggest lengthy and wide consultation within their respective institutions, with little to no student consultation, while a participant from the skills development provider group, who was a curriculum developer, felt that student consultation was critical. A participant believed that consultation with industry was critical, and other participants felt that subject matter experts and instructional designers were central to developing eLearning programmes, with a variety of media; quality assurance; and assessment specialists also playing a role. One participant talked about the project sponsor or funder as playing a critical role. Noble et al., (2022) argue that in the era of the 5th Industrial Revolution (5IR), stakeholders who should be consulted on new technologies include society, businesses, employees and customers, and not just shareholders, and there should be greater transparency around who these stakeholders are. D’Cruz et al., (2022) also argued that businesses should build these technologies with stakeholders’ values in mind, so that all stakeholders benefit from the technology.

From the findings, universities consulted employees, regulatory bodies (society); and industry (businesses). Skills development providers consulted students (customers) and the project sponsor/funder (shareholder) in addition to those above. The findings differ from literature that shows that the role-players involved in deciding on which values to embed in technology, are not known. Den Hond and Moser (2023) argue that if values influence ethical decision-making, and technology has embedded values, then there should be greater transparency around whose values are being propagated, whose values are being ignored or suppressed, and what is the expected outcome. Dafoe (2015) shares a similar view by questioning the circumstances under which specific stakeholders decide on which values to embed in technology, which reiterates the point

that a select group of stakeholders' values influence technology's development, at the expense of other stakeholders. What is clear from the findings is that the group of stakeholders consulted differ per institution, with some core consultations being common across institutions. Participant HEI-1-01 summarised it well: *"On the flip of that, you could do it yourself and say I know best and roll it out and you realize very soon that was not what you intended to do"*.

My search for relevant education literature following the 3 steps listed in the introduction, was unsuccessful. There is no relevant literature from education in any of the top journals that talks about which stakeholders are involved in deciding on the values that are included in eLearning programmes on eLearning platforms. The findings listed in table 14a therefore seem to be relevant and contribute to the body of knowledge around which stakeholders are involved in decisions about embedded values, in the South African PSET sector.

(id) Conclusion

Research findings show the list of stakeholders from the South African PSET sector, who choose the values to be embedded in eLearning platforms with eLearning programmes. Literature shows that there is a lack of transparency around which stakeholders are involved in choosing the values to be embedded in technology, (den Hond & Moser, 2023) . The finding therefore contradicts literature. The list of stakeholders consulted generated through the study maps closely to the list of stakeholders outlined by Noble et al., (2022) , as the stakeholders who should be consulted. The findings show that the role-players involved differ per educational institution, although some role-players are included in consultations at all institutions. There is no relevant literature from the education sector in top journals over the last five years, that either supports or refutes this study's findings. The list of stakeholders consulted (Table 14a) may therefore be a new contribution to the existing body of knowledge.

6.2.1.3 How were the final values for the technology selected?

(i) Role players in determining values and regulatory oversight

(ia) Evidence to support role players in determining values and regulatory oversight from literature

This theme considers who the final decision-makers are with respect to the values embedded in eLearning programmes offered on e-Learning platforms.

Participant UNI-1-01 said that industry inputs were critical to ensure that the programme used the latest information, and a team took the final decision based on *"what the profession wants, what the learner needs, what the academic knows, what researchers*

of new knowledge have already, what the latest thinking is” before deciding. Participant responses about who made the final decision were the following: the South African Qualifications Authority (SAQA), which is the regulatory body for qualifications, and the institution’s senate of council; government; subject expert; project sponsor; academic in consultation with the students; skills development provider; Quality Council; joint decision by the institution, professional body and Quality Council; and academic with the responsible faculty within an institution. There were even differences of opinions among the regulators as to who made the final decision.

Table 18a summarises the participant responses in terms of who makes the final decision. Participant SDP-1-01 had this to say about the project sponsor being the final decision-maker: *“So, it can be very difficult and I think sometimes you must ask yourself, is this stakeholder (project sponsor) really worth having as a stakeholder? Do we really need the money? Can we not maybe have less money but keep our integrity and morals”?*

Each participant gave a unique response, which suggests that participants don’t understand the decision-making process well; the process allows for different decision-makers; or institutions are making decisions about values without proper consultation or governance.

(ib) Evidence to support role players in determining values and regulatory oversight from literature

Higher education institutions, when faced with a crisis, rely on their principles and values to find a way forward (Liu et al., 2022) , so the importance of values as a moral compass cannot be over-stated. Miller (2021) argues that technology has moral and political values embedded in its design, which has long-term implications, and these values should be carefully considered when designing new technology. If values influence ethical decision-making, and technology has embedded values, then there should be greater transparency around whose values are being propagated, whose values are being ignored or suppressed, and what is the expected outcome (den Hond & Moser, 2023) . A select group of stakeholders’ values influence the development of technology, at the expense of other stakeholders (Dafoe, 2015) . Stakeholders should comprise society, businesses, employees and customers (Noble et al., 2022) , and not just shareholders. There should be transparency around the identity of stakeholders associated with digital technologies, and businesses should build these technologies with stakeholders’ values in mind, so that all stakeholders are beneficiaries of the technology (D’Cruz et al., 2022)

Algorithms embedded in machine learning technology, can make biased and discriminatory decisions, (Martin et al., 2019) . Businesses should be held accountable for its technology and the choices that they make by evaluating digital technologies' decisions through its embedded values; its design specifications; the data that it collects and uses for decision-making; and the assumptions underpinning its development (D'Cruz et al., 2022) .

(ic) Comparative analysis of findings vs literature

Table 18a summarises participant responses to who makes the final decision. Responses varied among participants, which suggests that the decision-making process is not well understood; the process allows for different decision-makers; or institutions are making decisions about values without proper consultation or governance.

Literature suggests that the importance of values as a moral compass cannot be overstated, as it functions like the north star through a crisis (Liu et al., 2022) . Technology has moral and political values embedded in its design, with long-term implications, and these values should be carefully considered when designing new technology (Miller, 2021) . If values influence ethical decision-making, and technology has embedded values, then there should be greater transparency around whose values are being propagated, whose values are being ignored or suppressed, and what is the expected outcome (den Hond & Moser, 2023) . The decision about which stakeholders make the final decisions, and under what circumstances, should be clarified (Dafoe, 2015) . Noble et al., (2022) call for greater transparency around who these stakeholders are, and what authorises them to make the final decision. Businesses should build technologies with stakeholders' values in mind, so that all stakeholders are beneficiaries of the technology (D'Cruz et al., 2022). In other words, educational institutions should consider all stakeholders' needs when creating eLearning programmes on eLearning platforms. Algorithms embedded in machine learning technology, can make biased and discriminatory decisions, and businesses (or educational institutions) should be held accountable for its technology and their choices (Martin et al., 2019) .

(id) Conclusion

The study's findings attempt to answer the question of who the final decision-maker is. Based on the responses, it could be one or groups of any number of stakeholders listed in Table 15a. This would suggest that the decision-making process is not well understood; the process is relaxed enough to allow for different decision-makers; or institutions are making decisions about values without proper consultation or governance. Literature is calling for transparency around who these decision-makers

are (Dafoe, 2015; D’Cruz et al., 2022; den Hond & Moser, 2023; Noble et al., 2022) . While Table 15a provides a start, further research is required to answer this question with more certainty.

6.2.1.4 How could these values be changed?

(i) Role players in determining values and regulatory oversight

This theme responds to the question about changing values in an eLearning programme on an eLearning platform, after it has been approved.

(ia) Evidence to support role players in determining values and regulatory oversight from the findings

Two participants felt that values should not be changed after programme implementation, but for different reasons: because of a lack of motivation to make the changes; and because of pressure from stakeholders. UNI-2-02 said: *“...because we’re a traditional contact institution the notion of having to spend time redesigning things, updating things is often seen as we’ll get there when there’s time or seen as more of an admin job rather than an important aspect of ensuring that the programme is fit for purpose”*. Participant SDP-3-01 added: *“After you’ve created something, getting someone to now use that is very difficult or buy into that is very difficult, particularly when we work with corporates, because the CSI rules are very stringent”*.

While one participant questioned the motivation of stakeholders wanting to make changes, two participants supported the notion of changing values to keep abreast of world changes. Participant SDP-5-01 commented: *“I don’t think you can have a course nowadays and just leave it as is because the world changes too fast outside the course”*. One participant said that it was up to the institution or provider to decide on changing values, and another participant pointed out that the regulations allowed for up to 50% of the programme to be changed without going back to the regulators. Participant UNI-1-01 explained: *“A complete overview is of course also possible depending on the scope and I know regulatory wise it has to be within 50% of the learning outcomes or the purpose of the programme still needs to be the same. And you can make all sorts of changes internally”*.

In response to the question on how could the programme values be changed, most participants indicated that it was possible to make up to 50% of changes, and the academics or subject specialists would make that decision to implement the changes. However, the changes had to be relevant. UNI-3-01 had this to say: *“Everyone doesn’t have to be consulted. Everyone doesn’t have to have a voice. I think the significant voices are important, so that would be my first question: what is the stakeholder status within the broader community and how important is that and how valid are the points that*

they bring to it". Two participants were not keen on making changes – one because of a reluctance on the part of academics, and the other because of the stringent rules of project sponsors like government and corporates.

(ib) Evidence to support role players in determining values and regulatory oversight from literature

Higher education institutions, when faced with a crisis, rely on their principles and values to find a way forward (Liu et al., 2022) , so the importance of values as a moral compass cannot be over-stated. Miller (2021) argues that technology has moral and political values embedded in its design, which has long-term implications, and these values should be carefully considered when designing new technology. If values influence ethical decision-making, and technology has embedded values, then there should be greater transparency around whose values are being propagated, whose values are being ignored or suppressed, and what is the expected outcome (den Hond & Moser, 2023) . A select group of stakeholders' values influence technology's development, at the expense of other stakeholders (Dafoe, 2015) . Stakeholders should comprise society, businesses, employees and customers (Noble et al., 2022) , and not just shareholders. There should be transparency around the identity of stakeholders associated with digital technologies, and businesses should build these technologies with stakeholders' values in mind, so that all stakeholders benefit from technology (D'Cruz et al., 2022)

Algorithms embedded in machine learning technology, can make biased and discriminatory decisions, (Martin et al., 2019) . Businesses should be held accountable for its technology and their choices by evaluating digital technologies' decisions through its embedded values; its design specifications; the data that it collects and uses for decision-making; and the assumptions underpinning its development (D'Cruz et al., 2022) .

(ic) Comparative analysis of findings vs literature

In response to the question on how could the programme values be changed, most participants indicated that it was possible to change up to 50% of the programme without going back to the regulatory bodies, and the academics or subject specialists would implement the changes. However, the changes had to be relevant. Two participants were not keen on making changes – one because of a reluctance on the part of academics, and the other because of the stringent rules of project sponsors like government and corporates.

Literature suggests that the importance of values as a moral compass cannot be over-stated (Liu et al., 2022) . Technology has moral and political values embedded in its

design, with long-term implications, and these values should be carefully considered when designing new technology (Miller, 2021) . If values influence ethical decision-making, and technology has embedded values, then there should be greater transparency around whose values are being propagated, whose values are being ignored or suppressed, what is the expected outcome, and “how can it be contested, disrupted, and changed?” (den Hond & Moser, 2023, p. 112) . Noble et al., (2022) call for greater transparency around who these stakeholders are, and what authorises them to make the final decision. Businesses should build technologies with stakeholders’ values in mind, so that all stakeholders benefit from technology (D’Cruz et al., 2022). In other words, educational institutions should consider all stakeholders’ needs when creating eLearning programmes on eLearning platforms. Likewise, the same considerations should apply when deciding to make changes to values in eLearning programmes on eLearning platforms. Algorithms embedded in machine learning technology, can make biased and discriminatory decisions, and businesses (or educational institutions) should be held accountable for its technology and their choices (Martin et al., 2019) . Stakeholders should therefore know if changes are being made to eLearning platforms, and if so, how are these changes being made?

(id) Conclusion

The study’s findings attempt to provide an answer to the question that den Hond and Moser (2023) raised about whether changes can be made to an eLearning programme on an eLearning platform after it has been approved. The findings of the study show that the answer to this question is affirmative, as up to 50% of the content can be changed without having to revert to the regulatory body. Participants were divided on whether changes should be made to an eLearning programme after it has been approved, with some opposing further changes, and others recognising the need for change to keep up with environmental changes. Stakeholders’ requests for changes had to be vetted in terms of who the stakeholder was and what relevance did the requested changes have. This finding adds to the body of knowledge about changing values in eLearning programmes on eLearning platforms.

6.2.1.5 How is the data gathered through technology, used and protected?

(i) Data protection and ethical considerations

(ia) Evidence to support data protection and ethical considerations from findings

The theme data protection and ethical considerations aims to address the question on the protection and use of data that technology platforms gather.

Most participants mentioned the Protection of Personal Information (POPI) Act as a guiding document for data security. Participant UNI-1-01 said: “*Our institution has taken*

the whole POPI Act very, very seriously". Some participants mentioned different levels of access to student data based on the role of the person. Student data is mostly protected under the POPI Act, and institutions have data security policies to prevent cyber-attacks. Participant UNI-1-01 explained: "*High level cyber security measures need to be put in place and then policy decisions about what is protected and what is not. So, security wise, that's why the technology people need to be on it, because otherwise you get hacked and that would be detrimental if the data gets out*". One participant seemed concerned about the effectiveness of data security at institutions, and gave an example of an actual cyber-attack at another institution. Universities seem to have levels of access to student data, based on the person's role. Participant UNIT-1-01 said: "*...there are layers of permissions so I can see my class, but nothing more. The administrator can see everybody's classes, etcetera, and the student can see only their own grades or their own work*". Some institutions rely on third parties like Amazon Web Services to protect data hosted in the cloud. There was no mention of third-party access to student data.

It seemed that while huge amounts of data were available, institutions did very little with the data. Participant UNI-3-01 said: "*In my university there is a lot of data available in our eLearning platform. It's not as widely used as I think it should be ... institutionally you could be building data analytics programmes to support students. You could be using it to improve teaching, but it doesn't happen*". One participant did however, mention that university researchers used student data as their main source of data. Two participants detailed how regulatory bodies used student data both for student tracking and research purposes. Participant PSET-2-01 said: "*All institutions submit data to HEMIS (DHET), you know, or there is the National Learner Records database (SAQA). We use it for statistics. We use it to inform us to make improvements*". One participant felt that there should be transparency about student data protection and use, and data should only be used for purposes for which student permission had been granted.

(ib) Evidence to support data protection and ethical considerations from literature

Datafication is the new goldrush, as businesses race to collect and assimilate ginormous amounts of data (Noble et al., 2022) to be used to create competitive advantage. Data privacy, consent and the lack of transparency in data collection raises ethical issues (Flyverbom et al., 2019) , which businesses largely ignore in their quest to personalise product advertising to customers, and to increase profitability (Noble et al., 2022) . Daniel (2019) cautioned about the inadequate privacy and security that big data systems provided, resulting in student data protection being compromised. Furthermore, using student data for research purposes without proper consent, raises ethical issues. Even

using student data in technology platforms to track performance and predict student outcomes, may lead to unintended consequences. Institutions therefore need data governance models and policies that determine the conditions under which student data can be used. With data being stored in the cloud, data privacy becomes more complex, and requires global ethical guidelines and a moral code to guide educational data usage (Daniel, 2019) . Daniel (2019) also cautioned against third-party use of data because educational institutions do not have student consent to transfer data to third parties.

Educational institutions house big data, and their challenge is to embrace AI while maintaining “core principles and values” (Bates et al., 2020, p. 10) . Algorithms embedded in machine learning technology, can make biased and discriminatory decisions, (Martin et al., 2019) . Businesses should be held accountable for its technology and the autonomous choices that they make, based on its embedded values; its design and purpose; the data that it collects and uses for decision-making; and the assumptions underpinning technology development (D’Cruz et al., 2022) . Zhang and Aslan (2021) suggest that AI tools have innovative applications and functions available (see Figure 4), to assist teachers and administrators to better understand individual student journeys. These tools use student data to track progress and make predictions about student success. Student data contained in the eLearning platform, can be manipulated to predict student performance using machine learning for early interventions (Gray & Perkins, 2019; Riestra-González et al., 2021) . Management and administrative staff also use AI tools to monitor the student life cycle of cohorts of students across the institution (Zawacki-Richter et al., 2019) . However, Lim et al., (2022) show that educational institution staff and students perceive and understand how to use learning analytics, and require much more education and support to align these perspectives.

(ic) Comparative analysis of findings vs literature

Findings show that most participants’ institutions used the Protection of Personal Information (POPI) Act (South African legislation) as a guiding document for data security, as well as access control to student data on technology platforms based on the person’s role and data security policies. The effectiveness of institution data security measures were questioned as cyber-attacks have been reported. Some institutions rely on third parties like Amazon Web Services to protect data hosted in the cloud. Literature supports the cautionary approach to data security in an era of datafication and assimilation of big data (Noble et al., 2022) and raises an alarm about ethical issues relating to data privacy, consent and the lack of transparency in how data is collected (Flyverbom et al., 2019) , which conflict with businesses’ desire to use data to personalise

product advertising (Noble et al., 2022) . Education systems containing big data are also cause for concern because of inadequate privacy and security, resulting in student data protection being compromised (Daniel, 2019) . With data being stored in the cloud, data privacy is more at risk, “necessitating the establishment of global ethics and moral obligations to use educational data”, and institutions need data governance models and policies that determine the conditions under which student data can be used (Daniel, 2019, p. 109) .

This study’s findings seem to suggest that while educational institutions possess huge amounts of student data, the data is not used optimally. There were suggestions of student tracking and using student data for research, but there was much more potential to make better use of the data. One participant felt that there should be transparency about student data protection and use, and data should only be used for purposes for which student permission had been granted.

Literature supports the findings about the collection of vast amounts of data by educational institutions, but is focused on the potential use of this data with the advent of AI (Bates et al., 2020) . Institutions must exercise caution as AI can make biased and discriminatory decisions, (Martin et al., 2019) , and institutions are accountable for these decisions (D’Cruz et al., 2022) . Zhang and Aslan (2021) suggest that AI tools can assist teachers and administrators to better understand individual student journeys by using student data to track progress and make predictions about student progress for early interventions (Gray & Perkins, 2019; Riestra-González et al., 2021) , of cohorts of students across the institution (Zawacki-Richter et al., 2019) . While South African institutions may not have reached this level of sophistication in terms of using student data, the potential to do so exists, and literature points to what should be considered when that time comes.

However, Lim et al., (2022) show that there are significant differences in how educators and students perceive and understand how to use learning analytics, and need much more education and support to align these perspectives. Participants in the study seem to suggest that not only are there differences of understandings among educators and students, but there may be different understandings among educators themselves, and perhaps capacity development should begin with institution staff.

One participant mentioned that there should be transparency about data security and use so that students understand how their data is being used. Literature supports this view as using student data for research purposes without proper consent, raises ethical issues and may have unintended consequences (Daniel, 2019) . Daniel (2019) also

cautioned against third-party use of data because educational institutions do not have student consent to transfer data to third parties, which was not mentioned by participants.

(id) Conclusion

Findings show that educational institutions follow government legislation for data security, and have controlled access to student data. Some institutions rely on third parties to protect data hosted in the cloud. There was a concern that data security at educational institutions is not as good as it should be. Literature supports these findings. Education systems containing big data have inadequate privacy and security, that compromises student data (Daniel, 2019) . There should be a cautionary approach to data security (Noble et al., 2022) and challenges with data privacy, consent and the lack of transparency in data collection result in ethical issues (Flyverbom et al., 2019) . With data being stored in the cloud, data privacy requires global ethical guidelines and codes to access educational data, and institutions need data governance models and policies that determine the conditions under which student data can be used (Daniel, 2019) .

Another finding of the study is that while educational institutions possess huge amounts of student data, the data is not used optimally. There were suggestions of student tracking and using student data for research, but there was much more potential to make better use of the data. There should be transparency about student data protection and use, and data should only be used for purposes for which student permission had been granted. Literature supports these findings about the collection of vast amounts of data by educational institutions, but focuses on the potential use of this data with the advent of AI (Bates et al., 2020) . Businesses' desire to use data to personalise product advertising (Noble et al., 2022) . Caution should be exercised as AI can make biased and discriminatory decisions, (Martin et al., 2019) , and institutions are accountable for these decisions (D'Cruz et al., 2022) . Zhang and Aslan (2021) suggest that AI tools can assist teachers and administrators to better understand individual student journeys by using student data to track progress and make predictions about student progress for early interventions (Gray & Perkins, 2019; Riestra-González et al., 2021) , of cohorts of students across the institution (Zawacki-Richter et al., 2019) . While South African institutions may not have reached this level of sophistication in terms of using student data, the potential to do so exists, and literature points to what should be considered when that time comes.

The third finding is that not only are there differences of understandings about AI and technology among educators and students, but there may be different understandings among educators themselves, and perhaps capacity development should begin with institution staff. These findings are supported in literature (Lim et al., 2022) .

6.2.1.6 How is technology evaluated?

(i) Choosing a suitable technology platform

This theme responds to the question of how technology is evaluated by considering the criteria used to evaluate the eLearning technology platform.

(ia) Evidence to support choosing a suitable technology platform from findings

Participants in general mentioned having a familiar architecture; being cloud-based; cost effective; open source; modern design; long-term sustainability; functionality; clean-cut interface; ease of navigation; and that no eLearning platform was perfect (Table 18a). Two participants mentioned that the actual users of eLearning platforms had no part in deciding which eLearning platform to choose. Participant UNI-3-01 said: “... *the problem is often that the stakeholders that make a decision about the eLearning platform are not the people that use it on the ground... Their outlook might be more cost orientated versus usability*”. Participant UNI-2-02 commented: “*We have these tools, but we don't always use them well*”, suggesting a need for capacity building. Participant SDP-2-01 said: “...*you can bring in a Rolls Royce. We need to understand really very well what are the needs of the client before we sell technology*”, suggesting that perhaps institutions aim to buy the best technology on the market without considering if it meets their needs. One participant had an interesting comment about education being a public good, and that big tech companies should not be making huge profits from technology in this sector.

The criteria in Table 18a respond to the question of how technology is evaluated, and provides insight into the considerations that influence decision-making. Participants' insights suggest that the academics and support staff who use the eLearning platform at educational institutions do not participate in the decision-making process. There was also a comment about open-source versus proprietary technology in terms of costs, considering that education is a public good.

