

**INNOVATIVE PRACTICES IN TECHNOLOGY AND THE
IMPROVEMENT OF LEARNING AND TEACHING IN HIGHER
EDUCATION: A CASE FOR PRIVATE INSTITUTIONS.**

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ABSTRACT

In the 21st Century, many Higher Education Institutions globally are undergoing dramatic changes like massification, globalisation and diversification. Another key transformer of the Higher Education environment is that of technology innovation.

The aim of this study is to determine the extent of technology integration in Higher Education Institutions. The research looks at the benefits and challenges of integrating technology into Higher Education Institutions in Southern Africa. There is an attempt to determine how innovative technology in a Higher Education Institution can impact students' academic performance and also influence positively the efficiency of the institution. In the research, technology is broadly represented, from personal devices to complex management systems, security and artificial intelligence.

The research methodology reflected a mixed method approach. This enabled data collection both qualitatively and quantitatively through the distribution of an online questionnaire. The data received showed that students believed that innovative technology integration at their Higher Education Institution would not only benefit the institution on many different levels of operation, but also impact positively on the nature of their learning experience and their results.

From the research one can conclude that despite the revolutionary technology developments that most of us have experienced on a personal level, the Higher Education Institutions have generally been slow to embrace wholly the integration of innovative technology. Pockets of the technology revolution is evident in a growing number of universities and colleges in the United States of America. The nature of technology integration in the South African Higher Education Institutions is limited though, but there are encouraging signs of their sprint to innovate with their technology integration despite financial limitations, particularly the private tertiary institutions. There is an opportunity for greater research to be conducted on the positive impact of technology integration into Higher Education Institutions in South Africa which may further revolutionise the current traditional view and experience of a tertiary education.

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1. CHAPTER 1 INTRODUCTION

Every aspect of our daily life is influenced in some way by a feat of technology. This includes our toddlers (some younger than two years old), children, young adults, middle-aged and senior citizens whose lives are invaded by an onslaught of technology development. Research by The Connected Kids report (2017), shares that there have been dramatic changes in the media habits of children in the last twenty years. Since 1995 the research organization Connected Kids has surveyed up to 2000 children from age 5 to 16 years of age. According to Wakefield (2015) in 1995 teenage girls had 3.5 hours of screen time, compared to 7.5 hours today. In 1995, five to 10-year-old boys and girls averaged 2.5 hours of screen time, today this has risen by an additional two hours to 4.5 hours. The report also notes that our children are now multi-screening - using multiple devices at the same time, watching TV while surfing the internet on a laptop and listening to music on their mobile phone. Our children are literally born accessible, and into a changing, complex world with screens at their fingertips.

We experience regularly the explosion of technology developments that create powerful new ways to learn, work and conduct our daily life. According to PricewaterhouseCoopers (2016) out of the five most significant global trends which Chief Executive Officers believe will transform business over the next five years, they identified that technology advances will keep transforming practices globally across all industries. The Chief Executive Officers' belief of the rapid developments is as a result of the following: Technology has become cheaper to access with a greater variety of options available to users and as a result, it is now more globalized. The users of technology enjoy greater ease with technology through greater access. Technology is seen as a natural part of everyday life. We only have to think of how we utilize technology in our everyday life. Organisation leaders are now more aware of how technology can secure a competitive advantage for their organization and the potential to have a multiplier effect on the organization. This means that as a result of the change in the input, like technology, society would begin to see a change, or increase in the output. For example, an improvement of processes or products.

It is one thing to acknowledge the existence of technology impact on an organization, and it's another to determine its potential value. Then, once the potential value is determined, it will be important to implement the technology that will benefit the students and the institutions

incrementally over time. As with any change process, there will be challenges which will impact on the scope of the implementation of technology, the reality of a short or long term investment, the range of technology experience of administration staff as well as lecturers. New knowledge and technologies are being created daily in our fast-changing world and as such, students will be exposed to more complex global challenges. The report to the European Commission on the Modernisation of Higher Education (2014) highlights that Higher Education innovation in the past has generally focused on slow, incremental changes made to teaching and learning practices. Higher Education Institutions now exist in high demand, technological world and require institutions to seek intentionally innovative practices driven by technology. Here technology, in its broadest sense refers to the tools, devices, machinery and digital equipment and processes that is created and designed to solve real-world problems that impact our lives, society and our environment positively. It feels natural then, for this impact to filter into the Higher Education space. There is now an expectation for Higher Education Institutions to make a definite move from the more conventional approach to teaching and learning to an approach that will require greater digital skills as lecturers work alongside their lecturer colleagues.

1.1 BACKGROUND TO THE STUDY

Advancement in education goes back thousands of years ago. In the beginning scholars and Sage's relied on the memorization of life experiences and knowledge. When the written word became practice, Fahmy (2004) notes the concern at the time was whether there would be a need for the human memory. The next part of the evolution was when teachers and their students formed the first learning communities in what has today become university and college campuses.

Moving into the 1900s, presentation technologies became popular in the 1950s. The distance learning format of study gained traction in the 1970s and the 1980s through telecourses and greater use of print media materials was used in the correspondence courses. The 1970s also saw the start of computer-based instruction. Over time education has also embraced technology tools like; the chalkboard, typewriters, fax machines, whiteboards with coloured markers, cameras, overhead projectors, floppy discs, digital cameras, CD-Roms, memory sticks, printers, videos and interactive whiteboards to name a few.

In the 1990s we experienced the revolution of the World Wide Web and its impact on education, with lecturers and students having endless volumes of information at their fingertips. It is evident that there is a history of education technology and the introduction of each innovation has had its fair share of naysayers and advocates. This is no different today. The last decade has seen significant, complex developments in technology in all spheres of our lives. A concern though is that the translation of technology (on a globally broad scale) particularly within the higher education space has been limited and slow.

Our current institutions have been designed for a traditional approach to teaching and learning. Piatt (2017) reminds us that the students in our universities today are digital natives, their world is about constant interactivity and instant feedback. Mintz (2017) purports that we need to move away from the one size fits all mentality (through the integration of technology) as we work with our students, and rather make learning more personalized, self-paced and adaptive to the needs of the individual.

Today, only a small percentage of students globally are working in courses in the sphere of robotics, virtual reality, artificial intelligence, blockchain, analytics to name a few technology developments applicable to education. Work environments are sprinting to keep up with the breathtaking pace of change to promote economic advantage and make significant social impact in their community. The concern for the researcher is whether the Higher Education Institutions in South Africa and Botswana are maximizing the integration of technology into their institutions to impact on student learning, lecturer facilitation of course work, and greater institutional efficiency as a result of technology.

1.2 THEORETICAL FOUNDATIONS

The educational theory that is related to innovative practices of technology in education is the Theory of Innovative Pedagogy by Gargay and Latchana (2011). In this instance, Pedagogy can refer to the process of education as well as the study of being a teacher. Traditionally teachers impart their knowledge, skills and values and have done so from one generation to the next for centuries. The term innovation, according to Gargay and Latchana (2011), states that it comes from the Latin word *innovates*, refers to the creation or invention of improved

products, processes and technologies by the leaders in education. The innovation refers to significant, positive change, like technology innovation as opposed to small, incremental changes in education.

So, Innovative Pedagogy according to Gargay and Latchana (2011) refers to the study of being innovative in the educational space. This includes the processes of innovative education and teaching. Key questions that drive the innovative process in education are; what is required by current students and future employers? How can curriculum and technology be integrated? What will work in education? How will the community benefit and what will the impact be on the environment? This theory informs the research as it combines both elements of the research, that of the concept of innovation and the development and growth of technology in the educational space.

In the research on Innovative Pedagogy it became evident that the term Innovation Pedagogy is also being interrogated by researchers like Lehto (2011). I have used these terms as interchangeable and see them as complementing one another. Innovation Pedagogy reflects an environment where the most innovative, up-to-date knowledge promotes a competitive advantage. In this study, I consider the integration of technology as a powerful opportunity to develop the learning environments of our students in higher education institutions through reviewing the traditional ways of receiving, understanding and applying knowledge from an academic perspective, then also consider its practical implementation in the world of work.

The challenge exists when our educators or lecturers literally have to upgrade their own skills at the same time as their students. Presently, employers need young graduates who have a broad technology proficiency, reflective thinking, critical thinking and teamwork to name a few. Teachers and lecturers have to commit to redefining their skills, particularly the technology skills and innovative thinking in order to support student learning.

If we see education as; a system, a process and a result, and we also appreciate that these dimensions are impacted by national, global and socio-economic challenges, it is with these new challenges that we begin to imagine and realise the need for intentionally, changed pedagogy that is relevant for students today. Innovative Pedagogy allows the rethinking of the current approach to education, educational practice and theory.

1.3 STATEMENT OF THE PROBLEM

Technology permeates every aspect of our life and naturally the development of technology in education has also been a significant area for development and growth. We have started to see the exploration of the virtual classroom, where students are taken on a virtual journey of the world, also, the extended use of iPads to action numerous applications, greater use of a multitude of mobile devices, blended learning and online learning, to enhance teaching and promote alternative ways of learning. With these realities being realised in the broader sense of education, one needs to consider the potential impact of technology on outcomes of students and the impact on Higher Education Institutions.

If we consider pedagogical innovations as new and different ways to view and experience learning, then the new technology may be applied in a different way. Innovation technology in the context of education, defines a different way in which knowledge is understood, and used to create innovation. In the report to the European Commission on the Modernisation of Higher Education (2014) it shares that there are limited European Higher Education Institutions that have carefully considered strategies to implement new teaching and learning methodologies, particularly those related to the use of technology. Technology initiatives were generally initiated by individuals with the skill and interest to drive the use of technology in their courses. This is astounding in Europe, with their design capitals and leaders in innovative practices in the world. In the same report, of all the institutions surveyed only 25% of them are using e-learning. This is not surprising when only 10% of their staff in the institutions were positive towards MOOCs, which are online courses of study taken by large numbers of students internationally, free of charge. If this survey is a reflection of the apathy of European Higher Education Institutions to improving their student learning through technology, then what does it mean for countries elsewhere in the world that face many more complex barriers to improving the number of students engaged in higher education. Students globally deserve access to Higher Education Institutions with practices that reflect more closely the technological world they were raised in and the kind of world they will be expected to contribute to as innovators.

1.3.1 OBJECTIVES OF THE STUDY

1. The main objective of the research is to find out the extent of which technology is integrated in Higher Education Institutions.
2. Sub-research Objectives include:
 1. To determine the benefits of integrating technology into Higher Education Institutions.
 2. To examine the challenges of integrating technology in Higher Education Institutions.
 3. To find out how students' academic performance can be improved through innovative technology.
4. To find out the efficiency of innovative technology in Higher Education

1.3.2 RESEARCH QUESTIONS

To what extent is technology used in Higher Education Institutions today?

What are the benefits of integrated technology use in Higher Education Institutions?

What are the challenges of integrating technology in Higher Education Institutions?

How can integrating technology improve student performance in Higher Education Institutions?

The objectives of the study and the research questions of the study identify the key areas to be investigated. Identifying our current scope of technology integration into higher education institutions will provide the baseline of our students' experiences. It is important to interrogate the advantages of integrating technology extensively into higher education institutions, not just for the benefit of enhancing the learning experiences, but also with the hope that there is a technology skill development for students that will be closer to their work-life experiences. This will create a sense of relevance for our students and facilitate the transition from student to employee.

1.4 WHAT DO WE MEAN BY INNOVATION?

There are many variations of the meaning of innovation in the business sector. Many key businesses are leaders in innovation way before the education space becomes innovative. It is of value to get a sense of their (business) beliefs of innovation. General Electric (2012) share their key definitions of innovation.

