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# RECONFIGURING POSTGRADUATE RESEARCH PRACTICES: STUDENT SATISFACTION WITH DIGITAL TECHNOLOGIES IN PRE- AND COVID-19 HIGHER EDUCATION CONTEXTS

**Nduduzo Comfort Ndebele[1]* and Lerato Hlengiwe Sokhulu[2]**

*[1]Discipline of Public Governance School of Management, Information Technology and Governance, University of KwaZulu-Natal, South Africa*
*[2]Discipline of Curriculum Studies, School of Education, University of KwaZulu-Natal, Durban, South Africa.*

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*Corresponding Author: Nduduzo Comfort Ndebele (ndebelen@ukzn.ac.za)*

## ABSTRACT

***This study examines postgraduate students' satisfaction with digital technologies for research in higher education, focusing on their experiences before and during the COVID-19 pandemic. Drawing on the Unified Theory of Acceptance and Use of Technology (UTAUT) framework, the study explores key aspects including availability, accessibility, affordability, ease of use, technical support, connectivity, and user training. A quantitative research approach was employed, using a structured online survey administered to 50 postgraduate students across two universities in KwaZulu-Natal, South Africa. Descriptive statistics and t-tests were used to analyse the data. The results reveal that before the pandemic, students reported generally neutral satisfaction levels across most aspects, reflecting limited integration of digital technologies into research practices. During the pandemic, satisfaction levels improved across ease of use, technical support, and user training, particularly at University 2, the historically Black-only university sampled in this study. However, challenges related to accessibility, affordability, and connectivity persisted. The study results emphasise the role of institutional investment in supportive infrastructure and digital literacy initiatives in enhancing postgraduate research experiences. The study concludes that while the pandemic accelerated digital transformation, systemic barriers continue to constrain student satisfaction. Recommendations include strengthening digital infrastructure, expanding training and support, addressing affordability, and sustaining post-pandemic innovations to better align digital technologies with the needs of postgraduate research.***

**KEYWORDS:** Digital technologies, Research, University, COVID-19, satisfaction, South Africa.

## 1. INTRODUCTION

The rapid advancement of digital technology, coupled with global crises like the COVID-19 pandemic, has significantly accelerated the integration of digital technologies into higher education (Kirkwood and Price, 2014; Mpungose, 2020; Sokhulu, 2021). As such, digital technologies have become crucial for both learning and research, transforming the traditional university experience. The COVID-19 pandemic forced higher education institutions worldwide to rapidly adapt to online delivery, including research activities. However, postgraduate students, with their diverse digital needs, have encountered challenges in adapting to this shift (Khoza, 2017; Makumane, 2023; Selwyn, 2014; Sokhulu, 2023). As a result, ensuring student preparedness and satisfaction in utilising digital technologies for research remains a critical concern for many universities, especially as digital tools become increasingly prevalent (Mpungose, 2020; Ndebele, 2024). More recently, the emergence of advanced digital technologies, particularly artificial intelligence (AI), has introduced additional complexities, including issues related to ethical use, academic integrity, digital literacy gaps, and the ability of students to critically engage with AI-generated content (Maimela and Mbonde, 2025; Sokhulu et al., 2025; Thaldar et al., 2025). These developments further intensify the need for higher education institutions to not only support access to digital technologies but also to develop students' critical and responsible use of evolving technologies in research contexts.

Henderson et al. (2015) emphasise the significant challenges that both higher education institutions and students face in effectively utilising digital technologies. Moreover, despite the accelerated integration of digital tools in higher education, particularly during and after the COVID-19 pandemic, there remains a limited understanding of how postgraduate students experience and evaluate the use of these technologies for research purposes across different periods. Furthermore, while the pandemic necessitated rapid digital adoption, it is unclear whether these shifts have translated into sustained student satisfaction, improved research practices, or meaningful support for postgraduate students in the evolving digital landscape.