(ib) Evidence to support choosing a suitable technology platform from literature

Zhang and Aslan (2021) list a variety of AI tools (see Figure 4), that will enrich students' learning experiences, and assist institution staff to better understand each student's learning journey, but the education sector is slow to adopt technology. Bates et al., (2020) argue that the PSET sector has barely scratched the surface of using AI for teaching and learning. There are several hurdles hindering implementation, which must first be addressed (Zhang & Aslan, 2021) .

Student engagement is an indicator of student journey, and the eLearning platform design should include student engagement in its design (Bond et al., 2020) . Trinh et al. (2023) argued that technology can make the learning journey much more interactive,

interesting and supportive of student engagement. Hill (2019) made a similar point by showing that an expert system eLearning platform, provides a comprehensive set of functions for a smooth student journey. However, Mpungose (2020) argued that some eLearning platforms require additional add-ons to meet student needs. Another key indicator for a successful student journey is user continuance, meaning that students stick with their eLearning programmes until completion (Al-Samarraie et al.; 2018) .

(ic) Comparative analysis of findings vs literature

Table 18a provides a useful set of criteria for evaluating an eLearning platform, which literature supports (Zhang and Aslan, 2021; Bates et al., 2020; Trinh et al., 2023; Hill, 2019; Mpungose, 2020; Jensen et al., 2020; Al-Samarraie et al, 2018) . The study's findings suggest that the education sector is slow to adopt technologies because the decision-makers are not the users of the technology; and therefore, the selected technology may not have the right fit, since it was probably based on cost rather than functionality. Furthermore, there is a need for capacity development among staff and students. Zhang and Aslan (2021) support this finding by arguing that despite having a wide choice of available technologies, educational institutions must first resolve their challenges of not having implementation policies and guidelines; ethics and privacy issues; the associated costs of technologies; and to be able to scale implementation, to be able to adopt and optimally use technology.

(id) Conclusion

The first finding is a list of criteria for evaluating a technology platform (Table 18a), which literature supports (Zhang and Aslan, 2021; Bates et al., 2020; Trinh et al., 2023; Hill, 2019; Mpungose, 2020; Jensen et al., 2020; Al-Samarraie et al, 2018) . The evaluation criteria used to evaluate the eLearning technology platform is important in determining the intrinsic values that are embedded in technology, before the eLearning programme with its values are added. The most important consideration should be student-centredness and it is therefore important to consult all stakeholders before an institution invests in a technology platform. Another finding is that the actual users of the eLearning platform do not participate in the decision-making process when choosing an eLearning platform. This finding ties back to the finding in 6.2.1.3 relating to the role-players involved in deciding on the values to be embedded in technology. Another finding related to the choice between open-source versus proprietary technology in terms of costs, and considering education being a public good, which is covered in the list of criteria in Table 18a.

6.2.2 To what extent does technology influence society?

(i) Access and equity of e-learning

This theme answers the question of the extent to which technology influences society by considering access to eLearning opportunities.

(ia) Evidence to support access and equity of e-learning from findings

Participants gave examples of how access to technology influences society, like having a pocket computer in the form of a smartphone, and knowing at the age of five that an AI bot on the phone can provide answers to problems. Participant PSET-3-01 said: “*My five-year-old granddaughter asked me a question and I said I'll have to check on that as I'm not sure. So, she says, “well, just ask Siri”.* A participant described this young generation as digital natives. Some participants talked about bridging geographic barriers to learning through eLearning. Participant SDP-1-02 said: “*It opens up access to those who are not physically able to go to university*”. A popular comment among participants was access to current and instantaneous information that enhanced learning. Participant SDP-3-01 said: “*With technology, you have information the minute you want to know or verify something*”.

In response to the question about the extent to which technology influences society, participants noted how access to technology benefits society by providing current, instantaneous information that can be accessed in large volumes or small chunks, to suit the individual's preferences. Technology has also provided opportunities for eLearning to individuals irrespective of where they are located. However, it is noted that South Africa is yet to resolve its issues of network connectivity, so access may be difficult in certain rural villages in South Africa.

(ib) Evidence to support access and equity of e-learning from literature

An important consideration is the ability of internet companies to provide access to the IOT to billions of people globally, because managing access is a problem. However, with the development new technologies like blockchain, access control of such large numbers of users is made possible (Novo, 2018) .

Van Schalkwyk (2021) observes that in a country like South Africa with a high inequality ratio, any attempt to implement new technologies and open resources, will further increase the current inequalities. According to Sutherland (2020) people from different socio-economic backgrounds have different levels of access to technologies, and therefore it is challenging to prepare them for jobs in a technologically-driven economy. Technologies like the metaverse can allow for learning to be individualised, however several resourcing challenges such as network connectivity, meeting educational

standards, and recruiting staff with specialised skills, facing the education sector hamper progress (Onu et al., 2024) .

Lembani et al., (2020) showed that there were significant differences in access to computers in homes, based on geographic location. It is therefore difficult to assume that if society had access to technologies, and if network connectivity in rural areas was resolved, that society living on the outskirts of urban areas, or under conditions of poverty will benefit, until access to actual devices has also been resolved.

Feubli et al., (2024) conducted a study of a hybrid class, where students choose to attend lectures in person or online. About a third of all students preferred each of the options of attending lectures online; attending lectures in person; and having the option to choose between the two each time. Some of the factors influencing students' decisions included their distance from campus; whether they had jobs; the level of difficulty of the work; and which year of study or semester they were in. Chakraborty et al., (2021) found that students attending an Indian university preferred face-to-face classes and attending MOOCs online, although they agreed that online education had served its purpose during the pandemic. These students felt that online learning was stressful and negatively impacted their social lives.

Chapter 2 had no literature about digital natives and the impact of early exposure to technology, so I followed the three steps described in the introduction to find relevant literature. Hurwitz and Schmitt (2020) showed that young children exposed to digital skills performed better at school in later years where digital skill was required. Corkin et al., (2022) described the differences in the ways in which young people used digital technologies to develop digital competencies, which placed students on either side of a digital divide. They argue that digital natives who use technologies more creatively are on the advantaged side of the digital divide. Barak (2018) showed that students who are digitally fluent are more flexible and accepting of change than students who are less digitally proficient. Also, digitally fluent students who preferred to collaborate with peers, showed higher levels of flexibility than their peers. These insights highlight how digital natives differ from their peers who were not as exposed to technology, or did not use technology as creatively from a young age.

(ic) Comparative analysis of findings vs literature

This study's finding was that young people who grow up with technology are more accustomed to it and are more likely to respond positively to eLearning. Literature supports this view (Hurwitz & Schmitt, 2020) and shows that the more digitally fluent students have greater flexibility in their response to change, and are more likely to work

well collaboratively (Barak, 2018) , but exposure to technology at an early age does not guarantee digital fluency, as it depends how technology was used at a young age that determines the type of digital skills developed, and this places students on either side of a digital divide (Corkin et al., 2022) .

Another finding was that society benefits from access to technology as it provides current, instantaneous information that can be accessed in large volumes or small chunks, to suit the individual's preferences. Technology also provides individuals with opportunities for eLearning, irrespective of where they are located. Technology manages access to the technology that allows society access to instantaneous, customised information. Technologies like blockchain, which manages access control of billions of users globally, enables internet companies to provide access to the Internet of Things (IOT) (Novo, 2018) . However, having access does not mean that students are willing to study online, as student preferences vary, depending on their personal circumstances and choices (Chakraborty et al., 2021; Feubli et al., 2024) . Also, Van Schalkwyk (2021), Sutherland (2020), and Lembani et al., (2020) all point out the harsh reality of South Africa where the digital divide of access has led to an information divide. South Africa still has network connectivity issues in certain parts of the country, and even after these issues have been resolved, society's access to devices to benefit from technologies, must also be resolved. Onu et al., (2024) show that South Africa is not unique in its challenges hampering the adoption of new technologies, and Van Schalkwyk, in a way, is justifying the lag in implementation of new technologies by arguing that new technologies benefit parts of society, while plunging the rest of society further into poverty by widening the digital and knowledge gaps.

(id) Conclusion

A finding of this study was that young people who grow up with technology are more accustomed to it and are more likely to respond positively to eLearning. Literature supports this view (Hurwitz & Schmitt, 2020) and shows that the more digitally fluent students have greater flexibility in their response to change, and are more likely to work well collaboratively (Barak, 2018) , but exposure to technology at an early age does not guarantee digital fluency, as it depends on the way in which technology was used at a young age that determines the type of digital skills that were developed, and this places students on either side of a digital divide (Corkin et al., 2022) .

Another finding was that access to technology benefits society by providing current, instantaneous information that can be accessed in large volumes or small chunks, to suit the individual's preferences. Technology has also provided eLearning opportunities to individuals irrespective of where they are located. While providing access to the IOT is

possible (Novo, 2018) , having access does not mean that students are willing to study online, as student preferences vary, depending on their personal circumstances and choices (Chakraborty et al., 2021; Feubli et al., 2024) . South Africa also has network connectivity issues (van Schalkwyk, 2021) , and even when these issues have been resolved, the issues of access to devices to benefit from technologies, must also be resolved (Lembani et al., 2020; Sutherland, 2020) . However, South Africa is not unique in its challenges that hamper adopting new technologies (Onu et al., 2024) , and Van Schalkwyk, in a way, is justifying the lag in implementation of new technologies by arguing that new technologies benefit parts of society, while plunging the rest of society further into poverty by widening the digital and knowledge gaps.

(ii) Technological advancement vs societal values

This theme considers the question of the extent to which technology influences society, by considering technology's positive and negative effects on societal values.

(iia) Evidence to support technological advancement vs societal values from findings

One participant raised issues of AI bias and social engineering. Participant UNI-3-01 said: *"We have lots of research on how technology, social media specifically is used to do social engineering, to stroke tensions between people"*. One participant talked about society losing its human qualities because of the influence of technology. Some participants talked about how fake news, misinformation and disinformation influences society. Participant PSET-3-01 said: *"There's good information but there's also fake information and depending on a person's maturity level, I don't think they were able to sometimes discern between the two. If you're not discernible about your sources and the validity of what you're reading, then it's also dangerous"*. Participants also talked about technological advancements in healthcare; automation; and e-waste production due to rapid technological advancements. I did not pursue the comment on e-waste further, due to time constraints, and this is therefore an area for further research.

Participants gave numerous examples of how technology has penetrated everyday life like accessing banking services; making travel bookings; and automating routine processes. Technology also enhances communication, collaboration and provides opportunities for lifelong learning, while giving access to current news and information. One participant viewed universities as a microcosm of society, and what happens in one space influences the other. Another participant pointed out that technology cannot be neutral because it humans designed it, and humans are not neutral. Participants also pointed out that technology has changed human-to-human interaction because the younger generation find it easier to communicate through technology and have not developed their social skills for in-person interactions.

Cyber-crime and cyber-bullying are on the increase, and society, especially the older generation, need to be taught digital literacy to function in this technologically driven society. Participant SDP-1-02 said: *“Cyber-crime is huge. I feel very strongly that we need to help our students discern fake news”*.

The new generation face health risks because of long hours spent using technology, and “sitting is the new smoking” risk that society must deal with. Participant SDP-5-01 had this to say: *“Our health is being threatened by eLearning. ... sitting is the new smoking. ...If we don't bring physical exercise into eLearning, we're going to set ourselves up for death”*. Addiction to technology is also a problem, and has been associated with mental health issues. Participant PSET-2-02 commented: *“Addiction- people get so tied to their devices that they neglect meeting up in person socially, or even exercising as they struggle to manage their screen time. It has a negative effect on mental health”*.

(iib) Evidence to support technological advancement vs societal values from literature

Algorithms embedded in machine learning technology, can make biased and discriminatory decisions, (Martin et al., 2019) , which are negative attributes of technology, and should be considered in the PSET sector because of AI's use in education. For example, student data from the eLearning platform, can be manipulated to predict student performance using machine learning for early interventions (Gray & Perkins, 2019; Riestra-González et al., 2021) , which can have negative consequences for the student if there is bias in the manipulation and decision-making.

Technology addiction deserves attention, especially among the youth. Busalim et al., (2019) showed that students who are addicted to Facebook® and who have low self-esteem perform worse academically than students who are not addicted, and students who have high self-esteem. In contrast, Suárez-Perdomo et al., (2022) showed that there were differences in procrastination behaviour among students who had low, medium or high addiction levels to social networks, but there was no evidence to suggest that their addictions had any effect on their academic performance. An argument exists for social networks like Facebook® to be good eLearning tools, but Busalim et al., (2019) caution of social media's negative side.

While technology positively affects student learning, it negatively affects their mental health (Cai et al., 2024) . Crawford et al., (2024) supported this argument, and showed that AI chatbots negatively affected student performance as a whole when considering their psychosocial wellbeing as well. There is a direct relationship between tolerance levels for peer-aggressive humour and cyber-bullying (Zhu et al., 2024) , which

educational institutions would do well to note, and include a value about peer-aggressive humour and cyber-bullying in its code of conduct for students.

Technology can influence public perceptions, thus creating a strong relationship between technology and society (Vesa & Tienari, 2022) , and opening the door for fake news to sway society into a particular way of thinking. Gimpel et al., (2021) showed that society is more likely to report fake news when reminded about social norms and societal expectations. Unfried and Priebe, (2024) showed that health misinformation is more common than any other type of misinformation, and trusting unsuspecting individuals spread most misinformation. If more members of the public reported fake news to social media platform administrators, and if society could be taught to discern credible sources from untrustworthy ones, then we could reduce the incidence of fake news.

While anecdotal evidence suggested that AI would have a negative effect on physical, mental and psychological wellbeing, there is now evidence to support these claims. This literature has bearing on the research study, which also considers technology's influence on society.

(iic) Comparative analysis of findings vs literature

Literature supports the finding about social media leading to social engineering and misinformation. Technology can influence public perceptions (Vesa & Tienari, 2022) , but when reminded about social norms and societal expectations, society does the right thing (Gimpel et al., 2021) , and society's spread of misinformation is mostly unintentional (Unfried & Priebe, 2024) .

Crawford et al., (2024) , supported the finding that technology like AI chat-bots negatively affected human-to-human communication by showing that students who have fewer friends rely on AI much more than those who have the support of friends and family.

Zhu et al., (2024) support the finding about cyber-crime, and in particular cyber-bullying being an issue, and suggest that cyber-bullying can be effectively dealt with by institutions introducing social values that speak to cyber-bullying and peer-aggressive humour.

Another finding was about health risks associated with using technology. Literature supports the claim of technology addiction (Busalim et al., 2019) , but show contradictory evidence about whether it decreases student performance (Suárez-Perdomo et al., 2022) . This is probably an area for further research.

A finding of this study was about the length of time spent on technology platforms that result in health risks, with a participant referring to the risk as "sitting is the new smoking".

While research in this area exists, I could not locate any research in one of the acceptable journals in the last five years. This is therefore an area for further research.

(iid) Conclusion

In response to the question of the extent to which technology influences society, by considering the positive and negative effects of technology on societal values, the findings show that while there are many positive influences on society, we should not discard the negative influences.

Literature supports the finding about social media leading to social engineering and misinformation. Technology can influence public perceptions (Vesa & Tienari, 2022) , but when reminded about social norms and societal expectations, society does the right thing (Gimpel et al., 2021) , and society's spread of misinformation is mostly unintentional (Unfried & Priebe, 2024) .

Crawford et al., (2024) , supported the finding that technology caused human-to-human communication to deteriorate, and showed that students with fewer friends rely on AI chat-bots much more than those who have supportive friends and family.

Zhu et al., (2024) support the finding about cyber-crime being an issue, and suggest that institutions can effectively deal with cyber-bullying by introducing social values about cyber-bullying and peer-aggressive humour.

Another finding was about health risks associated with using technology. Literature supports the claim of technology addiction (Busalim et al., 2019) , but show contradictory evidence about whether it decreases student performance (Suárez-Perdomo et al., 2022) . This is probably an area for further research.

A finding of this study was about the length of time spent on technology platforms that result in health risks, with a participant referring to the risk as "sitting is the new smoking". While research has been done in this area, no research appeared in one of the acceptable journals in the last five years. This is therefore an area for further research.

6.2.2.1 How does technology influence society?

(i) Evolution of technology

The theme of the evolution of technology responds to the question of how technology influences society by considering the impact of two disruptors in the education sector: the Covid-19 pandemic and the introduction of AI while society was still emerging out of the pandemic.

(ia) Evidence to support evolution of technology from findings

Participants held similar views about the pandemic speeding up educational institutions' adoption of technology platforms. A participant pointed out that there was a reluctance to adopt technology platforms prior to the pandemic, but the adoption was quick during the pandemic as institutions had no other means of continuing teaching and learning. Participant UNI-2-01 said: *"The pandemic was a huge learning curve because we've been grappling with this issue of getting students to learn online or to embrace technologies, and to get academics to use technologies in learning and teaching spaces. But the pandemic sort of catapulted or pushed forward the opportunity that they were forced to embrace these technologies"*. Another participant mentioned the emergence of AI soon after the pandemic, and another participant talked about the uncertainty of the role that AI plays in teaching and learning, while another participant warned about the gap in AI's capability because it can play a role in the attainment of knowledge and skills, but it is not able to contribute to a learner's emotional development, and all of these elements are important for the holistic development of a learner. Participant PSET-3-01 said: *"We're dealing with students as humans, who have feelings, who have off days, who have things happening to them... AI will never be able to recognize that and help with that development of a person which is just as important as development of your knowledge and your skills"*.

In response to the question of how technology influences society, participants said that the pandemic sped up technology's adoption, and while educational institutions are still discussing how to adopt generative AI into teaching and learning, they must consider the gaps in AI's capability and factor this into society's desire to adopt AI.

(ib) Evidence to support evolution of technology from literature

Online learning has been around for many decades, but it was not until the Covid-19 pandemic that its critical importance was realised globally as technology became a necessity for continued learning during lockdown, forcing post-school educational institutions to adopt digital technologies in strategies to reshape the delivery of post-school education (Adedoyin & Soykan, 2023; Moja, 2021; Lovino, 2023; Jensen et al., 2020) . The researchers argue that the pandemic had many negative effects on society, but it had positively affected post-school education and training globally because it forced a shift to online learning. Currently, there are no educational theories or models in the field of AI-driven eLearning, and most research focus on studying phenomena like AI's use in assessments (Zawacki-Richter et al., 2019; Zhang & Aslan, 2021) , which makes implementation more complex.

There is a significant gap between AI's capabilities and what the educational sector is implementing (Bates et al., 2020) . Zhang and Aslan (2021) like Zawacki-Richter et al.,

(2019) argue that the education sector is slow to adopt technology, which will enrich students' learning experiences, and assist educational institution staff to better understand each student's learning journey. However, there are challenges that must first be resolved before institutions can implement many of these technologies. For successful implementation, hurdles such as educators' lack of expertise; lack of implementation policies and guidelines; ethics and privacy issues; and the associated costs of technologies, as well as institutions' abilities to scale implementation, must be addressed (Zhang and Aslan, 2021) .

Bates et al., (2020) argue that the PSET sector has barely scratched the surface of using AI for teaching and learning, because educational institutions have not embraced this new technology. Their argument is that for artificial intelligence to co-exist with educators, AI should perform the tasks of presenting, managing and testing content, while lecturers focus on developing students' skills, as well as providing the emotional connection that machines are incapable of doing (Bates et al., 2020) .

The discussion on AI technologies for education is an important one because AI is the current disruptor in education, and South African educational institutions are looking at ways in which to incorporate AI into teaching and learning. In South Africa, however, only 12 of the 22 universities had commenced with online teaching and learning six weeks into the lockdown, as many students did not have devices such as laptops, and data, and university staff lacked the expertise to run online classes (van Schalkwyk, 2021) . Van Schalkwyk (2021) observed that in a country like South Africa with a high inequality ratio, any attempt to implement new technologies will further increase the current inequalities.

Jafari (2024) showed how the positive effect of using human-centred AI (HAI), i.e. AI with ethical and human values embedded in its design, can connect on a personal level with students, by recognising and understanding negative human emotions and feelings in a learning environment, thus improving AI's role in teaching and learning by changing its approach to suit the student's needs. Once perfected, this innovation will take the usefulness of AI to a new level, and bring humans and technology closer together. Crawford et al., (2024) showed that the AI-human connection led to social withdrawal and dependence on technology among young students who had fewer friends, and questioned whether AI chatbots should provide social support to students, even if it has this capability.

(ic) Comparative analysis of findings vs literature

The finding that the pandemic catapulted educational institutions into eLearning is a phenomenon supported in literature by several researchers in different parts of the world (Adedoyin & Soykan, 2023; Moja, 2021; Lovino, 2023; Jensen et al., 2020) . Given many educational institutions' reluctance to adopt new technology (Bates et al., 2020; Zawacki-Richter et al., 2019; Zhang & Aslan, 2021) the pandemic served as a catalyst that forced change, which Bates (Bates et al., 2020) predicts that only some institutions will be able to maintain post the pandemic, and many institutions will return to contact teaching and learning. Findings of the research show that AI emerged too soon after the disruption of the pandemic, so uptake is slow and cautious. Literature suggests that the slow uptake could be linked to the many challenges that educational institutions must address (Zawacki-Richter et al., 2019; Zhang & Aslan, 2021) .

This study found that technology has gaps because it will not be able to develop a student holistically as it lacks the capability to understand human emotions. Bates (2020) supports this view, but new research into HAI shows that technology programmed with human values and ethics, has the capability of recognising and responding to human emotions in a teaching and learning environment (Jafari, 2024) , but the question remains whether technology should be assigned the task of social support even though it has this built-in capability (Crawford et al., 2024) .

(id) Conclusion

In response to the question of how technology influences society by considering the Covid-19 pandemic's impact and introducing AI soon thereafter, literature supports the findings that the pandemic sped up technology's adoption (Adedoyin & Soykan, 2023; Moja, 2021; Lovino, 2023; Jensen et al., 2020) , and the prediction is that most institutions will return to contact teaching and learning, with only some adopting eLearning (Bates et al., 2020) . A possible reason for this step back is to allow educational institutions time to address and overcome the many challenges that hinder implementing technology at educational institutions (Zawacki-Richter et al., 2019; Zhang & Aslan, 2021) .

Another finding of this study was that there are gaps in AI's capability, especially around AI recognising human emotions, that must be factored into society's adoption of it. While some researchers (Bates et al., 2020) support this view, new research (Jafari, 2024) shows that human-centred AI that has human values and ethics embedded in its algorithm, can identify and respond to human emotions, but the question remains that just because HAI has the capability of providing emotional support, should it be allowed to do so (Crawford et al., 2024) ?

