African Perspectives of Research in Teaching and Learning Journal
Issue 6, Volume 9, 2025 Special Issue
ISSN Print: 2521-0262
ISSN Online: 2662-012X
ORIGINAL RESEARCH
https://doi.org/10.70875/v9i6article9

Embedding digital transformation in South African higher education through bridging the digital divide: A university case study

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Abstract

South Africa's intricate colonial legacy has significantly influenced and entrenched profound socio-economic divides across its populace. In the higher education sector, the adoption of digital technologies has been markedly uneven, mirroring the historical socio-economic gap. The COVID-19 pandemic uniquely drew attention to this digital divide, underscoring the critical need for comprehensive digital transformation strategies. Leveraging insights gained during the pandemic, this study advocates for deliberate efforts to bridge the digital divide, aspiring towards a digitally transformed landscape in South African higher education. This study is anchored in an annual university undergraduate student experience survey, where 10,943 respondents voluntarily participated. A total of 10 items related to experience in using digital technology were purposively included in this study. The study used quantitative and qualitative data collected in the survey. In addition, five purposively sampled key informant interviews were conducted with academic and support staff working in digital transformation within the university. Overall, this study showcases the persistent gaps in digital transformation at the university. Recommendations to narrow the digital divide and promote a digitally transformed higher education are suggested.

Keywords: Digital divide, digital technology, digital transformation, higher education, learning and teaching, student experience

Introduction

The colonial history of South Africa has had a significant bearing on the socio-political dynamics, significantly shaping the discrepancies in life experienced in the country. The evidence of this impact has also been seen in the higher education sector. More precisely, the lack of and sometimes slow progress in digital transformation is still a challenge, mainly attributed to the historical socio-economic gap. Nyahodza and Higgs (2017) agree with this notion that the remnants of colonial and apartheid-era policies continue to influence the higher education sector, perpetuating inequality. With the world becoming increasingly digital, technological inequality is one of the major factors slowing down the digital transformation in higher education.

The emergence of the COVID-19 pandemic, a global health emergency, brought to the fore the digital transformation agenda in higher education, which had begun to be overshadowed by immediate challenges such as student debt and university funding. Redda (2024, p. 461) describes digital transformation as "incorporating digital technologies into an organisation's basic operations and procedures". Within higher education, this integration of digital technologies must be linked to improving university core operations, which impact the delivery of the academic agenda of learning and teaching. Digital transformation cannot be discussed without first looking at the digital divide that is evident in most universities in South Africa. The digital divide can be described as the disparity between individuals who have access to digital tools and those who do not (Lythreatis, Singh, & El-Kassar, 2022). This gap encompasses not just the unavailability of

electronic devices and internet connectivity, but also a lack of digital literacy. Digital literacy encompasses the technical competence to use digital tools and cognitive ability to understand and apply the digital information in a socially responsible manner (Morgan, Sibson & Jackson, 2022). As a result, those with access to digital resources and literacy have a socio-economic advantage over those without the same access. Therefore, the digital transformation definition can be generalised to refer to the process of organisational change predominantly driven by digital technology (Seres, Pavlicevic, & Tumbas, 2018).

Digital transformation has far-reaching implications within a university's culture and delivery of the academic project. For instance, Benavides et al. (2020, p. 19) note that digital transformation,

"…dimensions inside higher education institutions (HEIs) do not just imply technological progress, instead it is more transcendental, and generates changes of meaning, affecting the culture immersed in the university, the administrative, formative activities and their evaluations, the pedagogical approaches, the teaching, research, extension and administrative processes, as well as the people immersed in it."

This article addresses the state of digital transformation within the South African higher education sector, with a particular reference to the undergraduate student experience at a specific university. It aims to scrutinise how the pandemic not only spotlighted the existing digital divide but also unveiled potential avenues for progress towards a digitally transformed university. By leveraging insights gained during the COVID-19 crisis, this study advocates for deliberate efforts to continue pursuing digital transformation, thus aspiring towards a digitally equitable landscape in South African higher education institutions. The main objective of this article is to explore, using Fraser's (2008) social justice theory, how narrowing the digital divide can aid efforts to achieve digital transformation in a higher education institution in South Africa. The goal, therefore, is to continue the digital transformation conversation within universities using empirical evidence drawn from a comprehensive university. The Department of Education (2004, p. 5) defines a comprehensive university as:

"an institution that offers a diverse range of academic programmes…including vocational, career-focused, professional, and general formative qualifications; integrating both technikon and university-type offerings, to promote access, articulation, applied research, and responsiveness to regional and national needs".

This study is situated at one of the largest contact universities in South Africa. This university was founded in 2005 through a merger of three different institutions (University of Johannesburg, 2025). The university offers both undergraduate and postgraduate studies, with approximately 76% undergraduate and 24% postgraduate students. As of 2024, the university's total student headcount enrolment was slightly under 55,000. Of the total enrolment, the majority (56%) of the students were female, with males constituting 44%. Furthermore, 84% of the students were from the black African population group.

Literature review

Digital transformation is widely recognised as one of the most significant drivers of change in the contemporary global landscape (Marks & AL-Ali, 2022). Rapid technological advancements have necessitated the adoption of digital transformation across various sectors, including healthcare, education, agriculture, business and commerce (Gkrimpizi, Peristeras, & Magnisalis, 2023; Mhlanga, Denhere, & Moloi, 2022; Saeed, Altamimi, Alkayyal, Alshehri, & Alabbad, 2023). The concept of digital transformation is often used interchangeably with digitisation and digitalisation, yet these three concepts differ in meaning. Digitisation refers to converting analogue or physical materials into digital format, for example, scanning paper documents to create digital files (Formosa & Formosa Pace, 2022; Rijswijk et al., 2020). In contrast, digitalisation involves the socio-technical process of integrating digital technologies into existing systems and workflows to enhance operations, user experiences, and service delivery.