This presents a critical problem for higher education institutions as they transition into the post-pandemic era, where advanced technologies such as AI, virtual reality and other digital research platforms continue to reshape academic practices. Without a clear understanding of postgraduate students' satisfaction and challenges, institutions may struggle to design responsive support systems, develop appropriate digital competencies, and ensure effective and ethical use of emerging technologies for research. This study sought to investigate and analyse postgraduate students' satisfaction with digital technologies in higher education, both before and during the COVID-19 era. By examining students' satisfaction, we hope to provide valuable insights and recommendations to inform future-oriented strategies for enhancing digital research experiences in higher education. Thus, this study sought to answer the following two key research questions:

What informs students' satisfaction with using digital technologies for research in higher education before and during the COVID-19 era?

How do postgraduate students' levels of satisfaction with digital technologies differ across aspects such as availability, accessibility, affordability, ease of use, technical support, connectivity, and user training before and during the COVID-19 era?

## 2. LITERATURE REVIEW

### *2.1. Digitalised postgraduate research in higher education*

Globally, higher education institutions are increasingly adopting digital technologies to equip students with the skills and competencies essential for thriving in the Fourth Industrial Revolution (4IR) and in 21st-century society (Dlamini, 2015; Khoza, 2017). This digital transformation compels institutions to revise and enhance curricula, integrating digital practices to improve both teaching effectiveness and research outcomes (Lai, 2011; Shava and Ndebele, 2024; Useh, 2021). Furthermore, to ensure students gain meaningful experiences, a clear framework for digital teaching, learning, and research practices is crucial (Arek-Bawa and Reddy, 2024). Over the past two decades, universities have incorporated a wide range of digital technologies into their operations, including platforms like Moodle, online libraries, and various tools for academic search, plagiarism detection, and assignment submission (Khoza, 2017; Mbambo and Du Plessis, 2024; Nkohla, 2025). However, the extent to which these technologies are effectively utilised to enhance postgraduate research experiences and satisfaction remains uneven and insufficiently understood.

Moreover, in South Africa, the primary role of higher education is to equip students with the skills and understanding needed to navigate the potential

and limitations of digital technologies, such as LMSs, research databases and general Artificial Intelligence (AI) tools, which are central to the 4IR digitisation (Motala and Menon, 2020). Higher education is also tasked with preparing graduates for rapidly evolving societies and economies {Motala, 2020 #1731;Ndebele, 2023 #1742}. The COVID-19 pandemic further emphasised key educational and research issues, particularly regarding how students engage with digital technologies in their learning. Research has shown that postgraduate students experience varying levels of satisfaction with the use of digital technologies in research (Azubuike et al., 2021; Biccard and Meeran, 2024; Khoza, 2017; Sokhulu et al., 2025). Therefore, it is crucial to examine the complexities of these experiences and satisfaction levels to enhance research practices. In the context of the COVID-19 era and beyond, postgraduate students are increasingly reliant on digital technologies throughout their research, highlighting the need to investigate the factors that influence their satisfaction with digital technologies.

### *2.2. Students satisfaction with using digital technologies for research in higher education before the COVID-19 era*

Even before the COVID-19 era, research has required the sustainable use of support systems such as digital technologies (McCallin and Nayar, 2012). Thus, universities that offer postgraduate research studies have been compelled to evaluate their programmes, processes, student satisfaction, and digital support systems in order to become more efficient, accountable, and better able to attend to students' research needs. As such, in New Zealand McCallin and Nayar (2012) conducted a study that asserted that a mixed model for postgraduate programmes was employed. This model involved supporting postgraduate students by providing in-person and one-on-one and group guidance, and the use of online programmes and teleconferences. Exploring the usefulness of university-recommended software resources among postgraduate students in a university in Australia, Henderson et al. (2015) found that postgraduate students ranked the online libraries, Learning Management Systems (LMSs) and e-books as very useful for research. Students also found Facebook and Twitter useful for generating data and collaboration with other researchers or students.

In a previous, smaller mixed-methods study, Masterman and Shuyska (2012) explored postgraduate students' experiences with digital technologies. The study revealed that while most students demonstrated functional competence with digital technologies, some demonstrated developing skills with digital technology. Thus, the explored literature provides evidence that digital technologies have been used to support postgraduate research even before the COVID-19 era. While these studies were useful for establishing the use of digital technologies before COVID-19, they do not reveal students' satisfaction with them. For example, McCallin and Nayar (2012) investigated students' perceptions of using digital technologies in research and Masterman and Shuyska (2012) alluded to students' experiences.