(ii) Artificial intelligence and education

The theme of artificial intelligence and education responds to the question of how technology influences society by considering technology and AI's penetration into communities.

(iia) Evidence to support artificial intelligence and education from findings

In response to the question of how technology influences society, this theme explored technology and AI's penetration into communities. Participants individually supported the notion of AI penetration, but some participants grappled with how AI should be integrated into teaching and learning, and hence society at large. Participant UNI-1-01 said: *"If we are authentic and we say that we as a sector are preparing students for their careers and their professional lives, then we must prepare them to also use AI"*. Other participants showed possibilities of a brighter future with AI, and gave examples of how AI and virtual reality (VR) were already being incorporated into teaching and learning through health programmes. Participant PSET-2-01 said: *"These days in the health programmes, a lot of the learning happens through simulations, virtual reality, and there are certain courses that students can do using technology or mixed reality"*. Some participants talked about the need for agility in a fast-changing environment. Participant UNI-2-01: *"Things are changing at such a fast pace. We need to be agile and be willing to learn"*.

While AI seemed to threaten livelihoods and certain jobs, some felt that society should strive for a balance between humans and AI by defining what each was good at, and using that as a launchpad. Participant UNI-1-01: *"We'll have to find out what it is that humans can do better than what computers can do, and find out how we balance it"*.

(iib) Evidence to support artificial intelligence and education from literature

Technology's evolution from simple tools to complex machines capable of travelling in space and beaming back pictures of distant galaxies (Noble et al., 2022) , and technology's ability to create greater efficiencies and innovations (Audretsch et al., 2019) , has transformed many sectors. In recent years, "smart shelves, augmented and virtual reality, avatars and robots" has revolutionised the retail sector (Noble et al., 2022, p. 200) , bringing business, technology and society closer to one another. These new technologies are effective in teaching and learning, as educators prepare students for the world of work. One such example is using virtual reality to mimic a clinical pharmacy setup, for experiential learning in pharmacy education (Doğan & Şahin, 2024) . Technology has evolved so quickly that AI embedded with human values and ethics is able to recognise and respond to human emotions (Jafari, 2024) .

However, Bates et al., (2020) argue that the PSET sector has barely scratched the surface of using AI for teaching and learning, because educational institutions are slow to embrace this new technology, and Jafari (2024) supports this view. With the popularisation of generative AI like ChatGPT, PSET institutions are scrambling to develop AI policies that introduce technologies to improve the student journey (Chan, 2023) . Educators must re-think their role if AI and humans are to co-exist, with AI performing tasks like presenting, managing and testing content, while educators focus more on developing students' skills, and providing emotional support (Bates et al., 2020)

(iic) Comparative analysis of findings vs literature

Research findings show that while participants individually supported the notion of AI penetration, some participants grappled with the way AI should be integrated into teaching and learning, and hence society at large. Bates et al., (2020) and Jafari (2024), support these findings and argue that while technology's benefits are clear, educators are slow to adopt technology.

Another finding is that educators recognise that if students are to be adequately prepared for the work environment, then they must bring technology into teaching and learning. Noble et al., (2022) and Audretsch et al., (2019) show why technology belongs in the classroom by demonstrating the power of technology to transform sectors, while Doğan and Şahin (2024) and Jafari (2024) showed how AI technology can be applied at educational institutions, to enhance teaching and learning. Literature therefore supports the research findings.

Another finding in the research is about finding balance between AI and humans, and educators being agile and willing to learn to adopt technology. Bates et al., (2020) suggest that educators must change their mindsets by assigning tasks like presenting, managing and testing content to AI, while they focus more on developing students' skills, and providing emotional support. The desire for greater agility and willingness to learn is a noble one, which researchers like Bates et al., (2020) , Jafari, (2024) , and Chan (2023) support.

(iid) Conclusion

In response to the question of how technology influences society, this theme explored the penetration of technology and AI into communities. As the PSET sector is a microcosm of society, what happens in this sector influences the broader society.

Research findings show that while there was support for AI penetration in education, how AI should be integrated into teaching and learning, and hence society at large remained a puzzle. Bates et al., (2020) and Jafari (2024), who support this finding, argue that while the benefits of technology are clear, educators are slow to adopt technology.

Another finding is that educators recognise the need for technology to prepare learners for the workplace. Noble et al., (2022) and Audretsch et al., (2019) show why technology belongs in the classroom by demonstrating the power of technology to transform sectors, while Doğan and Şahin (2024) and Jafari (2024) showed how AI technology can be applied at educational institutions, to enhance teaching and learning.

Another research finding is about finding balance between AI and humans, and educators being agile and willing to learn to adopt technology. Bates et al., (2020) suggest that educators must change their mindsets by assigning tasks like presenting, managing and testing content to AI, while they focus more on developing students' skills, and providing emotional support. The desire for greater agility and willingness to learn is a noble one, which Bates et al., (2020) , Jafari, (2024) , and Chan (2023) support.

6.2.2.2 How does society benefit from the use of technology?

(i) Choosing a suitable technology platform

The question of how society benefits from technology's use is answered through the theme of choosing a suitable technology platform.

(ia) Evidence to support choosing a suitable technology platform from literature

Several participants talked about the student journey from a navigation perspective, an ability to set individual learning pathways, and making the learner the centre of the platform design. Participant SDP-2-01 said: *"The system needs to be designed in such a way that I can create individual learning paths"*, and SDP-4-01 added: *"...you have to have a very clear picture of the profile of your learners and be able to plan for those that are not able to operate effectively on the platform"*. A participant talked about user capacitation to utilise the platform's different functions, another talked about optimal learning experiences; and a third participant pointed out the gaps in technology's capability to provide an optimal learning experience. Participant PSET-3-01 commented: *"There are no ways you can do a cooking practical online, even if you take a video, where's your sense of taste and smell? So, eLearning cannot cover everything but where it can, it has to be strong"*. A participant also expressed an opinion on levelling the playing fields by offering society free technology platforms with free access to data, and argued that education was meant to be a public good, which big tech companies are exploiting. UNI-3-01 commented: *"Even if you put things for free on YouTube or somewhere else, people still need data to access it. And so, you are excluding communities from that"*.

In response to the question of how society benefits from using technology, the theme of choosing a suitable technology platform offered the following insights: Society would benefit from technology that took into account learners' individual journeys in their design; the platform cost was affordable or free where possible; the technology should be easy to navigate; society should be taught how to use the various platform functions; and free data should be provided where possible.

(ib) Evidence to support choosing a suitable technology platform from literature

AI (technology) tools are used in education to perform various functions (Zawacki-Richter et al., 2019) . Zhang and Aslan (2021) support this view and suggest a list of educational tools (see Figure 4) with application for teaching and learning. Students can experience AI through adaptive software that personalises their individual learning journeys while lecturers use AI tools for automated assessments; plagiarism detection; etc. (Zawacki-Richter et al., 2019) . With generative AI like ChatGPT, growing in popularity, PSET institutions are scrambling to develop AI policies that encourage using such technologies to improve the student journey (Chan, 2023) .

Bond et al., (2020) theorised that a student's level of engagement within her learning communities is comparable to her learning outcomes, while Trinh et al. (2023) showed that using technology to support student engagement elevated a student's performance. Hill (2019) argued that using an expert system not only allows for teaching and learning to be more student-centred, but it also promotes higher-level thinking and problem-solving, while satisfying students' needs for social and intellectual interactions through its chat and online forums. Roski et al. (2024) proposed that by following the Universal Design Learning (UDL) Guidelines to design learning platforms, students can choose their own learning pathways, and once chosen, they tend to stick to what works for them. However, because of the socio-economic conditions in South Africa, a single teaching and learning policy for all would not work, given the challenges of ICT access, network connectivity and society's level of digital literacy (Lembani et al., 2020) , which affects educational institutions' AI and technology adoption policies.

(ic) Comparative analysis of findings vs literature

The study found that society would benefit from technology that made the student the centre of the choice of platform, by considering learners' individual learning journeys. This finding was supported in literature by Chan, (2023); Bond et al., (2020) ; Trinh et al. (2023); Hill (2019); and Roski et al. (2024) who all showed the benefits of individualising student journeys. The finding about the ease of navigation of the platform is referenced by Roski et al. (2024) in the UDL guideline, which suggests that by following the UDL

guideline when designing a technology platform, it would automatically address the navigation considerations.

The finding about levelling the playing fields by offering society free technology platforms with free access to data, seeing that education was meant to be a public good, is supported by Lembani et al., (2020) who talked about the socio-economic divide and poor network connectivity in rural areas of South Africa.

Another finding was about capacitating users to utilise technology optimally, and identifying the gaps in technology's capability that prevents an optimal learning experience. Lembani et al.,(2020) supported the call for building capacity on using technology, by arguing that giving access to technology is not enough; digital literacy is important for society to be able to use technology optimally. Jafari (2024) argues that the gap between AI and humans is quickly narrowing, with the introduction of HAI that can recognise and respond to human emotions. It is only a matter of time when technology can provide for all human needs (Grinin et al., 2020) .

(id) Conclusion

The question of how society benefits from using technology is answered by choosing a suitable technology platform.

A study finding was that society would benefit from technology that made the student the centre of the choice of platform, by considering learners' individual learning journeys. Supporting literature by Chan, (2023); Bond et al., (2020) ; Trinh et al. (2023); Hill (2019); and Roski et al. (2024) showed the benefits of individualising student journeys. The finding about the ease of navigation of the platform is referenced by Roski et al. (2024) in the UDL guideline, which suggests that by following the UDL guideline when designing a technology platform, the navigation considerations would automatically be addressed.

The finding about levelling the playing fields by offering society free technology platforms with free access to data, seeing that education was meant to be a public good, is supported by Lembani et al., (2020) who said that the socio-economic divide and poor access to connectivity in rural areas perpetuates the digital divide.

Another finding was about user capacitation to utilise technology optimally, and the gaps in the technology capability preventing an optimal learning experience. Lembani et al.,(2020) supported the call for capacity building on using technology, by arguing that giving access to technology is not enough; digital literacy is important for society to use technology optimally. Jafari (2024) argues that the gap between AI and humans is quickly narrowing, by introducing HAI that can recognise and respond to human

emotions. It is only a matter of time when technology can provide for all human needs, when we reach the point of technological singularity (Grinin et al., 2020) .

(ii) Technology as an enabler of 21st century skills

The theme of technology as an enabler of 21st century skills answer the question of how society benefits from using technology, by looking at graduate attributes, skills and the world of work.

(iia) Evidence to support technology as an enabler of 21st century skills from findings

Several participants suggested graduate attributes (Table 24a) that would contribute to 21st century skills, and collaboration was a popular choice. Some participants mentioned that institutions determine a set of graduate attributes with which learners should leave the institution upon graduation. Participant UNI-2-01: *“What we want our students to leave the institution with, what are those attributes ... that academics need to ensure”*.

Another perspective was that the mindset of teaching should shift towards learning skills to be able to operate in a technologically driven world. Participant UNIT-1-01: *“That is the change that we require in our teaching philosophy to move from teaching to learning tasks, and design and facilitation of those learning tasks”*. A participant offered a perspective that students gravitate towards learning in small packets of information that was specific to a particular profession or job. Participant SDP-3-01 said: *“Teachers want smaller chunks of knowledge, small chunks of work, ... or a single learning pathway that they want to be capacitated on”*.

Also, technology was not separate from teaching and learning; it served to build learner competencies for effective functioning in the workplace. Similarly, another view was that technology was an enabler that would affect future generations. Some participants raised concern about technology making some jobs redundant, for which students should be prepared, but on the positive side, technology also created new jobs. Two participants gave examples of teaching and learning that included simulators and virtual reality to enhance teaching and learning, and another participant gave a real-life example of how this impacts the medical profession.

The question of how society benefits from using technology through the theme of technology as an enabler of 21st century skills, considered graduate attributes (Table 24a), skills and the world of work.

Participants across groups mentioned collaboration. Some participants mentioned that educational institutions also have a unique set of graduate attributes for their learners. These graduate attributes will assist the learner to function more effectively in the workplace. With respect to society benefitting from technology, benefits would be

derived from using new technologies like virtual reality and AI to create simulations of real-life situations in the workplace, and society would benefit from practising through simulations to perfect skills such as learning how to fly a plane, or performing a particular medical procedure. Technology is not separate from teaching and learning, but an integrated part of it, so learning with technology helps society function with technology in the workplace. Another benefit to society was to overhaul the thinking around teaching and learning to focus on learning skills, and learning in small chunks of information that provide information pertinent to a particular skill of job. Society could then learn at its own pace, and focus on what is important to master a particular skillset.

Another finding was that technology has developed so rapidly that it is expected to be as smart as a human brain by 2025. This implies that beyond 2025, technology will be smarter than humans, and society must keep abreast of technological developments to be able to function in this technology-driven world. Technology will replace humans in many jobs, so society must figure out its role alongside technology.

(iib) Evidence to support technology as an enabler of 21st century skills from literature

There was no literature about technological singularity in Chapter 2, so I followed the three steps listed in the introduction to find suitable literature. Most of the literature were either in books or conference papers, or from journals that are not listed as top journals, and were therefore not considered. The article referenced by the participant during the interview, was from an article on the Harvard University website, which again was not considered an appropriate reference point. However, Grinin et al., (2020) calculated the point of technology singularity to be 2106, and agreed that there were many limitations to this calculation that warranted further research. Bearing in mind that they did their calculation prior to the launch of generative AI like ChatGPT, it probably requires a revisit. We are entering an era when humans will combine their creativity and intelligence with the computing power of technology to personalise products for individuals (Bednar & Welch, 2020) . This insight is important for the education sector because it produces the next generation of employees and entrepreneurs who will be collaborating more intimately with technology. Whether the singularity point is 2025 or 2106 is not as important as society working out the roles to assign to technology and the roles that humans will play in this new technologically-driven world.

Similarly in education, using generative AI tools like ChatGPT can inspire students to be more innovative (Romero-Rodríguez et al., 2023) . For AI to co-exist with educators, lecturers should consider assigning the tasks of presenting, managing and testing content to technology, and focus their efforts on developing students' skills, as well as providing emotional support that technology is incapable of doing (Bates et al., 2020) .

The role of the lecturer is therefore being re-focused, which may require re-training or capacity development to change educators' mindsets.

There was no literature on packaging education into small packets of information in Chapter 2. I conducted a literature search following the three steps mentioned in the introduction, and found two articles on massive open online courses (MOOCs). Razmerita et al., (2020) found that collaboration and group work in MOOCs improved student engagement and resulted in higher retention rates, while Carannante et al., (2021) studied how students' behaviour can affect their performance with MOOCs. MOOCs can be designed to serve any educational requirement.

Values are intrinsic in humans to do "what is good or desirable" (van de Poel, 2020, pp. 87–88) , that are "guiding principles" (Schwartz, 1994) . Values are therefore what drive us as individuals, to make choices. The relationship between personal values and ethical decision-making influences the decisions, behaviours and actions of society (Weber, 2019) . Technology has embedded values (Klenk, 2021; van de Poel, 2020), which Miller (2021) argues are moral and political values embedded in its design, with long-term implications, and should therefore be carefully considered during the design phase. Technology therefore, should not be evaluated on its physical attributes only, but also on its purpose (Heyndels, 2023) . Abernethy et al., (2024,) point out that despite several researchers referencing technology's embedded values, it is only in the present-day that AI technology is associated with human values. The debate about ethical guidelines for AI is far from over (Holmes et al., 2022; Nguyen et al., 2023) , despite already having several available guidelines (Hagendorff, 2020), and one of the reasons for this lack of clarity about AI ethical guidelines is that one set of guidelines will not be applicable to all (Nguyen et al., 2023) . It is therefore very important for these values to be transparent so that society, and in particular students and educators, can understand its reasoning and decision-making process (den Hond & Moser, 2023; Jafari, 2024) . This is especially true for HAI, which has ethical and human values embedded in its design, to recognise and respond to human emotions in a learning environment (Jafari, 2024) .

(iic) Comparative analysis of findings vs literature

One of this study's findings is a list of graduate attributes (Table 24a) that contribute to 21st century skills. These graduate attributes are synonymous with human values (Schwartz, 1994; van de Poel, 2020) . Literature shows lists of values embedded in technology platforms, but has not shown a list of human values that would contribute to 21st century skills, if embedded in eLearning programmes hosted on eLearning platforms.

Another finding was that the mindset of teaching should shift towards learning skills to operate in a technologically driven world. Literature supports this view, and even recommends which tasks lecturers should focus on, and which tasks can be outsourced to technology (Bates et al., 2020) .

Another finding was that students gravitate towards learning in small packets of information that was specific to a particular profession or job. MOOCs can be designed to serve this educational requirement, as it can be made more effective through collaboration, group work, and encouraging the right behaviours in students to enhance performance (Carannante et al., 2021; Razmerita et al., 2020) .

Another finding was that technology has developed so rapidly that it is expected to be as smart as a human brain by 2025. On the point of technological singularity, I could not verify the participant's claim as the source of this claim was not in a top-rated journal. Grinin et al., (2020) calculated the point of technology singularity to be 2106, but they did their calculation prior to the launch of generative AI like ChatGPT, so it may be outdated. Irrespective of when we reach technological singularity, we are entering an era of technology-human collaboration (Bednar & Welch, 2020) . This insight is important for the education sector because it produces the next generation of employees and entrepreneurs who will be collaborating more intimately with technology. Society needs to decide on the roles to assign to technology and the roles that humans will play in this new technologically-driven world.

(iid) Conclusion

This study contributed a list of graduate attributes (Table 24a) for 21st century skills. These graduate attributes are synonymous with human values (Schwartz, 1994; van de Poel, 2020) . The list of graduate attributes (Table 24a) contributes to the theoretical body of knowledge. While current research focuses on the values that are embedded in technology platforms, there is no current literature on a direct link with graduate attributes that should be embedded in eLearning programmes hosted on eLearning platforms, that will lead to students gaining 21st century skills.

Another finding was for the teaching mindset to shift towards learning skills to operate in a technologically driven world. Literature supports this view, and even recommends which tasks lecturers should focus on, and which tasks can be outsourced to technology (Bates et al., 2020) .

Another finding was that students would move towards learning in small packets of information that was specific to a particular profession or job. MOOCs can be designed to serve this educational requirement, as it can be made more effective through

collaboration, group work, and encouraging the right behaviours in students to enhance performance (Carannante et al., 2021; Razmerita et al., 2020) .

Another finding was that technology has developed so rapidly that it is expected to be as smart as a human brain by 2025. While the claim could not be verified, Grinin et al., (2020) calculated the point of technology singularity to be 2106, but their calculation may be out-dated as it does not account for generative AI like ChatGPT. Irrespective of when we reach technological singularity, we are entering an era of technology-human collaboration (Bednar & Welch, 2020) . This insight is important for the education sector because it produces the next generation of employees and entrepreneurs who will be collaborating more intimately with technology. Society needs to decide on the roles to assign to technology and the roles that humans will play in this new technologically-driven world.

6.3 Conclusion

The purpose of this chapter is to triangulate the research findings with extant literature, to find areas of similarities, differences or gaps in the literature.

6.3.1 How are the values that are embedded in technology, selected?

(i) Platform design and criteria influencing student journey

Literature supported the findings that eLearning platforms needed a student-centric design to enhance the student journey, by proposing that platform designers use the UDL guideline when designing eLearning platforms (Roski et al., 2024) and that student engagement was necessary for a successful student journey (Bond et al., 2020). Different eLearning platforms influenced the student journey differently (Hill, 2019; Trinh et al., 2023) , but irrespective of the choice of platform, eLearning continuance was key to student success (Al-Samarraie et al., 2018) .

By extending the learner-centred approach to assessments, the incidence of cheating can be reduced (Rüth et al., 2024) , which could be an important step towards reducing the need for proctoring tools during assessments, which raise questions about fairness or equity (K. Lee & Fanguy, 2022) . Assessment-on-demand is an extension to the student-centric approach to platform design that promotes flexibility in the student journey, if implemented. Literature did not mention this finding, and it is therefore a contribution to the body of theoretical knowledge, which should be an area for further research.

The findings of this study show that when selecting values to be embedded in technology stakeholders should consider technology's beneficiaries, which in this case are students, and designing the technology with the student needs in mind encourages students to use the technology platform, which is a step towards a successful outcome. This finding

therefore contributes to the body of knowledge about value selection during the design phase of technology.

(ii) Balancing online and face-to-face learning

This study found that the concept of embedding values into eLearning platforms was better expressed by referring to values being embedded into eLearning programmes offered on eLearning platforms. Literature supports this confusion as it was only with the advent of AI that the association of values with technology has become more widespread (Abernethy et al., 2024) . However, there is ample literature to support the view that technology has embedded values (Heyndels, 2023; Klenk, 2021; Miller, 2021; van de Poel, 2020) . I could not validate the finding that face-to-face learning and eLearning programmes shared the same values, and this is therefore an area for further research as it questions the role of the intrinsic values embedded in eLearning platforms that offers an eLearning programme versus a lecturer offering a similar programme in class. I could also not validate using storytelling as a tool to instil values in students, and this is also an area for further research, especially in relation to storytelling in the PSET sector. However, it is an interesting finding that could add to the body of knowledge of ways in which to instil values.

In answering the question of how values are selected from an online versus face-to-face learning pedagogy, this study found that the value selection for both programmes were similar as educational institutions seem to only consider values from the perspective of embedding them into programmes and not the mode of delivery, which in the case of eLearning, would be technology platforms that have built-in values, and in the case of face-to-face learning, would be the lecturer's values. Further research should be done into how the mode of delivery (eLearning versus face-to-face) affects values' influence on students, and if students using either mode have been exposed to the same values at the end of their learning.

(iii) Technology as an enabler of 21st century skills

The findings show that educational institutions favour using AI in education, despite the challenges of the risks of cheating and plagiarism. Literature provided ways of reducing the inclination towards cheating by making assessments more relevant to student needs and their future careers (Rüth et al., 2024) , making the use of proctoring tools fair (K. Lee & Fanguy, 2022) , and developing AI policies to deal with cheating and plagiarism (Chan, 2023) . However, Bates et al., (2020) and Jafari (2024) argue that the PSET sector has barely scratched the surface of using artificial intelligence for teaching and learning, and despite evidence to the contrary, educational institution staff were reluctant to introduce new technologies into teaching and learning.

Participants contributed towards a list of values that should be embedded in eLearning programmes and platforms (Table 10a). The list of values could vary according to specific profession requirements. This list adds to the values found in existing AI guidelines (Hagendorff, 2020) , and educational institutions could also consider it when developing their unique AI guidelines (Chan, 2023; Nguyen et al., 2023) . A participant suggested that some institutions may consider deliberately teaching the values of plagiarism, integrity and digital literacy over and beyond just embedding them in the eLearning platform.