It is through digitalisation that organisations begin to modernise how they function (Rijswijk et al., 2020).

Digital transformation progressively builds on digitisation and digitalisation processes and goes beyond mere technology integration; it represents a more strategic, organisation-wide shift that essentially changes how value is created, delivered, and sustained through the adoption of digital technologies (McCarthy, Maor, McConney, & Cavanaugh, 2023; Rijswijk et al., 2020; Verhoef et al., 2021). Within higher education, digital transformation refers to the strategic integration of digital technologies aimed at reshaping institutional operations, reimagining the delivery of learning and teaching, and enhancing engagement with students and other stakeholders (McCarthy et al., 2023). Key dimensions of digital transformation in higher education include technological integration, operational efficiency, innovative educational delivery models, enhanced student experience and engagement, and progressive leadership and governance structures (Marks & AL-Ali, 2022; McCarthy et al., 2023). This transformation is not merely about digitising existing processes, but about fundamentally rethinking the institutional mission and approach in response to the demands of a digitally driven world (Alenezi & Akour, 2023; Bisri, Putri & Rosmansyah, 2023).

Artificial Intelligence (AI) is one of the key drivers of digital transformation in higher education today (Machado, Santos, Sacavém, & Sousa, 2024; Nekhass et al., 2024). Studies have highlighted some of the benefits that AI presents for higher education, which include personalised learning, opportunities for active learning and streamlined administrative functions (Ahmed et al., 2024; Bosch et al., 2023; Khlaif et al., 2024; Nekhass et al., 2024). In Morocco, Nekhass et al. (2024) found that digital transformation and AI integration were fundamental drivers for reshaping higher education by enhancing personalised learning, optimising operations, fostering innovation and establishing new benchmarks for quality and interaction.

Bosch et al. (2023) noted the rising adoption of AI among undergraduate students at South African universities. The authors found that students were using these tools as a supplementary learning resource and consequently highlighted the need for universities to provide training on their practical use. This emphasises the importance of AI literacy, which is important not only for students but also for academic staff. Khalif et al. (2024) further highlighted this in a study among faculty members in a multi-institutional study in the Middle East. The study found that it is essential for academic staff members to undergo continuous professional development to enhance their digital competencies and support the integration of AI tools in their assessments. Likewise, Bian et al. (2024) demonstrate that AI literacy can help both students and academic staff contribute to a more dynamic education environment. They emphasise that universities need to prioritise professional development in order to bridge the algorithmic divide. However, the integration of AI into higher education raises concerns and challenges related to ethical issues, data security and privacy issues (Ahmed et al., 2024; Bosch et al., 2023; Khlaif et al., 2024; Nekhass et al., 2024). Therefore, while AI is driving digital transformation in higher education, research shows that universities must foster digital literacy among students and academic staff to prevent AI from exacerbating existing inequalities and creating new forms of digital divides within the system.

Woldegiorgis (2025) examined digital transformation cultures in East African countries and identified some of the challenges that have impeded digital transformation. These include unstable electricity, internet and connectivity issues, a lack of pedagogical knowledge on technology integration among faculty, and high internet costs and a lack of digital facilities. In a study conducted in South Africa, Mabidi (2024) found that South African universities experience challenges such as resistance to change by staff members who were not keen to adopt new teaching platforms, poor internet connectivity, a lack of technical skills and a lack of adequate devices. Kanyane (2023) highlights that the use of digital technologies by academic staff is essential to drive the adoption of innovative technology in higher education. The author argues that there is an absence of a clear, integrated national strategy to drive digital transformation in South African

higher education (Kanyane, 2023). Msila (2022) echoes similar sentiments in a study among higher education leaders from ten South African institutions. This study highlighted that there is a critical need for higher education leaders to possess specific digital skills, promote digital leadership and have a clear digital transformation vision.

Digital transformation gained significant momentum during the COVID-19 pandemic when traditionally contact institutions were propelled to shift from contact learning to online or emergency remote teaching and learning (Marks & AL-Ali, 2022; McCarthy et al., 2023; Mhlanga & Moloi, 2020). Universities were challenged to adapt to new ways of working with technology, especially learning and teaching. Various technologies were adopted to ensure the effective facilitation of remote learning and teaching (Mhlanga & Moloi, 2020; Woldegiorgis, 2022). These included using WhatsApp groups to communicate with students, advanced use of the learning management system (LMS), provision of learning devices to students to enable them to participate in learning and teaching effectively, use of synchronous platforms such as MS Teams, Zoom, and Google Meet, as well as providing data to students to enable them to participate in online learning activities (Motala & Menon, 2020; Redda, 2024). Laufer et al. (2021) conducted a mixed-methods study with more than 80 education leaders spanning 24 countries and found that the pandemic led to rapid digital transformation in higher education, which facilitated an opportunity for flexible individualised learning and access to education. A cross-sectional study among undergraduate students in the Faculty of Social Science at a Greek university reported that 75.5% used a personal laptop for learning during the COVID-19 pandemic. However, the study also revealed that many students lacked adequate digital infrastructure to engage in remote learning effectively (Zaimakis & Papadaki, 2022). Digital literacy has also emerged as a challenge for both students and lecturers in the face of digital transformation (Lubinga, Maramura, & Masiya, 2023; Ogunode & Ndayebom, 2023).

Research indicates that although digital transformation is essential, it can potentially deepen the existing educational digital divide within and between countries when not implemented with diversity, equity and inclusion in mind (Babalola & Genga, 2024). Laufer et al. (2021) also found that the rapid digital transformation during the COVID pandemic exacerbated existing inequalities in access to technology and digital literacy. Several studies have identified similar challenges (Lubinga et al., 2023; Motala & Menon, 2020; Mpungose, 2020; Muloiwa-Klenam, Mutakwa & Maistry, 2024; Woldegiorgis, 2022). If not addressed, these inequalities can widen the digital divide within higher education institutions. Menari and Kushwah (2024) note that the digital divide exposes differences in access to digital devices and internet connectivity among students, significantly challenging their learning experience. Several studies have explored and documented how digital transformation during the COVID-19 pandemic, in many cases, widened the digital divide (Motala & Menon, 2020; Redda, 2024; Woldegiorgis, 2022). Motala and Menon (2020) highlight that the pandemic intensified the existing disparities in access to technological devices for students, particularly for those who had limited network connectivity or relied on basic smartphones to participate in learning and teaching.