<u>Definitions</u>	<u>Top Choice Total Mentions</u>	
The implementation of new processes, products, organizational changes or marketing changes	35%	47%
An environment/culture that embraces positive change, creativity and continuous improvement	27%	42%
Research and development, new intellectual property (IP), and inventions	17%	41%
Staying ahead in the market and being a market leader	11%	32%
Solutions that benefit society and societal outcomes (including environmental outcomes)	9%	29%
None of the aspects above is close to my personal definition of innovation	1%	10%

Figure 1.

How business defines innovation. From GE Global Innovation Barometer: Global Research Report (General Electric, January 2012),

The two top definitions are interesting. The first definition that was recognized by 92% of respondents speaks to the change (physical, mechanical, processes and possibly products) that comes about as a result of innovation. It feels tangible and quantifiable as respondents can identify with their new reality as a result of the innovation. For example, the introduction of an administrative student management system at a university. Secondly, the next definition refers to the soft skills that may be promoted and nurtured in an organization to enable creativity and innovation, For example, the work environment developed by Google for their employees.

Technological innovation in education is becoming more evident globally. Most of the definitions can relate to technology innovation in higher education. The introduction of more innovative practices is aimed at meeting the needs of the students as well as raising the quality and efficiency of the institutions. There is commentary from the world of work that some graduates are not sufficiently prepared by higher education for the workplace, with the requirement for the higher education experience to reflect a culture where our students are more work ready and entrepreneurial. The private sector as well as governments expect higher education institutions to respond to the fast paced changes through innovation.

Higher education institutions globally are faced with multiple challenges; the varied academic levels of students, the preparedness of their students, the increasing cost of education, the sheer volume of students expecting to enter higher education, the lack of creative solutions to student funding, a limited number of visionary leadership. Regardless of the challenges, the Institutions of Higher Education are still trying to assure the provision of quality education and students that are globally competitive. A wondering though (that encapsulates a number of the key issues) is whether our higher education institutions are being technologically innovative enough in their practices to enable to meet the needs of the changing student body and in turn, for the students to meet the demands of the ever-changing world?

1.5 PURPOSE OF THE STUDY

There is a growing body of literature on technology innovation in higher education. There is research that has highlighted the challenges facing technology implementation and maintenance (response to fast-paced changes) in higher education and the ability to address the future needs and some of the concerns raised. In the US Department National Education Technology Plan (2017) transformational learning enabled by technology is identified as a priority. In this way, allowing all-the-time learning to take place for a diverse community of students in an equitable way. According to The New Media Horizon Consortium Report (2017) is research that is conducted to support strategic technology planning for higher education. There is a focus on technology's key trends, potential challenges and significant developments and impact on higher education. In Reimagining Higher Education, Sledge and Fishman (2014) speak to the changing nature of the higher education landscape and reference that institutions

need to reflect the current digital era to support tech savvy students. If Higher Education Institutions leaders do not respond to the fast-paced changing world with technology in higher education, it will be counterproductive and almost counter-intuitive to how young adults access information and learn. The authors do note a growth in online and blended learning in Higher Education Institutions. Whether multiple technology innovation practices have been implemented extensively in Southern African institutions is to be determined.

The purpose of this study is to investigate the implementation of innovative technology practices in higher education and its believed impact on student outcomes, the quality of student learning and institutional efficiency. The proposed study will attempt to elicit whether this is the case in a Higher Education Institution in Botswana and in South Africa.

Further interrogation of the concept of innovation is illuminated by Barba (2016) innovation is, “Something new or different that delivers value to the world, with the key criteria that I’m not innovating if I’m not bettering people’s lives. Put simply, it is the future delivered.” This definition is apt in the context of this study because the innovative practices related to technology in higher education is intended to better people’s lives through the improved experience and outcomes. There should be greater value-add to the way in which Higher Education Institutions ‘work’ globally as a result of technology. The reference to the future connects powerfully to the fact that our youngest children are already tech-wise and our education institutions need to provide their (students’) world of learning in a relevant way.

The author Reisman (2006) defines technology as, the development and application of tools, machines, materials and processes that help in solving human problems. This definition succinctly encapsulates the complexity of processes and ends strongly, finding a solution to a problem.

1.6 SIGNIFICANCE OF THE STUDY

If one considers the volume of research and the resultant reports (in the past three years) related to technology enabled learning in higher education or similar themes around technology integration into higher education, they acknowledge the need for Higher Education Institutions to review what they are doing and how they are doing it. There is an urgency to meet the growing demand for higher education for more students from one year to the next, students with diverse needs and varying economic profile to be able to afford the cost of a degree from beginning to end. Some students already have an advantage over their lecturers in terms of accessing knowledge, how Higher Education Institutions choose to use this to their advantage will determine their decisions related to the use of technology in the institution.

The integration of technology is not just limited to the benefit for the students in terms of the technology experience, but also the potential for technology to impact the nature of learning for the students and the experience of lecturers as they ‘deliver’ learning. Lecturers have an opportunity to reflect their relevance in the fast-changing world of technology. Their methodologies will be in greater sync with the students’ experiences than ever before. Students too will feel a sense of relevance in how they are learning and possibly their understanding of the world of work that they intend to enter.

The Higher Education Institutions have many ways to benefit. Firstly, at the most practical level, administrative functioning can be supported. There is an opportunity that the marketing department could maximize social media to promote the institutions and its activities. The operations department stands to benefit by implementing efficient systems related to online maintenance reporting or online procurement practices. The financial department of the institution could gain by implementing online procurement and payment processes. A key beneficiary to the integration of technology in Higher Education Institutions should also be the future employers. The employers will benefit from the well-educated and technology-exposed and technology-capable new employees, as they make powerful contributions for developing their organisations, local economy, and ultimately the national economy.

1.7 SCOPE OF THE STUDY

The intention is to identify the extent of the use of technology in Higher Education Institutions, two in Botswana and fifteen in South Africa. The use of technology by the students, implies the use of technology by lecturers too. This will give us an insight into institutions in our Southern African context and their commitment towards the implementation of technology in its systems, processes and potentially, its outcomes. The intention is to identify usage of technology in the ‘process of educating’ and the ‘process of learning’ by the students. The selection of the South African institutions is that it is in the researcher’s immediate context. There is a curiosity about how technologically innovative the educational experience is in Southern Africa. The choice of Botho University is as a result of the researcher being a student at the university and being impressed with my own distance learning educational experience. The use of Blackboard for university/student communication, the access to digital lectures and the mobile options provided by Botho University ranks highly for students.

The research identified the current level/state of technology usage within the different institutions. This gave an understanding of the level of implementation of technology and highlighted the impact of these technologies in a number of higher education institutions in Southern Africa. I imagined them to be quite varied, with Botho University being more technologically advanced in terms of the technology available to students to access and learn through. I base my bias on my personal experience and the anecdotal commentary of the experience of students at other higher education institutions. I also expected institutions to be lagging behind in terms of the implementation of some of the more advanced technologies available internationally, utilized by the more financially able and forward-thinking higher education institutions around the world.

1.8 LIMITATIONS OF THE STUDY

Time constraints impacted on the richness of the process of data collection. There was also the concern of the reliance on higher education students to respond to the request to participate in the surveys during their exam time. The time commitment by the researcher to synthesise and analyse the data thoroughly at a higher level was a challenge as the researcher’s inexperience of the data analysis process. This required ‘on the task’ learning and an additional time commitment by the researcher.

CHAPTER TWO

2. REVIEW OF THE RELATED LITERATURE: INTRODUCTION

This chapter is a review of previous works that have indicated the necessity of focusing on innovative practices in higher education, this includes technology and its impact on learning and teaching in higher education. The literature includes definitions of different types of innovations and allows us to appreciate the breadth of the concept of innovation. Challenges facing the Higher Education Institutions is shared as they highlight the impetus for innovative thinking and action in the field of technology in higher education institutions. These actions are considered as the most effective way to improve student academic performance and greater institutional efficiency. The literature review will also highlight some of the challenges and limitations of integrating technology into higher education.

2.1 WHAT IS INNOVATION?

When change is implemented in an organisation, or made to a product or process, is it as a result of the improvements required or rather, is it as a result of innovation?

Here are definitions for different kinds of innovation by Christensen (2014).

Sustaining innovation is the improvement of an already existing product, process or service. This will happen through modifications and refinements which will benefit the customer's experience and use of the item or the process. An example of sustaining innovation is an updated model of a laptop that offers more functions and has faster processing capabilities.

Disruptive innovation creates noteworthy change which results in greater affordability, greater use of product, greater access through process(es). The innovation will effectively replace the original product, service or process. An example of disruptive innovation is the introduction of Apple's iTunes which changed the music industry.

Christensen broadens our thinking on innovation. I predict that the majority of innovation initiated by higher education institutions in southern Africa, is sustaining innovation by nature

if one considers the internal student administrative management or an online fees payment options as examples.

In order for all the creative genius on our campuses to be harnessed to; identify, create and implement opportunities for innovation, the spirit and the culture on innovation needs to prevail in the leadership of the higher education institution. This is critical for innovation particularly when one considers, Moore's Law which states there is a doubling of computer processing speed every 18 months. This surely has to be recognized and acted upon in the context of learning in higher education institutions and on a macro scale, the world of work.

In a recent online article in Huff Post (2016), one is reminded about the slow pace of change in higher education institutions, despite the technological transformation in most other industries. There is reference to the increased availability of Open Educational Resources (OERs). According to United Nations Educational, Scientific and Cultural Organisation (n.d.), OERs are any type of educational materials that are in the public domain or introduced with an open license. Examples of OERs are; textbooks, curriculum frameworks, lecturer's notes, tests, examinations, project work and videos to name a few. 'Open' refers to one's ability to freely copy and use the material, even share it, legally. The article goes on to share how university leaders are considering how technology can promote alternative ways of learning as well as enhance the students' higher education experience. These feel like examples of sustaining innovation as described by Christensen.

In the Higher Education Institutions today, there is growing realization for the need to see and approach students' learning in a more individualized way, rather than a 'one size fits all' approach. With greater numbers of students attending universities the profiles of students is more diverse and have different needs. If we consider that our children are exposed to technology from such a young age these days, technology could serve as the tool for personalization of learning for our students. The Erickson Institute (2016) survey of Technology and Young Children in the Digital Age shared this outcome.

- 85% of youngsters accessed and used some kind of technological device
- 78% of youngsters accessed and used television independently
- 53% of youngsters accessed and used tablets

- 42% of youngsters accessed and used smart phones
- 32% of youngsters accessed and used a computer

The futurist Kurzweil (2001) believes that it is unlikely that we will experience 100 years of progress in the 21st century, but rather closer to 20 000 years of progress by today's rate. This tops Moore's Law. This prediction should be cause for concern if we consider what we know anecdotally about the current status quo of teaching, learning and technology in higher education and the predicted future of how the world is going to work. This rate of 'progress' serves as a challenge to the implementation of technology in higher education institutions.

Traditionally, Higher Education Institutions pride themselves on their knowledge-building, with a reluctance to openly share knowledge, where all could benefit. Possessiveness and intellectual property rights related to research and knowledge 'development' is typical. Leaders in education need to begin to make the paradigm shift towards embracing Open Education Resource and embracing the benefits of sharing knowledge more openly and collaboratively for the benefit of the students' learning. Coupled with enhanced learning experiences for students, through engagement with technology, lecturers have access to more data, more detailed dashboards to track student progress as well as the student experience of university.