Literature supported the findings that called for greater transparency around the values embedded in eLearning platforms (den Hond & Moser, 2023; Jafari, 2024) .

Another finding was to include incentives as an embedded value, to motivate learners to complete their eLearning programmes, which was supported in literature by Lee and Yeung (2022) ; Chevalier et al., (2018) ; and Mbiti et al., (2019) who all showed that offering the right incentives does improve student success rates.

The implications of these findings are that this study confirms educational institutions' willingness to adopt AI, despite the challenges that threaten its adoption; the study added a list of values educational institution consideration when they are developing their own technology policies, which adds to the body of knowledge about values embedded in technology platforms; it adds to the call for greater transparency around the values embedded in technology platforms; and it recommends adding incentives as an embedded value to improve student success rates.

6.3.1.1 What purpose does technology serve?

(i) Evolution of technology

There is a contradiction between the findings of this study and the literature, about the perception of the role of technology. While participants said that technology is a tool (McOmber, 1999) or supplementary aid, literature suggests that modern-day technology is value-laden (Miller, 2021) . Participants have made a connection between technology and values, but they struggled to see how values were embedded in technology (den Hond & Moser, 2023; Miller, 2021) and how these values influenced society (den Hond & Moser, 2023; Vesa & Tienari, 2022) , especially because they saw eLearning programmes and platforms as an integrated unit (see finding in 6.2.1 ii).

The findings show several examples of how technology has evolved and how using technology in teaching and learning has evolved parallelly, even though at a slower pace. Literature supports this finding. Even though distance education institutions incorporate new web-based technologies into teaching and learning (De Nito et al., 2023) , the

education sector is slow to respond, despite substantial evidence that shows technology's positive impact on education (Garzón & Acevedo, 2019) , and the greater efficiencies and disruptive innovations that they bring (Audretsch et al., 2019) . Physical constraints like network connectivity; inadequate or no technology policies; and staff technological capabilities continue to hamper technology's adoption in the education sector (Onu et al., 2024) .

The implications of the first finding that is contradicted in the literature suggests that educators have not made the connection between the intrinsic values embedded in technology platforms, interacting with the values embedded in eLearning programmes that are hosted on eLearning platforms, and how all of this as an integrated unit, influences students and society. It is worth exploring this finding deeper because to truly understand how the values embedded in technology influence society, both the known values from eLearning programmes and the hidden values embedded in the platform must be considered together. This insight is a valuable contribution to the existing body of knowledge, and warrants further research.

Implications of the finding on the slow pace of adopting technology and the challenges faced by educational institutions draws attention to the willingness of educational institutions to adopt technology, but the challenges that they face are holding them back. To move forward, educational institutions must capacitate their staff about new technologies; develop their technology policies; and resolve the network connectivity issues (Onu et al., 2024) .

[\(ii\) Balancing online and face-to-face learning](#)

Literature supported the finding that eLearning programmes offered flexible and self-paced learning, which face-to-face learning did not offer, especially if the eLearning platform had been intentionally designed, which referred to the Universal Design for Learning (UDL) that enables students to determine their own learning pathways, and learn at their own pace (Roski et al., 2024) . Another finding was that academics sometimes used the programme designed for face-to-face teaching and learning, online, which affected the quality of online teaching and learning, and negatively impacted student success. If educational institutions do not implement the UDL for eLearning, then students may have difficulty navigating content that was designed for the classroom. This finding offers a plausible explanation for a finding in 6.2.1.1(i) above where participants saw technology as a tool, and saw the values in programmes offered through contact teaching and learning as the same as values in programmes offered through technology platforms. If educators are using the same learning material for both modes

of delivery, then the finding makes sense, but if the UDL is followed for online eLearning, then there should be a difference in the embedded values.

Another finding of the study was that the purpose of technology from an eLearning and face-to-face perspective, is to support teaching and learning irrespective of its mode of delivery, since even in face-to-face teaching and learning, technology platforms are still used for communication, collaboration, and sharing learning materials. The literature shows that lecturers were divided on which mode of learning and teaching better supported communication; and were divided on their preference of mode of teaching and learning (Jensen et al., 2020). Students too had their preferences for online or in-person lectures, with some preferring to have the option of both (Feubli et al., 2024) , showing that both modes had their strengths and weaknesses (Orhan, 2024) .

I could not find literature to confirm the last finding on eLearning allowing for an increase in cohort size as a cost-effective alternative to educating large numbers of students in physical classes. This finding therefore contributes to the body of knowledge about eLearning. An investigation into eLearning platforms supporting increased cohort sizes is an area for further research. This idea could be extended to look at the cost implications of offering eLearning to large cohorts of students through contact classes and eLearning as a comparative study.

Literature supported the first finding that eLearning programmes offered flexible and self-paced learning, and therefore this finding confirms the current body of knowledge about eLearning programmes. Another finding was that academics sometimes used the programme designed for face-to-face teaching and learning, online, which affected the quality of online teaching and learning, and negatively impacted student success. The implication of this finding is that some educational institutions do not see a difference between offering teaching and learning, and in a classroom, which impacts on student success in the online environment. Another finding of the study was that the purpose of technology from an eLearning and face-to-face perspective, is to support teaching and learning irrespective of its mode of delivery. This finding supports the current body of knowledge.

(iii) Artificial intelligence and education

The study showed that education institutions in general wanted to adopt AI, but the education sector is slow to adopt technology. Literature supports this finding with Zhang and Aslan (2021) arguing that despite a variety of AI tools being available (see Figure 4), the education sector is slow to adopt any of them, which Bates et al., (2020) blame on educational institutions not embracing new technology.

This study also found that AI is already being used in the education sector, particularly in health programmes that use simulations and virtual reality, and to develop learning programmes. Literature supports these findings. AI technology tools are used in education to perform functions such as intelligent tutoring; collaborative learning; and scenario simulations, while also personalising a student's learning journey (Zawacki-Richter et al., 2019). Zhang and Aslan (2021) suggest that there are a variety of AI tools with innovative applications and functions (see Figure 4), but like Bates et al., (2020), believe that technology adoption in the education sector is slow.

Another finding of this study is that technology is integrated with teaching and learning, and cannot be separated from one another. Literature supports this view with Miller (2021) arguing that technology has moral and political values embedded in its design, which has long-term implications. Technology therefore, should not be evaluated on its physical attributes only, but also on its purpose (Heyndels, 2023). One could argue that integrating technology with teaching and learning follows the same logic, since values are instilled into learning programmes, which are then offered on eLearning platforms with intrinsic embedded values. The evaluation of eLearning programmes offered on technology platforms should be evaluated collectively on its physical attributes, function and purpose.

Implications of these findings are that they confirm the current body of knowledge of AI in education.

6.3.1.2 Which stakeholders were consulted in its development?

(i) Role players in determining values and regulatory oversight

Findings from this research show the list of stakeholders from the South African PSET sector, who are involved in choosing the values to be embedded in eLearning platforms with eLearning programmes. Literature shows that there is a lack of transparency around which stakeholders are involved in choosing the values to be embedded in technology, (den Hond & Moser, 2023). The finding therefore contradicts literature. The list of stakeholders consulted generated through the study maps closely to the list of stakeholders that Noble et al., (2022), outlined, as those stakeholders who should be consulted. The findings show that the role-players involved differ per educational institution, although some role-players are included in consultations at all institutions. There is no relevant literature from the education sector in top journals over the last five years, that either supports or refutes the study's findings. The list of stakeholders consulted (Table 14a) may therefore be a new contribution to the existing body of knowledge about transparency relating to the stakeholders involved in determining the

values that are embedded into eLearning programmes offered through technology platforms.

6.3.1.3 How were the final values for the technology selected?

(i) Role players in determining values and regulatory oversight

The study's findings attempt to answer the question of who the final decision-maker is. Based on the responses, it could be one or groups of any number of stakeholders listed in Table 15a. This would suggest that the decision-making process is not well understood; the process is relaxed enough to allow for different decision-makers; or institutions are making decisions about values without proper consultation or governance. Literature is calling for transparency around who these decision-makers are (Dafoe, 2015; D'Cruz et al., 2022; den Hond & Moser, 2023; Noble et al., 2022) . While Table 15a provides a start, further research is required to answer this question with more certainty. The implications of the finding are therefore a contribution to the existing body of knowledge, that requires further research.

6.3.1.4 How could these values be changed?

(i) Role players in determining values and regulatory oversight

The findings of this study attempt to provide an answer to the question that den Hond and Moser (2023) raised about whether changes can be made to an eLearning programme on an eLearning platform after it has been approved. The findings of the study show that the answer to this question is affirmative, as up to 50% of the content can be changed without having to revert to the regulatory body. Participants were divided on whether changes should be made to an eLearning programme after it has been approved, with some opposing further changes, and others recognising the need for change to keep up with environmental changes. Stakeholder requests for changes had to be vetted in terms of the importance of the stakeholder and the relevance of the requested changes. This finding adds to the body of knowledge about changing values on technology platforms after they have been embedded.

6.3.1.5 How is the data gathered through technology, used and protected?

(i) Data protection and ethical considerations

Findings show that educational institutions follow government legislation for data security, and have controlled access control to student data. Some institutions rely on third parties to protect data hosted in the cloud. There was a concern that data security at educational institutions is not as good as it should be. Literature supports these findings. Education systems containing big data have inadequate privacy and security, that compromises student data (Daniel, 2019) . There should be a cautionary approach to data security (Noble et al., 2022) and challenges with data privacy, consent and the lack of transparency in data collection result in ethical issues (Flyverbom et al., 2019) .

With data being stored in the cloud, data privacy requires global ethical guidelines and codes to access educational data, and institutions need data governance models and policies that determine the conditions under which student data can be used (Daniel, 2019) .

Another finding of the study is that while educational institutions possess huge amounts of student data, the data is not used optimally. There were suggestions of student tracking and using student data for research, but there was much more potential to make better use of the data. There should be transparency about student data protection and use, and data should only be used for purposes for which student permission had been granted. Literature supports these findings about educational institutions collecting of vast amounts of data, but focuses on the potential use of this data with the advent of AI (Bates et al., 2020) . Businesses' desire is to use data to personalise product advertising (Noble et al., 2022) . Caution should be exercised as AI can make biased and discriminatory decisions, (Martin et al., 2019) , and institutions are accountable for these decisions (D'Cruz et al., 2022) . Zhang and Aslan (2021) suggest that AI tools can assist teachers and administrators to better understand individual student journeys by using student data to track progress and make predictions about student progress for early interventions (Gray & Perkins, 2019; Riestra-González et al., 2021) , of cohorts of students across the institution (Zawacki-Richter et al., 2019) . While South African institutions may not have reached this level of sophistication in terms of using student data, the potential to do so exists, and literature points to what should be considered when that time comes.

The third finding is that not only do educators and students have differences of understandings about AI and technology, but there may be different understandings among educators themselves, and perhaps capacity development should begin with institution staff. These findings are supported in literature (Lim et al., 2022) .

Implications of these findings are that all three findings add to the body of knowledge about data protection, data privacy and use.

6.3.1.6 How is technology evaluated?

(i) Choosing a suitable technology platform

The first finding is a list of criteria for evaluating a technology platform (Table 18a), which literature supports (Zhang and Aslan, 2021; Bates et al., 2020; Trinh et al., 2023; Hill, 2019; Mpungose, 2020; Jensen et al., 2020; Al-Samarraie et al, 2018) . The evaluation criteria for the eLearning technology platform is important in determining the intrinsic values that are embedded in technology, before the adding the eLearning programme values. The most important consideration should be student-centredness and it is

therefore important for an institution to consult all stakeholders before investing in a technology platform. Another finding is that the actual users of the eLearning platform did not participate in choosing the eLearning platform. This finding ties back to the finding in 6.2.1.3 relating to the role-players involved in deciding on the values to be embedded in technology. Another finding related to the choice between open-source versus proprietary technology in terms of costs, and considering education being a public good, which is covered in the list of criteria in Table 18a.

The study contributes a set of evaluation criteria for technology platforms, which can add to the body of knowledge about evaluation criteria.

6.3.1.7 Conclusion for Research Question 1: How are values that are embedded in technology, selected?

When designing the technology platform, the UDL guideline should be used (Roski et al., 2024) with consideration for student engagement and the student journey (Bond et al., 2020), that encouraged eLearning continuance (Al-Samarraie et al., 2018). By extending the learner-centred approach to assessments, the incidence of cheating can be reduced (Rüth et al., 2024). Literature did not mention assessments-on-demand as an extension to the student-centric approach to platform design, and is therefore a contribution to the body of knowledge, which should be an area for further research. The findings of this study show that the values selected for embedding in technology should consider the students, and designing the technology with the student needs in mind encourages students to use the technology platform towards a successful outcome. This finding therefore contributes to the body of knowledge about value selection during the design phase of technology.

Embedding values into eLearning platforms was alternatively expressed by referring to values being embedded into eLearning programmes offered on eLearning platforms. In answering the question of how values are selected from an online versus face-to-face learning pedagogy, this study found that the value selection for both programmes were similar as educational institutions seem to only consider values from the perspective of embedding them into programmes and not the mode of delivery, which in the case of eLearning, would be technology platforms that have built-in values, and in the case of face-to-face learning, would be the lecturer's values. However, I could not verify the finding that face-to-face learning and eLearning programmes shared the same values, and it is therefore an area for further research, as it questions the role of the intrinsic values embedded in eLearning platforms that offers an eLearning programme versus the lecturer offering a similar programme in class.

Another finding was that academics sometimes used the programme designed for face-to-face teaching and learning, online, which affected the quality of online teaching and learning, and negatively impacted student success. This finding offers a plausible explanation for the finding that technology was a tool, because the values in programmes offered through face-to-face teaching and learning are the same as values in programmes offered through technology platforms, if the mode of delivery is ignored. If educators are using the same learning material for both modes of delivery, then the finding makes sense, but if institutions follow the UDL for online eLearning, then there should be a difference in the embedded values.

Another finding of the study was that the purpose of technology from an eLearning and face-to-face perspective, is to support teaching and learning irrespective of its mode of delivery, since even in face-to-face teaching and learning, technology platforms are still used for communication, collaboration, and sharing learning materials. The literature shows that lecturers were divided on their preference of mode of teaching and learning (Jensen et al., 2020). Students too had their preferences for online or in-person lectures, with some preferring to have the option of both (Feubli et al., 2024) , showing that both modes had their strengths and weaknesses (Orhan, 2024) . The study contributed towards a list of values that could be embedded in eLearning programmes and platforms (Table 10a), which may vary by profession, contributes to the values found in existing AI guidelines (Hagendorff, 2020) , and educational institutions could also consider when developing their unique AI guidelines (Chan, 2023; Nguyen et al., 2023) . Another finding was the recommendation to include incentives as an embedded value, to motivate learners to complete their eLearning programmes, which literature supported (Chevalier et al., 2018; Y. H. Lee & Yeung, 2022; Mbiti et al., 2019) . The findings, supported by literature, called for greater transparency around the values embedded in eLearning platforms (den Hond & Moser, 2023; Jafari, 2024) .

To better understand how values were selected to be embedded into technology platforms, a greater understanding of the purpose of technology in the PSET sector was needed. There is a contradiction between the findings of this study and the literature, in terms of the perception of the role of technology, as the finding is that technology is a tool (McOmber, 1999) or supplementary aid, and literature suggests that modern-day technology is value-laden (Miller, 2021) . Participants made a connection between technology and values, but they struggled to see how values were embedded in technology (den Hond & Moser, 2023; Miller, 2021) and how these values influenced society (den Hond & Moser, 2023; Vesa & Tienari, 2022) , especially because they saw eLearning programmes and platforms as an integrated unit (see finding in 6.2.1 ii), and they

understood values being embedded into eLearning programmes. The implications of the first finding that is contradicted in the literature suggests that educators have not made the connection between the intrinsic values embedded in technology platforms, interacting with the values embedded in eLearning programmes that are hosted on eLearning platforms, and how all of this as an integrated unit, influences students and society. It is worth exploring this finding deeper because to truly understand how the values embedded in technology influence society, both the known values from eLearning programmes and the hidden values embedded in the platform must be considered together. This insight is a valuable contribution to the existing body of knowledge, and warrants further research.

The finding on the slow pace of technology adoption and the challenges that educational institutions face draws attention to educational institutions' willingness to adopt technology, but the challenges that they face are holding them back. Bates et al., (2020) and Jafari (2024) argue that the PSET sector has barely scratched the surface of using artificial intelligence for teaching and learning, and despite evidence to the contrary, educational institution staff were reluctant to introduce new technologies into teaching and learning. To move forward, educational institutions must capacitate their staff about new technologies; develop their technology policies; and resolve the network connectivity issues (Onu et al., 2024) .

Another finding on eLearning supporting an increase in cohort size as a cost-effective alternative to educating large numbers of students in classrooms, could not be confirmed in literature. This finding is therefore a contribution to the body of knowledge about eLearning. An investigation into eLearning platforms supporting increased cohort sizes is an area for further research. This idea could be extended to look at the cost implications of offering eLearning to large cohorts of students through contact classes and eLearning as a comparative study.

The study showed that education institutions in general supported the adoption of AI, even though they were slow to implement it. This finding is supported in literature (Zhang & Aslan, 2021) . This study also found that AI is already being used in the education sector, particularly in health programmes that use of simulations and virtual reality, which literature supports (Zawacki-Richter et al., 2019) . Another finding of this study is that technology is integrated with teaching and learning, and cannot be separated from one another. Literature supports this view with Miller (2021) arguing that technology has moral and political values embedded in its design, which has long-term implications. The evaluation of eLearning programmes offered on technology platforms should be evaluated collectively on its physical attributes, function and purpose.

Another dimension to understanding how the values embedded in technology is selected, is to understand which stakeholders were consulted, who were the final decision-makers, and if values could be changed after they were embedded, could they, and who would make that decision? Findings from this research show the list of stakeholders from the PSET sector in South Africa, who are involved in choosing the values to be embedded in eLearning platforms with eLearning programmes. Literature shows that there is a lack of transparency around which stakeholders are involved in choosing the values to be embedded in technology, (den Hond & Moser, 2023) . The finding therefore contradicts literature. The list of stakeholders consulted generated through the study maps closely to the list of stakeholders outlined by Noble et al., (2022) , as the stakeholders who should be consulted. The findings show that the role-players involved differ per educational institution, although some role-players are included in consultations at all institutions. There is no relevant literature from the education sector in top journals over the last five years, that either supports or refutes the findings of this study. The list of stakeholders consulted (Table 14a) may therefore be a new contribution to the existing body of knowledge about transparency relating to the stakeholders involved in determining the values that are embedded into eLearning programmes offered through technology platforms.

The findings of this study attempt to provide an answer to the question of who the final decision-maker is. Based on the responses, it could be one or groups of any number of stakeholders listed in Table 15a. This would suggest that the decision-making process is not well understood; the process is relaxed enough to allow for different decision-makers; or institutions are making decisions about values without proper consultation or governance. Literature is calling for transparency around who these decision-makers are (Dafoe, 2015; D’Cruz et al., 2022; den Hond & Moser, 2023; Noble et al., 2022) . While Table 15a provides a start, further research is required to answer this question with more certainty. The implications of the finding are therefore a contribution to the existing body of knowledge, that requires further research.

The study attempts to provide an answer to the question raised by den Hond and Moser (2023) about whether changes can be made after it has been approved. The findings of the study show that the answer to this question is affirmative, as up to 50% of the content can be changed without having to revert to the regulatory body. Participants were divided on whether changes should be made to an eLearning programme after it has been approved, with some opposing further changes, and others recognising the need for change to keep up with environmental changes. Requests for changes from stakeholders had to be vetted in terms of the importance of the stakeholder and the

relevance of the requested changes. This finding adds to the body of knowledge about changing values on technology platforms after they have been embedded.

Another dimension to responding to the question on how the values embedded in technology are selected, involves data protection and the use of data. Findings show that educational institutions follow government legislation for data security, and have controlled access control to student data. Some institutions rely on third parties to protect data hosted in the cloud. There was a concern that data security at educational institutions is not as good as it should be. Literature supports these findings, as education systems containing big data have inadequate privacy and security, that compromises student data (Daniel, 2019) . There should be a cautionary approach to data security (Noble et al., 2022) and challenges with data privacy, consent and the lack of transparency in data collection result in ethical issues (Flyverbom et al., 2019) . With data being stored in the cloud, data privacy requires global ethical guidelines and codes to access educational data, and institutions need data governance models and policies that determine the conditions under which student data can be used (Daniel, 2019) .

Another finding of the study is that while educational institutions possess huge amounts of student data, the data is not used optimally. Literature focuses on the potential use of this data with the advent of AI (Bates et al., 2020) . The third finding is that not only are there differences of understandings about AI and technology among educators and students, but there may be different understandings among educators themselves, and perhaps capacity development should begin with institution staff. These findings are supported in literature (Lim et al., 2022) .

The last consideration to responding to the question on how values that are embedded in technology are selected, is to consider the criteria used to evaluate technology platforms. The first finding is a list of criteria for evaluating a technology platform (Table 18a), which is supported by literature (Zhang and Aslan, 2021; Bates et al., 2020; Trinh et al., 2023; Hill, 2019; Mpungose, 2020; Jensen et al., 2020; Al-Samarraie et al, 2018) . The evaluation criteria used to evaluate the eLearning technology platform is important in determining the intrinsic values that are embedded in technology, before the eLearning programme with its values are added. The most important consideration should be student-centredness and it is therefore important for all stakeholders, including students, to be consulted before an institution invests in a technology platform. This study contributes a set of evaluation criteria for technology platforms, which can add to the body of knowledge about evaluation criteria.

6.3.2 To what extent does technology influence society?

(i) Access and equity of e-learning

A finding of this study was that young people who grow up with technology are more accustomed to it and are more likely to respond positively to eLearning. Literature supports this view (Hurwitz & Schmitt, 2020) and shows that the more digitally fluent students have greater flexibility in their response to change, and are more likely to work well collaboratively (Barak, 2018), but exposure to technology at an early age does not guarantee digital fluency, as it depends on the way in which technology was used at a young age that determines the type of digital skills that were developed, and this places students on either side of a digital divide (Corkin et al., 2022).