Reliable internet connectivity was a key enabler of access to remote learning, yet during the pandemic, it emerged as one of the significant challenges experienced by students. This issue was particularly acute for those from rural areas who had to return home during the lockdown to continue their studies (Azionya & Nhedzi, 2021; Kativhu, 2021). While universities had made limited data provision for students, Wagner et al. (2024) found that only 66% of students at one South African university reported having reliable internet access. Among those who depended on monthly data provided by the university, many faced challenges due to insufficient data (Wagner et al., 2024). This challenge was not unique to this university, but persisted across the sector (Babalola & Genga, 2024; Mabidi, 2024; Motala & Menon, 2020). Babalola and Genga (2024) argued that addressing the digital divide has the potential to facilitate digital transformation in South African higher education institutions by enhancing digital infrastructure and ensuring

digital equitable access to technology. If higher education institutions invest in digital tools and resources, this will provide an opportunity for institutions to provide high-quality and accessible education to all students, therefore fostering inclusivity. Similarly, Laufer et al. (2021) also argued for the "equalising effect" that digital transformation activities offer to higher education in terms of easing access to higher education for traditional students and underrepresented groups.

Methods

This study is anchored in the 2023 annual university undergraduate survey. In the survey, 40,023 undergraduate students were targeted, and 14,550 (36.4%) voluntarily participated. Of these, 10,943 (27.3%) completed the questionnaire and were used in this study. The survey questionnaire contained 62 items, which explored the different aspects of student experience at the university. These include perceptions of the academic project, such as lecture delivery, lecturer interaction, and assessments. Furthermore, the survey assessed opinions on the services that support the academic project, such as libraries, computer laboratories, internet service, campus environment, places of residence, student finance, among others. For purposes of this study, only 10 items from the survey, which related to experiences in interaction and adoption of digital technology at the university, were selected for analysis (see Appendix A).

The study utilised a cross-sectional research design, gathering data through both a survey and key informant interviews. Cross-sectional designs are associated with the observation of a given context at a specific point in time (Kesmodel, 2018). This research design is beneficial for studies that seek to indicate the current state of a challenge. Specifically, all quantitative and some qualitative data were obtained through the student experience survey. Furthermore, this was supported with qualitative data drawn from five key informant interviews, which were conducted with staff members directly involved in various aspects of digital transformation at the university. The key informants were purposively selected by the authors based on their established domain expertise and their specific roles and responsibilities within the university (Creswell & Creswell, 2023). Among the five interviewees were professors and staff members working in digital transformation, staff development and student digital development technology. These interviews focused on understanding the digital transformation gaps at the institutional level, primarily related to administrative and academic use of digital technology and the implications thereof. The interviews were audio-recorded and transcribed.

Quantitative data from the survey were analysed using descriptive statistics, while thematic analysis was employed to analyse the open-ended data from the survey and the interview transcripts. Descriptive statistics help show how different variables in the quantitative data collected are related (Kaur, Stoltzfus & Yellapu, 2018). In this study, the descriptive statistics were used to show the relationships between the digital divide and internet data purchasing behaviour, place of residence and primary source of funding for university fees. Clarke and Braun (2014, p. 1948) describe thematic analysis as a "method for identifying and analysing patterns of meaning in qualitative data". In the context of this study, this approach was used to explore meanings in qualitative data obtained from key informant interviews and open-ended questions in the survey.

Ethical considerations

Ethical approval for the study was sought and received from the university's Faculty of Education Ethical Research Committee. The annual survey and the key informant interviews were approved separately, with the following clearances provided: UGES Ethics: SEM 1-2023-042 and Interview ethics: SEM 1-2024-033.

Results

Profile of the survey respondents

Of the 10,943 responses included in the survey, more than half (58.7%) were female students, whilst 39.6% were male. The remaining proportion of students preferred either to self-describe or not disclose their gender identity. More than 90% of the students surveyed were from the African population group.

As shown in Figure 1, the highest proportion of respondents was in their first year of study, followed by those in their second year, with the lowest proportion being the students in their fourth year. This decrease in respondents as the year of study advances could be attributed to the fact that the survey is conducted annually. Consequently, students in later years would have been asked to participate in similar studies during prior years at the university.