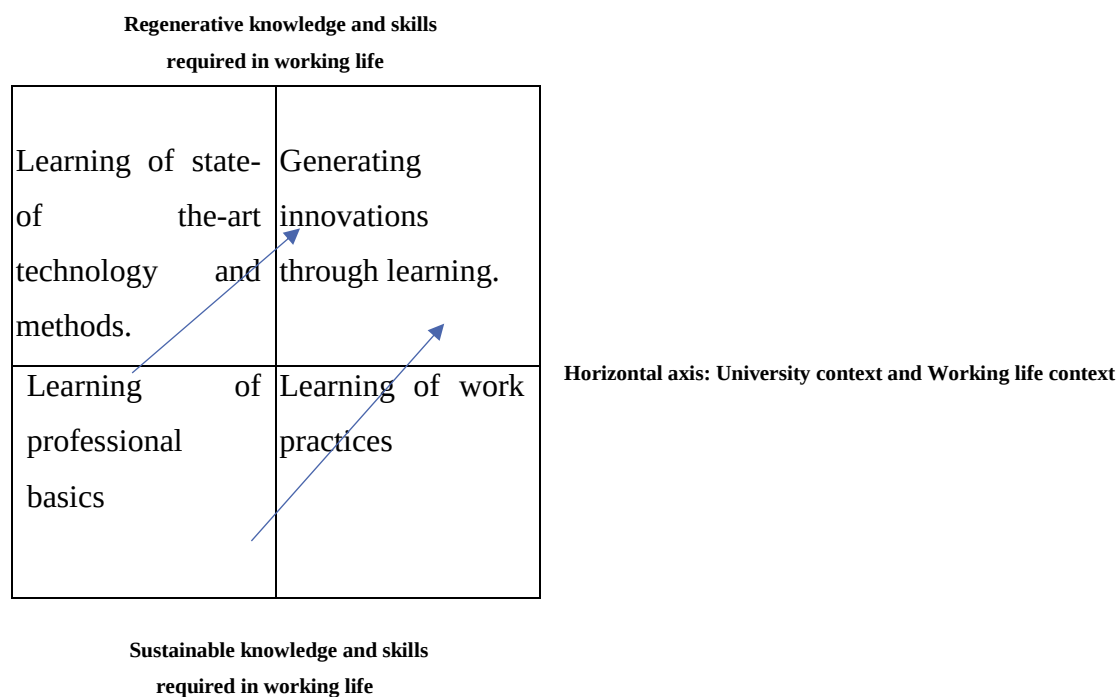
Higher Education Institutions committed to embracing the next generation of learning in their institutions will need to nurture a culture of change, particularly for the people behind the technology. This does not reference the students, but rather the lecturers. Are the majority of our current lecturers able to lead our students into maximizing teaching and learning with the most advanced technologies available to Higher Education Institutions?

At The 'Oscars of Innovation in Higher Education' namely The Reimagine Education Conference (2015), one of the most celebrated innovations, the flipped classroom, was recognized for its huge contribution to learning in higher education. The flipped classroom is an integrated approach between on-campus and on-line learning. The flipped classroom requires students to occupy the in-class time to discuss questions and collaboratively solve problems in groups. Students then spend their off-campus time viewing and absorbing the course content on line. The intention is that students arrive to class with exposure to the 'knowledge' ready to apply their understanding. The question is, "What of the lecturer?"

According to Garrett (2015, p.2) dean of Wharton School, University of Pennsylvania, claims that it is not university education at risk of being lost, it's actually the lecture. The awards focused specifically on innovation in higher education in 2015, where 21 projects received awards, that were selected from 427 entries by Higher Education Institutions and companies in 43 countries.

Virkunen and Hyrkanen (2007) share a model that reflects the important relationship between technology, innovation, university studies and the world of work in Lehto et al (2011).

Figure 1.



In Figure 1 the horizontal axis speaks to the university experience and the world of work. In the left lower quadrant encompasses the traditional learning experiences. The top left quadrant acknowledges the possible exposure of advanced skill development (technology) during the final stages of study or when more experienced in the world of work. In the bottom right quadrant we refer to the learning that happens while in the world of work and may be in the form of professional development opportunities. If some of the key drivers for change in higher education institutions are; globalization, entrepreneurship, accessibility and technology, to name a few then ultimately we would want to see a strong connection and interplay between the studies of our students, their transitions into the world of work and then aspirations, create

the top right quadrant which purports that in turn, innovations would be generated through these strong connections.

2.2 THE ROLE OF LECTURERS IN A TECHNOLOGY-RICH HIGHER EDUCATION ENVIRONMENT

Will future higher education qualifications be free of face to face human engagement between student and lecturer? Will the human touch always be required in higher education? In Jones' research, he interviewed Superintendent Hancock (2012). Hancock was committed to improving student performance through technology. He advocated strongly, that all the instructors should receive training in technology. When the students' results did improve, the question was whether it was as a result of Hancock's leadership and vision or that he ensured that all instructors were technology savvy? Duran et al (2012), agree that regular, student-centred professional development will have a significant impact on technology integration programmes. Technology-driven instructors have the opportunity to turn the results of the assessment data into carefully crafted, improved instructional opportunities, using the most appropriate on-line resources. Instructors can also identify the knowledge and application of knowledge and design personalized learning activities for students to reach the next level of mastery. This can range from promoting inquiry-based learning to connecting students' learning with real-world scenarios. The higher education institution has a responsibility to provide their instructors, with consistent professional development opportunities to enhance, promote technology-driven teaching and learning. The focus will be skills development of teaching online, teaching within a blended learning environment, or flipped classroom approach and in particular, their skill to improve research-supported teaching. Institutions are motivating instructors to become tech savvy by incentivizing their teams through rewards for excellent technology teaching practices. This may come in the form of greater job stability and continued access to professional development.

In an article by McKenzie (2017) an assistant professor of higher education administration and policy at the University of Florida, Justin Ortagus argues that the productivity value-proposition of technology may be overrated. This thinking was supported by the 1987 Nobel Prize winner, Solow (1987), an American economist who said,

‘You can see the computer age everywhere but in the productivity statistics.’

Ortagus was skeptical of Higher Education Institutions that used one productivity metric to reflect productivity and pushed his agenda of three productivity outputs; teaching, research and public service which he believed gave a more authentic measure of productivity related to technology integration into higher education. More recently we have findings that contradicts Ortagus’ view on limited productivity benefits through technology integration into Higher Education Institutions. In the report to the European Commission on the Modernisation of Higher Education (2104) the researchers speak of the developments and benefits of ‘fast’ student data received by lecturers on a dashboard format. The data highlights the impact of different teaching and learning approaches. Stanford Lytics Lab is devoting much time to research to better understand the influences on student performance. Informative feedback tools are being developed for lecturers that will inform academic productivity. The Open-Learning initiative of Carnegie Mellon University and the University of Maryland are leaders in this field of learning analytics. Good feedback can impact positive student outcomes and ultimately greater capacity in the workplace.

Hong and Songan (2011) acknowledge the key contributions of Higher Education Institutions in Malaysia as contributing significantly to the economic and social growth of a country. They recognize the developing role of lecturers in Information Communication Technology (ICT)-rich Higher Education environments where lecturers now serve more as facilitators than traditional teachers. They highlight, due to technology that lecturers from different Higher Education Institutions support students in different settings, belonging to different universities. Technology development has resulted in lecturers engaging with many distance learning students as opposed to the traditional face to face lecture experience. Lecturers truly need to embody life-long learning as they straddle between the traditional past and the online present.

Education is the driving force for economic and social development in any country according to Mehta and Kalva (2006). It is therefore imperative according to Hattangdi and Ghosh (2008) to enable good quality accessible higher education to students in developing countries in order to impact the local economy and social environment.

In a presentation by Mabelebe (2015) on the emerging challenges facing higher education in South Africa, he highlighted one of his key trends as ICT implications for Higher Education

Institutions. Related to this trend is the human resources required to drive and embrace technology development into institutions.

2.3 THE BENEFITS OF HIGHLY INTEGRATED TECHNOLOGY USE IN HIGHER EDUCATION INSTITUTIONS FOR STUDENTS AND INSTITUTIONS

According to Borysenko (2015), an advocate of the changing expectations of students today, many past students speak to the poor value proposition of cost versus their capacity to earn a good return on their education investment. It raises a number of challenges for Higher Education Institutions, namely; dwindling budgets, the changing student profile and the retention of students. Students are expecting a reduction in study costs and they see one of the ways of ensuring this, is through greater use of technology. Students believe that the teaching and learning experience will improve in this way too. There is a growing expectation for less time commitment to earn a degree. According to Hudson (2017), moves have been made in some Higher Education Institutions in the United Kingdom to reduce the length of some university degrees. This innovation has highlighted its own challenges; fees remained the same or were higher than a three-year degree course, and the real saving came with 'living expenses' of the third year of university. However, there are universities that have been creative and integrated elements of a Masters' programme into the undergraduate course. Students have voiced the need for a greater number and variety of courses to be offered online through distance learning to allow for greater flexibility. The narrow course options online are problematic too. Students feel boxed into course options that may not be their first choice. The possibility of online course options will grow over time. Daniel (2016) reminds us that service providers are governed by the cost, quality, access triangle which dictates online distance learning options. The anecdotal sentiments are of frustration and disillusionment, but I admire the commitment and fortitude of the distance learning students to persevere to a perceived, better future as a result of their qualifications. It is my opinion that the technology changes happening in higher education institutions will up the ante amongst institutions, and the competition will be good for them as they become more creative and committed to providing quality higher education that is trusted by the public.

2.4 THE NEED FOR GREATER MOBILITY OF STUDENTS

The current technology and the technology of the future is contributing to opportunities for greater student as well as faculty mobility. This means that students are able to enroll in their university of choice around the world, without spending a day on the campus. In this way, universities and colleges are able to ‘tap’ into the insatiable international student market through their use of technology. This increased opportunity for mobility is equally applicable to lecturers, who now can teach for a number of institutions at the same time from their home base. This innovation potentially impacts on faculty recruitment, the reduction in the physical number of students that you have on a campus and therefore the positive impact and pressure on infrastructure and possibly the customer value-proposition. Cochrane (2010) notes that mobile technologies impacts learning outcomes by improving access to education, also, mobility while studying, through the use of mobile technologies which facilitates learning processes and instructional methods.

The National Education Technology Plan NETP (2016) envisages a collective vision and proposed action to transform the use of technology in higher education. The intention would be to enable the diverse needs of a greater number of students across greater geographies through networked institutions and collaborative relationships with technology providers. This united technology-driven approach that promotes ‘everywhere learning’, through flexible educational experiences for all students will serve to meet the needs of the growing diversity and varied needs of our students.

So, what will the new higher education eco-system look like? According to the NETP et al, one could expect to see a more student-centered approach to learning with technology being added to the current institutional structures. The key principles of the student-centered approach involving technology would hinge on the following points;

- Students would have greater access to technology to freely explore their interests widely to make informed decisions about their tertiary education and potential career pathways.
- Student success can be enabled through technology as support is provided to address student needs where they are academically at any given time, this would be done

through targeted diagnostic tools for extension as well as remediation support. Student data dashboards would provide the information for these. These dashboards would be providing insights into multiple analytics data.

- Technology has the ability to provide students with the most up to date information and study materials. This needs to be harnessed for the benefit of the students.
- More flexibility in course design that promotes the ‘stackability’ of credentials will require greater fluidity between courses and institutions. This will allow students to move effortlessly between different institutions that provide different, yet complementary courses. This system would be largely technology enabled and driven.
- Students will have greater capacity to document their learning and demonstrate the application of their learning through technology, South (2017).

The push for re-designing the students’ experience of higher education is encapsulated in part of a comment by Vogt (2017) who cited Joseph South where he says, “It is impossible to redesign students to fit into a system, but we can re-design a system for students.” I partially agree with Joseph because wholly redesigning a student is impossible, however, the need for innovation in our Higher Education Institutions is partly as a result of the innovations in our world, thus requiring us to revisit what the higher education experience is for our students. Early access to technology and the resultant impact on our younger generation speaks to this desperate need and expectation.