Another finding was that access to technology benefits society by providing instantaneous information that is current and can be accessed in large volumes or small chunks, to suit the individual's preferences. Technology has also provided opportunities for eLearning to individuals irrespective of where they are located. While providing access to the IOT is possible (Novo, 2018), having access does not mean that students are willing to study online, as student preferences vary, depending on their personal circumstances and choices (Chakraborty et al., 2021; Feubli et al., 2024). South Africa also has connectivity issues (van Schalkwyk, 2021), and even when these issues have been resolved, the issues of access to devices to benefit from technologies, must also be resolved (Lembani et al., 2020; Sutherland, 2020). However, South Africa is not unique in its challenges that hamper technology's adoption (Onu et al., 2024), and Van Schalkwyk, in a way, is justifying the lag in implementation of new technologies by arguing that new technologies benefit parts of society, while plunging the rest of society further into poverty by widening the digital and knowledge gaps.

These findings add to the body of existing knowledge about the challenges of accessing eLearning, and the choices that students make based on their personal circumstances.

(ii) Technological advancement vs societal values

In response to the question of the extent to which technology influences society, by considering technology's positive and negative effects on societal values, the findings show that while there are many positive influences on society, the negative influences should not be discarded.

The finding about social media leading to social engineering and misinformation has been supported in the literature. Technology can influence public perceptions (Vesa & Tienari, 2022), but when reminded about social norms and societal expectations, society does the right thing (Gimpel et al., 2021), and the spread of misinformation is mostly unintentional by society in general (Unfried & Priebe, 2024).

The finding that human-human communication deteriorating because of AI chatbots was supported in literature by Crawford et al., (2024) , who showed that students who have fewer friends rely on AI much more than those who have the support of friends and family.

The finding about cyber-crime being an issue, is supported by Zhu et al., (2024) who suggest that cyber-bullying can be effectively dealt with by institutions introducing social values that speak to cyber-bullying and peer-aggressive humour.

Another finding was about health risks associated with using technology. Literature supports the claim of technology addiction (Busalim et al., 2019) , but show contradictory evidence about whether it decreases student performance (Suárez-Perdomo et al., 2022) . This is probably an area for further research.

A finding of this study was about the length of time spent on technology platforms that result in health risks, with a participant referring to the risk as “sitting is the new smoking”. While research has been done in this area, none of the research was published in one of the acceptable journals. This is therefore an area for further research.

The Implications of these findings are that they contribute to the existing body of knowledge on technological advancement vs societal values. The finding about health risks associated with lengthy use of technology, should be researched further as there is contradictory evidence in literature.

6.3.2.1 How does technology influence society?

(i) Evolution of technology

In response to the question of how technology influences society by considering the impact of the Covid-19 pandemic and the introduction of AI soon thereafter, literature supports the findings that the pandemic sped up the adoption of technology (Adedoyin & Soykan, 2023; Moja, 2021; Lovino, 2023; Jensen et al., 2020) , and the prediction is that most institutions will return to contact teaching and learning, with only some adopting eLearning (Bates et al., 2020) . A possible reason for this step back is to allow educational institutions time to address and overcome the many challenges that hinder technology implementation at educational institutions (Zawacki-Richter et al., 2019; Zhang & Aslan, 2021) .

Another finding of this study was that there are gaps in the capability of AI, especially around AI recognising human emotions, that must be factored into its adoption by society. While some researchers (Bates et al., 2020) support this view, new research (Jafari, 2024) shows that human-centred AI that has human values and ethics embedded in its algorithm, can identify and respond to human emotions, but the question remains that

just because HAI has the capability of providing emotional support, should it be allowed to do so (Crawford et al., 2024) ?

The implications of these findings are that they add to the existing body of knowledge about the adoption of technology in education, and the challenges faces by educational institutions.

(ii) Artificial intelligence and education

In response to the question of how technology influences society, this theme explored the penetration of technology and AI into communities. As the PSET sector is a microcosm of society, what happens in this sector influences the broader society.

Findings of the research show that while there was support for AI penetration in education, how AI should be integrated into teaching and learning, and hence society at large remained a puzzle. This finding is supported in literature by Bates et al., (2020) and Jafari (2024), who both argue that while the benefits of technology are clear, educators are slow to adopt technology.

Another finding is that educators recognise the need for technology to prepare learners for the workplace. Noble et al., (2022) and Audretsch et al., (2019) show why technology belongs in the classroom by demonstrating the power of technology to transform sectors, while Doğan and Şahin (2024) and Jafari (2024) showed how AI technology can be applied at educational institutions, to enhance teaching and learning. The research findings are therefore supported in literature.

Another finding in the research is about finding balance between AI and humans, and educators being agile and willing to learn to adopt technology. Bates et al., (2020) suggest that educators must change their mindsets by assigning tasks like presenting, managing and testing content to AI, while they focus more on developing students' skills, and providing emotional support. The desire for greater agility and willingness to learn is a noble one, supported by a call from researchers like Bates et al., (2020) , Jafari, (2024) , and Chan (2023) .

The implications of these findings are that they add to the existing body of literature about AI adoption in education.

6.3.2.2 How does society benefit from the use of technology?

(i) Choosing a suitable technology platform

The question of how society benefits from using technology is answered by selecting a suitable technology platform.

A finding of the study was that society would benefit from technology that made the student the centre of the choice of platform, by considering learners' individual learning

journeys. This finding was supported in literature by Chan, (2023); Bond et al., (2020) ; Trinh et al. (2023); Hill (2019); and Roski et al. (2024) who all showed the benefits of individualising student journeys. The finding about the ease of navigation of the platform is referenced by Roski et al. (2024) in the UDL guideline, which suggests that by following the UDL guideline when designing a technology platform, the navigation considerations would automatically be addressed.

The finding about levelling the playing fields by offering society free technology platforms with free access to data, seeing that education was meant to be a public good, is supported by Lembani et al., (2020) who talked about the socio-economic divide and poor network connectivity in rural South Africa.

Another finding was about user capacitation to utilise technology optimally, and the gaps in the technology capability from providing an optimal learning experience. Lembani et al.,(2020) supported the call for capacity building on the use of technology, by arguing that giving access to technology is not enough; digital literacy is important for society to use technology optimally. Jafari (2024) argues that the gap between AI and humans is quickly narrowing, with HAI that can recognise and respond to human emotions. It is only a matter of time when technology can provide for all human needs, when we reach the point of technological singularity (Grinin et al., 2020) .

The implications of these findings are that they add to the existing body of knowledge about choosing a technology platform that best suits society's needs.

[\(ii\) Technology as an enabler of 21st century skills](#)

One of the findings of this study was a contribution to a list of graduate attributes (Table 24a) that would contribute to 21st century skills. These graduate attributes are synonymous with human values (Schwartz, 1994; van de Poel, 2020) . The list of graduate attributes (Table 24a) that would contribute to 21st century skills is a contribution of this research to the body of knowledge. While current research focuses on the values that are embedded in technology platforms, there is no current literature on a direct link with graduate attributes that should be embedded in eLearning programmes hosted on eLearning platforms, that will lead to students gaining 21st century skills.

Another finding was that the mindset of teaching should shift towards learning skills to operate in a technologically driven world. Literature supports this view, and even recommends which tasks lecturers should focus on, and which tasks can be outsourced to technology (Bates et al., 2020) .

Another finding was that students would move towards learning in small packets of information that was specific to a particular profession or job. MOOCs can be designed

to serve this educational requirement, as it can be made more effective through collaboration, group work, and encouraging the right behaviours in students to enhance performance (Carannante et al., 2021; Razmerita et al., 2020) .

Another finding was that technology has developed so rapidly that it is expected to be as smart as a human brain by 2025. While the claim could not be verified, Grinin et al., (2020) calculated the point of technology singularity to be 2106, but their calculation was done prior to the launch of generative AI like ChatGPT, so it may be out-dated. Irrespective of when we reach technological singularity, we are entering an era of technology-human collaboration (Bednar & Welch, 2020) . This insight is important for the education sector because it produces the next generation of employees and entrepreneurs who will be collaborating more intimately with technology. Society needs to decide on the roles to assign to technology and the roles that humans will play in this new technologically-driven world.

The implications of these findings are a contribution to the current body of knowledge as technology as an enabler of 21st century skills, and a contribution of a set of graduate attributes (Table 24a) that would contribute to 21st century skills. While current research focuses on the values that are embedded in technology platforms, there is no current literature on a direct link with graduate attributes that should be embedded in eLearning programmes hosted on eLearning platforms, that will lead to students gaining 21st century skills.

6.3.2.3 Conclusion for research question 2: To what extent does technology influence society?

To answer the question of the extent to which technology influences society, access and equity of eLearning was considered. A finding of this study was that young people who grow up with technology are more accustomed to it and are more likely to respond positively to eLearning. Literature supports this view (Hurwitz & Schmitt, 2020) and shows that the more digitally fluent students have greater flexibility in their response to change, and are more likely to work well collaboratively (Barak, 2018) , but exposure to technology at an early age does not guarantee digital fluency, as it depends on the way in which technology was used at a young age that determines the type of digital skills that were developed, and this places students on either side of a digital divide (Corkin et al., 2022) .

Another finding was that access to technology benefits society by providing instantaneous, current information that can be accessed according to personal preferences. Technology has also provided opportunities for eLearning to individuals irrespective of where they are located. While providing access to the IOT is possible

(Novo, 2018) , having access does not mean that students are willing to study online, as student preferences vary, depending on their personal circumstances and choices (Chakraborty et al., 2021; Feubli et al., 2024) . Issues of connectivity (van Schalkwyk, 2021) , and access to devices to benefit from technologies, must also be resolved (Lembani et al., 2020; Sutherland, 2020) , including the bigger issue of widening the digital and knowledge gaps (van Schalkwyk, 2021) . These findings add to the body of existing knowledge about the challenges of accessing eLearning, and the choices that students make based on their personal circumstances.

In response to the question of the extent to which technology influences society, by considering technology's positive and negative effects on societal values, the findings show that while there are many positive influences on society, the negative influences should not be discarded. The finding that social media leads to social engineering and misinformation has been supported in literature. Technology can influence public perceptions (Vesa & Tienari, 2022) , but when reminded about social norms and societal expectations, society does the right thing (Gimpel et al., 2021) and the spread of misinformation is mostly unintentional by society in general (Unfried & Priebe, 2024) . The finding that human-to-human communication deteriorating because of AI chatbots was supported in literature by Crawford et al., (2024) , who showed that students who have fewer friends rely on AI much more than those who have the support of friends and family.

The finding about cyber-crime being an issue, is supported by Zhu et al., (2024) who suggest that cyber-bullying can be effectively dealt with by institutions introducing social values that speak to cyber-bullying and peer-aggressive humour. Another finding was about health risks associated with using technology. Literature supports the claim of technology addiction (Busalim et al., 2019) , but show contradictory evidence about whether it decreases student performance (Suárez-Perdomo et al., 2022) . This is probably an area for further research. A finding of this study was about the length of time spent on technology platforms that result in health risks, with a participant referring to the risk as "sitting is the new smoking". While research has been done in this area, none of the research was published in one of the acceptable journals. This is therefore an area for further research. The Implications of these findings are that they contribute to the existing body of knowledge on technological advancement vs societal values. The finding about health risks associated with lengthy use of technology, should be researched further as there is contradictory evidence in literature.

Another consideration in responding to the question on the extent to which technology influences society, is to consider how technology influences society. Literature supports the findings that the pandemic sped up the adoption of technology (Adedoyin & Soykan,

2023; Moja, 2021; Lovino, 2023; Jensen et al., 2020) , and the prediction is that most institutions will return to contact teaching and learning, with only some adopting eLearning (Bates et al., 2020) . A possible reason for this step back is to allow educational institutions time to address and overcome the many challenges that hinder technology implementation at educational institutions (Zawacki-Richter et al., 2019; Zhang & Aslan, 2021) . Another finding of this study was that there are gaps in the capability of AI, especially around AI recognising human emotions, that must be factored into its adoption by society. While some researchers (Bates et al., 2020) support this view, new research (Jafari, 2024) shows that human-centred AI that has human values and ethics embedded in its algorithm, can identify and respond to human emotions, but the question remains that just because HAI has the capability of providing emotional support, should it be allowed to do so (Crawford et al., 2024) ? These findings add to the existing body of knowledge about the adoption of technology in education, and the challenges faced by educational institutions.

As the PSET sector is a microcosm of society, what happens in this sector influences the broader society. Findings of the research show that while there was support for AI penetration in education, how AI should be integrated into teaching and learning, and hence society at large remained a puzzle. This finding is supported in literature by Bates et al., (2020) and Jafari (2024), who both argue that while the benefits of technology are clear, educators are slow to adopt technology. Another finding is that educators recognise the need for technology to prepare learners for the workplace. Noble et al., (2022) and Audretsch et al., (2019) show why technology belongs in the classroom by demonstrating the power of technology to transform sectors, while Doğan and Şahin (2024) , and Jafari (2024) showed how AI technology can be applied at educational institutions, to enhance teaching and learning. The research findings are therefore supported in literature. Another finding is about finding balance between AI and humans, and educators being agile and willing to learn to adopt technology. Bates et al., (2020) suggest that educators must change their mindsets by assigning tasks like presenting, managing and testing content to AI, while they focus more on developing students' skills, and providing emotional support. The desire for greater agility and willingness to learn is a noble one, supported by a call from researchers like Bates et al., (2020) , Jafari, (2024) , and Chan (2023) . These findings add to the existing body of literature about AI adoption in education.

The question of the extent to which technology influences society, is explored through understanding how society benefits from the use of technology. A finding of the study was that society would benefit from technology that made the student the centre of the

choice of platform, by considering learners' individual learning journeys. This finding was supported in literature by Chan, (2023); Bond et al., (2020) ; Trinh et al. (2023); Hill (2019); and Roski et al. (2024) who all showed the benefits of individualising student journeys. The finding about the ease of navigation of the platform is referenced by Roski et al. (2024) in the UDL guideline, which suggests that by following the UDL guideline when designing a technology platform, the navigation considerations would automatically be addressed. The finding about levelling the playing fields by offering society free technology platforms with free access to data, seeing that education was meant to be a public good, is supported by Lembani et al., (2020) who talked about the socio-economic divide and poor network connectivity in rural areas of South Africa. Another finding was about user capacitation to utilise technology optimally, and the gaps in the technology capability from providing an optimal learning experience. Lembani et al.,(2020) supported the call for capacity building on the use of technology, by arguing that giving access to technology is not enough; digital literacy is important for society to be able to use technology optimally. Jafari (2024) argues that the gap between AI and humans is quickly narrowing, with HAI that can recognise and respond to human emotions. It is only a matter of time when technology can provide for all human needs, when we reach the point of technological singularity (Grinin et al., 2020) . These findings add to the existing body of knowledge about the choice of technology platform that best suits the needs of society.

One of the findings of this study was a contribution to a list of graduate attributes (Table 24a) that would contribute to 21st century skills. These graduate attributes are synonymous with human values (Schwartz, 1994; van de Poel, 2020) , and contribute to the existing body of knowledge. While current research focuses on the values that are embedded in technology platforms, there is no current literature on a direct link with graduate attributes that should be embedded in eLearning programmes hosted on eLearning platforms, that will lead to students gaining 21st century skills.

Another finding was that the mindset of teaching should shift towards learning skills to be able to operate in a technologically driven world. Literature supports this view, and even recommends which tasks lecturers should focus on, and which tasks can be outsourced to technology (Bates et al., 2020) . Another finding was that students would move towards learning in small packets of information that was specific to a particular profession or job. MOOCs can be designed to serve this educational requirement, as it can be made more effective through collaboration, group work, and encouraging the right behaviours in students to enhance performance (Carannante et al., 2021; Razmerita et al., 2020) . Another finding was that technology has developed so rapidly that it is

expected to be as smart as a human brain by 2025. While the claim could not be verified, Grinin et al., (2020) calculated the point of technology singularity to be 2106, but their calculation was done prior to the launch of generative AI like ChatGPT, so it may be out-dated. Irrespective of when we reach technological singularity, we are entering an era of technology-human collaboration (Bednar & Welch, 2020) . This insight is important for the education sector because it produces the next generation of employees and entrepreneurs who will be collaborating more intimately with technology. Society needs to decide on the roles to assign to technology and the roles that humans will play in this new technologically-driven world.

These findings contribute to the current body of knowledge as technology as an enabler of 21st century skills, and a set of graduate attributes (Table 24a) that would contribute to 21st century skills. While current research focuses on the values that are embedded in technology platforms, there is no current literature on a direct link with graduate attributes that should be embedded in eLearning programmes hosted on eLearning platforms, that will lead to students gaining 21st century skills.

6.3.3 Revised conceptual framework

Based on the discussion in Chapter 6, the following changes were made to the conceptual framework (Figure 6 in Chapter 5):

6.3.3.1 Additions to the conceptual framework

A new block was added, highlighting the breakdown of what a student-centric design means, and the following were added here:

Table 25: New theoretical constructs describing student-centric design

Theoretical construct	Theme	Comment
Student engagement	choosing a suitable technology platform	Added after evidence from literature
user continuance	choosing a suitable technology platform	Added after evidence from literature
Assessments on demand	choosing a suitable technology platform	moved here

6.3.3.2 Removal from the conceptual framework

Based on literature, *technology as a tool* was removed from the purpose and function block. Literature confirms that technology is value-laden (Miller, 2021)

6.3.3.3 Contributions to the current body of knowledge

Table 26: Contributions to the current body of knowledge

Theoretical construct	Theme	Comment
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cohort size	balancing online and face-to-face learning	Requires further research
final decision-makers	Role players in determining values and regulatory oversight	Requires further research
stakeholders consulted	Role players in determining values and regulatory oversight	
changing values	Role players in determining values and regulatory oversight	
addiction	technological advancement vs societal values	Requires further research
inactivity	technological advancement vs societal values	Requires further research

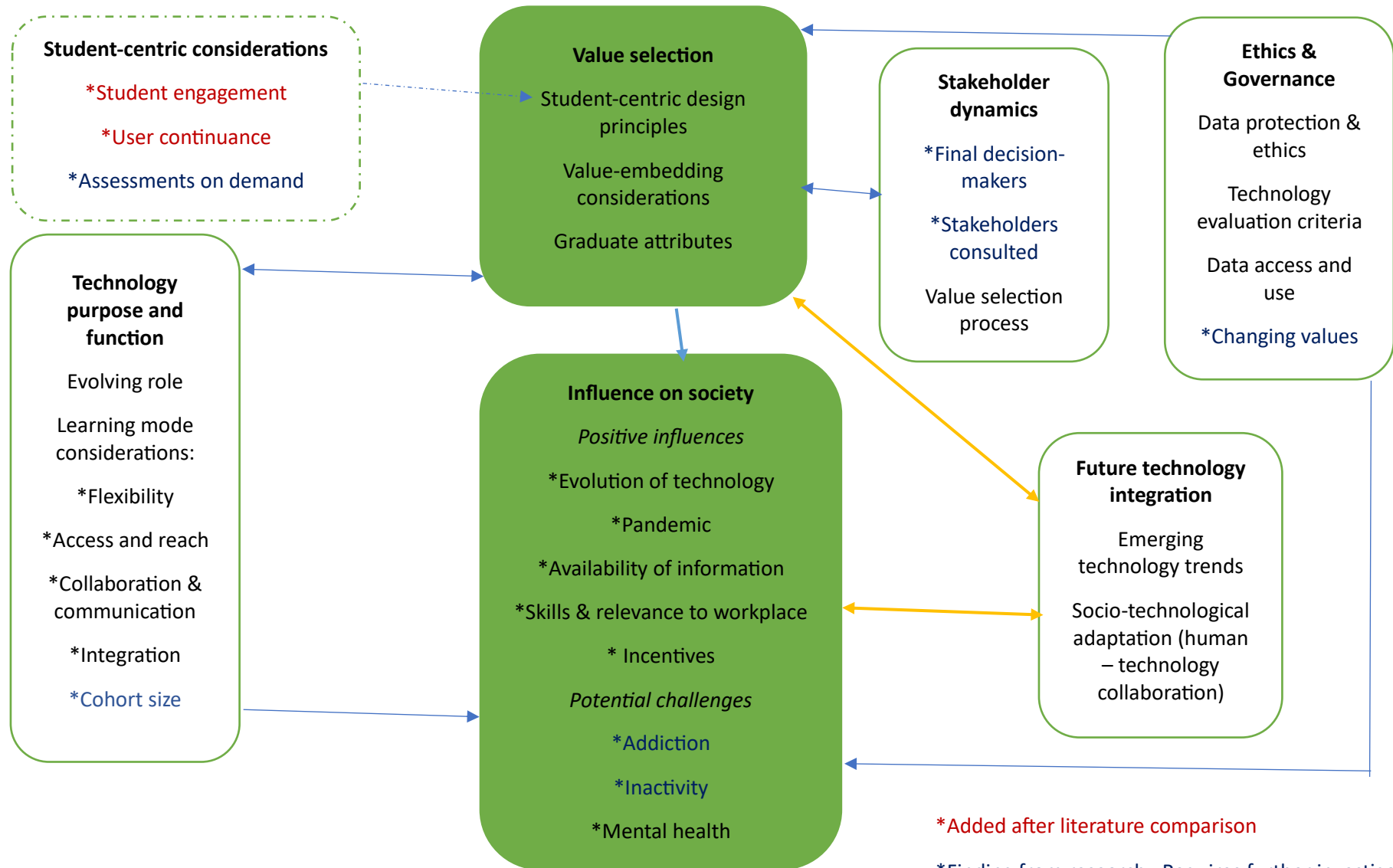


Figure 8: Revised conceptual framework
 Source: Author's own work based on research findings

*Added after literature comparison

*Finding from research. Requires further investigation

Technology as a tool/supplementary aid was removed

Chapter 7: Conclusion

7.1 Introduction

This chapter presents the research outcomes for this study, based on the discussion in Chapter 6. The study aimed to explore how values embedded in technology platforms are selected, and how it influences society. This included beginning with an exploration of how the education sector understands the embedding of values into eLearning platforms hosting eLearning programmes, and how these values influenced students, and society in general. The research further aimed to look at how these values were selected, who selected them, and once they were selected, could they be changed. The research also aimed to explore the factors that influenced the choice of values. Lastly, the research aimed to use this information to give stakeholders in the education and training sector, a framework to guide the choice of values selected to embed in new technologies that are being adopted.

This chapter considers principal theoretical conclusions on each research question and sub-question, derived from the discussion in Chapter 6. The chapter also looks at the research contribution made; discusses recommendations for stakeholders; limitations of the research; and suggestions for future research.