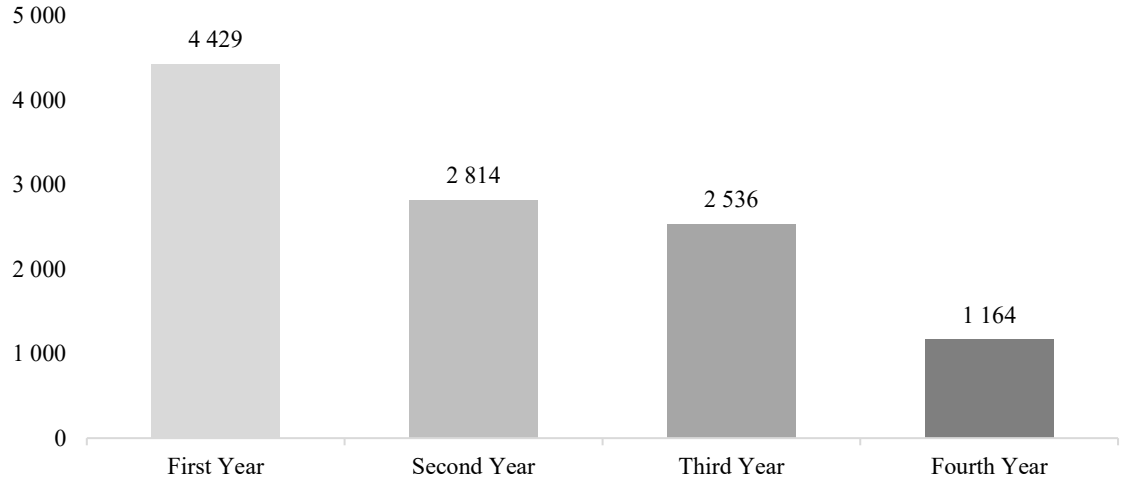

Figure 1: Year of study

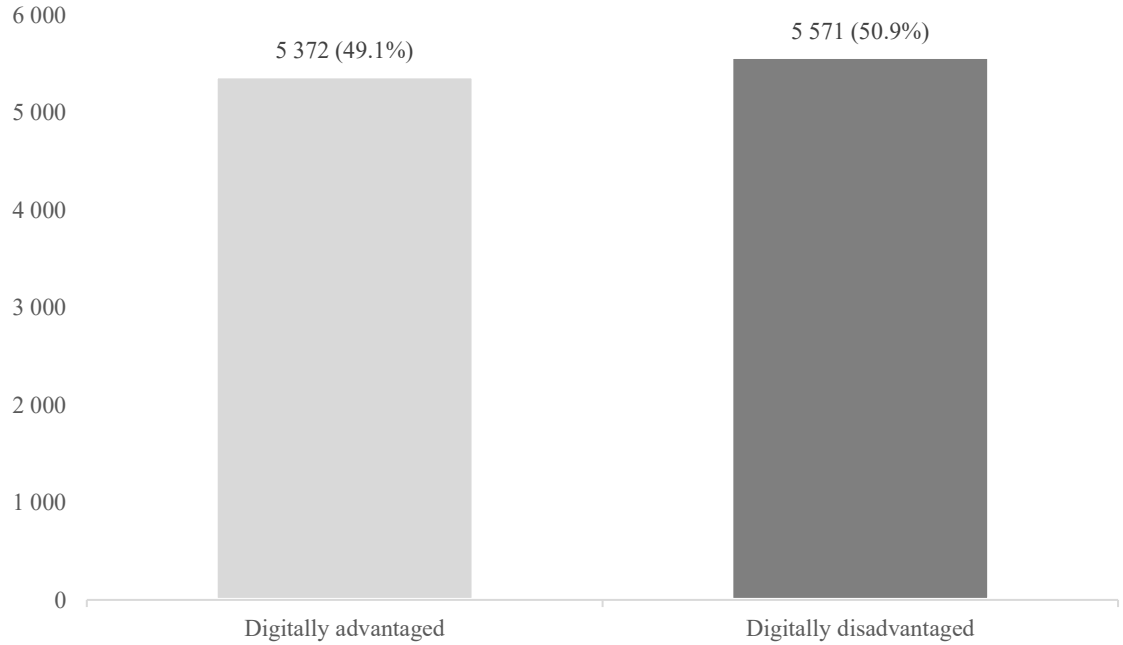

Figure 2: Digital Divide

The digital divide

In this study, we sought to classify the gap between two groups of students, namely, those with unhindered digital access and those without the same privilege. To achieve this, we used the survey responses to a question which asked the students about their greatest practical challenge to learning. This question had several options for students to choose from, ranging from personal reasons to institutional environmental challenges. Students who mentioned any of the following answers: "Having difficulties with or not having internet access", "Understanding the online learning platform" or "Not having an electronic device" as their main practical challenges to

learning were classified as the digitally disadvantaged group. Slightly more than a quarter of the respondents (28.9%) had difficulties with or lacked internet access, while 14.7% stated not having an electronic device as a primary challenge to learning. In addition, 7.3% indicated that they struggled with understanding online learning platforms. The rest of the students who did not report having these challenges were classified as digitally advantaged. For this study, we define the two classifications as what constitutes the digital divide. Figure 2 shows that 49.1% of the students were considered to be digitally advantaged, whilst 50.9% were digitally disadvantaged.

Digital access among students, faculty, and administrative staff in the university shows significant disparities. While there are institutional efforts to provide internet access and devices, the quality and efficiency of these resources vary. Participant 1 mentioned that, while the university's device loan programme aims to address these gaps, it is not without limitations such as inefficiency: "*Anybody can ask for a loan device... if a student has a need, they will receive a loan device, although [its] not as efficient as possible.*" These inefficient systems could result in some students and staff members not getting the devices on time, thus widening the digital divide and slowing down the digital transformation within the university. The fact that some students indicated that they did not have access to a digital device, despite the university offering loan services, suggests a gap still exists. This gap could be attributed to students being unaware of this service or struggling with the loan application process, thereby missing out on the opportunity to get a loan computer. Another possibility could be that the devices offered by the university do not serve the students' requirements, for instance, in cases where a student may require a high-performance computer. Additionally, devices for staff can also be a challenge, as Participant 2 noted, *"staff are not equipped with the best. So, whilst we call ourselves digitally savvy, we don't actually have the best equipment for staff"*.

Although there are efforts to equip students and staff with necessary digital tools, these efforts need to be considered holistically (going beyond access) or can sometimes be undermined by resistance from stakeholders, as noted by Participant 3 saying, "*There is resistance from both staff and sometimes students, and not everyone has the same access to digital technology*." To get around this challenge, participant 3 stated, "*You don't just introduce technology, you have to engage, you have to train, and you have to monitor*."

On the digital literacy gap, Participant 5 explained that students are often adept at using social media for entertainment but struggle to apply those same digital skills to their academic work.

Despite this challenge, Participant 1 expressed optimism about progress in digital literacy, stating, "*I think staff and students are becoming increasingly digitally literate, which is definitely making life easier*." However, this progress is uneven, indicating the need for consistent and comprehensive training. Participant 2 stated that "*Many of our staff are unable to format a document properly,*" highlighting the fundamental digital skills gap that still exists for some staff.