The adoption of more technology-driven systems, teaching and learning practices in Higher Education Institutions needs to impact the nature and quality of the learning experience. One would expect beneficial outcomes that were previously not there. Removing the traditional barriers of physical attendance at a university, expanding flexible learning engagements (through technology) between resources, students, peers, mentors and their immediate community and on a macro scale, the world of work, could serve the immediate and long-term needs of students. Opportunities for life-long learning is promoted and embedded through these supportive structures. If students received credits for on-the-job experience(s) gained through their courses, one would like to see them receiving credits for it as evidence of the stackable credentials referenced earlier. An additional advantage would be in favour of previously disadvantaged students for whom higher education was inaccessible. According to the U.S Department of Education (2016) technology can provide parity of access as all students now

have admittance to high quality, low cost learning resources irrespective of their social and financial status, disabilities or the location of the institution. This benefit is echoed in the World Bank's Review on Equity and Access to tertiary Education in the Africa region (2009) where the Africa Higher Education Collaborative (AHEC) calls for greater access to higher education and improved equity in higher education in Africa. This affirms the premise that the greater the number of qualified and skilled students will increase the prosperity and sustainability of Africa's future. Interestingly the review does not share literature on how greater access and equity can be achieved.

2.5 THE BENEFIT OF ASSESSMENT ENABLED BY TECHNOLOGY

The way in which students can be assessed within a technology driven environment is one of the advantages of technology. In the traditional higher education setting paper-based assessments designed by lecturers lacks the more scientific approach evident in technology-based assessments. Here, there may be input from psychometricians, other content specific specialists. In a more coordinated approach to assessment through technology usage, institutions are able to collect data about instructional approaches of for example, a particular faculty and begin to identify the most effective teaching practices of lecturers. This in turn can promote greater consistency of these practices. Thille (2013) shares the learnings from the Carnegie Mellon Open Learning Initiative (OLI) courses have shown a reduced input from lecturers to provide all the feedback to students. Their online approach of sound scaffolding of learning and cognitive tutoring and online assessments have shown that students enrolled in the OLI courses perform on a par with those students enrolled in a face to face version of the same course. Lamon and Camon (2016) share in a presentation how Wharton Online Ordinal Peer Performance and Evaluation Engine (WHOOOPPEE) was developed by the University of Pennsylvania where students participate in the peer evaluation process of courses, reducing the input and lecturer directed nature of traditional Higher Education Institutions.

Technology allows large numbers of students to be assessed at once with real time results provided, highlighting students' needs and next steps. There is an opportunity for multiple, varied analytical data to be gathered during the assessments that can provide additional insight into student learning and progress. The technology-based assessments also ensure consistent access, approach and assessment of student work by instructors, as opposed to the variability

that may happen with multiple instructors of the same course material. Immediate e marking, recording and documentation of assessment and progress means greater portability as students move between faculties and institutions. Technology encourages greater use of formative assessment (throughout the learning process) and not just summative assessments (at end of a section of work), providing rich data for lecturers, students and their peers over shorter periods of the learning timeline. This data provides insights into how to get to the next stage of growth. Eli Review (pg.40 n d) developed by the Michigan State University created a revision cycle to improve writing. One of the natural benefits of technology enabled assessment is the instant creation of e portfolios of students' work which could include; research efforts, collaborative projects and final products and even processes of learning.

2.6 SOME OF THE CHALLENGES OF INTEGRATING TECHNOLOGY INTO HIGHER EDUCATION INSTITUTIONS

University lecturers from the Baby Boomer generation born mid-1940s to mid-1960s may mean that they may lack techno-literacy as they have not in their schooling or tertiary education been exposed to and worked with technology, says Bennet-Kapusniak (2015). One of the big challenges of the integration of technology into higher education institutions is institution-wide buy-in and the lecturers embracing fully and utilizing technology widely in the courses they offer. Cannell (2013) in her research noted that lecturers were already overworked and lack the skills to implement technology without support as it requires a change in the way in which you work with the students. The lecturers need to be supported intentionally through these changes.

Coupled with the commitment to using technology, the institution has to have the will and the resources to secure and offer the necessary professional development for lecturers. This could be resourced internally or externally. At some universities, a formalized programme has been developed to improve competency and promote a more experiential learning experience for students. This is a compulsory programme aimed at growth and development for the lecturers and leveraging the opportunity to develop teaching practices and impact on the student's learning experience. No matter how hard institutions try to provide the necessary professional development, technology is developing at such a rate that the knowledge of the lecturers is becoming diminished over time. Gleason (2012) refers to the fourth industrial revolution where multiple technology inventions will provide opportunity to not only replace many human

workers but also the human brain, by using artificial intelligence which has far greater ‘human brain power’ than humans. This includes the role of lecturers. Universities and lecturers will have to begin to rethink their role in the learning experience of students.

The New Media Consortium Horizon Report (2017) identifies an achievement gap amongst students as a result of; race, ethnicity, socio-economic status or gender. This is problematic for institutions as they would like all students to have equal opportunities within their institutions. Lecturers have the same expectations of all students however, not all students have the ability to access the world-wide web equally. Also, students access the web on different types of technology devices, which can impact on their technology experience. The report also makes the point that some 200 million fewer women than men access the internet globally. This is a problem.

Another reason why institutions may be reluctant to embrace technology integration is that of cost. Not only the initial outlay, but the cyclical upgrade of hardware and software that is required as technologies become obsolete or more advanced relatively quickly. A Global Report by Edtech (2016) predicted that the growth in education technology globally is set to grow by 17% per annum. They predict education technology to be valued at \$252Bn by 2020. The report claims that education is only 2% digitized. The question then is, “Where will institutions get the funding to develop their institutions to reflect the highly-digitized work environment?” An interesting point in the report speaks to the slow pace of digitization in education, some five times slower than other sectors. This is due to the number of people involved in the decision-making process related to digital transitions in education. If this continues as a practice, it will have a long term negative impact on our students, Higher Education Institutions and the world of work. As our work environment rapidly evolves, our Higher Education Institutions will be challenged to respond to the skills needed in the fast-evolving work space.

Where courageous institutions have facilitated online education qualifications, getting these qualifications recognized internationally has been a challenge. Nagel (2017) tells us that there is a movement in Europe, where “The European Commission” is placing a ‘stake in the ground’ to recognize informal learning. The publication ‘European Guidelines for Validating Non-Formal and Informal Learning.’ In our context, I would imagine that this is similar to our continuous professional development points attained from workshops, presentations or

conferences. Ongoing professional development in technology, digital literacy over a period of years could reflect powerful formal and informal learning.

A final challenge with large-scale integration of technology into higher education institutions is that of teaching students, digital citizenship. This means nurturing respectful, intentional and responsible internet usage. This remains a challenge for our students and we see examples of racist, political, sexist and defamatory commentary made by students on social media on a weekly basis.

2.7 TECHNOLOGICAL INNOVATION IN THE CONTEXT OF BOTSWANA AND SOUTH AFRICA

The researcher's experience as a student at Botho University has included technology as an integral part of the Distance Learning programme. According to Lekopanye and Mogwe (2014) both researchers from Botho University state that Botswana trails behind other Information and Communication Technology (ICT) advanced countries, sighting the cost of implementing technology as prohibitive and interestingly a reluctance by the Batswana to embrace ICT due to their limited exposure to technology. The drive to implement technology development initiatives was approved as far back as 1997 in the Vision 2016 statement which included the role of technology in the "Informed and educated Nation" pillar of nation building and development. Lekopanye and Mogwe's research concluded that their respondents recognized the role and value of ICT in their everyday life and acknowledged the benefit(s) of ICT integration into tertiary institutions. Uys (2004) acknowledged the University of Botswana's implementation of technology to enable greater accessibility and impact positively the curriculum for their students. He references positively the solid technology infrastructure and lauds the eight hundred plus student work stations that reflects the university's technology-wise learning community.

Van Zyl (2011) highlights the interesting opportunity in South Africa where the median age of young adults is 20 years of age. According to Van Zyl, this fact creates exciting innovation opportunities in how content is delivered in higher education institutions. To support innovation development in South Africa, in 2008 the 'Ten Year Innovation Plan of South Africa' was established by the Department of Science and Technology. Unfortunately, the formation of the Technology Innovation Agency has come to nought.

The University of the Witwatersrand (Wits) is one of the leaders of technology innovation in South Africa with a recent investment of over R4 million to its new computer laboratory. Wits is also home to one of the IBM research laboratories on the continent. The University of Pretoria boasts an engineering faculty ranked in the 1% globally, it is called the Faculty of Engineering, Built Environment and IT (EBIT). The University of Stellenbosch has a small computer science department but the unique feature of this department is the practical experience element where the students focus on entrepreneurship and practical experience. They also have a track record of their students entering doctoral programmes internationally. While these universities have high functioning, relevant computer science, engineering faculties, whether there is a holistic approach to technology innovation in all faculties across all functions of their university campuses was not established.

It was interesting to recently see an advert for a Programme Manager (Education) at Varsity College, Sandton, Gauteng. The advert gives insight into the current level of integration of technology in this higher education institution in the context of the education Department at Varsity College.

Championing Technology Enhanced Learning at Varsity College.

- Complete the SMARTboard, 'Teachers 4 Change' Certification
- Oversee the integration of Interactive Whiteboard technology and mobile devices into the B.Ed. classroom by working with Full-time lecturers for Education on each campus
- 'Champion' the use of the SMARTboard and mobile devices to enhance learning within the School of Education Faculty in the region, i.e. to support the training of student teachers and lecturers.
- Complete training on the Learning Management System Blackboard
- Be supportive of the Varsity College Learn environment in relation to the Varsity College Teacher Education Programme and Module offerings

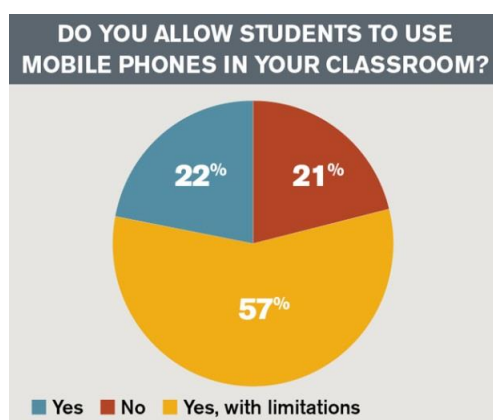
2.8 HOW TECHNOLOGY IS INTEGRATED INTO SOME HIGHER EDUCATION INSTITUTIONS

Innovative technology is valued for its potential impact on teaching, learning and creative inquiry in higher education. So, how is technology used in some Higher Education Institutions?

Kelly (2017) shares a 2017 a Teaching with Technology Survey revealed the following results about the most popular technology used at Higher Education Institutions.

MOST POPULAR TECHNOLOGY USED BY STUDENTS	
Laptops	57%
Mobile phones	33%
Tablets	6%
Chromebooks	1%
Other	3%

Interestingly of the lecturers surveyed, 79% of them allowed students to use mobile phones (wholly or in some way or another) during their lectures.



According to the New Media Consortium Horizon Report 2017) seven categories of technologies, tools and strategies have been identified as conduits to enhance learning in higher education. Each category serves as a starting point and can be added to as new technology is introduced. Most of the technologies are already integrated in some universities and colleges in the United States.

Consumer technology includes robotics, drones, real time communication and wearable technology. At first glance one may not appreciate the connection between the technology and

learning. It may appear to be of greater social value. Therein lies the value. Technology that is enjoyed and pursued at home often finds its way into the educational sphere. These examples can be used as learning aids and have proven to be quite adaptable in higher education institutions. For example, drones are used in scientific or geographic exploration and research projects. Drones too are designed and enhanced during engineering projects. Robotics is used in the medical and engineering faculties amongst others. Real time communication is globally valuable in accessing international higher education courses. According to Cole (2016) wearable technology like the Fitbit or the Apple Watch that collects, analyses and shares data in real-time has huge potential for students in higher education. If students received regular reports of their academic data we may well see a change in student behavior and commitment to their studies.

Digital strategies are; makerspaces, location intelligence, preservation and conservation technologies. These are not technology devices but rather speak to the way in which technological devices and software can be used to enhance learning. Makerspaces are dedicated spaces in the learning environment where students are allowed the space to make ‘things’ in a practical way, combining the skills of the hands and the mind. We are seeing evidence in Makerspaces in schools already. As Martinez and Stager (2013) assert,

‘Making, lets you take control of your life, be more active, and be responsible for your own learning.’