7.2 Principal theoretical conclusions

7.2.1 How are the values that are embedded in technology, selected?

The theoretical conclusions are based on consideration of three themes: Platform design and criteria influencing student journey; Balancing online and face-to-face learning; and Technology as an enabler of 21st century skills.

(i) Platform design and criteria influencing student journey

eLearning platforms require a student-centric design to enhance the student journey, and platform designers should use the UDL guideline when designing eLearning platforms (Roski et al., 2024) . By ensuring that the learner-centred approach also applies to assessments, the incidence of cheating can be reduced (Rüth et al., 2024) , which could be an important step towards reducing the need for proctoring tools during assessments, which raise questions about fairness and equity (K. Lee & Fanguy, 2022) . Literature supported the study's finding.

Student engagement is required for a successful student journey (Bond et al., 2020). Different eLearning platforms influence the student journey differently (Hill, 2019; Trinh et al., 2023) , but irrespective of the choice of platform, *eLearning continuance* was key to student success (Al-Samarraie et al., 2018) . Literature links the student journey to student engagement and continuance, which adds greater depth to the student-centric design concept, and is included in the revised conceptual framework.

Assessments-on-demand is an extension to the student-centric approach to platform design that promotes flexibility in the student journey. No literature could be found to verify this finding, and it is therefore a contribution to the body of knowledge, and an area for further research.

(ia) Conclusion

The values embedded in technology should consider the beneficiaries of technology, which in this case are students, and by designing the technology with the student needs in mind, students are encouraged to use the technology platform towards a successful outcome. A UDL guideline helps with designing student-centric platforms, while considering student engagement, user continuance, and assessments on demand as part of the student journey. This conclusion therefore supports the body of knowledge about value selection during the design phase of technology, and adds assessments-on-demand to the current body of knowledge.

(ii) Balancing online and face-to-face learning

The concept of embedding values into eLearning platforms is better expressed by referring to values being embedded into eLearning programmes offered on eLearning platforms. This claim questions the role of intrinsic values embedded in eLearning platforms that offers an eLearning programme, versus the lecturer offering a similar programme in class. Some educational institutions seem to only consider values that are embedded into programmes and not the mode of delivery, which in the case of eLearning, would be technology platforms that have built-in values, and in the case of face-to-face learning, would be the lecturer's values.

Literature shows that it was only with the advent of AI that the association of values with technology has become more widespread (Abernethy et al., 2024) . However, there is ample literature to support the view that technology has embedded values (Heyndels, 2023; Klenk, 2021; Miller, 2021; van de Poel, 2020) , which contradicts the view that only eLearning programmes has embedded values, thus ignoring the embedded values in eLearning platforms. Further research should be done into how the mode of delivery (eLearning versus face-to-face) affects the influence of values on students, to determine if students are exposed to the same set of values at the end of their learning.

Storytelling can be used as a tool to instil values in students. This conclusion is not confirmed by literature, and is therefore an area for further research, especially in relation to storytelling in the PSET sector. It is nevertheless an interesting consideration that could add to the practical body of knowledge of ways in which to instil values.

(iia) Conclusion

In answering the question of how values are selected from an online versus face-to-face learning pedagogy, the value selection for both programmes were similar as educational institutions seem to only consider values from the perspective of embedding them into programmes and not the mode of delivery. Further research should be done into how the mode of delivery (eLearning versus face-to-face) affects values' influence on students, to determine if all students are exposed to the same set of values at the end of their learning.

Storytelling can be used as a tool to instil values in students, which adds to the body of practice knowledge of ways in which to instil values into students.

(iii) Technology as an enabler of 21st century skills

Educational institutions are in favour of using AI in education, despite the challenges of the potential for cheating and plagiarism. Literature provided ways of reducing the inclination towards cheating by making assessments more relevant to student needs and their future careers (Rüth et al., 2024) , making the use of proctoring tools fair (K. Lee & Fanguy, 2022) , and developing AI policies to deal with cheating and plagiarism (Chan, 2023) . There are pockets of good practice already being implemented, like using VR in pharmacy education (Doğan & Şahin, 2024) . The PSET sector has barely scratched the surface of using artificial intelligence for teaching and learning, and despite evidence to support technology's use, educational institution staff were reluctant to introduce new technologies into teaching and learning (Bates et al., 2020; Jafari, 2024) , so it would be interesting to see how the rollout of AI at educational institutions, proceed.

There should be greater transparency around the values embedded in eLearning platforms. Literature supports this call (den Hond & Moser, 2023; Jafari, 2024) because if values are known, then technology users can make more informed choices when selecting technology platforms.

Incentives should be an embedded value, to motivate learners to complete their eLearning programmes. This conclusion is supported in literature by Lee and Yeung (2022) ; Chevalier et al., (2018) ; and Mbiti et al., (2019) who all showed that offering the right incentives improve student success rates.

A list of values that should be embedded in eLearning programmes and platforms (Table 10a) has been proposed. The values should vary according to the requirements of a particular profession. This list supplements the values found in existing AI guidelines (Hagendorff, 2020) , and could also be considered by educational institutions when developing their unique AI guidelines (Chan, 2023; Nguyen et al., 2023). This list

contributes to the theoretical body of knowledge about values embedded in technology platforms.

(iia) Conclusion

In answering the question of how values are selected from the perspective of technology being an enabler of 21st century skills, there should be a consideration of AI as a current disruptor in education, and educational institutions are looking at ways in which AI can be incorporated into teaching and learning, as challenges are dealt with. There is a willingness to adopt AI, despite literature suggesting a reluctance for AI adoption (Bates et al., 2020; Jafari, 2024) , and pockets of implementation can be seen (Doğan & Şahin, 2024) . There should be greater transparency around the values embedded in eLearning platforms, which is supported in literature (den Hond & Moser, 2023; Jafari, 2024) . Incentives should be an embedded value, to motivate learners to improve student success rates (Chevalier et al., 2018; Y. H. Lee & Yeung, 2022; Mbiti et al., 2019) .

7.2.1.1 What purpose does technology serve?

The theoretical conclusions are based on consideration of three themes: Evolution of technology; Balancing online and face-to-face learning; and Artificial intelligence and AI.

(i) Evolution of technology

Technology has evolved and the use of technology in teaching and learning has evolved parallelly, even though at a slower pace. Literature supports this finding. Even though distance education institutions incorporate new web-based technologies into teaching and learning (De Nito et al., 2023) , the education sector is slow to respond, despite substantial evidence that shows the positive impact of new technologies on education (Garzón & Acevedo, 2019) , and the greater efficiencies and disruptive innovations that they bring (Audretsch et al., 2019) . Technology adoption in the education sector continues to be hampered by physical constraints and challenges (Onu et al., 2024) .

The slow pace of technology adoption and the challenges faced by educational institutions draws attention to the willingness of educational institutions to adopt technology, but the challenges that they face are holding them back. To move forward, educational institutions must capacitate their staff about new technologies; develop their technology policies; and resolve the network connectivity issues (Onu et al., 2024) .

Technology is a tool or supplementary aid in the education and training sector. This study's findings contradict literature, about perceptions of technology's role. The view that technology is a tool (McOmber, 1999) or supplementary aid is an old one, and literature suggests that modern-day technology is value-laden (Miller, 2021) . Participants have made a connection between technology and values, but they struggled

to see how values were embedded in technology (den Hond & Moser, 2023; Miller, 2021) and how these values influenced society (den Hond & Moser, 2023; Vesa & Tienari, 2022) . The conceptual framework will therefore be adjusted to reflect what appears in the literature.

This contradiction with literature suggests that educators have not made the connection between the intrinsic values embedded in technology platforms, interacting with the values embedded in eLearning programmes that are hosted on eLearning platforms, and how all of this as an integrated unit, influence students and society. It is worth exploring this finding deeper because to truly understand how the values embedded in technology influence society, both the known values from eLearning programmes and the hidden values embedded in the platform must be considered together. This insight is a valuable contribution to the existing body of knowledge, and warrants further research.

(ia) Conclusion

Technology has evolved and technology's use in teaching and learning has evolved parallelly, even though at a slower pace. There is a willingness of educational institutions to adopt technology, but they must find ways to deal with the challenges that are holding them back. To move forward, educational institutions must capacitate their staff about new technologies; develop their technology policies; and resolve the network connectivity issues (Onu et al., 2024) .

I will amend the conclusion that technology is a tool or supplementary aid in the education and training sector, to reflect literature that suggests that technology is value-laden (Miller, 2021) . It is worth exploring this conclusion deeper because to truly understand how the values embedded in technology influence society, both the known values from eLearning programmes and the hidden values embedded in the platform must be considered together. This insight is therefore a valuable contribution to the existing body of knowledge, and warrants further research.

(ii) Balancing online and face-to-face learning

eLearning programmes offer flexible and self-paced learning, which face-to-face learning does not offer, especially if the eLearning platform was intentionally designed. This conclusion is supported in literature, which referred to the Universal Design for Learning (UDL) that enables students to determine their own learning pathways, and pace (Roski et al., 2024) . The conclusion confirms the current theoretical body of knowledge about eLearning programmes.

The purpose of technology is to support teaching and learning irrespective of its mode of delivery. Even in face-to-face teaching and learning, technology platforms are still

used for communication, collaboration, and sharing learning materials. The literature shows that lecturers and students were divided on their preference of mode of teaching and learning (Feubli et al., 2024; Jensen et al., 2020) , with both modes having their strengths and weaknesses (Orhan, 2024) . This conclusion supports the current theoretical body of knowledge about the purpose of technology in education.

Academics sometimes use the programme designed for face-to-face teaching and learning, online, which affects the quality of online teaching and learning, and negatively impacts student success. Although this conclusion is not verified in literature, it does suggest that if educational institutions do not implement the UDL for eLearning, then students may find it difficult to navigate content that was designed for the classroom. This finding offers a plausible explanation for academics viewing technology as a tool, and see the values in programmes offered through face-to-face teaching and learning as the same as values in programmes offered through technology platforms. If educators are using the same learning material for both modes of delivery, then the finding makes sense, but if the UDL is followed for online eLearning, then there should be a difference in the embedded values. This conclusion adds to the theoretical body of knowledge about eLearning platform and programme design.

eLearning accommodates increased cohort sizes as a cost-effective alternative to face-to-face teaching and learning. This conclusion could not be confirmed in literature, and is a contribution to the body of knowledge about eLearning. An investigation into eLearning platforms supporting increased cohort sizes is an area for further research. This idea could be extended to look at the cost implications of offering teaching and learning to large cohorts of students through contact classes, and eLearning as a comparative study.

(iia) Conclusion

The study offers conclusions supported by literature, that eLearning programmes offer flexible and self-paced learning, which face-to-face learning does not offer, especially if the eLearning platform was intentionally designed; and the purpose of technology is to support teaching and learning irrespective of its mode of delivery. The study offers a new finding not supported by literature, that academics sometimes use the programme designed for face-to-face teaching and learning, online, which affects the quality of online teaching and learning, and negatively impacts student success. This finding offers a plausible explanation for why academics view technology as a tool, and why they view the values of face-to-face teaching and eLearning programmes as the same, and highlights the importance of using the UDL for platform design. The study also concludes that eLearning accommodates increased cohort sizes as a cost-effective alternative to

face-to-face teaching and learning, which is not confirmed in literature, and warrants further investigation.

(iii) Artificial intelligence and education

Education institutions in general support the adoption of AI; and AI is already being used in the education sector, particularly in health programmes that use simulations and virtual reality, to develop learning programmes. Literature supports these findings of AI technology tools used in education to perform functions such as intelligent tutoring; collaborative learning; and scenario simulations, while also personalising a student's learning journey (Zawacki-Richter et al., 2019) . Zhang and Aslan (2021) suggest that there are a variety of AI tools with innovative applications and functions, but like Bates et al., (2020) , believe that technology adoption in the education sector is slow, which Bates et al., (2020) blame on educational institutions not embracing new technology. This may seem like a contradiction, but it means that educational institutions are supporting the adoption of technology, and there are signs of small pockets of adoption, but overall, progress towards implementation is slow.

Technology is integrated with teaching and learning, and cannot be separated from one another. Literature supports this view with Miller (2021) arguing that technology has moral and political values embedded in its design, which has long-term implications. Technology therefore, should not be evaluated on its physical attributes only, but also on its purpose (Heyndels, 2023) . One could argue that integrating technology with teaching and learning follows the same logic, since values are instilled into eLearning programmes, which are then offered on eLearning platforms that already has intrinsic embedded values. eLearning programmes offered on technology platforms should be evaluated collectively on its physical attributes, function and purpose.

(iiia) Conclusion

The conclusions that education institutions in general support the adoption of AI, and AI is already being used in the education sector; and technology is integrated with teaching and learning, and cannot be separated from one another, confirm the current body of knowledge of AI in education.

7.2.1.2 Which stakeholders were consulted in its development?

(i) Role players in determining values and regulatory oversight

The stakeholders who are consulted when choosing the values to be embedded in eLearning programmes offered on eLearning platforms, are known, but may differ between educational institutions. Literature shows that there is a lack of transparency around which stakeholders are involved in choosing the values to be embedded in technology, (den Hond & Moser, 2023) , which contradicts the study conclusion. The list

of stakeholders consulted generated through the study, maps closely to the list of stakeholders who should be consulted that Noble et al., (2022) , outlined, although there may be some variances across educational institutions. This conclusion therefore extends the body of theoretical knowledge about transparency of stakeholders consulted.

There is no relevant literature from the education sector in top journals over the last five years, that either supports or refutes the conclusion that *the stakeholders who are consulted when choosing the values to be embedded in eLearning programmes offered on eLearning platforms, are known, but may differ between educational institutions* , and therefore, the list of stakeholders consulted (Table 14a) may be a new contribution to the existing theoretical body of knowledge about transparency relating to the stakeholders involved in determining the values that are embedded into eLearning programmes offered through technology platforms.

(ia) Conclusion

The conclusion contributes to the existing theoretical body of knowledge about transparency around the stakeholders who are consulted when developing eLearning programmes and platforms in the PSET sector.

7.2.1.3 How were the final values for the technology selected?

(i) Role players in determining values and regulatory oversight

There is no clarity of who makes the final decision about which values to include or discard from eLearning programmes and platforms. Based on the responses, it could be one or groups of any number of stakeholders listed in Table 15a. This would suggest that the decision-making process is not well understood; the process is relaxed enough to allow for different decision-makers; or institutions are making decisions about values without proper consultation or governance. Literature supports this finding by calling for transparency around who these decision-makers are (Dafoe, 2015; D’Cruz et al., 2022; den Hond & Moser, 2023; Noble et al., 2022) . While Table 15a provides a start, further research is required to answer this question with more certainty. The conclusion is therefore a

(ia) Conclusion

The conclusion of who makes the final decision about which values to include or discard from eLearning programmes and platforms, was inconclusive, and requires further research. It could be one or groups of any number of stakeholders listed in Table 15a, which suggests that the decision-making process is not well understood; the process is relaxed enough to allow for different decision-makers; or institutions are making decisions about values without proper consultation or governance.

7.2.1.4 How could these values be changed?

(i) Role players in determining values and regulatory oversight

Up to 50% of the content of an eLearning programme can be changed without having to revert to the regulatory body. While this information does not appear in any of the extant literature, it can be found in policy documents of regulatory bodies and educational institutions in South Africa. It is different from extant literature as den Hond and Moser (2023) pose the question about whether values can be changed once it has been embedded in technology. From an education perspective, change is possible and welcome so that programmes keep abreast of environmental changes, but there was some resistance on the basis that the stakeholder requesting the change had to be “important” and the requested changes had to be relevant.

(ia) Conclusion

This conclusion extends the theoretical body of knowledge about changing values on technology platforms after they have been embedded.

7.2.1.5 How is the data gathered through technology, used and protected?

(i) Data protection and ethical considerations

Despite educational institutions complying with government legislation on data security, and having additional security measures in place, data security may still be questionable. Literature supports these findings. Education systems containing big data have inadequate privacy and security, that compromises student data (Daniel, 2019) . There should be a cautionary approach to data security (Noble et al., 2022) and challenges with data privacy, consent and the lack of transparency in data collection result in ethical issues (Flyverbom et al., 2019) . With data being stored in the cloud, data privacy requires global ethical guidelines and codes to access educational data, and institutions need data governance models and policies that determine the conditions under which student data can be used (Daniel, 2019) . This finding confirms the current body of knowledge about data protection and ethics.

Not only are there differences of understandings about AI and technology among educators and students, but there may be different understandings among educators themselves. Capacity development should perhaps begin with institution staff (Lim et al., 2022) . This finding confirms current knowledge about AI.

Educational institutions possess huge amounts of student data, that is not used optimally. Literature supports these findings about the collection of vast amounts of data by educational institutions, but focuses on the potential use of this data with the advent of AI (Bates et al., 2020) . Businesses’ desire is to use data to personalise product advertising (Noble et al., 2022) . Caution should be exercised as AI can make biased

and discriminatory decisions, (Martin et al., 2019) , and institutions are accountable for these decisions (D’Cruz et al., 2022) . AI tools can assist teachers and administrators to better understand individual student journeys by using student data to track progress (Zhang & Aslan, 2021) and make predictions about student progress for early interventions (Gray & Perkins, 2019; Riestra-González et al., 2021) , of cohorts of students across the institution (Zawacki-Richter et al., 2019) . While South African institutions may not have reached this level of sophistication in terms of student data use, the potential to do so exists, and literature points to what should be considered when that time comes. This finding contributes to the current theoretical body of knowledge about the use of data.

(ia) Conclusion

All three conclusions add to the body of knowledge about data protection, data privacy and use.

7.2.1.6 How is technology evaluated?

(i) Choosing a suitable technology platform

The evaluation criteria for a technology platform begins with student centredness. Literature supports this conclusion (Zhang and Aslan, 2021; Bates et al., 2020; Trinh et al., 2023; Hill, 2019; Mpungose, 2020; Jensen et al., 2020; Al-Samarraie et al, 2018) . The evaluation criteria for the eLearning technology platform are important to determine the intrinsic values that are embedded in technology, before the eLearning programme with its values are added. The most important consideration should be student-centredness and it is therefore important for all stakeholders to be consulted before an institution invests in a technology platform. Another consideration is the cost of the platform, which also considers proprietary versus open-source technology. A set of evaluation criteria is found in Table 21a, which contributes to the theoretical body of knowledge about evaluation criteria.

(ia) Conclusion

The conclusion adds to the current body of knowledge about platform evaluation criteria, and contributes a set of evaluation criteria for technology platforms (Table 18a).

7.2.2 To what extent does technology influence society?

The theoretical conclusions are based on consideration of two themes: Access and equity of eLearning; and Technological advancement vs societal values.

(i) Access and equity of eLearning

Young people who grow up with technology are more accustomed to it and are more likely to respond positively to eLearning. Literature supports this view (Hurwitz & Schmitt, 2020) and shows that the more digitally fluent students have greater flexibility in their

response to change, and are more likely to work well collaboratively (Barak, 2018) , but exposure to technology at an early age does not guarantee digital fluency, as it depends on the way in which technology was used at a young age that determines the type of digital skills that were developed, and this places students on either side of a digital divide (Corkin et al., 2022) . This finding contributes to the current theoretical body of knowledge.

Access to technology benefits society by providing current, instantaneous information that can be accessed in large volumes or small chunks, to suit the individual's preferences. Technology provides eLearning opportunities irrespective of where students are located. While providing access to the Internet of Things (IOT) is possible (Novo, 2018) , having access does not mean that students are willing to study online, as student preferences vary, depending on their personal circumstances and choices (Chakraborty et al., 2021; Feubli et al., 2024) . South Africa also has data connectivity issues (van Schalkwyk, 2021) , and even when these issues have been resolved, the issues of access to devices to benefit from technologies, must also be resolved (Lembani et al., 2020; Sutherland, 2020) . However, South Africa is not unique in its challenges that hamper the adoption of new technologies (Onu et al., 2024) , and van Schalkwyk, in a way, is justifying the lag in implementation of new technologies by arguing that new technologies benefit parts of society, while plunging the rest of society further into poverty by widening the digital and knowledge gaps. This finding confirms the current body of knowledge.

(ia) Conclusion

These conclusions add to the body of existing knowledge about the challenges of accessing eLearning, and the choices that students make based on their personal circumstances.

(ii) Technological advancement vs societal values

Human-to-human communication is deteriorating because of AI. Crawford et al., (2024) , showed that students who have fewer friends rely on AI much more than those who have the support of friends and family. Literature therefore confirms the findings.

Cyber-crime and cyber bullying are serious issues. This conclusion is supported by Zhu et al., (2024) who suggest that cyber-bullying can be effectively dealt with by institutions introducing social values that speak to cyber-bullying and peer-aggressive humour.

Social media supports social engineering and misinformation. Technology can influence public perceptions (Vesa & Tienari, 2022) , but when reminded about social norms and societal expectations, society does the right thing (Gimpel et al., 2021) , and the spread

of misinformation is mostly unintentional by society in general (Unfried & Priebe, 2024) . While the literature differs from the conclusion, the argument still stands, as literature only shows how to reduce the incidence of the spread of misinformation and social engineering among the general public, but it does not speak to the intentional social engineering and spread of misinformation.

The length of time spent on technology platforms poses health risks. Literature supports the claim of technology addiction (Busalim et al., 2019) , but show contradictory evidence about whether it results in a decrease in student performance (Suárez-Perdomo et al., 2022) . This is probably an area for further research. While research has been done in the area of physical health risks, none of the research appears in one of the acceptable journals. This is therefore an area for further research.

(iia) Conclusion

In response to the question of the extent to which technology influences society, by considering technology's positive and negative effects on societal values, even though there are many positive influences on society, but the negative influences should not be discarded. The conclusions contribute to the existing body of knowledge on technological advancement vs societal values. The conclusion about health risks associated with addiction and lengthy use of technology, should be researched further as there is contradictory and insufficient evidence in literature.

7.2.2.1 How does technology influence society?

The theoretical conclusions are based on consideration of two themes: Evolution of technology; and Artificial intelligence and education.

(i) Evolution of technology

The pandemic sped up the adoption of technology. Literature supports this finding (Adedoyin & Soykan, 2023; Moja, 2021; Lovino, 2023; Jensen et al., 2020) , and predicts that most institutions will return to contact teaching and learning, with only some adopting eLearning (Bates et al., 2020) . A possible reason for this step back is to allow educational institutions time to address and overcome the many challenges that hinder implementing technology at educational institutions (Zawacki-Richter et al., 2019; Zhang & Aslan, 2021) .