Access to the internet

Approximately half the respondents relied on the university campus internet for their learning purposes, whilst less than a tenth indicated that they bought data for internet access. Figure 3 shows that a higher proportion of digitally disadvantaged students purchased data compared to those who are digitally advantaged. It is safe to assume that students from wealthier families will most likely have Wi-Fi or fixed internet at home and thus may not need to buy data.

Use of AI tools

The survey found that 28.4% of the respondents had used AI tools for their learning. This signifies a slow uptake of the digital technology tools that could support learning at the university. On the other hand, some students may be more likely to underreport their use of AI tools, especially when the university takes a hard stance on plagiarism. As the use of AI tools evolves, the number of students using them can be expected to grow. Furthermore, the low use of AI tools

presents an opportunity for the university to develop digital and AI literacy support for students on how to use AI tools appropriately. The university has developed guidelines for students on the use of AI tools (University of Johannesburg, 2023). These guidelines emphasise that students may use artificial intelligence tools such as ChatGPT in their academic work in a responsible, informed, transparent and ethical manner. For instance, on transparency, the guidelines state that students must declare how they have used the AI tools and for which content in their academic work. Furthermore, the guidelines also demonstrate how students can reference the use of AI tools in their academic work. Lastly, these guidelines are linked to the university's plagiarism policy, to allow students to understand the implications and consequences of abuse of AI tools.

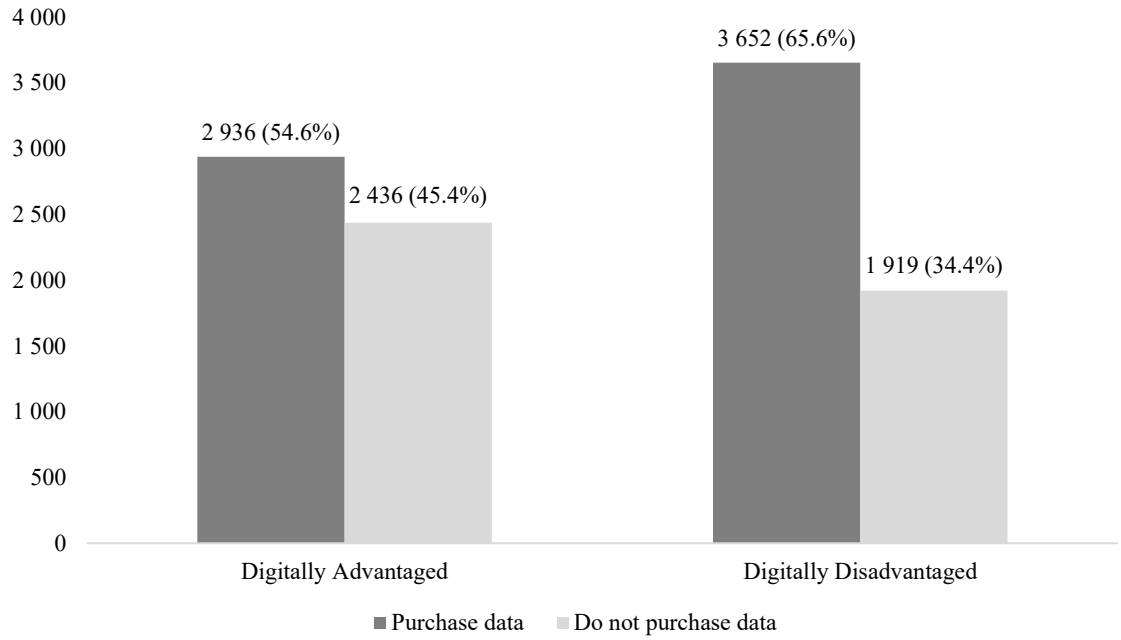

Figure 3: Purchasing internet data for academic purposes

Place of residence

To better understand the digital divide, it is important to explore the background characteristics of the two student classifications in this study. A comparison of the place of residence between the students in the two classifications showed that 70.5% of those who were staying with their parents were digitally advantaged. However, it is concerning to note that 62.2% of those staying in campus residences were digitally disadvantaged. Further analysis of the digitally disadvantaged students in the university residence showed that most of them had challenges accessing the internet or a reliable internet source. When asked how the university can improve students' learning and teaching experience, 135 students suggested that the university's Wi-Fi needed to be improved, especially in the residences. Some of the student comments relating to this are shown below:

"Can the university kindly provide students with monthly data to help us cause our res [campus residence] Wi-Fi has been a problem, which means we can't access blackboard [learning management system] more frequent, which result in us being unable to finish online homework and tests leading to late submission."(Student comment)

"For the university to fix the Wi-Fi connection issues that we experience due to load

shedding as this causes inconveniences." (Student comment)

This challenge not only applies to university residences but also relates to adequate Wi-Fi provision for teaching spaces. Participant 4 remarked, *"One of the challenges we have with smart classrooms is you absolutely need to make sure that the Internet, the Wi-Fi ... is good enough that 500 students can link on at the same time.",* highlighting the challenges with internet connectivity.

Interviewed staff acknowledged the institutional efforts they had observed to extend and enhance Wi-Fi coverage across campuses, thus creating digital awareness among first-year students. "*There is a concerted effort from the university to make sure that all students have access to devices and internet*," remarked Participant 1, pointing to the broad initiatives undertaken."

As shown in Figure 4, the primary source of funding for students showed that the majority of those who rely on savings and earnings were digitally advantaged. The contrary is observed in those who rely on bursaries or scholarships, where the majority are digitally disadvantaged. Of the 69.6% of the respondents who were using a bursary or scholarship to pay for their studies, 80.6% of them were on a government bursary (National Student Financial Aid Scheme [NSFAS]). The dependence on the government bursary highlights the fact that most of these students came from disadvantaged homes, where access to digital technology is limited. According to the university records, approximately two-thirds of the students rely on the NSFAS government funding scheme. The NSFAS bursary is designed to support students coming from disadvantaged homes, where the household income is not more than R350 000 (National Students Financial Aid Scheme, 2024).