Many people in more urban areas may utilize location intelligence on a daily basis as we navigate our way to unknown destinations. Preservation technology speaks to the technology used to protect cultural heritage and historic structures, so, not just valuing the history of structures but being proactive about its preservation. According to the Zoological Society of London (2016) conservation technology refers to the tools to increase conservation capabilities. This is to monitor nature, survey wildlife and also engage the public in conservation efforts. This has the ability to impact the way in which veterinary students and wild life conservationists learn.

Internet technologies includes blockchain, digital scholarship and syndication of tools. It refers to the infrastructure required to interact easily with networks. According to Consumer News and Business Channel (n.d.) blockchain is a global online database that anyone can access provided that you have internet connectivity. It does not belong to anyone is basically

monitored by its users. In a blockchain a student will have access to a multitude of databases, sharing a range of information.

Enabling technologies include; affective technologies, artificial intelligence, big data, speech to speech translation and virtual assistants. These technologies have the ability to transform what we expect our devices are able to do. I would like to dwell briefly on affective technology. In a matter of years, machines will be programmed to recognize and interpret data to simulate human action and emotions using specific analytic points on a student's face for example. Lecturers will be able to gather data about how their students felt before a lesson, during the lesson and they how they felt after a lesson. This will provide lecturers with a more holistic view of the students they teach. Big data is the huge volume and variety of data that students can access, deeply for information. According to Massachusetts Institute of Technology (2016) Watson IBM is an example of artificial data that is being accessed to support language processing, voice recognition, assist with medical diagnosis, providing medical data and imagery that assists doctors to spot diseases more accurately.

Social media technologies include crowd sourcing, social networks and online worlds. This is an area of rapid development that impacts on most student-aged or student-going population. Creating virtual worlds to study the future or the past adds to our learning in a powerful way. Students are generally well connected. Through crowd sourcing they can collectively contribute to a cause or project, share ideas and mobilise together. Skarzauskaile (2012) shares an example of successful crowdsourcing at the University of North Carolina, in the creation of text book content by students, lecturers and specialists in their field.

Learning technologies is mobile learning, virtual and remote laboratories and includes Next-Generation Learning Management System (NGLMS). Learning technologies includes tools and resources that have specifically been adapted for education. The Next Generation Learning Management System is a platform to teachers and students to connect and exchange information among each other. This is reiterated by Vogt and Koper (2013) in their research of Learning Management Systems for the Open University, where they were intentional about the need for Learning Management Systems to bring students, lecturers, specialists, researchers into contact with each other to foster a truly collaborative learning community to impact learning powerfully.

Visualization technologies include 3D printing, mixed reality and virtual reality. They provide rich visual data for us to make sense of complex situations. 3D printers have even been introduced into the primary school setting. University students are pursuing the extraordinary potential of 3D printing in many different industries and would be used in faculties like; medicine, engineer, architecture and design. Augmented reality is the creation of world experiences for people to engage with in a way that they never would be able to in real-life. For example, experiencing space travel.

Becker (2017) speaks about the Internet of Things that is used on campuses to enhance safety. Valuable in the American as well as South African context to alert students and others of danger, protests, a rogue gunman and general safety on campus.

Schaffhauser (2017) tells us that there is an app called Accu Campus that uses artificial intelligence algorithms to determine student data analytics like; demographic information of the student, academic information and behavior information. The AI algorithms will determine students at risk and inform them to become more engaged, offer support and provide staff contact details of adults who could provide support. What reach this app has to re-direct students to their academic responsibility.

2.9 SYSTEMS DRIVEN BY TECHNOLOGY THAT SUPPORT STUDENT SUCCESS

Higher Education Institutions committed to a technology-driven approach to teaching and learning will require a strong, dynamic infrastructure. For example, Anderson (2102) shares the impact of the decreasing number of D's and F's on student report cards at Ivy Tech Community College as they implement predictive analytics and other data practices gained through cloud-based and open source platforms. In this way, a student's predicted success can be gauged within the first two weeks of their studying at the College. Hensley (2017) notes that at-risk students are identified and interventions are actioned, they are asked if they are facing any learning challenges as opposed to the university reacting to their failure.

The digital infrastructure of institutions must include the reliable and secure storage of student progress data. A system is needed that will accumulate and record the students' credentials on

the system, whether they have been achieved through formal assessments, work experience, or credits secured from any previous learning. There will need to be policies (like a responsible use policy) in place to determine who can access information. Students need to understand what their rights and responsibilities are regarding data accessing. The institution's information management system will house information related to personal details, assessment, finance, progress, communication and facilitate access to coursework materials. Students have the opportunity to stay informed, to engage with fellow students online and interact with their lecturers regularly too. Long and Mott (2017) share that the Next Generation Digital Learning Environment (NGDLE) goes beyond the administration of learning, and is more personalized and focused on multiple assessment sources, with the ability to exchange content and learning data, also, to use analytics to support and advise students.

Technology enables greater accessibility for students. This includes students with disabilities. Support needs to be built in at the early stages of development of learning software and hardware.

A major investment by technology-driven institutions is to ensure consistent and reliable access to the internet. Without it, one cannot access high quality learning resources, which leads to disappointment and frustration. The Internet is the 'backbone' that supports the rest of the institutions digital structures and processes.

2.10 INNOVATION LEADERSHIP

Leaders that have a sound understanding of how technology developments can support teaching (as per the seven categories of technology) and learning and other functions of Higher Education Institutions. These leaders will be driven to determine a collaborative vision with fellow lecturers and students and contribute to the planning for their institution. They will be committed to innovate the academic model through technology as well as facilitate through technology and greater student support. The lecturers as leaders will be more data driven as they will use the data to inform their next steps. They will work closely with technology teams who will keep them informed of all the data they require to inform their decision-making. According to the Institute for a Competitive Workforce (2011) the leaders of Higher Education Institutions will need to continue to engage with the private sector service providers to transfer

the traditional colleges and universities as they wrestle with how best to use the global knowledge market to benefit their students and their institutions.

2.11 CONCLUSION

In our ever-changing world, higher education institutions need to be responsive to their changing environment as well as the changing student population. While I acknowledge that technology is not the silver-bullet of solutions to all challenges facing higher education, I believe that it can make a significant contribution to innovative practice.

In order to meet the needs of students, and reflect a dynamic higher education eco-system, visionary leadership is required. Leaders who acknowledge the power of technology to accelerate and realise their goals of improved teaching and learning experiences as well as implement efficient university structures to support their core business. Equally, visionary instructors committed to their own personal skill development of best practices in technology are required in our institutions. Our student population is not really concerned by what the higher education system was in the past, but increasingly will demand what they expect it to be. The ability to be socially mobile, access academic programmes while mobile, and access instant feedback, speaks to their desire for instant gratification, a trait of this generation of under 20s who are growing up in an environment of impatience. Coupled with this, there is an expectation of greater choices of courses, recognition for all learning and skills development to be considered and rewarded, and more affordable higher education opportunities. Institutions can achieve all this and more with the intentional, systematic introduction of technology. It is unlikely that we will ever reach the end of technology's reach into the world of education, and our students are leading the way.

3. CHAPTER THREE: RESEARCH METHODOLOGY INTRODUCTION

Research methodology as described by Kallet (2004) is committed to answer two main questions related to the research problem. Firstly, to find out how the data will be collected and

then, how the data will be analysed? During the research process, there was a seeking of solutions through the systematic and objective analysis of data. The results of most research can solve problems, clarify problems and influence perspectives. This may seem self-explanatory as problems form the basis of research.

The study used the mixed method research approach. According to Leech and Onwuegbuzie (2008) mixed methods research involves the collection, analysis and interpretation of both qualitative and quantitative data in the same study. The motivation for using the mixed method approach is that I collected information that was related to perspectives and experiences of individuals, and this required the use of the qualitative approach. Also, I collected 'hard' data from the individuals that was quantified in numerical form, and this required the quantitative approach.

The qualitative approach is seen by Ben-Eliyahu (2014) as obtaining information in a deeper way. This could be through interviews or open-ended questions. As the number of participants may generally be small, it can be difficult to generalize the outcomes to the whole population. The process requires quite a time investment with this approach. He goes on to state that the qualitative approach can be used across a larger group of participants and allows for one to identify patterns and relationships between phenomena in a quantifiable way.

In this study, I chose to use the mixed approach as I gathered qualitative data through interviews and through a section on the student survey where a small number of key open –ended questions were posed. The qualitative aspect of the data collection was determined as the students shared their exposure to and use of technology in their respective higher education institution.

The combination of the qualitative and the quantitative approach provided rich data that strengthened the research and the nature of the results.

During this chapter, the researcher also had the opportunity to reflect on the design method used, the relevance of the questions and responses to elicit the data required to draw research conclusions. There was a concern regarding the ethical issues for a lecturer sharing information under the protection of the Intellectual property policies at the institution.

3.1 RESEARCH DESIGN

According to New York University (n.d.) the description of research design speaks to the use of any data methodology. More importantly though, design refers specifically to the chosen structure of the enquiry. This is to highlight the importance that the data one chooses to collect, serves the purpose and enables one to draw accurate conclusions. Through the design then, does our data answer any questions that we have or even disprove any perceived outcomes? Simply put, Farooq (2013) says that research design is the pre-planned outline that explains how the problem you are researching, is going to be addressed.

The quantitative research design answered the research questions. This quantitative research further described the students' experience of technology in the Higher Education Institution that they attended. As there were students who attended different Higher Education Institutions, there was an opportunity to compare the different technology experiences of students from different institutions. Though this was not the core purpose of the research.

The quantitative data was important to determine the current level of experience and exposure students had with technology at their Higher Education Institution. It was to determine their current reality, the facts of the experience, and answer the question of how technology was used in Higher Education Institutions today. It was an objective measure.

The research design was not a single design but also included qualitative research design. The qualitative element with open format questions allowed for respondents' perspectives, experiences and beliefs to be shared. These responses addressed some of the research questions and were non-numerical in nature. Here was an attempt to gain an understanding of students' thinking regarding technology integration and use at Higher Education Institutions.

The research design approach that was used included; surveys for students as well as lecturers. The surveys provided qualitative as well as quantitative data. The intention was to conduct interviews with key technology leaders (budget holders) in the Higher Education Institutions. The research also drew on current data that complemented the data collected during this research process.

3.2 METHODS OF DATA COLLECTION

A questionnaire was used to elicit information related to the breadth of technology exposure experienced by students and possibly a lecturer. The questionnaire was presented in the form of an online survey as the most appropriate means of data collection. This was complemented with an interview. According to Penn University (n.d.) they describe a survey as a research method that enables one to collect information from a specific group of respondents using standardized questions.

The questions were targeted to promote objectivity. There was a combination of questions that were categorical questions that related specifically to the type of technology usage (and exposure) experienced by the students in the Higher Education Institution and then also, open-ended questions. The answers to the categorical questions provided the base-line information of technology integration within the institution. The open-ended questions elicited the participants' feelings and beliefs of technology and its impact at their institution. This was an opportunity to gain deeper insight and add greater depth to the data.

Before the online survey was administered, there was an opportunity for the draft survey to be tested with a small group of ten students. After the survey, feedback was sought regarding the terminology used, clarity of questions, time required and the accessibility of the online survey.

The researcher used the opportunity to share personal experience of technology usage in one of the higher education institutions, based on personal experience as well as through observation of student learning engagement.

The methods of data collection focused on primary sources of information. In this way, the information was first hand and reflected the experience of the participants being surveyed. Any other data sourced from previous research in this area, was considered as secondary sources of data.

3.3 POPULATION AND SAMPLE SELECTION

The research study intended to use a random sample of third year students from Botho University (BU), Gaborone. The intention was to include third year students at BU as they

would have had a longer period of study and possibly the greatest exposure and experience of technology during their study. I planned to use the same principle for students attending different Higher Education Institutions in South Africa. The results of the study were generalized to these different Higher Education Institutions. The intention was to secure responses from 100 students in each organization. The aim was to get a response from one of the lecturers at the institutions.