There are gaps in the capability of AI, especially around AI recognising human emotions, that must be factored into its adoption by society. While some researchers (Bates et al., 2020) support this view, new research (Jafari, 2024) shows that human-centred AI (HAI) that has human values and ethics embedded in its algorithm, can identify and respond

to human emotions, but the question remains that just because HAI has the capability of providing emotional support, should it be allowed to do so (Crawford et al., 2024) ?

(ia) Conclusion

Literature supports the conclusion that the pandemic sped up technology's adoption, and differs slightly with the conclusion that there are gaps in the capability of AI, especially around AI recognising human emotions, that must be factored into its adoption by society, based on new developments in the field of AI. The conclusions add to the existing body of knowledge about the adoption of technology in education, and the challenges faced by educational institutions.

(ii) Artificial intelligence and education

There is uncertainty about how to integrate AI into teaching and learning, and society at large. This finding is supported in literature by Bates et al., (2020) and Jafari (2024), who both argue that while technology's benefits are clear, educators are slow to adopt technology.

Educators recognise the need for technology to prepare learners for the workplace. Noble et al., (2022) and Audretsch et al., (2019) show why technology belongs in the classroom by demonstrating the power of technology to transform sectors, while Doğan and Şahin (2024) and Jafari (2024) showed how AI technology can be applied at educational institutions, to enhance teaching and learning. The research findings are therefore supported in literature.

There is a fine balance between AI and human capabilities, and educators must be agile and willing to adopt technology. Bates et al., (2020) suggest that educators must change their mindsets by assigning tasks like presenting, managing and testing content to AI, while they focus more on developing students' skills, and providing emotional support. The desire for greater agility and willingness to learn is a noble one, which Bates et al., (2020) , Jafari, (2024) , and Chan (2023) support.

(iia) Conclusion

The conclusions support the existing body of literature about AI adoption in education.

7.2.2.2 How does society benefit from the use of technology?

(i) Choosing a suitable technology platform

Society would benefit from technology that placed the student at the centre of the choice of platform, by considering learners' individual learning journeys. This finding was supported in literature by Chan, (2023); Bond et al., (2020) ; Trinh et al. (2023); Hill (2019); and Roski et al. (2024) who all showed the benefits of individualising student journeys. The conclusion therefore supports the current body of knowledge.

The technology platform should be easy to navigate. Roski et al. (2024) addressed issues of navigation in the UDL guideline, which suggests that following the UDL guideline when designing a technology platform, would automatically address navigation considerations. The conclusion therefore supports the current body of knowledge.

The playing fields should be levelled by offering society free technology platforms with free access to data. This conclusion is supported by Lembani et al., (2020) who talked about the socio-economic divide and poor network connectivity in rural areas of South Africa. The conclusion therefore supports the current body of knowledge.

Society is not capacitated to utilise technology optimally, and there are gaps in the technology capability that prevent an optimal learning experience. Lembani et al.,(2020) supported the call for capacity building on the use of technology, by arguing that giving access to technology is not enough; digital literacy is important for society to be able to use technology optimally. Jafari (2024) argues that the gap between AI and humans is quickly narrowing, with the introduction of HAI that can recognise and respond to human emotions. It is only a matter of time when technology can provide for all human needs, when we reach the point of technological singularity (Grinin et al., 2020) . This conclusion adds to the current body of knowledge about AI and education.

(ia) Conclusion

These conclusions support the existing body of knowledge about how society would benefit from technology, through the choice of an appropriate technology platform and through capacity development.

(ii) Technology as an enabler of 21st century skills

The mindset of teaching should shift towards learning skills to operate in a technologically driven world. Literature supports this view, and even recommends which tasks lecturers should focus on, and which tasks can be outsourced to technology (Bates et al., 2020) .

Students prefer to learn in small chunks of information that was specific to a particular profession or job. MOOCs can be designed to serve this educational requirement, as it can be made more effective through collaboration, group work, and encouraging the right behaviours in students to enhance performance (Carannante et al., 2021; Razmerita et al., 2020) .

Technology has developed so rapidly that it is expected to be as smart as a human brain by 2025. While the claim could not be verified, Grinin et al., (2020) calculated the point of technology singularity to be 2106, but their calculation was done prior to the launch of generative AI like ChatGPT, so it may be out-dated. Irrespective of when we reach

technological singularity, we are entering an era of technology-human collaboration (Bednar & Welch, 2020) . This insight is important for the education sector because it produces the next generation of employees and entrepreneurs who will be collaborating more intimately with technology. Society needs to decide on the roles to assign to technology and the roles that humans will play in this new technologically-driven world. The conclusion therefore supports the current body of knowledge about technology's rapid advancement.

Graduate attributes contribute to 21st century skills. These graduate attributes are synonymous with human values (Schwartz, 1994; van de Poel, 2020) . The list of graduate attributes (Table 24a) that contribute to 21st century skills, is an addition to the theoretical body of knowledge about technology and 21st century skills for the workplace. While current research focuses on the values that are embedded in technology platforms, there is no literature that directly links graduate attributes that should be embedded in eLearning programmes hosted on eLearning platforms, with students gaining 21st century skills for the workplace. This is therefore an area for further research.

(ia) Conclusion

These conclusions contribute to the current body of knowledge as technology as an enabler of 21st century skills, and provide of a set of graduate attributes (Table 24a) that would contribute to 21st century skills. While current research focuses on the values that are embedded in technology platforms, there is no current literature on a direct link with graduate attributes that should be embedded in eLearning programmes hosted on eLearning platforms, that will lead to students gaining 21st century skills.

7.3 Research contribution

7.3.1 Introduction

This research was about exploring how values embedded in technology are selected, and how it influences society. This research stems from debates in the business sector (den Hond & Moser, 2023), and was not considered in the education sector, so this research sheds light on a topical issue in a different sector.

7.3.2 Adding to the body of existing knowledge

7.3.2.1 Assessments-on-demand

Assessments-on-demand involve giving students the freedom to determine their learning pathways, by deciding when to complete e-assessments. It is offered online, with no need for a facilitator to monitor progress, as proctoring tools are available to ensure that the student does not cheat. Assessment questions are drawn from a databank of questions, so the questions are randomised. There is currently no literature available on

this concept; so, it is a contribution to the current theoretical body of knowledge about e-assessments and designing student-centric platforms.

7.3.2.2 Storytelling as a tool to instil values

Storytelling can be used as a tool to instil values in students. While storytelling is well documented, this particular use to instil values is not validated by literature, and is therefore an area for further research, especially in relation to storytelling in the PSET sector. It is nevertheless an interesting consideration that adds to the body of knowledge of ways in which to instil values more purposefully as an alternative to embedding values.

7.3.2.3 Proposed values for embedding into eLearning programmes and platforms

The study contributed a list of values that could be embedded in eLearning programmes and platforms (Table 10a). Another insight is that the values should vary according to the requirements of a particular profession. This list supplements the values found in existing AI guidelines (Hagendorff, 2020) , and educational institutions could consider this list when developing their unique AI guidelines (Chan, 2023; Nguyen et al., 2023). This list contributes to the body of knowledge about values embedded in technology platforms.

7.3.2.4 Understanding the role of technology in education

The study concluded that technology is a tool or supplementary aid in the education and training sector, which contradicted literature. The view that technology is a tool (McOmer, 1999) or supplementary aid is an old one, and literature suggests that modern-day technology is value-laden (Miller, 2021) . Participants had made a connection between technology and values, but they struggled to see how values were embedded in technology (den Hond & Moser, 2023; Miller, 2021) and how these values influenced society (den Hond & Moser, 2023; Vesa & Tienari, 2022) . This contradiction with literature suggests that educators have not made the connection between the intrinsic values embedded in technology platforms, interacting with the values embedded in eLearning programmes that are hosted on eLearning platforms, and how all of this as an integrated unit, influences students and society. It is worth exploring this finding deeper because to truly understand how the values embedded in technology influence society, both the known values from eLearning programmes and the hidden values embedded in the platform must be considered together. This insight is a valuable contribution to the existing body of knowledge, and warrants further research.

7.3.2.5 Differentiating between face-to-face and eLearning programme development

The study concluded that academics sometimes use the programme designed for face-to-face teaching and learning, online, which affects the quality of online teaching and learning, and negatively impacts student success. Although this conclusion is not verified in literature, it does suggest that if educational institutions do not implement the UDL for

eLearning, then students may find it difficult to navigate content that was designed for the classroom. This finding offers a plausible explanation for academics viewing technology as a tool, as they see the values in programmes offered through face-to-face teaching and learning as the same as values in programmes offered through technology platforms. If educators are using the same learning material for both modes of delivery, then the finding makes sense, but if the UDL is followed for online learning, then there should be a difference in the embedded values. This conclusion adds to the body of knowledge about eLearning platform and programme design.

7.3.2.6 Cost-effective alternative for increased cohort size

The study concluded that eLearning accommodates increased cohort sizes as a cost-effective alternative to face-to-face teaching and learning. This conclusion could not be confirmed in literature, and is a contribution to the body of knowledge about eLearning. An investigation into eLearning platforms supporting increased cohort sizes is an area for further research. This idea could be extended to look at the cost implications of offering teaching and learning to large cohorts of students through contact classes, and eLearning as a comparative study.

7.3.2.7 Stakeholders consulted

There is no relevant literature from the education sector in top journals over the last five years, that either supports or refutes the conclusion that the stakeholders who are consulted when choosing the values to be embedded in eLearning programmes offered on eLearning platforms, are known, but may differ between educational institutions, and therefore, the list of stakeholders consulted (Table 14a) may be a new contribution to the existing body of knowledge about transparency relating to the stakeholders involved in determining the values that are embedded into eLearning programmes offered through technology platforms.

7.3.2.8 Graduate attributes and 21st century skills

The study concluded that graduate attributes contribute to 21st century skills. These graduate attributes are synonymous with human values (Schwartz, 1994; van de Poel, 2020). The list of graduate attributes (Table 24a) that contribute to 21st century skills, is an addition to the body of knowledge about technology and 21st century skills for the workplace. While current research focuses on the values that are embedded in technology platforms, there is no literature that directly links graduate attributes that should be embedded in eLearning programmes hosted on eLearning platforms, with students gaining 21st century skills for the workplace. This is therefore an area for further research.

7.3.2.9 Conceptual framework

One of the major contributions to the body of knowledge about how values embedded in technology platforms are selected, and influence society, is the conceptual framework. Researchers can use this framework as a starting point to expand and refine the concepts. It also provides academic staff involved in developing eLearning programmes and eLearning platforms at educational institutions, with a framework to conceptualise the graduate attributes that they wish to embed in eLearning platforms and eLearning programmes, and see how these values synergistically prepare a student for the world of work.

7.3.3 Extending the understanding of existing knowledge

7.3.3.1 Embedding values into eLearning platforms versus eLearning programmes

One of the aims of this study was to explore how the education sector understands the embedding of values into eLearning platforms hosting eLearning programmes, and how these values influenced students, and society in general. The study concluded that the values embedded into eLearning platforms is better expressed by referring to values being embedded into eLearning programmes offered on eLearning platforms. This claim questions the role of intrinsic values embedded in eLearning platforms that offers an eLearning programme, versus the offering of a similar programme by a lecturer in class. Some educational institutions seem to only consider values from the perspective of embedding them into programmes and not the mode of delivery, which in the case of eLearning, would be technology platforms that have built-in values, and in the case of face-to-face learning, would be the values of the lecturer. This contribution helps to understand the mindset of the education sector, and warrants further research into how the mode of delivery (eLearning versus face-to-face) affects the influence of values on students, to determine if students are exposed to the same set of values at the end of their learning.

7.3.3.2 Stakeholders consulted

The study confirmed that the stakeholders who are consulted when choosing the values to be embedded in eLearning programmes offered on eLearning platforms, are known, but may differ between educational institutions. Literature shows that there is a lack of transparency around which stakeholders are involved in choosing the values to be embedded in technology, (den Hond & Moser, 2023) , which contradicts the study conclusion. The list of stakeholders consulted generated through the study, maps closely to the list of stakeholders outlined by Noble et al., (2022) , as the stakeholders who should be consulted, although there may be some variances across educational institutions. This contribution therefore extends the body of knowledge about transparency of stakeholders consulted.

7.3.3.3 Changing values in eLearning programmes and platforms

The study concluded that up to 50% of the content of an eLearning programme can be changed without having to revert to the regulatory body. While this information does not appear in any of the extant literature, it can be found in policy documents of regulatory bodies and educational institutions in South Africa. It is different from extant literature as den Hond and Moser (2023) pose the question about whether values can be changed once it has been embedded in technology. From an education perspective, change is possible and welcome so that programmes keep abreast of environmental changes, but there was some resistance on the basis that the stakeholder requesting the change had to be “important” and the requested changes had to be relevant. This conclusion extends the body of knowledge about changing values on technology platforms after they have been embedded.

7.3.3.4 Sub-optimal use of data

The study concludes that educational institutions possess huge amounts of student data, that is not used optimally. Literature supports these findings about educational institutions collecting big data, but focuses on the potential use of this data with the advent of AI (Bates et al., 2020). Businesses’ desire is to use data to personalise product advertising (Noble et al., 2022). Caution should be exercised as AI can make biased and discriminatory decisions, (Martin et al., 2019), and institutions are accountable for these decisions (D’Cruz et al., 2022). AI tools can assist teachers and administrators to better understand individual student journeys by using student data to track progress (Zhang & Aslan, 2021) and make predictions about student progress for early interventions (Gray & Perkins, 2019; Riestra-González et al., 2021), of cohorts of students across the institution (Zawacki-Richter et al., 2019). While South African institutions may not have reached this level of sophistication in terms of student data use, the potential to do so exists, and literature points to what should be considered when that time comes. This study therefore extends the current body of knowledge about the use of data.

7.3.3.5 Social media as agents of social engineering and misinformation

The study concluded that social media supports social engineering and misinformation. Technology can influence public perceptions (Vesa & Tienari, 2022), but when reminded about social norms and societal expectations, society does the right thing (Gimpel et al., 2021), and the spread of misinformation is mostly unintentional (Unfried & Priebe, 2024). While the literature differs from the conclusion, the argument still stands, as literature only shows how to reduce the incidence of the spread of misinformation and social engineering among the general public, but it does not speak to the intentional social engineering and spread of misinformation. This conclusion therefore extends the current

body of knowledge about the role of social media in social engineering and misinformation.

7.3.3.6 Technology addiction and health risks

The study concluded that the length of time spent on technology platforms poses health risks. Literature supports the claim of technology addiction (Busalim et al., 2019) , but show contradictory evidence about whether it results in a decrease in student performance (Suárez-Perdomo et al., 2022) . While research has been done in the area of physical health risks, none of the research appears in one of the acceptable journals. This is therefore an area for further research. The conclusion therefore extends the body of knowledge about technology addiction and health risks.

7.3.3.7 AI technology capabilities

The study concludes that there are gaps in AI's capability, especially around AI recognising human emotions, that society must consider before adoption. While some researchers (Bates et al., 2020) support this view, new research (Jafari, 2024) shows that human-centred AI (HAI) that has human values and ethics embedded in its algorithm, can identify and respond to human emotions, but the question remains that just because HAI has the capability of providing emotional support, should it be allowed to do so (Crawford et al., 2024) ? This conclusion therefore extends the body of knowledge about the capabilities of AI technology that must be considered before its adoption.

7.3.3.8 Smart technology

The study concluded that technology has developed so rapidly that it is expected to be as smart as a human brain by 2025. While the claim could not be verified, Grinin et al., (2020) calculated the point of technology singularity to be 2106, but their calculation was done prior to the launch of generative AI like ChatGPT, so it may be out-dated. Irrespective of when we reach technological singularity, we are entering an era of technology-human collaboration (Bednar & Welch, 2020) . This insight is important for the education sector because it produces the next generation of employees and entrepreneurs who will be collaborating more intimately with technology. Society needs to decide on the roles to assign to technology and the roles that humans will play in this new technologically-driven world. The conclusion therefore extends the current body of knowledge about the rapid advancement of technology.

7.3.4 Supporting the understanding of existing knowledge

Even when conclusions of the study confirm literature claims, this study is done in a different setting, so the conclusions are still valuable to the existing body of knowledge because it gives a different perspective. The table below shows the study conclusions and the body of knowledge that it supports.

Table 27: Conclusions that are supported in literature

Conclusion	Existing body of knowledge
<i>eLearning platforms require a student-centric design to enhance the student journey</i>	(Roski et al., 2024)
<i>Educational institutions are in favour of using AI in education, despite the challenges of the potential for cheating and plagiarism.</i>	(Doğan & Şahin, 2024) .
<i>There should be greater transparency around the values embedded in eLearning platforms</i>	(den Hond & Moser, 2023; Jafari, 2024)
<i>There should be greater transparency around the values embedded in eLearning platforms.</i>	(den Hond & Moser, 2023; Jafari, 2024)
<i>Incentives should be an embedded value, to motivate learners to complete their eLearning programmes</i>	Lee and Yeung (2022) ; Chevalier et al., (2018) ; and Mbiti et al., (2019) .
<i>Technology has evolved and the use of technology in teaching and learning has evolved parallelly, even though at a slower pace.</i>	(De Nito et al., 2023); (Garzón & Acevedo, 2019); (Audretsch et al., 2019); (Onu et al., 2024)
<i>eLearning programmes offer flexible and self-paced learning, which face-to-face learning does not offer, especially if the eLearning platform was intentionally designed.</i>	(Roski et al., 2024)
<i>The purpose of technology is to support teaching and learning irrespective of its mode of delivery.</i>	(Feubli et al., 2024; Jensen et al., 2020); (Orhan, 2024)
<i>Education institutions in general support the adoption of AI; and AI is already being used in the education sector</i>	(Zawacki-Richter et al., 2019); Zhang and Aslan (2021); Bates et al., (2020);
<i>Technology is integrated with teaching and learning, and cannot be separated from one another.</i>	Miller (2021) ; (Heyndels, 2023);
<i>There is no clarity of who makes the final decision about which values to include or discard from eLearning programmes and platforms.</i>	(Dafoe, 2015; D’Cruz et al., 2022; den Hond & Moser, 2023; Noble et al., 2022)
<i>Despite educational institutions complying with government legislation on data security, and having additional security measures in place, data security may still be questionable.</i>	(Daniel, 2019); (Noble et al., 2022); (Flyverbom et al., 2019)
<i>Not only are there differences of understandings about AI and technology among educators and students, but there may be different understandings among educators themselves</i>	(Lim et al., 2022)
<i>The evaluation criteria for a technology platform begins with student centredness.</i>	(Zhang and Aslan, 2021; Bates et al., 2020; Trinh et al., 2023; Hill, 2019; Mpungose, 2020; Jensen et al., 2020; Al-Samarraie et al, 2018)
<i>Young people who grow up with technology are more accustomed to it and are more likely to respond positively to eLearning.</i>	(Hurwitz & Schmitt, 2020); (Barak, 2018); (Corkin et al., 2022)
<i>Access to technology benefits society by providing current, instantaneous information that can be accessed in large volumes or small chunks, to suit the individual’s preferences.</i>	(Novo, 2018); (Chakraborty et al., 2021; Feubli et al., 2024) ; (Lembani et al., 2020; Sutherland, 2020); (Onu et al., 2024)

Conclusion	Existing body of knowledge
<i>Human-to-human communication is deteriorating because of AI.</i>	Crawford et al., (2024)
<i>The pandemic sped up the adoption of technology.</i>	(Adedoyin & Soykan, 2023; Moja, 2021; Lovino, 2023; Jensen et al., 2020); (Bates et al., 2020); (Zawacki-Richter et al., 2019; Zhang & Aslan, 2021)
<i>There is uncertainty about how to integrate AI into teaching and learning, and society at large.</i>	Bates et al., (2020) ; Jafari (2024),
<i>Educators recognise the need for technology to prepare learners for the workplace</i>	Noble et al., (2022) ; Audretsch et al., (2019) ; Doğan and Şahin (2024) ; Jafari (2024)
<i>There is a fine balance between AI and human capabilities, and educators must be agile and willing to adopt technology</i>	Bates et al., (2020); Jafari, (2024) ;Chan (2023)
<i>Society would benefit from technology that placed the student at the centre of the choice of platform, by considering learners' individual learning journeys.</i>	Chan, (2023); Bond et al., (2020) ; Trinh et al. (2023); Hill (2019); and Roski et al. (2024)
<i>The technology platform should be easy to navigate.</i>	Roski et al. (2024)
<i>The playing fields should be levelled by offering society free technology platforms with free access to data.</i>	Lembani et al., (2020)
<i>Society is not capacitated to utilise technology optimally, and there are gaps in the technology capability that prevent an optimal learning experience</i>	Lembani et al., (2020); Jafari (2024) ; (Grinin et al., 2020)
<i>The mindset of teaching should shift towards learning skills to operate in a technologically driven world.</i>	(Bates et al., 2020)
<i>Students prefer to learn in small chunks of information that was specific to a particular profession or job</i>	(Carannante et al., 2021; Razmerita et al., 2020)

7.3.5 Conclusion

This study set out to explore how values embedded in technology are selected, and how they influence society, in the context of the South African PSET sector. The research question has relevance in an era of AI disruption of sectors, and the education sector is no different. In response to the question of how values are selected, the study concluded that the criteria used to design the technology platform played a role in selecting intrinsic values embedded in technology, and proposed a set of criteria that can add to existing criteria lists. Furthermore, the selected graduate attributes for 21st century skills, contributed to the values that were embedded in eLearning programmes accessed through eLearning platforms. The study confirms that technology is integrated with teaching and learning, and should not be viewed separately.

Technology's use in education has evolved parallelly with the evolution of technology, but at a slower rate. The slow pace is due to the sector's challenges, which include the lack of policies; staff capability to work with the latest technologies; and student issues with access to data and devices to access the technology. However, technology is used in education at a minimum, for communication, collaboration and access to learning materials for face-to-face teaching and learning. One of the problems highlighted by this study, is using materials prepared for face-to-face teaching and learning, in an eLearning environment, which makes the student journey difficult, and results in poor outcomes.

In response to the question of which stakeholders were consulted during the development of the eLearning platform and programme, the study found that the process of consultation is public knowledge, and generated a list of stakeholders consulted. However, the list varies by educational institution. The study therefore contributed to the larger question about transparency involving stakeholder consultations.

The question on who made the final decision about which values to include in technology platforms and eLearning programmes, was not answered satisfactorily. Based on the responses, it could be one or groups of any number of stakeholders, suggesting that the decision-making process is not well understood; the process is relaxed enough to allow for different decision-makers; or institutions are making decisions about values without proper consultation or governance.

The study is clear on its conclusion that once values have been embedded into technology or eLearning programmes, it was possible to implement changes, and the academic responsible for the programme would implement these changes. This is an important conclusion with relevance to transparency.

