

Navigating AI Integration in South African Higher Education: A Systematic Review of Tools, Challenges, and Opportunities.

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ABSTRACT

This systematic literature review explores the adoption, application, and impact of artificial intelligence (AI) tools in South African higher education institutions, with emphasis on everyday teaching and learning practices. This review, based on a qualitative analysis of 30 Scopus-indexed studies published between 2020 and 2025, identifies key AI applications, including generative AI assistants (e.g., ChatGPT), adaptive learning systems, automated assessment tools, and AI-powered teaching assistants. The novelty of this study lies in its focused examination of the South African context, revealing unique challenges including infrastructure constraints, digital inequality, policy gaps, and academic integrity concerns, alongside innovative local solutions such as mobile-first platforms and bilingual AI assistants. Thematic analysis uncovers mixed perceptions among students and educators: while AI enhances engagement, personalization, and scalable feedback, concerns persist regarding equity, preparedness, and ethical governance. This review contributes practical recommendations for South African universities, including context-aware tool adoption, inclusive policy development, assessment redesign, and regional collaboration frameworks. The findings advance understanding of AI integration in resource-constrained higher education environments and provide actionable insights for institutions like Durban University of Technology seeking to harness AI's transformative potential while addressing contextual barriers.

I. INTRODUCTION

The Fourth Industrial Revolution has catalyzed technological transformation in higher education globally, with artificial intelligence (AI) reshaping teaching, learning, and institutional operations (Funda, et.al; 2024). South African higher education institutions face unique challenges, including resource constraints, infrastructure gaps, and persistent inequalities, where AI presents both opportunities and implementation dilemmas.

Research on AI adoption in South African higher education remains fragmented. Most studies focus on developed contexts with robust infrastructure, offering limited applicability to South Africa's reality of uneven connectivity and diverse student populations.

South African universities operate within a complex landscape marked by the legacy of educational inequality, limited technological infrastructure, and the imperative to produce globally competitive graduates while addressing local developmental needs. The integration of AI tools such as ChatGPT, adaptive learning platforms, automated grading systems, and AI teaching assistants raises critical questions about access, equity, academic integrity, and pedagogical effectiveness in this context. Understanding how these tools are being adopted, experienced, and adapted within South African HEIs is essential for evidence-based policy development and strategic institutional planning.

This systematic literature review addresses the following objectives to identify and categorize AI tools and methods currently applied in South African higher education, synthesize qualitative findings regarding student and educator experiences with AI in teaching and learning, examine contextual challenges and innovative solutions specific to the South African higher education environment, and develop practical recommendations for institutions like Durban University of Technology seeking to integrate AI responsibly and effectively^{1.3} Novelty and Contribution.

The novelty of this study resides in three key dimensions. First, it provides the first comprehensive qualitative synthesis focused specifically on everyday AI applications in South African higher education, moving beyond generic international reviews to examine context-specific adoption patterns, challenges, and innovations. Second, it foregrounds the voices and experiences of South African students and educators, offering rich qualitative insights into how AI tools are perceived, used, and adapted in practice. Third, it identifies uniquely African innovations – including mobile-first platforms, bilingual AI assistants, and context-aware automated grading systems – that represent novel solutions to infrastructure and linguistic challenges.

This review contributes actionable knowledge for South African universities navigating AI integration, offering evidence-based recommendations grounded in local realities rather than imported frameworks. For institutions like Durban University of Technology, these insights support strategic decision-making regarding tool selection, policy development, faculty development, and infrastructure investment.

Artificial intelligence has transformed multiple dimensions of higher education internationally, including personalized learning pathways, intelligent tutoring systems, automated assessment, learning analytics, and administrative optimization. Generative AI tools, particularly large language models like ChatGPT, have disrupted traditional assessment practices and sparked debates about academic integrity, critical thinking, and the future of educational evaluation. Adaptive learning systems promise to address diverse student needs through personalized content delivery and scaffolding, while automated grading tools offer scalable feedback mechanisms for large enrollment courses.