Author Bullen (2017) states that the minimum sample size of 100 is required to secure a meaningful result. I was comfortable with a response of 98 students from the institutions in Southern Africa. The reason why I made peace with the 98 respondents is that students at the institutions were either writing exams or they had already completed their exams and may have finished university for the year. This left me with limited opportunity to access students easily. In this instance, the researcher's personal network of ex-students taught at school, were now attending Higher Education Institutions. This was purposeful and aimed at ensuring a homogenous group, namely higher education students. The ex-student network then recruited additional respondents from their peer groups, friendship groups, study groups and course groups. They effectively promoted snowball sampling which according to Brenner (2016) is a type of sampling where respondents invite others (in this case it had to be students) to take the survey.

3.4 VALIDATION OF THE INSTRUMENT

To promote validation of the instrument, a pilot study was held to create an opportunity for feedback and allow further refinement of the instrument. These draft questions were shared with colleagues who are tertiary students to get suggestions of improvements that helped me to ascertain whether the questions serve their purpose.

The validity of the tool in this case, a survey questionnaire, was largely determined by the content, in other words, the questions that were going to be asked. According to Benson and Clark (1992) an instrument is content valid when the items reflect the process and content dimensions of the objectives of the instrument. Interestingly, Whitehead (2014) makes an interesting comment, that the more structured a qualitative questionnaire is, the less opportunity

there is for a free flow narrative to occur. I had a raised awareness of this limitation of the questionnaire as presented on the online survey.

The quantitative aspect of the survey, provided the data required. The questions were direct, objective and the respondents connected with them as they were related to their own personal experience. There was an expectation that the additional, first-hand experience was shared openly. This allowed me to extrapolate from this data, connections and patterns from the experiences of the students. I was then able to draw conclusions from this.

There was a concern that the validity of the online questionnaires, surveys were in question as people might have been in a hurry to complete it and so did not give accurate responses. Also, the researcher may have made an assumption that all respondents in the sample group had access to the internet to enable them to complete the questionnaire in their own time as well.

3.5 RELIABILITY OF THE INSTRUMENT

Researcher Mora (2011) describes reliability as being concerned with the consistency of the measurement. A consistent measure, means that the answers to the questions will provide the same type of information each time the survey is used under the same conditions. I expected this to be true during the process. An important feature of reliability is that the random sample respondents know that they were safe from discrimination in terms of the answers that they provided. Sensitivity was required here. The researcher wondered whether the students would be open and honest about their experience at university? Each set of data informed my understanding of the research.

According to Nechkosta (2015) triangulation is about gaining a good understanding from different perspectives, related to an investigation. In this way, increasing one's knowledge and strengthening a researcher's perspective related to the investigation. Triangulation, which means using more than one method to collect data on the same topic, increases the confidence in the research data. As students shared their experiences of technology integration at the higher education that they attend, the research benefitted from the diversity (of the students and the higher education institution they attend in southern Africa) and the quantity of the data. The researcher also delved into the current research and data that was available. There were numerous national and international reports that were read that shared the multiple perspectives

related to innovative technology introductions into higher education institutions. There was also a valuable opportunity to interview a lecturer from one of the leading private Higher Education Institutions in South Africa.

To promote high reliability, the researcher expected that the questions would provide the information sought, and believed that the results would not show large variations.

3.6 DATA COLLECTION PROCEDURES

In this research project, data collection methods referred to the way in which data was going to be collected, i.e. qualitative and quantitative methods, through the online questionnaire.

To collect information from students, an untimed, on-line questionnaire was designed to take no longer than ten minutes. During this time information was collected on the current technology experience and exposure of students and lecturers, thereafter, the respondents answered more open-ended questions related to their belief and experience of the impact of technology on teaching, learning and outcomes. One lecturer was interviewed using the same questions as the questionnaire to enhance consistency in the nature of the questions.

3.7 THE SURVEY QUESTIONNAIRE BIAS

The questionnaire design has exposed itself to a variety of potential bias. I will share each one briefly.

Not all respondents answered all of the questions. This has limited the amount of data intended to acquire to that which has been acquired.

The short questions with limited response options like yes, no, maybe showed the majority of respondents answering a definite yes or no.

The double-barreled question that required a two-part response did not always get a two-part response.

There are three questions that speaks to the respondents 'belief' which has elicited many different responses.

The longer responses to the open format questions towards the end of the survey questionnaire

saw some respondents not answering the question, or responding using one word answers instead of more of an explanation.

3.8 THE SURVEY QUESTIONNAIRE RELIABILITY

According to Venkitachalam (2015) a questionnaire is said to be reliable if we get similar or a strong percent of agreement repeatedly at different times. In the context of this survey it is believed that a retest within a short (3 months) or medium (6 months) time-frame would yield similar results. Wilson (n.d) reminds us that positive correlation can occur if in the retest students acknowledge that their learning experiences and academic results had improved as a result of innovative technology being integrated into their higher education institution, and new technology had in fact been employed at the institution.

3.9 THE SURVEY QUESTIONNAIRE VALIDITY

The small pre-test of ten students did not highlight concerns, confusion or ambiguity. The survey questionnaire was answered by 96 students. Shuttleworth (n.d.) describes population validity as an external validity that determines whether the sample could be extrapolated to a population as a whole.

3.10 THE RESPONDENTS

Non-probability convenience sampling was used. According to Brenner (2016) this refers to the most convenient way to recruit participation in the survey. Convenience sampling is a type of non-probability sampling method that secures data from a population that can be conveniently accessed.

3.11 ADVANTAGES OF THE METHOD

According to Glen (2015) this method is cost and time efficient.

There is also experiential relevance of the data collected from a specific population (student)

This method also creates an opportunity for qualitative data to be gathered.

3.12 DISADVANTAGES OF THE METHOD

According to Glen (2015) it is quite difficult to gauge whether the researcher is representing the population, in this case the whole student population.

The Division of Instructional Innovation and assessment (DIIA) at the University of Texas (2008) notes that a response of between 30-40 percent is average for questionnaires completed electronically. If according to Gilliam (2000) a response rate of less than 30 percent makes one's methodology, validity and value of the results questionable, a response rate of 95 percent in this study is good.

3.13 ETHICAL CONSIDERATIONS

There were a few important considerations to be focused on regarding ethical considerations during this research. Firstly, the respondents deserved to be informed how the research would serve the interest of the Higher Education Institutions in the region. It's noteworthy that Smith (2003) reminds one that there may be intellectual property restrictions. This was particularly pertinent to the lecturers by virtue of their contractual boundaries or in the code of ethics of the institution.

The respondents needed to agree to participating voluntarily in the research. This was another opportunity, or the opportunity to confirm that the study was a research study. The respondents were assured that their responses were to be treated with confidentiality and privacy. There was some concern regarding access to the internet for the respondents. There was a hope that the respondents would have easy access to the internet to complete the on-line survey. There were no bias or restrictions placed on the respondents related to race, gender or economic prejudice.

The City University of Hong Kong (n.d.) describes research ethics as the guidelines for the responsible conduct of research and one is reminded of honesty when reporting data, objectivity in the design of the instrument, data analysis and data interpretation.

It was important to obtain ethical clearance from Botho University Faculty of Graduate Studies and Research to obtain permission to conduct research with the students at the university. This permit was obtained by applying formally in writing for permission to conduct data collection with students.

3.14 DATA ANALYSIS AND INTERPRETATION OF THE RESULTS

The use of Google forms allowed the researcher to analyse the responses thoroughly. The results were interpreted automatically within the Google forms features. There was an option to create numerical and graphical formats across sectional matrixes. Google forms was a comprehensive survey technology tool that allowed the researcher to collect and analyse the data. It was time-efficient and served the purpose of this study. The qualitative data was supportive as it provided information directly from technology users, it gave their perspectives as they related their experiences of technology usage and innovation in their higher education institution. There was a constant checking between the nature of the responses from the respondents and whether the answer was providing data to inform the research questions. As more and more data was received, the researcher was able to see patterns and consistencies of experience in the nature of the responses. The deductive approach to analyzing the group data from students was used, looking for similarities and differences to the responses of the survey questions.

3.15 CONCLUSION

Research methodology needs to serve the purpose of the research, by providing the data required to make certain claims regarding the research hypothesis. So, reliable data collection was a must. The questionnaire served this purpose well. The researcher sourced information directly from primary sources in higher education institutions, namely, students to find out the extent and impact of technology in their experience at their chosen higher education institution. An online survey questionnaire was used to gain data from the students. These students were from different higher education institutions in southern Africa. The number of respondents contributed to the reliability and validation of the research. The data was triangulated using the perspectives of a number of different respondents. The response from the ex-lecturer interview (based on the same questions as the questionnaire) was included in the questionnaire responses

and provided confirmation of many of the experiences of the students. The researcher acknowledges that a larger pool of responses from lecturers would have benefitted the data and added a stronger voice to this 'eco-system' of professionals within the higher education fraternity. The rich secondary sources of information gained from previous research in this area of study provided a window into possible results and similarities. The volume of the literature generated, particularly those of the last five to seven years reflected to the researcher, the relevance of the research in our immediate context as well as internationally.

4 CHAPTER FOUR: ANALYSIS OF RESULTS AND PRESENTATION OF FINDINGS

The purpose of the study was to find out the extent to which technology is integrated into Higher Education Institutions.

Various methods were used to generate the data, therefore the purpose of this chapter is to present and discuss the findings based on the research questions.

The findings are presented in sections guided by the research questions and data will be represented as per participants demographic, for example on page 49.

4.1 INTRODUCTION

Chapter three outlined the research methodology. The measuring instrument, the online questionnaire survey was discussed. This chapter will investigate the key research data obtained from the study.

The benefit of the integration of the innovative technology into higher education institutions is the focal point of this research. These benefits stand to improve the quality of teaching and learning for the students, impact powerfully on the presentation of course material by lecturers and more sophisticated NGLMS stand to guarantee greater administrative efficiency in higher education.

4.2 MAIN BODY

4.2.1 RESPONSES

In this study the expectation was for 100 respondents to the online questionnaire survey. 98 higher education respondents replied. A questionnaire survey was designed to elicit factual data. Appendix1 contains a copy of the online questionnaire survey.

The online questionnaire survey was constructed to answer the key research questions.

4.2.2 QUANTITATIVE RESPONSES

The responses to question 1 captured the demographic of the institutions the students attend. Table 1. Student demographic.

4.2.2.1 NAME OF THE INSTITUTION ATTENDING

Institution	n	%
University Cape Town	6	8.4
University South Africa	9	12.6
Institute of Marketing Management, Stellenbosch	1	1.4
Nelson Mandela Metro University	1	1.4
University of Orange Free State	1	1.4
Witswatersrand University	11	15.4
Stellenbosch University	3	4.2
University Pretoria	14	19.7
North West University	3	4.2
Varsity College, Rondebosch	1	1.4
Varsity College, Sandton	2	2.8
Interior Design Greenside	1	1.4
Damlin Technical College	1	1.4
Vega College	1	1.4
Rhodes University	2	2.8
Open Window Institute	1	1.4
University Botswana	5	7
Baisago University	1	1.4
Unknown/invalid	7	9.8

The motivation to have students respond from different institutions in Southern Africa was that I realized that if students all came from the same institutions, I may well get very similar responses as the institution would provide the same kind of technology integration throughout the institution. I realized that each institution could be on a different technology integration trajectory and it would be of value to get an insight into this per institution. So, in order to greater difference in the institution's implementation of technology I opted for more than one institution. While a survey was sent to students at Botho University, no students responded to the survey and they were unfortunately not represented in the demographic of students.

The responses to question 2 showed the year of study the students were in. Table 2.