The study concluded that despite institutions following legislation and having internal policies on data security, security measures were insufficient and could be improved. Education institutions have access to big data, but they are under-utilising the data.

In response to the question of how technology is evaluated, the study proposed a set of evaluation criteria, which places students at the centre. This design is important for a smooth student journey resulting in student success.

In response to the question on the extent to which technology influences society, the study concluded that society benefits from instantaneous access to information through technology, and young people who grow up using technology creatively, are more likely to adapt to eLearning than those who were not exposed to technology, or did not use it creatively. However, there are also negative influences such as cyber bullying; the

spread of misinformation; addiction to technology; and effects on mental and physical health that should not be ignored.

The study concluded that technology's influence on society was accelerated during the pandemic, however, there is still uncertainty about how best to integrate new AI technologies into society. One of the pitfalls is the realisation that technology does not serve all of society's needs, and there should be clear consideration of the capabilities of technology versus those of humans. The study showed that society would benefit from technology if it was easy to navigate; if the technology platform was designed around the student or user; if the playing fields were levelled by giving all of society access to data and technology platforms; if society recognises the gaps in what technology can and cannot do; and if educators changed their mindsets to learn skills that were relevant to a 21st century workforce. Society also benefits from technology that has embedded values that develops 21st century skills in the user, that helps them function better in the workplace.

7.4 Recommendations for management and/or other stakeholders

The main stakeholder groups who will be interested in this study are the educational institutions; government; business; and researchers.

7.4.1 Educational institutions

Education institution staff should think about how to balance face-to-face teaching and learning with eLearning, given the outcomes of this study on the positive and negative characteristics of both modes, and the preferences of both academic staff and students highlighted in this study.

The study has shown that the will to implement AI is there, but challenges hinder implementation. Institutions are therefore encouraged to develop their AI policies; capacitate their staff; and deal with student issues of access to technology and data so that their paths are cleared to implement AI.

Education institutions should think about how to select values to embed in technology platforms, and in eLearning programmes, so that the values work synergistically to build 21st century skills and prepare the student for the world of work.

With the world accelerating towards technological singularity, educational institutions should consider the 21st century skills needed for the next generation of employees and entrepreneurs who must work collaboratively with AI.

7.4.2 Government

To reduce the digital divide and put society on an even playing field to benefit from technology, government officials should consider issues of data connectivity and access

to technology platforms, especially for communities in rural areas. Education policies also need to change to adopt new technologies and to bring education into the 21st century. If distance education institutions can adopt new technologies successfully (De Nito et al., 2023) , then traditional educational institutions should be able to follow suit.

7.4.3 Business

Businesses that develop technology are recommended to consider the education sector as a public good, and cost their technologies appropriately. These businesses should also take a leaf out of the education sector page, and make stakeholder consultations about the values embedded into technology, transparent. Businesses should also play a bigger part in working collaboratively with the education sector to ensure that education institutions are developing graduates with the skills required for the future.

7.4.4 Researchers

Researchers are encouraged to build on the conceptual framework provided in this study, and apply it to other sectors or to the post-school education and training sector in other countries. Researchers are also encouraged to accept this invitation to expand on the study by either replicating it in another sector or in the education sector in another country, or picking one of the eight topics suggested for further research.

7.5 Limitations of the research

The limitations of the research design can be found in Chapter 4. This chapter considers limitations of the whole study.

The study was restricted to the PSET sector in South Africa, and excluded participants from other countries. The results therefore cannot be generalised for the education sector globally, but the researcher can decide if the study can be replicated in other countries by following the same research design and methods. The study also excluded primary and secondary school education, and other sectors.

The aim of the research was to gain an overview of participants' perceptions, and given the limited interview time and number of questions asked, there was a fine balance between depth and breadth of probing. Some participants' responses were not probed deeper, because of time constraints. The study identified sub-themes that were not probed further, given the time constraints.

The participants in the study were mainly from urban educational institutions, so there was an under-representation of educational institutions in rural parts of the country. Having greater representation from participants in rural institutions may have influenced the outcomes of this study.

While the research covered technology's influence on society, the reverse relationship (society's influence on technology) fell outside its scope, and is therefore a gap for future research.

7.6 Suggestions for future research

Due to limitations in the current research, this study could not explore all the emerging themes and constructs that I gathered during data collection. The following are recommended topics for further research:

7.6.1 Assessments-on-demand

Assessments-on-demand is an extension to the student-centric approach to platform design that promotes flexibility in the student journey. Academics are looking for evidence to show that this is a viable option, and if implemented, will improve the student journey.

7.6.2 Comparison of modes of delivery on influence of values on students

Some educational institutions seem to only consider values from the perspective of embedding them into programmes and not the mode of delivery, which for eLearning, would be technology platforms that have built-in values, and for face-to-face learning, would be the lecturer's values. Further research should be done into how the mode of delivery (eLearning versus face-to-face) affects the influence of values on students, to determine if students are exposed to the same set of values at the end of their learning.

7.6.3 Storytelling as a tool to instil values

Storytelling has been used in other business contexts, but its effectiveness in imparting values in the PSET sector has not been studied. It would be interesting to see if storytelling can complement the intrinsic sets of values embedded in eLearning platforms and eLearning programmes, by making values more explicit.

7.6.4 Embedded values and their collective influence on students

Values are embedded into technology, as well as into eLearning programmes. The recommended study is on how the two sets of values interact with each other to influence the student and society, in an integrated manner.

7.6.5 The cost-effectiveness of eLearning platforms with large cohorts of students

The cost of education, whether face-to-face or online, is expensive. The former has costs associated with buildings, staff, equipment, etc., while the latter has costs of development, license fees, etc. It would be interesting to explore a comparative study of face-to-face with eLearning from a cost perspective, bearing in mind that costs are not only financial.

7.6.6 Final decision-makers on choice of values

This study could not conclusively pronounce on who the final decision-makers were who decided on which values to embed in eLearning programmes and platforms. At best, the study generated a list of potential decision-makers, but it was difficult to isolate the final decision-maker. This study attempted to respond to this question posed by den Hond and Moser (2023) about having greater transparency around the final decision-maker, and is therefore an area for further research.

7.6.7 Health risks resulting from lengthy periods of time online

There is conflicting literature about the health risks posed by addiction to technology, and the long time spent interacting with technology, particularly around the hazards of sitting. One participant described this phenomenon as “sitting is the new smoking”. With the younger generation growing up as digital natives, society needs more information about the health risks that they face.

7.6.8 Relationship between graduate attributes and 21st century skills for the workplace

This study concluded that graduate attributes are values that are embedded in eLearning programmes offered on eLearning platforms. Educational institutions develop graduate attributes as values with which students leave the institution, but there is no study on how graduate attributes that are embedded on eLearning platforms and eLearning programmes, instil 21st century skills that prepare students for the workplace.

7.6.9 Society’s influence on technology

The relational agentic role of technology (den Hond & Moser, 2023) fell outside the scope of this study. While the study explored technology’s influence on society, it did not consider society’s influence on technology. With AI being developed to resemble humans, society’s influence is therefore important to understand. This is therefore an area for further research.

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Appendix 1: Interview Guide

Exploring how values are embedded in technology, and its influence on society: A study of the post-school education and training sector in South Africa

Interview date:		
Interview time:		
Place:		
Interviewer:		
Interviewee:		
Organisation and Position of Interviewee		
Question type (Josselson, 2013)	Interview question	Related research question
Orientating / framing question	<p>q1. I'd like to talk about the use of technology in teaching and learning. From your knowledge and experience, how is technology used in the PSET sector?</p> <p>q2. Please describe your role and experience with technology in the PSET sector.</p>	
Boundaries of the research questions	Q1. From your knowledge and experience, what purpose does technology serve in teaching and learning?	Sub-question 1.1: What purpose does technology serve?
	Q2. From your knowledge and experience, who would be consulted during the planning and development phase of a new e-learning programme on an e-learning platform?	Sub-question 1.2: Which stakeholders were consulted in its development?
	Q3a. Based on your knowledge and experience, how are all the different stakeholder needs accommodated into the final e-learning programme? Who has the final decision?	Sub-question 1.3: How were the final values for the technology selected?

	Q3b. Tell me about the values that underpin online programmes. How are these values determined, and who has the final say on which values to include?	Sub-question 1.3: How were the final values for the technology selected?
	Q4. Once the e-learning programme has been registered, can additional stakeholder needs be incorporated? If so, how?	Sub-question 1.4: How could these values be changed?
	Q5. Based on your knowledge and experience, how would the e-learning platform be evaluated?	Sub-question 1.6: How is technology evaluated?
	Q6. How is the learner information generated through the e-learning platform, protected, and how is it used?	Sub-question 1.5: How is the data gathered through technology, used and protected?
	Q7. In your opinion, how does technology influence society?	Sub-question 2.1: How does technology influence society?
	Q8. What benefits of e-learning platforms are there for learners, and the community in general?	Sub-question 2.2: How does society benefit from the use of technology?
Clarifying/probing questions	Can you please elaborate? Please explain what you mean? Can you give me an example? Tell me more about what you've just mentioned	
Closing question	Q9. How do you see the future of technology in the PSET sector?	
	Thank you for your participation.	

Appendix 2: Recruiting participants

Based on Josselson's (2013) recommendations for recruiting participants, my strategy to recruit participants is as follows:

"I am conducting a study within the post-school education and training sector, that looks at how values are embodied in teaching and learning programmes offered through technology, and its influence on students (society). I am engaging with individuals who have knowledge about blended or e-learning, and have had a role to play in the development process of learning programmes, either from a content or a technology platform development perspective. The interview will take approximately sixty minutes. I will be asking about your personal experiences, so no preparation is required. The interview could take place in person (if in Gauteng) or online – whichever you would prefer. There is no remuneration payable for your participation. Your participation is voluntary, and you may withdraw from this study at any time. I will record our conversation and transcribe it thereafter, but your personal information will remain confidential, and will not appear in the final report. Are you willing to participate in this important study?"

Appendix 3: Confidentiality and non-disclosure agreement

It is a condition of engagement that students will assist in preserving all confidential information, ideas and plans; any confidential information or any information in respect of any data gathered, captured or analysed in respect of the research work they undertake in fulfilment of GIBS masters or doctoral degree programmes, in this case the research project titled ***Exploring how values are embedded in technology, and its influence on society: A study of the post-school education and training sector in South Africa*** conducted by The parties under this agreement agree to the following:

1. To apply their best efforts to keep any information confidential which has been acquired or may acquire pursuant to the research work. For the purposes of this clause, confidential information excludes information which:
 - 1.1 is publicly available or becomes publicly available through no act or default of any Party;
 - 1.2 was in the possession of a Party prior to its disclosure otherwise than because of a breach by any party of any obligation of confidentiality to which it is subject;
 - 1.3 is disclosed to the student by a person which did not acquire the information under an obligation of confidentiality; and
 - 1.4 is independently acquired by a student and because of work carried out by a person to whom no disclosure of such information has been made;
2. No party shall use or disclose confidential information except with the prior written consent of GIBS or in accordance with an order of a court of competent jurisdiction or in order to comply with any law or governmental regulations by which any Party concerned is bound or as may be lawfully requested in writing by any governmental authority.
3. The party undertakes to permanently delete any electronic copies of confidential information received, and destroy any confidential printed documentation or similar material in their possession promptly once they are no longer required, usually on completion of the service contracted by the student.
4. On completion of the contracted service on behalf of the student, the party is to confirm to the student that they are not in possession of any confidential information.

Signed at _____ on this _____ day of _____ 20___. On
behalf of:

Name: _____ Signature: _____

duly authorised and warranting such
authority Witness: _____

Appendix 4: Certification of additional support

(Additional support retained or not – to be **completed by all students.**)

Please note that failure to comply and report on this honestly will result in disciplinary action.

I hereby certify that (please indicate which statement applies):

• **I DID NOT RECEIVE any additional/outside assistance (that is, statistical, transcriptional, thematic, coding, and/or editorial services) on my research report:**

.....

• **I RECEIVED additional/outside assistance (that is, statistical, transcriptional, thematic, coding, and/or editorial services) on my research report:**

.....

If any additional services were retained, **please indicate below which:**

- Statistician**
- Coding (quantitative and qualitative)**
- Transcriber**
- Editor**

Please provide the name(s) and contact details of all retained:

NAME:

EMAIL ADDRESS:

CONTACT NUMBER:

TYPE OF SERVICE:

NAME:

EMAIL ADDRESS:

CONTACT NUMBER:

TYPE OF SERVICE: 55

NAME:

EMAIL ADDRESS:

CONTACT NUMBER:

TYPE OF SERVICE:

I hereby declare that all *interpretations (statistical and/or thematic) arising from the analysis and write-up of the results for my study were completed by myself without outside assistance.*

STUDENT NUMBER:

...23023342.....

Appendix 5: List of codes and categories

Code	Category	Theme
Technological evolution: Technology in general	Technological evolution	Evolution of technology
Technological evolution: AI		
Technological evolution: LMS		
Technological evolution: Pandemic		
Technological evolution: Smart classroom		
Technology as a tool: Support	Technology as a tool	Balancing online and face-to-face learning
Technology as a tool: Tool		
Technology as a tool: Supplementary aid		
Influence of e-learning platforms on teaching and learning: E-learning tools-efficiency	Influence of e-learning platforms on teaching and learning	
Influence of e-learning platforms on teaching and learning: Facilitators		
Influence of e-learning platforms on teaching and learning: Flexible and self-paced learning		
Influence of e-learning platforms on teaching and learning: How students learn		
Influence of e-learning platforms on teaching and learning: Student cohort size_ elearning		
Influence of e-learning platforms on teaching and learning: Student-lecturer interaction		
Modes of learning: Blended learning	Modes of learning	
Modes of learning: e-learning vs face-to-face		
Modes of learning: Using technology in teaching and learning		
Modes of learning: Values relating to programmes		
Factors affecting technology adoption in PSET: Covid, AI and functions	Factors affecting technology adoption in PSET	
Factors affecting technology adoption in PSET: mindset		
Online platforms supporting teaching and learning: Diversity of student views	Online platforms supporting	

Online platforms supporting teaching and learning: E-learning_opportunities_student mindset	teaching and learning			
Online platforms supporting teaching and learning: Student mindset				
Online platforms supporting teaching and learning: Student support				
Online platforms supporting teaching and learning: Teaching innovation				
Student learning journey: Access to education opportunity	Student learning journey			
Student learning journey: Learning journey				
Online platform design considerations: Costs associated with e-learning platforms	Online platform design considerations	Platform design and criteria influencing student journey		
Online platform design considerations: Designing for social inclusion				
Online platform design considerations: Drop-out rates and student retention_challenges				
Online platform design considerations: E-learning platform design				
Online platform design considerations: Infrastructure required to support e-learning				
Online platforms supporting teaching and learning				
Online platforms supporting teaching and learning: Diversity of student views				
Online platforms supporting teaching and learning: E-learning_opportunities_student mindset				
Online platforms supporting teaching and learning: E-learning_student support				
Online platforms supporting teaching and learning: E-learning_teaching innovation				
Assessments: Online assessments			Assessments	
Data protection: Data protection_policies			Data protection	
Data protection: Future of technology_regulation				

Use of student data: Use of data_academics	Use of student data	Data protection and ethical considerations
Use of student data: Use of data_external bodies		
Use of student data: Use of data_institution		
Use of student data: Use of data_sector		
Accessing student data: Confidentiality	Accessing student data	
Accessing student data: Risks		
Accessing student data: Stakeholders with access to student data		
Accessing student data: Technology Ts&Cs		
Accessing information through technology: Access to information through e-learning platforms	Accessing information through technology	Access and equity of e-learning
Accessing information through technology: Accessing e-learning through mobile devices		
Accessing information through technology: Accessing information from any location		
Accessing information through technology: Instant access to information		
Navigating the digital divide: Challenges	Navigating the digital divide	
Navigating the digital divide: Infrastructure challenges		
Navigating the digital divide: Technology and the digital divide		
Criteria for evaluating e-learning platforms: Ability to create individual learning pathways	Criteria for evaluating e-learning platforms	
Criteria for evaluating e-learning platforms: Ability to migrate from old to new systems		
Criteria for evaluating e-learning platforms: Cloud-based		
Criteria for evaluating e-learning platforms: Communication capabilities		
Criteria for evaluating e-learning platforms: Cost		
Criteria for evaluating e-learning platforms: Curriculum developers		

Criteria for evaluating e-learning platforms: Developers	Choosing a suitable technology platform
Criteria for evaluating e-learning platforms: Engagement and collaboration	
Criteria for evaluating e-learning platforms: Experts	
Criteria for evaluating e-learning platforms: Familiar architecture	
Criteria for evaluating e-learning platforms: Fit for purpose	
Criteria for evaluating e-learning platforms: Guidelines	
Criteria for evaluating e-learning platforms: How technology is used	
Criteria for evaluating e-learning platforms: ICT staff	
Criteria for evaluating e-learning platforms: International	
Criteria for evaluating e-learning platforms: Long-term solution	
Criteria for evaluating e-learning platforms: Navigation	
Criteria for evaluating e-learning platforms: One source of truth	
Criteria for evaluating e-learning platforms: Open source	
Criteria for evaluating e-learning platforms: Postgraduates	
Criteria for evaluating e-learning platforms: Public good	
Criteria for evaluating e-learning platforms: Simplicity of access	
Criteria for evaluating e-learning platforms: simplicity of design	
Criteria for evaluating e-learning platforms: Speed	
Criteria for evaluating e-learning platforms: Student journey	
Criteria for evaluating e-learning platforms: Students	
Criteria for evaluating e-learning platforms: TVET Colleges	
Criteria for evaluating e-learning platforms: universal design	
Criteria for evaluating e-learning platforms: University	
Criteria for evaluating e-learning platforms: Uptime	
Criteria for evaluating e-learning platforms: Use	

Stakeholders consulted: Academic team	Stakeholders consulted	
Stakeholders consulted: Alumni		
Stakeholders consulted: Experts		
Stakeholders consulted: Government		
Stakeholders consulted: Industry		
Stakeholders consulted: No consultation		
Stakeholders consulted: Others		
Stakeholders consulted: Regulatory bodies		
Stakeholders consulted: Students		
Stakeholders consulted: Users of the technology platform		
Final decision-maker: Final decision-maker_academic	Final decision-maker	
Final decision-maker: Final decision-maker_industry body		
Final decision-maker: Other		
Final decision-maker: regulatory body		
Final decision-maker: SDP		
Possibility of changing values after registration: changing stakeholder values_need	Possibility of changing values after registration	Role players in determining values and regulatory oversight
Possibility of changing values after registration: changing stakeholder values_updates		
Possibility of changing values after registration: Ease of changing values		
Possibility of changing values after registration: Power of e-learning developer		
Regulatory controls over e-learning platforms: Accreditation and registration	Regulatory controls over e-learning platforms	
Regulatory controls over e-learning platforms: QA of e-learning platforms		
Values associated with e-learning platforms: Values related to specific professions	Values associated with e-learning platforms	
Values associated with e-learning platforms: Values_accessibility		
Values associated with e-learning platforms: Values_accreditation		
Values associated with e-learning platforms: Values_affordability		

Values associated with e-learning platforms: Values_assessment and integrity	Technology as an Enabler of 21st Century Skills
Values associated with e-learning platforms: Values_autonomy and agency	
Values associated with e-learning platforms: Values_Confidence	
Values associated with e-learning platforms: Values_creativity	
Values associated with e-learning platforms: Values_critical thinking	
Values associated with e-learning platforms: Values_data security	
Values associated with e-learning platforms: Values_digital literacy and respect	
Values associated with e-learning platforms: Values_digitally competent	
Values associated with e-learning platforms: Values_discipline	
Values associated with e-learning platforms: Values_equity	
Values associated with e-learning platforms: values_ethics	
Values associated with e-learning platforms: Values_flexibility	
Values associated with e-learning platforms: Values_incentives	
Values associated with e-learning platforms: Values_quality	
Values associated with e-learning platforms: Values_reliability	
Values associated with e-learning platforms: Values_self-directed	
Values associated with e-learning platforms: Values_Singularity	
Values associated with e-learning platforms: Values_student centredness	
Values associated with e-learning platforms: Values_time management	
Values associated with e-learning platforms: Values_transparency	
Graduate attributes: Creating a learning community	Graduate attributes
Graduate attributes: E-learning platform_enabling collaboration	
Graduate attributes: E-learning platform_enabling community building	

Graduate attributes: E-learning platforms enabling information-sharing		
Graduate attributes: E-learning platforms_enabling choice		
Graduate attributes: Technology building graduate attributes		
Graduate attributes: Values_graduate attributes		
	Preparation for work environment	
Preparation for work environment: Developing skills through teaching and learning		
Preparation for work environment: Developing skills through technology		
Preparation for work environment: Future of technology_world of work		
Preparation for work environment: Preparation for the world of work		
Preparation for work environment: Strengthening profile		
	Technology in the future	Artificial intelligence and future in education
Technology in the future: E-learning into the future		
Technology in the future: Operating in an environment of constant change		
Technology in the future: Research in the future		
Technology in the future: Technology gaining prominence		
Technology in the future: Technology integration		
	AI in the PSET sector	
AI in the PSET sector: AI database		
AI in the PSET sector: AI into the future		
AI in the PSET sector: Benefits of AI technologies		
AI in the PSET sector: Using AI in teaching and learning		
	Technology's influence on society	
Technology's influence on society: Automation		
Technology's influence on society: Better informed society		
Technology's influence on society: Changing mindsets		
Technology's influence on society: Collaboration		
Technology's influence on society: Communication		
Technology's influence on society: community reach		

Technology's influence on society: Creating global citizens		Technological advancement vs societal values
Technology's influence on society: Creating new possibilities		
Technology's influence on society: Creating opportunities		
Technology's influence on society: Cybercrime and cyber bullying		
Technology's influence on society: Dependence		
Technology's influence on society: Efficiencies		
Technology's influence on society: Fake news		
Technology's influence on society: Life without technology		
Technology's influence on society: lifelong learning		
Technology's influence on society: PSET contribution to society		
	Negative effects of technology use	
Negative effects of technology use: Access to student data_profiteering		
Negative effects of technology use: AI biases		
Negative effects of technology use: Effect on climate		
Negative effects of technology use: Health risks		
Negative effects of technology use: Human connection		
Negative effects of technology use: Life span of technology		
Negative effects of technology use: Profiteering		
Negative effects of technology use: Resistance to the use of technology		
Negative effects of technology use: Skills development provider motivation		