Source of funding

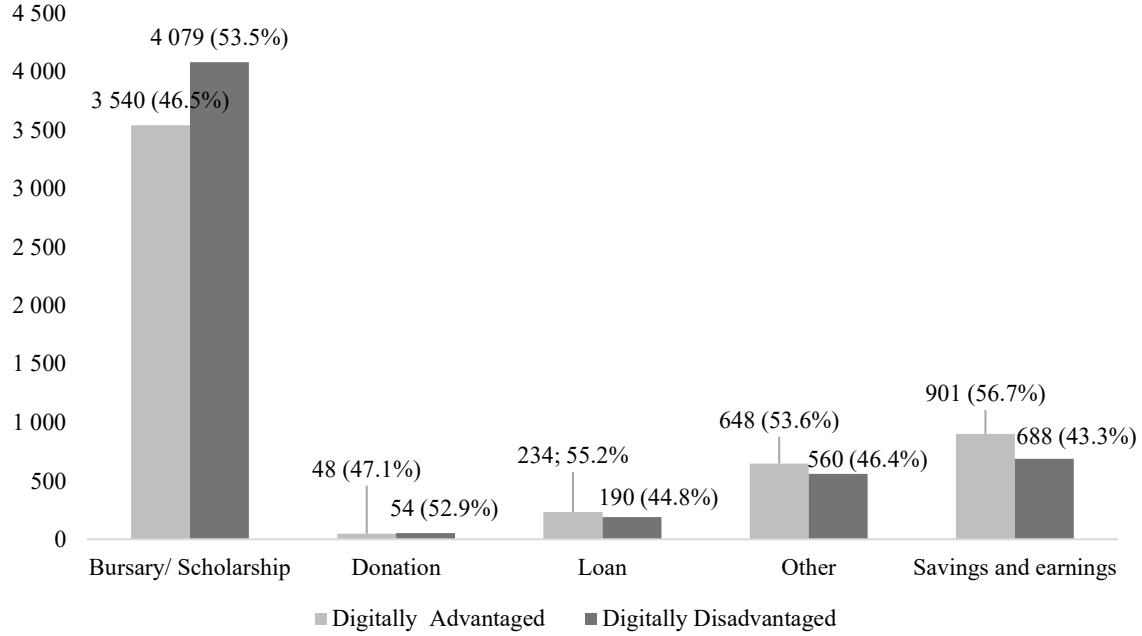

Figure 4: Main source of funding for university fees

The primary device used for learning

The survey results showed that 64.1% of the students used a laptop or notebook as their primary device for learning, while the rest used a smartphone/tablet or a desktop computer. Figure 5 shows the digital divide classification within each primary electronic device used for learning. Of note, two-thirds of those using the Apple iPad as the primary device were digitally advantaged. For those using an Android device, the majority were digitally disadvantaged. This difference again speaks to the financial background of the students,

where the typically more expensive Apple products are usually owned by those students coming from wealthy homes. However, the use of Apple iPhones was not remarkably different.

Impact of Digital Transformation on Academic Practices

Digital transformation has significantly reshaped teaching, learning, and administrative processes in higher education, offering both opportunities and challenges. Benefits include increased flexibility and accessibility, as "*students can learn at any time and location that suits them*", as noted by Participant 1. These tools allow for collaborative work, easy sharing of resources, and the ability to stay connected even when not physically present.

However, concerns were raised about the potential negative impact on student engagement and learning. Participant 2 cautioned, "*we mustn't forget the barriers that digital education comes with*". The limitations of digital learning environments can hinder interaction and the sense of community. "*The engagement was so limited...I was faced with a screen of 26 people who I don't even know if they were there*," shared Participant 2, illustrating the challenges of maintaining interaction in a digital environment when teaching online during the Covid-19 pandemic. Participant 2 added, "*it does curb engagement and sometimes deep learning*," pointing to the need for balancing digital and face-to-face interactions to foster meaningful learning experiences.

"*We might forget that there's a human being at the other end*," warned Participant 2, emphasising the importance of maintaining human connections in digital education. Furthermore, the pressure to quickly adapt to digital tools can be overwhelming for both students and staff, leading to resistance and burnout. "*I found it so demoralising*," shared one informant about their experience teaching online during the COVID-19 pandemic, highlighting the emotional toll of rapid digital transformation.