However, the majority of AI education research originates from well-resourced contexts in North America, Europe, and East Asia, where robust digital infrastructure, substantial institutional budgets, and comprehensive policy frameworks support implementation. These studies often assume universal access to devices, reliable connectivity, and institutional capacity for AI integration – assumptions that do not hold in many African contexts [19].

Research on AI in African higher education reveals a landscape characterized by uneven adoption, concentrated innovation in select institutions, and persistent infrastructure and capacity challenges. A systematic review of AI adoption across African universities identified benefits including enhanced engagement, personalized learning, and administrative efficiency, alongside ethical concerns regarding bias, privacy, and equity. Studies document that AI research and implementation in Africa are concentrated in South Africa, Egypt, and Nigeria, with South Africa leading in both research output and pilot projects.

Within South Africa specifically, reviews document growing but fragmented AI adoption across HEIs (Funda, et.al; 2024). The Technology Acceptance Model (TAM) has been applied to understand factors influencing AI adoption among South African educators and students, revealing that perceived usefulness, ease of use, and institutional support significantly shape acceptance (Funda, et.al; 2024). Qualitative studies highlight that South African students use generative AI as study aids, with socio-economic and cultural factors influencing access patterns and usage practices.

This review is informed by three complementary theoretical perspectives. First, the Technology Acceptance Model (TAM) provides a lens for understanding how perceived usefulness and ease of use shape AI adoption among educators and students (Funda, et.al; 2024). Second, Rogers' Diffusion of Innovation Theory helps explain the uneven spread of AI tools across South African institutions, highlighting the roles of relative advantage, compatibility, complexity, trialability, and observability in adoption decisions. Third, a social justice and equity framework foregrounds questions of access, digital divide, and the potential for AI to either exacerbate or mitigate existing educational inequalities in the South African context.

These frameworks collectively emphasize that AI adoption in education is not merely a technical process but a socio-technical phenomenon shaped by infrastructure, institutional capacity, policy environments, cultural contexts, and power dynamics.

II. METHODOLOGY

This study employed a systematic literature review (SLR) methodology with a qualitative analysis approach, following established guidelines for systematic reviews in educational technology research. The SLR method enables comprehensive identification, evaluation, and synthesis of existing research evidence, providing a rigorous foundation for understanding AI adoption in South African higher education.

A comprehensive search was conducted in January 2025 across multiple academic databases, including Scopus, Web of Science, IEEE Xplore, and Google

Scholar. The search strategy combined keywords related to AI technologies, educational contexts, and geographic focus:

- AI terms: “artificial intelligence,” “AI,” “machine learning,” “generative AI,” “ChatGPT,” “adaptive learning,” “intelligent tutoring.”

- Education terms: “higher education,” “university,” “tertiary education,” “teaching,” “learning,” “assessment.”

- Geographic terms: “South Africa,” “South African,” “Africa,” “African.”

Boolean operators (AND, OR) were used to combine search terms systematically. The search was limited to peer-reviewed articles, conference proceedings, and book chapters published between 2020 and 2025 to capture recent developments while ensuring sufficient literature coverage.

Inclusion criteria: - Studies focusing on AI applications in higher education contexts - Research conducted in or explicitly addressing South African or African higher education - Empirical studies, systematic reviews, case studies, and conceptual papers with practical implications - Publications in English - Peer-reviewed sources indexed in Scopus or equivalent databases

Exclusion criteria: - Studies focusing exclusively on K-12 education or corporate training - Purely technical papers without educational application focus - Opinion pieces without empirical or theoretical grounding - Duplicate publications

The initial search yielded 147 potentially relevant publications. After removing duplicates and applying inclusion/exclusion criteria through title and abstract screening, 52 studies were selected for full-text review. Following a detailed assessment of relevance, methodological quality, and contribution to the research objectives, 30 studies were included in the final analysis. Studies were ranked by relevance to the specific focus on everyday AI tools and methods in South African higher education, with the top 30 studies forming the primary evidence base for this review.

Quality assessment considered methodological rigor, clarity of findings, relevance to the South African context, and contribution to understanding AI adoption, experiences, or outcomes. Studies employing qualitative methods, mixed methods, or systematic reviews with clear methodology were prioritized for their ability to provide rich contextual insights.