Few studies have examined postgraduate satisfaction with digital technologies, including e-learning, digital resources, and online libraries. For instance, research by Jamaludin and Mahmud (2011), Ozoemelem (2009), Abedalaziz et al. (2013), Anagnostopoulou et al. (2015), Ankrah and Atuase (2018) and Agboola et al. (2019) examined this topic in Asia and parts of Africa. Other studies have focused on factors such as supervisory experiences, while digital technology satisfaction among postgraduate students has been widely explored in research published during and after the COVID-19 pandemic, a period during which digital technology use significantly increased. This study is significant as it specifically investigates postgraduate students' satisfaction with digital technologies within the South African context, with the aim of benchmarking these findings on a global scale.

### *2.3. Students' satisfaction with using digital technologies for research in higher education during the COVID-19 era*

As the world adjusted to the COVID-19 pandemic, many HLEs employed the use of digital technologies on an increased scale, and research studies reflected on students' satisfaction with these digital tools. For instance, (Shehzadi et al., 2021) and Islam and Sheikh (2020)investigated postgraduate students' satisfaction with e-learning at Pakistani universities during the COVID-19 era. The findings showed that students' positive satisfaction with e-learning digital technologies depended on the quality of the digital technology used. Therefore, quality e-learning digital technologies contributed positively to satisfaction. Likewise, explored factors influencing students' satisfaction with e-learning during the COVID-19 era using a cross-sectional study of 258 students in a Malaysian university. The results revealed that factors such as instructor performance, course evaluation, and system quality influence students' satisfaction with e-learning. With systems quality

determining students' positive satisfaction the most.

Several studies have been conducted in South Africa (Andoh et al., 2020; Buthelezi and Van Wyk, 2020; Lekhetho, 2022; Murithi, 2020; Netshitangani and Machaisa, 2021; Sokhulu and Ndebele, 2025) have examined postgraduate students' satisfaction with digital technologies. These studies found that students were generally satisfied with online communication and support from supervisors, administrators, colleagues, and peers through platforms such as email, WhatsApp, and other social and professional media. However, students expressed dissatisfaction with unreliable internet services and the lack of appropriate hardware and software to conduct their research. For example, one study highlighted complaints about limited access to recent publications on a university website portal, which hindered research progress due to insufficient funds to pay for access to essential articles (Lekhetho, 2022). In response to these challenges, students called for additional support and training to help them use available digital technologies more effectively (Buthelezi and Van Wyk, 2020).

Moreover, it is also worth noting that there is limited literature on postgraduate students' satisfaction with digital technology, particularly in the two eras before and during COVID-19. Furthermore, postgraduate students remain an under-researched group in higher education. Yet their experiences and satisfaction need to be seen and published to improve programmes and attract more potential postgraduate students.

## 3. RESEARCH DESIGN AND METHODOLOGY

### *3.1. Research approach, design and sampling*

This study employed a quantitative research approach to investigate students' perceptions of the efficiency of digital technologies for research before and during the COVID-19 pandemic. The quantitative approach allowed for both quantitative and qualitative data collection and analysis, providing a comprehensive understanding of the research topic (Creswell and Plano Clark, 2018). However, this study's results reflect only quantitative data from student responses to an online survey. The participants recruited in this study were postgraduate students from two universities in KwaZulu-Natal, South Africa, one historically White-only university (1) and the other historically Black-only university (2). A simple random sampling method was employed to ensure equal representation of students across the two universities' academic levels (Honours, master's, and doctoral). This sampling method helped capture dynamic perceptions of 50 postgraduate students regarding the efficiency of digital technologies in research during and before the COVID-19 era.