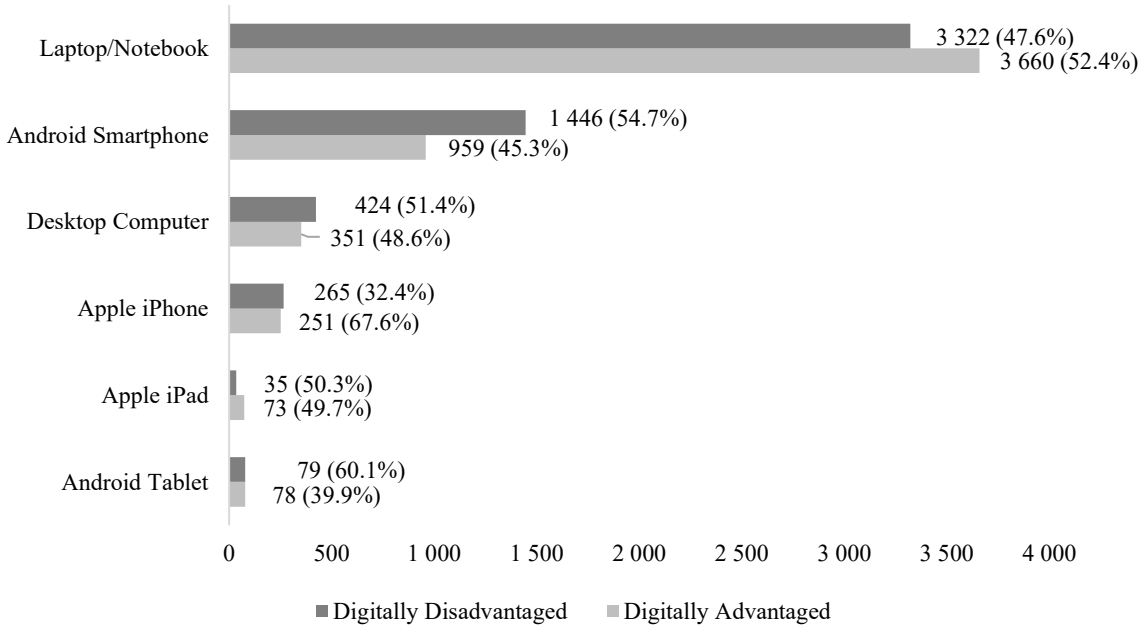

Figure 5: Primary electronic device for learning

Support Structures for Promoting Digital Literacies

The university has multiple support structures for developing digital literacy, including computer labs, training programmes, and helpdesks. For instance, Participant 5 noted that, "*In first year orientation, we give a little bit of skills, but we do not necessarily ground these really across the platforms across our knowledge fields,[for] these kinds of skills that we require also the attitudes and the values that need to go with*

that." Furthermore, Participant 4 stated that "*In August, we have proper short learning programs where we have ... presentations [such] as PowerPoint for the Workplace, Teams for the Workplace, introduction to Excel for the Workplace and digital citizenship ... freely available to all students.*" However, the effectiveness of these initiatives is mixed, and there is a need for more structured and accessible resources. For instance, Participant 3 stated that "*You do need to monitor your students and be available to them (when needed)*," emphasising the importance of ongoing support. The presence of computer labs and digital literacy training during orientation is beneficial, but more targeted and continuous training is necessary to ensure proficiency. "*The digital or computer literacy training happening and available to students during orientation is essential*," Participant 5 mentioned, stressing the importance of initial training. Highlighting the need for collective effort, Participant 3 remarked, "*If we work together, students, academics, policymakers, and industry, we can turn our universities into spaces that drive digital innovation in society*."

Overall, the interviewed staff respondents noted several initiatives aimed at promoting equitable access to technology and digital skills that the institution was implementing. However, Participant 5 noted that while the institution had maintained reasonable technological adoption, there were gaps in systematic, institution-wide digital literacy development, particularly in moving from basic digital skills to advanced fluencies.

Discussion

The findings revealed that slightly more than half of the undergraduate students at the university required support to overcome digital disadvantage. While this is a cause for concern, it is not unexpected, given that most of these students were funded by NSFAS, a government programme designed to assist underprivileged students.

Reliable internet access is arguably a basic requirement for digital participation. Students with limited or unstable connectivity often struggle to benefit from the digital world, whether conducting online research or accessing materials on the learning management system. Within this context, providing access to the internet to those in need could be viewed as a form of redistribution of resources that was highlighted in Fraser's (2008) theory of social justice. Several students suggested that the university consider providing alternative data solutions in areas where Wi-Fi is unreliable. This challenge must be understood in the broader context of South Africa's electricity supply issues, which lead to frequent power cuts. Some students in residences reported that loadshedding and power outages disrupted their Wi-Fi access, subsequently hindering their participation in digital learning activities. These observations are consistent with findings from other studies (Azionya & Nhedzi, 2021; Mabidi, 2024; Motala & Menon, 2020; Woldegiorgis, 2022). Although the university has backup generators in key campus areas, these do not always cover all student residences where connectivity is also needed.

Additionally, some students reported having to purchase extra data to participate fully in digital learning. One potential solution could be for the university to reintroduce free mobile data, a measure successfully implemented during the COVID-19 pandemic, when each student received 30GB of data per month, an intervention discontinued once the pandemic subsided. This ongoing challenge suggests two avenues for addressing the digital divide: first, improving Wi-Fi connectivity, especially in areas with unstable service; second, exploring partnerships with private sector companies to fund enhancements in digital infrastructure.

Beyond internet access, the availability of electronic devices significantly shapes students' ability to engage with digital resources. The university has a device lending programme, providing laptops to students who lack their own. This initiative, available to any student in need, aligns with the principle of redistribution highlighted in Fraser's (2008) theory of social justice. Without such interventions, the digital divide would likely continue to widen. However, even with reliable internet and access to devices, a lack of digital skills can prevent students from fully benefiting from online platforms. Students who struggle with navigating the learning

management system remain at a disadvantage compared to their more digitally literate peers. In response, the university has also introduced digital literacy training.

Furthermore, ongoing support and resources are needed to help staff and students continuously improve their digital literacy. AI tools can be potentially used in learning, teaching and support. For instance, universities could customise open-source large language models (LLMS) to develop adaptive learning platforms that can assist students and staff. These LLMs have the potential to individualise learning opportunities, offering progress in digital transformation in the higher education institutions (Ahmed et al., 2024; Nekhass et al., 2024).

This study also identified both successes and challenges in embedding digital transformation at the university. Digital transformation has positively impacted educational practices and administrative processes, as previously noted (Mhlanga & Moloi, 2020; Nekhass et al., 2024). However, despite the device loan program, some students still lack access to learning devices, echoing findings from other studies that identify device gaps as a barrier to digital learning (Mhlanga & Moloi, 2020; Motala & Menon, 2020; Muloiwa-Klenam et al., 2024). Administrative and procurement delays further compounded these access issues, underscoring the need for a robust digital transformation strategy and innovation-driven leadership points emphasised by Msila (2022) and Mhlanga et al. (2022). While digital literacy training is available, the findings suggest a need for more comprehensive support for both students and staff, a conclusion supported by other researchers (Bosch et al., 2023; Lubinga et al., 2023; Ogunode & Ndayebom, 2023).