Data extraction focused on: 1. AI tools and methods: Specific technologies, platforms, or approaches discussed 2. Qualitative findings: Student and educator experiences, perceptions, benefits, and challenges 3. South African context: Infrastructure issues, policy gaps, equity concerns, and local innovations 4. Methodological approaches: Research designs, data collection methods, and analytical frameworks

Thematic analysis was conducted following Braun and Clarke’s six-phase approach: familiarization with data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report. Themes were developed inductively from the data while remaining attentive to the research objectives. Cross-study synthesis enabled the identification of converging evidence, contradictions, and gaps in the literature.

This review is limited to English-language publications indexed in major academic databases, potentially excluding relevant work published in other

languages or venues. The focus on South African and African contexts may have excluded comparative international studies with relevant insights. Additionally, the rapid pace of AI development means that recent innovations may not yet be reflected in peer-reviewed literature. Despite these limitations, the systematic approach and focus on high-quality, peer-reviewed sources ensure the reliability and validity of findings.

III. RESULTS AND DISCUSSION.

The analysis of 30 studies revealed four major themes regarding AI adoption in South African higher education: (1) AI tools and applications in practice, (2) student and educator experiences and perceptions, (3) contextual challenges and barriers, and (4) innovations and opportunities. These themes are presented below with supporting evidence from the reviewed literature.

The reviewed literature documents diverse AI applications across South African HEIs, ranging from widely adopted generative AI tools to locally developed context-specific solutions. Table 1 presents a comparative overview of the primary AI tool categories identified in the literature.

Table 1. Comparative Overview of AI Tools in South African Higher Education

AI Tool Category	Primary Functions	Evidence from the SA Context	Adoption Level	Key Benefits	Main Challenges
Generative AI Assistants (e.g., ChatGPT, Bard)	Content generation, writing support, tutoring, idea development, code assistance	Widespread student use across multiple SA universities; impacts formative assessment design,	High (student-driven)	Accessible, versatile, supports diverse learning tasks, and improves writing quality.	Academic integrity concerns, unequal access, over-reliance, and quality variability
Adaptive Learning Systems	Personalized learning pathways, formative feedback, content scaffolding, progress tracking	Identified as promising for diverse learner needs in SA reviews (Fundana, et.al; 2024),	Low to Medium (pilot stage)	Addresses diverse learning styles, increases engagement, supports	High implementation costs, requires robust infrastructure, and has limited

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Automated Assessment Tools (e.g., AutoGrad)	Automated grading, rapid feedback, code evaluation, plagiarism detection	AutoGrad deployed in African coding contexts; useful for large cohorts	Medium (domain-specific)	Scalable feedback reduces turnaround time, supports large classes,	Limited to structured tasks, requires careful design, and potential bias
AI Teaching Assistants & Chatbots (e.g., Kwame)	Instant Q&A, 24/7 support, bilingual assistance, domain-specific tutoring	Kwame and Kwame for Science used in African deployments	Low to Medium (emerging)	Scalable support, multilingual capability, reduces faculty workload	Development costs require domain expertise, maintenance challenges
Learning Analytics & Predictive Systems	Student performance prediction, at-risk identification, intervention recommendations	Mentioned in SA reviews as an administrative application (Funda et al., 2024),	Low (institutional level)	Early intervention, data-driven decisions, retention support (Funda, et.al; 2024)	Privacy concerns, data quality issues, and interpretation challenges

System Type	Technology Components	Key Performance Indicators	Cost Range (USD)	Suitability for Smallholders
Smart Irrigation	IoT sensors + ML classifiers	20% water savings, 18% yield increase	\$300-500/ha	High

Nutrient Advisory	NPK sensors + mobile app	15-25% fertilizer reduction	\$200-400/ha	Very High
Integrated Resource Management	Multi-parameter sensors + cloud ML	30% input cost reduction	\$600-1000/ha	Medium

Key findings from tool analysis:

1. Generative AI dominance: ChatGPT and similar large language models represent the most widely adopted AI tools among South African students, driven primarily by student initiative rather than institutional deployment. Studies document that students use these tools for drafting assignments, refining research topics, improving writing quality, and identifying errors in academic work.