### *3.2. Data collection method*

Data collection was conducted through a structured online questionnaire administered to the participants. The survey instrument was designed to gather quantitative data on postgraduate students' perceptions of the efficiency of digital technologies in research, including measures of availability, accessibility, ease of use, user training, affordability, connectivity, and satisfaction with various digital technologies. Closed-ended questions were included to produce quantitative results on students' perceptions. Before distribution, the questionnaire underwent pilot testing with a small group of students to refine wording, ensure the relevance of the questions, and provide clear instructions. This process validated the survey questionnaire instrument and enhanced its reliability. Participants were invited to complete the questionnaire electronically via each university's notice system. The survey period spanned from September 2022 to June 2023, allowing sufficient data collection and responses to produce adequate quantitative results.

### *3.3. Data Analysis*

Quantitative data were analysed in 2024 using descriptive statistics to summarise participants' responses and assess changes in perceptions over time. Ethical approval for this study was obtained from both University 1 and University 2 Ethics Committees in the 2022 academic year, ensuring that all procedures adhered to ethical standards and protected participants' confidentiality and anonymity throughout the research process.

### *3.4. Theoretical framework for the study: UTAUT*

This study employed the Unified Theory of Acceptance and Use of Technology (UTAUT) conceptual framework to explore postgraduate students' experiences of using digital technologies pre- and during the COVID-19 outbreak. UTAUT is a recently developed conceptual framework that synthesises previous models. UTAUT outperforms these earlier models because it provides a holistic perspective, considering various factors that are profound for human digital learning (Manrai et al., 2024). UTAUT has four unique constructs that affect users' experiences with technology. These include: Performance expectancy, Effort expectancy, Social

influence, and Facilitating conditions. In other words, these constructs help in understanding students' experiences and acceptance of using digital technologies for research purposes pre and during COVID-19 times. Moreover, UTAUT is useful in analysing student' experiences with digital technologies because it is enhanced with moderators such as age, gender, experience and voluntariness which improves its analytical lens and thus make the framework different. The moderators further affect the four constructs influencing technology usage thus extensively explaining technology acceptance (see Figure 1 below). The arrows in the figure indicate the relationships between constructs, moderators and users' behavior.

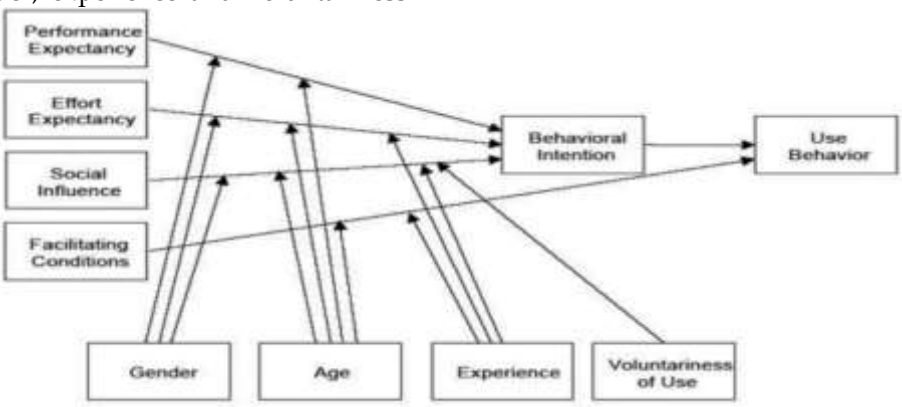


***Figure 1. The relationship between constructs, moderators and users' behaviour***

In this study, Performance Expectancy (PE) refers to students' anticipation of engaging in research using digital technologies to successfully complete research activities. The influence of PE in students' use of digital technology is affected by age and gender (Venkatesh and Zhang, 2010). Effort Expectancy (EE) refers to perceived ease of navigating digital technologies. In other words, if participants find it easy to conduct research using digital technologies, there are more chances for them to write their dissertation successfully and complete all research activities which are digitilised. EE is moderated by gender, age, and experience. Studies have found that effort expectancy is higher in young females and new users who do not have much experience with digital technologies (Marchewka and Kostiwa, 2007; Sewandono et al., 2023; Venkatesh et al., 2000).