Fraser's (2008) theory of social justice, with its focus on redistribution, recognition, and representation, provides a valuable lens for analysing digital transformation. On redistribution, there is a clear need to bridge the digital divide by providing computers, reliable internet, and suitable digital infrastructure to all, particularly those from historically disadvantaged backgrounds. Devices must be fit for purpose to maximise educational opportunities. However, inefficient procurement processes, as noted by Babalola and Genga (2024), can slow progress, a concern also raised by staff interviewees in this study.

Recognition, as outlined by Fraser (2008), pertains to communication and interpretation. This is especially relevant for digital skills training, which should be offered in culturally diverse formats to ensure broad uptake. For example, training could be offered in multiple languages during orientation, or through animated videos to cater to diverse learners. Initial training should also be supplemented with specific programme and course support, aligned to curricula. Without such efforts, the university's initiatives to bridge the digital divide may fall short of their intended impact. Addressing these gaps in communication and interpretation presents a clear opportunity for more deliberate action in overcoming barriers to digital transformation.

Finally, representation is crucial in ensuring all stakeholders have a voice in the digital transformation process. This study exemplifies an effort to capture the students' voices through their experiences, and its annual administration across the undergraduate body yields valuable insights. These findings should inform university governance and decision-making, ensuring policies are responsive to the needs of students and staff. Consideration should be given to how to share with students the extent to which these insights have led to specific decisions, and to explore additional ways in which students' voices can be heard. The concerns of staff, as highlighted in interviews, also indicate areas for improvement in addressing their digital transformation challenges.

Conclusion

Although there is significant progress within the university in digitally transforming learning and teaching, this study has shown that the digital divide is still prevalent in terms of access to resources and skills. This divide is a significant limitation in sustaining the rapid transformation that was ushered in by the COVID-19 pandemic.

From the findings and the literature, a few recommendations can be noted. First, there is a need for universities to develop sustainable funding mechanisms that will support digital transformation. These funding mechanisms could include corporate partners. Strong university-private partnerships could be a solution in an era where public funding from government budgets is under pressure. Corporate funding could be used to improve internet access, acquire better devices and develop improved digital training courses. Furthermore, universities should aim to improve internal procurement processes, making them more efficient and responsive to the needs of staff and students.

Another recommendation is to enhance onboarding programmes to include comprehensive digital and AI literacy training for new students and staff members. Additionally, leveraging successful practices from other institutions, such as structured first-year orientations, could improve digital inclusion (de Klerk, Krull, & Maleswena, 2021; Grayson, Brenner, & September, 2025; Muloiwa-Klenam et al., 2023). Universities should consider benchmarking their digital technology offerings with other stakeholders in the sector to improve their practices. This may assist in narrowing the digital divide and thus improve the digital transformation in higher education.

Lastly, institutions should establish participatory mechanisms, such as an annual survey used in this study, that ensure ongoing input from diverse stakeholders in shaping digital learning environments. These studies should also include staff members and not be limited only to students. In addition, alternative avenues should be available for the university community to communicate their digital transformation needs at any time, thus enhancing inclusivity.

By addressing these challenges and leveraging the benefits of digital transformation, South African higher education institutions can work towards bridging the digital divide and embedding digital practices more effectively.

Limitations of the study

The first limitation of this study is that, while it adopted a social justice lens, it did not explore the digital divide in terms of decolonisation. In addition, the impact of cultural diversity in achieving digital transformation was narrowly included. The researchers propose that future work on digital transformation should explore linkages between digital transformation, the digital divide, decolonisation, and cultural diversity in higher education. Furthermore, while narrowing the digital divide provides significant progress towards achieving digital transformation in higher education, it is not the only factor to achieve this. Bridging the digital divide may need to be supported by other factors not explored in this study, such as revising curricula, strengthening institutional policies on digital inclusion and equity, as well as continuous investment in digital technologies. Future studies should explore these aforementioned factors to continue the conversation on digital transformation in higher education.

Disclosures

Conflict of interest

The authors declare no conflict of interests.

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Appendix A: Survey Questions

The following items from the university's undergraduate experience survey were used in this article:

Question	Response Options
Which gender do you most identify with?	Male (1), Female (2), Prefer to self-describe (3), Prefer not to say (4)
Which South African population group best describes you?	African (1), Coloured (2), Indian/Asian (3), White (4), Prefer not to say (5)
Where are you currently residing while studying?	With my parents (1), With my family) (2), With my friends (3), UJ on-campus student residence (4), UJ approved/accredited off-campus privately owned student accommodation (POSA) (5), I rent a place (6), In a home that I own (7), I do not have a place to stay (8), Other (please specify) (9).
Which one of the following electronic devices do you use the most for your learning?	Desktop computer (1), Laptop/Notebook (2), Tablet or iPad (3), 2-in-1 tablet with separate detachable (4), Smartphone or iPhone (5)
What is your main source of internet access for your academic learning?	(1) Fixed internet connection, (2)I buy data when I need it, (3) I go to a public place that has Wi-Fi, (4) I use the on-campus UJ Wi-Fi, (5) Wireless internet connection, (6) Other(specify),
Do you purchase data for academic purposes?	Yes (1), No (2)
Have you used Artificial Intelligence (AI) tools in your learning?	Yes (1), No (2), I don't know what AI tools are (3)
What type of financial support was used to fund your studies?	Bursary/Scholarship (1), Loan (2), Savings and earnings (3), Donation (4), Other (please specify) (5)
What has been the biggest practical challenge in your learning experience?	Having difficulties with or not having internet access (1), Not having a quiet place to study (2), Understanding the online learning platform (3), Getting feedback from the lecturers (4), English as a language of learning (5), Not having an electronic device (6), Transport to campus (7), Other (please specify) (8).
What suggestions do you have to improve your overall learning experience?	[open-ended]