4.2.2.2 THE YEAR OF STUDY OF THE RESPONDENTS

Year of study	n	%
1 st Year	30	32.6
2 nd Year	12	13
3 rd Year	27	29.3
4 th Year	6	6.6
5 th Year	2	2.2
Honours	6	6.6
Final	4	4.4
Other	5	5.5

The third question required students to identify the ways in which technology is used in the Higher Education Institution that they attend. This question relates directly to the first research question posed in chapter 1.

4.2.2.3 THE TYPE OF TECHNOLOGY THAT STUDENTS COULD ACCESS AT THEIR INSTITUTION.

How is technology used	n	%
Student Management System	53	56.4
Blackboard	50	53.2
Moodle	18	19.1
Text Matching Tools	62	66
Mobile Apps	53	56.4
Discussion forums	43	45.7
e Portfolios	41	43.6
e assessments	52	55.3
e recording of results	68	72.3
Social networking	42	44.7
Whiteboards	1	1.1

Google classroom	1	1.1
Sun Learn	1	1.1
Online registration	1	1.1
Power Point presentations	1	1.1

The fourth question asked students to identify what technology can be accessed online at the Higher Education Institution they attend. This question relates to the first research question posed in chapter 1.

4.2.2.4 STUDENTS IDENTIFIED TECHNOLOGY THEY COULD ACCESS ONLINE AT THEIR INSTITUTION.

Students can access online	n	%
Course announcements	90	94.7
E mail services	90	94.7
Course materials	91	95.8
Lecture recordings	49	51.8
Fully on-line course	23	24.2
MOOCS	1	1.1
Electronic library	1	1.1
None of the above	1	1.1

The fifth question required students to consider whether they believed that greater use of technology would improve the effectiveness of their learning and the quality of their learning experience. This question relates to research question 2 in chapter 1.

4.2.2.5 DO STUDENTS BELIEVE THAT GREATER USE OF TECHNOLOGY COULD IMPROVE THEIR LEARNING AND THE QUALITY OF THEIR LEARNING EXPERIENCE?

Question 5	N	%
Yes	79	83.2
No	3	3.2

Maybe	14	14.7
Other	3	3.3

The sixth question asked students whether they believed that their lecturers were maximizing the use of technology to enhance the learning experience of students. This question is related to questions 3 and 4 in chapter 1. Table 4.

4.2.2.6 DO STUDENTS BELIEVE THAT THEIR LECTURERS ARE MAXIMISING THE USE OF TECHNOLOGY IN THEIR COURSE?

Question 6	N	%
Yes	42	45.2
No	30	32.3
Maybe	16	17.2
Other	7	7.7

The seventh question asked students to consider whether the institution that they attend, meets their expectation in their use of technology. This question is related to questions 1, 3 and 4 in chapter 1. Table 5.

4.2.2.7 DOES THE INSTITUTION THAT YOU ATTEND MEET YOUR EXPECTATION OF TECHNOLOGY USAGE?

Question 7	N	%
Yes	59	62.1
No	24	25.3
Maybe	11	11.6
Other	4	4.4

4.2.8 QUALITATIVE RESPONSES

The open answer format question eight asked students to share how they believe the integration of technology into the course that they are studying, would enhance their learning experience and also improve their results. This question is related to research question 1, 2 and 3.

The responses from the students have been categorized into under the following sub-headings:

4.2.8.1 STUDENTS' ABILITY TO ACCESS THE INTERNET AND TECHNOLOGY

The vast majority of students spoke to the quick, easy access to learning materials on line and this led to greater time efficiency. It was not only the easy accessibility that they believed would enhance their learning, but also that the information that they were using could be easily stored, it would be the most recent information that they could find, and they would be able to access the information as and when they wanted to, as often as they wanted to. Greater access also meant that students would be exposed to a variety of perspectives related to the area of studies which would be beneficial. There was a belief that this would improve their results. Access to online submissions would also be time-efficient. Coupled with easy access, was the opportunity for quicker feedback, a quicker response time from the students to learn from their mistakes and possibly an improvement in their results. Commentary was also shared regarding students having access to technology that they would one day use in the work place and they saw this as valuable, e.g. VR technology and production for Film studies. Some students believed that because they had access to greater volume of material, that it could improve the quality of the material they were exposed to and therefor improve their results.

4.2.8.2 THE POTENTIAL OF USING A VARIETY OF TECHNOLOGY TOOLS TO ENHANCE STUDENT LEARNING.

A number of students mentioned that technology would allow for a range of multi-media to be used. This variety could enhance the nature of their learning, making it more interesting, more impactful, more engaging and potentially improve their retention of content knowledge and therefore improve their results. One student shared that the greater use of multi-media was preferred to dense readings and reflects more accurately how the student interacts with the real world.

4.2.8.3 TECHNOLOGY CREATES AN OPPORTUNITY FOR IMPROVED WORKING RELATIONSHIPS.

There were students who noted that they were able to connect with their lecturers and their peers more easily online. This was positive as they were able to engage with regards to their learning, feedback, planning and preparation. One student in particular felt strongly that technology would promote her student-lecturer relationship in a busy environment where face to face access to lecturers was not easy. With greater involvement with lecturers there is a belief that results will improve.

4.2.8.4 OUTLIER RESPONSES OF INTEREST

There were two responses that were of particular interest. Firstly, a student made the point that it made no difference how much information you had access to as a result of technology, but rather, it was how you engaged with the information that would make the difference to your results. Also, one student noted that despite access to technology, hard copies of information was still a preference.

This was a two-part question and some students responded to the first part only, others to the second part only, and some to neither of the question.

The open answer format question nine asks students to share what other technology development they would like to see introduced at the Higher Education Institution that they attend. The feedback can be categorized as there was repetition and congruency with many of the responses. This question is related to research question 2 in chapter 1.

4.2.8.5 GREATER ACCESS CREATES GREATER OPPORTUNITIES

A number of students stated that they would like greater access to the following online opportunities, enabled by technology; library materials, lectures, tests, exams, Skype calls with lecturers, discussion forums, real-life simulations, timetables, announcements, social media interactions and video calls. There was a request for greater use of technology by lecturers. Some students felt that their institutions provided adequate technology but propose an upgrade

of existing, outdated technology, like old projectors, and old whiteboards. There was also an interesting comment where it was felt that there should be a greater expectation by lecturers for students to engage with technology during lectures.

4.2.8.6 DIFFERENT TYPES OF DEVICES SERVE DIFFERENT NEEDS

Some students identified students needing access to specific devices like; iPads, low cost lap tops, particularly for students who could not afford their own, therefore enabling greater access to technology for all. Kindles and e readers were named as valuable tools to access research materials.

4.2.8.7 SAFETY ON CAMPUS

A student mentioned the need for use of biometrics technology for when students access the university campus or any university venue. This would improve safety and security on the campus.

The tenth question asks students to comment on what they see as the main reason(s) why the higher education institution that they attend, may not be technologically innovative. The responses have been categorized into key challenge factors that showed overlap and consistency. This question is related to research questions 3 and 4 in chapter 1.

4.2.8.8 COST IMPLICATIONS CAN HAMPER INNOVATIONS

The majority of students acknowledged to cost of the implementation as being the prohibiting factor against the integration of the latest technology innovations into their institutions. The students cited the decrease in government subsidies, the disconnect between the institutions vision and their financial planning and gain. It was also mentioned that technology is being updated, or changing so rapidly that it would be costly and difficult for the institution to maintain these changes. The cost implication was not just impactful on the institution but also students as well. Not all students can afford laptops and would find paperless courses difficult to participate in. Also, lack of internet access off campus would further exclude these students from their studies. Cost implications was not necessarily just related to new technologies, but it was mentioned that the upgrade of current technologies would be costly. The lack of plug

points in lecture halls was a simple example of this. Some students also noted frustration at the limited WiFi connectivity on campuses. There were a few responses where students acknowledged the positive technology developments at their institutions. A comment was made that more online courses meant greater scalability and therefore potentially greater profit for the institution.

4.2.8.9 LECTURERS NEED ONGOING TRAINING AND SUPPORT

Students noted that lecturers were mostly of a different generation and though highly knowledgeable, not prepared to or able to transition into the online space. It was felt that some lecturers lacked the will to implement technology, they didn't always see the benefit of the technology. Some students saw lecturers as lazy and old fashioned and saw the traditional approach to lectures as a way to ensure attendance of students at lectures.

4.2 CONCLUSION

The number of responses from students in the South African institutions was pleasing as they had a longer period of time in which to respond. The 1 response from Botho University was disappointing, but then only a short amount of time was made available for respondents as there was a delay in the ethical clearance from the university. The process (timing) of the collection of data could have been coordinated to be more cohesive and intentional. There were times when the collection of data process felt out of control and sporadic. The survey questionnaire, at the time of design, appeared to be able to answer the research questions. The results received mostly reflected consistency of experiences between students at different higher education institutions in South Africa. The lack of more detailed answers by some students diminished the comprehensiveness of the data.

5. CHAPTER 5: DISCUSSION AND INTERPRETATION OF RESULTS: INTRODUCTION

The purpose of this study was to gain an understanding of the extent of technology integration in Higher Education Institutions. The intention was to determine this integration within Higher Education Institutions in southern Africa, with the focus being in various institutions in South Africa as well as Botho University in Botswana. The researcher set out to identify the

challenges of integration of technology into Higher Education Institutions and aimed to determine how students' academic performance and the efficiency of the institutions could improve, through the integration of technology into the institution.

This chapter reports the discussion and interpretation of the results, conclusions and recommendations that resulted from this study.

A questionnaire survey instrument was developed and mailed to students. Respondents in South African Higher Education Institutions were identified from a network of past students that the researcher taught, and who are currently attending Higher Education Institutions in South Africa. An additional set of respondents was identified within the institution of the researcher, that being Botho University. Through the use of the survey instrument, data was collected which addressed the research questions posed in chapter one of the dissertation.

5.1 DISCUSSION AND THE INTERPRETATION OF THE RESULTS

All respondents were asked to share the course that they were enrolled in and the name of the institution that they attend. Not all respondents answered this question with accuracy. They may have answered one of the two parts and in some instances neither of the questions was answered. These students may have believed that the information was personal or they may have felt vulnerable, thinking that their responses regarding their institution was not confidential. There were also responses from students attending universities outside of southern Africa and these had to be discredited. The variety of the respondents in southern Africa provided a breadth of exposure of the integration of technology into these institutions which served the study well. The course taken by respondents could also impact on the extent to which technology is integrated into the students' course. This would be the next level of understanding that could be determined. This survey provided a limited insight into a students' experience of technology integration at their Higher Education Institute.

The responses for the second question of the study showed respondents in their first year and even one in their sixth year of study. The responses by first, second and third year students was straight forward, but there was confusion regarding the following responses to other option; final year, did this mean the third year in a three year programme or fourth year in a longer

course, or an Honours year which is generally a fourth year of a three-year degree. Understanding the content (as per the previous paragraph) would further develop understanding of the technology offering per course, per year. The value of identifying the year of study was of interest but the information has been used with limited significance. This lack of clarity of final year, fourth year resulted unnecessary confusion and 'split' of the respondents into their own smaller sub-sets as opposed to being included into broader groups. Further response options should have been defined in the survey.

The responses to the third question got into identifying what the students were exposed to on the technology front at their institution. The majority of students (56.4%) noted that they experience of using a student management system, which seems surprising, one would have expected an even higher number of students to have experience of this, unless their parents are registered from an administrative point of view and they manage their child's administration. This seems unlikely for most independent students though. The majority of students (66%) had noted that they had experience of text matching tools which reflects most institutions utilizing these tools in a bid to combat plagiarism. There may be students who take courses, that may be more practical in nature, like Clothing Design who have less or no exposure to this tool. The recording of results was also experienced by the vast majority of students (72%). The recording of assessment and exam results is where technology is most widely used in the Higher Education Institutions. The majority of higher education students do not come from generally well-resourced private schools, however, a percentage do. Here they will have experienced interactive whiteboards in their classrooms. Out of 94 respondents only one students had experienced the use of whiteboards at their institution.