Social influence (SI) to students belief that their social community members are going to help them in understanding how to conduct online assessment successfully. Social influence is affected by students' age, gender, experience and voluntariness. Thus, SI is prominent in voluntary cases of new, inexperienced older female users (Chaputula, 2016; Venkatesh and Zhang, 2010). The extent to which an individual believes that the existence of organisational and technological infrastructure facilitates the use of technology is defined as a Facilitating Condition (FC). This suggests that FC is the support and training offered to students to enhance their digital skills when they encounter challenges with digital technologies. The moderating factors for FC include students' age and experience. Given the above discussions, UTAUT is suitable for exploring students' complex experiences with digital technologies. In this study, UTAUT is useful for investigating postgraduate students' experiences with digital technologies in research. UTAUT will therefore be used as a lens to scrutinise students' online assessment experiences as first-year university students.

## 4. RESEARCH RESULTS

### *4.1. Descriptive comparisons – University 1 versus University 2*

Data looks at availability, accessibility, affordability, ease of use, technical support, connectivity and user training of digital academic and research systems. The systems considered were Learning management systems, Online classrooms/Teams, Messaging/Communication systems, referencing systems, Free online journal/article/thesis databases, Paid online journal/article/thesis databases, Plagiarism checking systems, Grammar/language use systems, General internet websites, Statistical and data analysis systems, Online data collection systems and Journal/article submission systems. The responses from respondents, for instance, on how each system was available and accessible before and during COVID-19, were used to create the composite variables below. University 1 refers to the historically

white-only institution, and University 2 a historically black-only university.

***Table 1. This is the table caption.***

| | | Before | | During | |
|---|---|---|---|---|---|
| | University | Mean | SD | Mean | SD |
| Availability | University 1 | 3.28 | 1.057 | 3.22 | 1.062 |
| | University 2 | 3.26 | 1.001 | 3.38 | 1.033 |
| Accessibility | University 1 | 3.42 | 1.083 | 3.22 | 1.181 |
| | University 2 | 3.23 | 1.032 | 3.31 | 1.129 |
| Affordability | University 1 | 3.05 | 1.203 | 3.20 | 1.096 |
| | University 2 | 3.03 | 1.168 | 3.18 | 1.076 |
| Ease of Use | University 1 | 3.20 | 1.060 | 3.26 | 1.252 |
| | University 2 | 2.98 | 1.067 | 3.53 | 1.016 |
| Technical Support | University 1 | 3.05 | 1.112 | 3.02 | 1.163 |
| | University 2 | 2.91 | 1.140 | 3.25 | 1.453 |
| Connectivity | University 1 | 3.18 | 1.206 | 3.34 | 1.194 |
| | University 2 | 3.03 | 1.147 | 3.24 | 1.167 |
| User Training | University 1 | 3.11 | 1.175 | 3.25 | 1.078 |
| | University 2 | 2.78 | 1.153 | 3.03 | 1.188 |

***Source: Author's own construction (2023).***

### *4.1.1. Availability*

Before Covid-19, University 1 had a mean score of 3.28 (SD = 1.057) compared to University 2's 3.26 (SD = 1.001). However, during the period, University 2's mean score increased to 3.38 (SD = 1.033), surpassing University 1's score of 3.22 (SD = 1.062). Thus, before the period, both universities had a neutral level of satisfaction regarding the availability of academic and research digital technologies. During the period, University 2's satisfaction level increased significantly.

### *4.1.2. Accessibility*

University 1 had a higher mean score of 3.42 (SD = 1.083) compared to University 2's 3.23 (SD = 1.032) before COVID-19. During the period, both universities experienced a decrease in mean scores, with University 1 dropping to 3.22 (SD = 1.181) and University 2 dropping to 3.31 (SD = 1.129). Hence, prior to the period, University 1 had a high level of satisfaction with the systems, while University 2's satisfaction level was neutral. During the COVID-19 period, both universities experienced a decrease in satisfaction levels.

### *4.1.3. Affordability*

Both universities had similar mean scores before the period (University 1: 3.05, SD = 1.203; University 2: 3.03, SD = 1.168). During Covid-19, University 1's score increased slightly to 3.20 (SD = 1.096), while University 2's score remained almost unchanged at 3.18 (SD = 1.076). Before the COVID-19 period, both universities had a neutral level of satisfaction regarding the affordability of accessing and using. During the period, both universities maintained a neutral level of satisfaction regarding this affordability aspect.

### *4.1.4. Ease of use*

University 1 had a higher mean score of 3.20 (SD = 1.06) compared to University 2's 2.98 (SD = 1.067) before the period. However, during the period, University 2 showed a significant improvement, reaching a mean score of 3.53 (SD = 1.016), while University 1 increased slightly to 3.26 (SD = 1.252). Before the COVID-19 period, both universities had a neutral level of satisfaction regarding technical support. Postgraduates were neither satisfied nor dissatisfied with these. During the period, University 2's satisfaction level increased to a high level while 1's remained neutral.

### *4.1.5. Technical support*

University 1 had a slightly higher mean score of 3.05 (SD = 1.112) compared to University 2's 2.91 (SD = 1.14) before the period. During the period, University 1's score decreased slightly to 3.02 (SD = 1.163), while University 2's score increased to 3.25 (SD = 1.453).

### *4.1.6. Connectivity*

Before the period, University 1 had a slightly higher mean score of 3.18 (SD = 1.206) compared to University 2's 3.03 (SD = 1.147). During the period, University 1's score increased to 3.34 (SD = 1.194), while University 2's score remained relatively stable at 3.24 (SD = 1.167). Before COVID-19, University 1 had a neutral satisfaction level, while University 2's satisfaction level was low. During the period, both universities' satisfaction level increased to a high level, but University 1's was higher.

### *4.1.7. User training*

University 1 had a higher mean score of 3.11 (SD = 1.175) compared to University 2's 2.75 (SD = 1.153) before the period. However, during the period, University 2 showed improvement, increasing its

mean score to 3.03 (SD = 1.188), while University 1's score increased to 3.25 (SD = 1.078). Before the period, University 1 had a neutral satisfaction level, while University 2's satisfaction level was low. During the period, University 1's satisfaction level increased to a high level, while University 2's reached a neutral level.

### *4.1.8. Change over time comparison*

University 2 generally showed greater improvement across various aspects than University 1 during the period, particularly in ease of use and technical support, despite starting with lower mean scores. University 1 maintained or slightly improved its scores across most aspects, while University 2 showed greater variability in its changes over time, as evidenced by larger standard deviations in some cases.

## *4.2. T-tests for before and during COVID-19: Between Universities*

Table 2 presents an independent-samples t-test to assess whether the mean scores (levels of satisfaction with the presented components) before and during COVID-19 differed significantly between Uni 1 and Uni 2.

***Table II. Independent T-test between universities showing the Levene's Test for Equality of Variances.***

| | F | Sig. | T | Df | Sig. (2 tailed) | Mean Diff. | SE. M |
|---|---|---|---|---|---|---|---|
| BC Availability | 0.35 | 0.56 | 0.08 | 47 | 0.94 | 0.02 | 0.29 |
| BC Accessibility | 0.19 | 0.67 | 0.62 | 45 | 0.54 | 0.19 | 0.31 |
| BC Affordability | - | 0.99 | 0.06 | 47 | 0.95 | 0.02 | 0.34 |
| BC Ease of Use | 0.00 | 0.96 | 0.70 | 45 | 0.49 | 0.22 | 0.31 |
| BC Technical Support | 0.00 | 0.98 | 0.42 | 45 | 0.68 | 0.14 | 0.33 |
| BC Connectivity | 0.15 | 0.71 | 0.44 | 45 | 0.66 | 0.15 | 0.34 |
| BC User Training | 0.08 | 0.78 | 1.08 | 47 | 0.29 | 0.36 | 0.33 |
| DC Availability | 0.00 | 0.98 | (0.48) | 40 | 0.64 | (0.16) | 0.33 |
| DC Accessibility | 0.06 | 0.81 | (0.25) | 39 | 0.81 | (0.09) | 0.37 |
| DC Affordability | 0.06 | 0.81 | 0.05 | 39 | 0.96 | 0.02 | 0.34 |
| DC Ease of Use | 1.53 | 0.22 | (0.75) | 39 | 0.46 | (0.27) | 0.36 |
| DC Technical Support | 3.24 | 0.08 | (0.55) | 39 | 0.59 | (0.22) | 0.41 |
| DC Connectivity | 0.25 | 0.62 | 0.27 | 39 | 0.79 | 0.10 | 0.37 |
| DC User Training | 0.46 | 0.50 | 0.65 | 39 | 0.52 | 0.23 | 0.35 |