The fourth question showed strong use of technology for communication purposes of announcements as well as course materials. This is predictability obvious as the institution is sharing information, a one-way flow of information. The limited opportunities experienced by students (51.6%) of lecture recordings is low. Lecture recordings could enhance the learning experience by students as they would be able to refer to the lectures multiple times, thereby developing understanding over time, as opposed to a once off lecture. Student results could improve. The framing of question three and four was quite similar and in hindsight elements of what students could access in question four, form part of the question. For example, lecture recordings in four, could form part of a comprehensive Blackboard offering like at Botho

University. The researcher should have thought through question three and four and consolidated them.

The responses to the fifth question noted an overwhelming (83.2%) belief by students that the greater use of technology at their institution would improve their learning experience and also the quality of their learning experience. As many of these students are literally raised with technology, or in a world of fast-changing technology this may be a natural response for them. The limitation of the question though, is that it does not ask the students how or why they say so? The (3.2%) of students who said they did not believe that technology would enhance their learning experience may well be students who do not have 24/7 access to technology or connectivity, or the nature of their course does not require technology intervention or enhancement.

The sixth questions about whether lecturers were maximizing the use of technology in their lectures was interesting, with (45%) saying they believed their lectures were on point here. This is aligned with the many ways in which institutions were using technology in question three. Here students shared high use of; mobile apps (56.4%), discussion forums (45.7%), e portfolios (43.6%), e assessments (55.3%), e recording of results (72.3%), e feedback (57.4%) and social networking (44.7%). Each of these elements would more than likely have some lecture engagement. It's interesting to note that in the previous question, (83.2%) of students believed that technology would enhance their learning experience but then in the next question, only (17.2%) of students felt that maybe their lecturers were doing their best using technology to enhance the learning experience of students. If we add the no responses with the maybe, we get (49.5%) of students who are ambivalent about whether their lecturers are maximizing the use of technology to enhance the learning experience of students.

Question seven responses to whether the institution use of technology meets the expectations of students was interesting. Students' access and exposure to technology reflects their day to day reality at their institution, it is what it is. The (62.1%) came as a surprise. The research of this dissertation shows the extent to which technology can be used innovatively in higher education institutions, and the survey questionnaire, highlighted only the most basic and obvious of these. So, is this high yes response feels like it is as a result of limited understanding of technology development for integration into higher education institutions. This seems fair, how many students would be familiar with the use of facial biometrics and its value for safety

and security on a campus? If students have not been exposed to the blended learning style or the flipped classroom approach, as further opportunities for higher education institutions, this would not be on the radar of students. The (25.3%) of students may well have a different understanding of the additional opportunities that could be explored and feel underwhelmed by the current offering of their institution.

The results for questions eight to ten will be interpreted under the same headings identified in chapter four.

Question eight elicited 90 responses, however, the nature of the responses was inconsistent. The question design asked two questions and required two answers. This was not good as many respondents answered only the first or the second part of the question, and a few answered both parts. The question should have asked one question only.

The feedback regarding accessibility spoke to a world without financial restrictions, the utopia for students where they would have 24/7 access to enhance their learning experience. While no reference was made to financial restrictions within the question, students openly shared what they saw as the benefits of technology integration into their programme of study. They acknowledged greater efficiency of systems, the important storage of information and in particular their results, work and the value of easy access to this information. While many believed that greater exposure to more detailed information in their courses and different perspectives, there was recognition of the time that this would take. The more information that one can access, the more time you will need. The more perspectives you are exposed to, the more confusing it can be. The greater access one has to greater volumes of information, requires higher skill levels of selection of material, analysis and synthesis of information. While quicker feedback opportunities were acknowledged, one wonders whether the assessment practices would remain as complex as they are, whether technology would dilute the nature of the assessments and exams to fit into a technology-based model for 'instant' feedback. Will some rigour not be lost?

It was acknowledged that a variety of technology integrations would enhance learning and improve results, however, these once again were assumed without consideration for financial implications, the practicality of this and the sustainability of it over the longer term. The use of

the word 'belief' encouraged this openness of responses, without restriction. The word belief also does not expect that responses are factual or based on first-hand experience.

Students believed that greater access would forge greater working relationships with peers and with lecturers and this would positively impact student learning and results. While it may facilitate access to each other, it does not guarantee effective relationships, two-way communication, or improved results. Improved results come from hard work and how one engages with information, within a highly technologically advanced environment, or with a technologically barren environment.

Question nine required students to share the technology enhancements that they would like to see at their institution of study. The question posed was too open-ended and broad. The question should have been framed in a way to guide student thinking, possibly by asking students consider the two most important or immediate technology priorities they would like to see implemented. To further focus their thinking, it could have asked students to think of one in the area of academics and the other consideration in the administration or area of safety on the campus. The responses by students to this question were broad, and also very much dependent upon the course they were taking which had specific needs, like; real-life simulations in a geography course. The majority of the responses were practical and spoke to the introduction of some of the most obvious technologies to enhance for example timetabling and lecturing by teachers. The question also assumes that the students have given this thought beyond what they experience each day. Is this realistic? It assumes that students are saying, "I wonder what it would be like if we had..."

In the final open format question, ten, students were required to share why they thought that their higher education institution may not be technologically innovative. The responses here reflected a real acknowledgement of the financial implications as well as the limitations of the older generation lecturers to embrace the use of technology. The students showed an understanding of the limitations of finances and therefore the restrictions to being technologically innovative. This financial limitation is borne out in the research. Students' experiences of many of their lecturers as being technology-deficit is consistent with the research in this dissertation.

5.2 SUMMARY OF FINDINGS WITH THE REFERENCE TO THE OBJECTIVES AND THE RESEARCH QUESTIONS

The main objective of the research is to find out the extent of technology integration in Higher Education Institutions.

5.2.1 OBJECTIVE 1

To determine the benefits of integrating the use of technology into Higher Education Institutions the researcher identified key findings in chapter two from a number of reports, one being The New Media Report of 2017 highlights the current thinking and integration of technology in leading higher education institutions, with examples of technology in seven different categories, namely; consumer technology, digital technologies, preservation technology, internet technologies, social media technologies, learning technologies and visualization technologies.

5.2.2 OBJECTIVE 2

The examination of the challenges of integrating the use of technology in Higher Education Institutions was identified in current research and also through the questionnaire responses. The most significant challenges being financial constraints, the rapidly changing development of technology which makes it difficult to keep pace with the upgrades of hardware, software and newly developed systems and the associated training for these systems. Also, the human limitation in the form of lecturer apathy or reluctance came through strongly in the research as well as the student survey responses. In the research Cannell (2013) was cited to support the reality that most lecturers lacked the skills to implement technology.

5.2.3 OBJECTIVE 3

To find out how students' academic performance and the efficiency of the Higher Education Institution can be improved through innovative technology, a number of key areas was shared in the research, that was shared in National Education Technology Plan (2016). These are

super-advanced and for many institutions, aspirational. Academic development through technology integration was seen possible through students having greater access to technology, to enable greater access to the most up-to-date information and courses.

Institutional efficiency could be improved by students being able to document their learning more easily through the use of technology, thereby supporting the work of the lecturers and empowering the students to take responsibility for their learning and the documentation of their learning experiences, in the form of e portfolios as an example.

5.2.4 RESEARCH QUESTIONS

The research questions ‘unpacked’ the objectives. The researcher got an insight into how technology is used in Higher Education Institutions in South African Tertiary institutions through the questionnaire survey. This was beneficial and quite revealing. If one considers the potential technologies that are available to be integrated into Higher Education Institutions, there was quite a gap between the South African students’ exposure and experience, with that of leading institutions in the United States of America.

The benefits for students as well as Higher Education Institutions of highly integrated technology use in Higher Education Institutions has been well documented in the research as well as through the students’ responses in the questionnaire survey.

The need for innovation leadership, the costly financial implications as well as the role of the lecturers in a technology-rich learning environment were key areas identified in the research as challenges of integrating the use of technology in Higher Education Institutions.

How best can lecturers promote improved student performance and the improved functioning of Higher Education Institutions through greater use of technology highlighted the lecturers as the key drivers of technology integration and usage for the betterment of the student learning experience, and the positive impact on their studies. Without lecturers embracing the use of technology, participating and leading the ongoing professional development requirements for the introduction of technology, very little progress will be made. In the research as well as the student survey responses, some students viewed lecturers as one of the challenges to implementing innovative technology into their institutions. This is a negative view of highly

qualified, knowledgeable and experienced professionals. Time, patience and accountability (of lecturers) to implement technology in their institutions could change this view.

5.3 EDUCATIONAL IMPLICATIONS OF THE STUDY

The study provides a current insight into the level of integration of technology into some Southern African Higher Education Institutions. If one considers this data from the questionnaire survey, in the context of the research which shows more advanced and highly sophisticated technology integration opportunities, institutions in South Africa have opportunities for growth in many areas of these advanced technologies, like Artificial Intelligence. This is an opportunity for further interrogation of technology integration into Higher Education Institutions in South Africa as well as southern Africa. In our context, an intentional focus on affordable hardware, like laptops, iPads and easy 24/7 access for all students to the internet would already be a positive development. From there then, research, design and create affordable online courses for larger numbers of our students to access, qualify and become an integral part of the economy of their country.

5.4 RECOMMENDATIONS FOR FURTHER RESEARCH DIRECTIONS

Further research is recommended to identify ways to subsidise universities to enable them to be technologically current to ensure that our students are globally relevant and part of the global job market.

There is also an opportunity for deeper research to consider the real impact on student outcomes with the integration of technology by obtaining hard data during and after the integration of technology into a particular course.

Research to determine the impact on student preparedness for the world of work where technology is used to bridge the gap between higher education knowledge and content and the reality of work systems and experience in specific fields of work.

5.5 CONCLUSION

There appears to be no stopping, turning back or slowing the pace of technology development. Technology impacts us in most areas of our lives and for many people in their work environment. The sight of young toddlers interacting with technology like the games on cell phones shows the extent of the exposure we have to technology at the youngest age. It seems inconceivable then that educational institutions like Higher Education Institutions cannot benefit from the integration of technology, or that they can choose to delay the integration of technology into how they teach their students, or how students learn. Carefully considered systems design can also benefit the effective functioning of Higher Education Institutions in how they manage student records, campus safety, predict students' outcomes and community with their community.

Penny (2017) reminds us that this may be the last generation where the conversation is about separating them (students) from their technology in their learning. He purports that we need to be realistic and consider carefully this world of learning of our students. He cautions that we need to consider that we are teaching cyborgs, youngsters whose functioning is supported or dependent upon an electronic device. This reality calls for creativity, careful planning and a responsiveness from our higher education institutions, as they consider integrating technology innovatively into their institutions to reflect our students' learning needs in the twenty first century.

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Appendix 1

The survey questionnaire was designed on Google sheets. I was unable to download it.

It can be accessed at: <https://docs.google.com/forms/d/e/1FAIpQLScmk4l85KdRDOi5RyVXqsf-8wIx9gEsEocDNXcFzL1aJOFCg/viewform>

These are the questions:

Technology in Higher Education

1. Course enrolled and name of institution attending
2. Year of study (options given to tick)
3. Your Higher Education Institution Uses (options given to tick)

4. At your Higher Education Institution, you can access the following online (options given to tick)
5. Do you believe that the greater use of technology will improve your learning effectiveness and the quality of your learning experience? (Yes, No, Maybe)
6. Do you believe that your lecturers are maximizing the use of technology to enhance the learning experience of students? (Yes, No, Maybe)
7. Is your institution meeting your expectations in the use of technology? (Yes, No, Maybe)
8. How do you believe that greater technology use in your course will (1) enhance your learning experience and (2) improve your results?
9. What other technology developments would you like to see introduced at the Higher Education Institution that you attend?
10. What do you see as the main reason(s) why your Higher Education Institution may not be technologically innovative?