***Source: Author's own construction (2023).***

The above shows that there were no statistically significant differences in BC and DC satisfaction levels across all assessed components (availability, accessibility, affordability, ease of use, technical support, connectivity, and user training). While there were differences, they could not be attributed to the two universities' populations. The $p>0.05$ on the Levene's test shows that the equality of variance assumption was met in the analysis. Different levels of satisfaction were observed between the pre-COVID-19 and COVID-19 periods, but these differences were random.

## *4.3. T-tests for before and during COVID-19: Within universities*

Table 3 presents comparisons between the BC and DC periods within each university for postgraduate students' satisfaction with the same components.

***Table 2. Independent T-test between universities showing the Levene's Test for Equality of Variances.***

| Uni | Pair | Changes | M | SD | SE. M | t | Df | Sig (2 tailed) |
|---|---|---|---|---|---|---|---|---|
| | 1 | BC Availability -DC Availability | 0.01 | 0.61 | 0.13 | 0.05 | 22 | 0.96 |
| | 2 | BC Accessibility – DC Accessibility | 0.19 | 0.97 | 0.21 | 0.92 | 21 | 0.37 |
| | 3 | BC Affordability – DC Affordability | -0.14 | 0.59 | 0.12 | -1.16 | 22 | 0.26 |
| | 4 | BC End of Use – DC End of Use | -0.01 | 0.58 | 0.12 | -0.11 | 22 | 0.91 |
| | 5 | BC Technical Support – DC Technical Support | 0.06 | 0.53 | 0.11 | 0.58 | 22 | 0.57 |
| | 6 | BC Connectivity – DC Connectivity | -0.10 | 0.72 | 0.15 | -0.69 | 22 | 0.50 |
| | 7 | BC User Training – DC User Training | -0.14 | 0.37 | 0.08 | -1.80 | 21 | 0.09 |
| | 1 | BC Availability – DC Availability | -0.26 | 0.85 | 0.19 | -1.36 | 18 | 0.19 |
| | 2 | BC Accessibility – DC Accessibility | -0.12 | 0.91 | 0.22 | -0.57 | 17 | 0.57 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 3 | BC Affordability – DC Affordability | -0.12 | 0.67 | 0.16 | -0.76 | 17 | 0.46 |
| | 4 | BC Ease of Use – DC Ease of Use | -0.58 | 0.94 | 0.22 | -2.62 | 17 | 0.02 |
| | 5 | BC Technical Support – DC Technical Support | -0.47 | 1.16 | 0.27 | -1.71 | 17 | 0.11 |
| | 6 | BC Connectivity – DC Connectivity | -0.28 | 1.19 | 0.29 | -0.96 | 16 | 0.35 |
| | 7 | BC User Training – DC User Training | -0.37 | 0.88 | 0.20 | -1.83 | 18 | 0.08 |

***Source: Author's own construction (2023).***

The findings also show that there were statistically significant differences in satisfaction levels between before and during COVID-19 across all components in both University 1 and University 2. Differences in the descriptive data were therefore classifiable as random rather than as differences capturing the differences in the populations of interest. An exceptional change was on Uni 2' before and during COVID-19 ease of use, which was statistically significant [t(17)=-2.64, p=0.02]. This shows that an improvement in the student's satisfaction of 0.58 was statistically significant. However, this was too small an effect size to focus on.

### *4.4. Discussion of Results*

The findings of this study reveal important insights into postgraduate students' satisfaction with digital technologies for research before and during the COVID-19 era. Prior to the pandemic, students in both universities generally expressed neutral levels of satisfaction across most dimensions, including availability, accessibility, affordability, ease of use, technical support, connectivity, and user training. This suggests that, although digital technologies were available, they were not fully embedded within postgraduate research practices, leaving students with mixed experiences of their effectiveness. During the COVID-19 period, satisfaction levels demonstrated a more dynamic pattern. University 2, in particular, recorded notable improvements in ease of use, technical support, and user training. This trend indicates that the urgency of the pandemic compelled institutions to strengthen digital technologies and enhance support structures. The improvement in ease of use, which reached statistical significance in University 2, highlights how targeted investments in user-friendly platforms and digital literacy initiatives can directly influence student experiences. This suggests that despite longstanding resource constraints and systemic inequalities, the urgency of the COVID-19 pandemic catalysed targeted digital investments and support interventions that meaningfully improved postgraduate students' engagement with and satisfaction in using digital technologies.

Nevertheless, the study also identifies areas of persistent concern. Accessibility declined during the COVID-19 period across both universities, highlighting infrastructural and socio-economic barriers, including unstable internet connectivity, limited access to research databases, and challenges related to digital equity. Affordability remained neutral before and during the pandemic, suggesting that while institutional efforts may have mitigated some costs, postgraduate students continued to bear financial burdens for data, hardware, and subscription-based resources.

The results demonstrate that students' satisfaction with digital technologies during COVID-19 varied across constructs of the UTAUT framework. Performance expectancy is evident in the rising scores for availability and affordability, indicating that students recognised digital technologies as essential tools for supporting research and academic tasks. Although both universities began with neutral levels of satisfaction in these areas, the improvements particularly at University 2 suggest that students increasingly believed technology would help them achieve successful outcomes. Similarly, effort expectancy aligns with the significant improvement in ease of use at University 2, indicating that students became more confident in navigating systems when supported by improved infrastructure, training, and digital interventions introduced during the pandemic. The increase in satisfaction with connectivity and user training further highlights the role of facilitating conditions, as stronger support structures allowed students to engage more effectively with digital platforms.

At the same time, the mixed results in accessibility and technical support underscore the moderating influence of contextual factors such as institutional preparedness, prior experience, and available resources. For instance, University 1 initially outperformed University 2 in accessibility and user training, but during COVID-19, University 2 showed greater improvements, reflecting the role of social influence and institutional responsiveness in shaping students' acceptance of technology. This suggests that although University 1, as a historically white-

only institution, benefited from stronger pre-existing infrastructure and support systems, University 2's greater improvements during COVID-19 reflect a more responsive and adaptive institutional approach, highlighting how targeted interventions and social influence can mitigate historical inequalities and enhance students' acceptance and use of technology. Additionally, this suggests that external encouragement, targeted support, and peer or institutional guidance played a critical role in motivating students to engage with digital technologies despite initial challenges. Overall, these findings confirm UTAUT's utility as a framework for understanding how constructs such as performance expectancy, effort expectancy, social influence, and facilitating conditions, along with moderators such as institutional capacity and prior experience, shaped postgraduate students' technology use pre- and during COVID-19.

## 5. CONCLUSION AND RECOMMENDATIONS

This study concludes that postgraduate students' satisfaction with digital technologies in higher education was largely neutral before the COVID-19 pandemic and improved in some respects during the pandemic, particularly in relation to ease of use, technical support, and training. These gains demonstrate that rapid digitalisation during crises can enhance the postgraduate research experience when universities invest strategically in supportive infrastructure. However, persistent challenges, especially affordability, accessibility, and connectivity, continue to limit the full potential of digital technologies in supporting postgraduate research. Without deliberate interventions, the uneven experiences reported by students may perpetuate inequalities and undermine the benefits of digitalised research environments.

Based on the study findings, we recommend that universities strengthen infrastructure and connectivity by investing in stable internet access and affordable data partnerships, while also enhancing training and support to ensure postgraduate students can effectively use advanced digital technologies. Affordability challenges should be addressed through device loan schemes, access to open educational resources, and institutional subscriptions. Furthermore, digital innovations introduced during the COVID-19 period should be sustained and scaled according to institutional needs rather than abandoned. For example, employ blended models in postgraduate research programmes such as webinars, online and face-to-face supervision meetings. Finally, postgraduate-specific support mechanisms must be designed and continuously introduced to students, offering access to research databases, journal submission platforms, and advanced data analysis tools.

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