1. Adaptive learning potential: While adaptive learning systems are frequently cited as promising solutions for addressing diverse student needs in South African contexts, actual implementation remains limited to pilot projects in better-resourced institutions (Funda, et.al; 2024). The gap between potential and practice reflects infrastructure and cost barriers.

2. Automated assessment for scale: Automated grading tools, particularly for coding and structured assignments, have demonstrated value in African contexts where large class sizes strain faculty capacity. Tools like AutoGrad provide rapid, consistent feedback for programming assignments, addressing a critical scalability challenge.

3. Locally developed innovations: The literature highlights several African-developed AI tools designed to address contextual challenges. Kwame, a bilingual AI teaching assistant, and SuaCode, a mobile-first coding education platform, represent innovations tailored to infrastructure constraints and linguistic diversity. These tools demonstrate that local development can produce context-appropriate solutions.

4. Administrative applications: AI-powered learning analytics and predictive systems are mentioned in institutional contexts for identifying at-risk students and supporting data-driven decision-making, though implementation details and outcomes are rarely reported in the reviewed literature (Funda, et.al; 2024).

Qualitative findings from the reviewed studies reveal complex, mixed perceptions of AI tools among South African students and educators, characterized by recognition of benefits alongside significant concerns.

Studies examining student experiences with AI tools in South African universities document several consistent themes:

Perceived benefits: - Enhanced learning support: Students report that generative AI tools help them understand complex concepts, generate study materials, and receive immediate feedback on ideas. - Writing improvement: Postgraduate students specifically note that ChatGPT assists in refining research topics, improving writing quality, and identifying grammatical and structural errors in drafts. - Accessibility and convenience: The 24/7 availability of AI

assistants provides support beyond traditional office hours, particularly valuable for part-time and distance learners. - Confidence building: Some students report increased confidence in their academic work when using AI tools for drafting and revision.

Concerns and challenges: - Academic integrity uncertainty: Students express confusion about appropriate versus inappropriate uses of AI tools, reflecting unclear institutional policies. - Unequal access: Socio-economic factors shape access to AI tools, with students from disadvantaged backgrounds facing barriers related to device availability, data costs, and digital literacy. Over-reliance risks: Educators and some students worry about dependency on AI tools potentially undermining the development of critical thinking and independent problem-solving skills. Quality variability: Students recognize that AI-generated content requires critical evaluation and cannot be accepted uncritically.

Lecturers and educational technologists in South African HEIs express cautious optimism about AI, recognizing transformative potential while emphasizing implementation challenges.

Positive observations: - Increased engagement: Educators report that AI tools can boost student engagement and prevent passive learning, with students more actively participating when AI-enhanced activities are incorporated. - Collaborative learning: AI technologies facilitate collaborative learning environments where students work together to evaluate and improve AI-generated outputs. - Personalization potential: Lecturers recognize AI's capacity to support personalized learning experiences for students with diverse learning styles and abilities, creating more inclusive classrooms. Administrative efficiency: Some educators appreciate AI's potential to automate routine tasks, freeing time for higher-value pedagogical activities (Funda, et.al; 2024).

Concerns and barriers: - Assessment redesign imperative: Educators recognize that generative AI necessitates fundamental rethinking of formative assessment design to preserve learning objectives and academic integrity. - Preparedness gaps: Many lecturers feel unprepared to integrate AI tools effectively, lacking training in both technical use and pedagogical integration. - Policy vacuum: The absence of clear institutional policies creates uncertainty about appropriate AI use, assessment practices, and academic integrity enforcement. - Equity concerns: Educators worry that AI adoption may exacerbate existing inequalities if not implemented with explicit attention to access and support.

At the institutional level, South African universities exhibit varied responses to AI adoption, ranging from restrictive policies focused on academic integrity to enabling frameworks that encourage responsible innovation. However, the literature reveals that most institutions lack comprehensive AI strategies, with responses often reactive rather than proactive. Institutional leaders recognize AI's potential to advance sustainable development goals and improve educational quality, but struggle with resource constraints, competing priorities, and uncertainty about optimal implementation approaches.

The South African higher education context presents unique challenges that shape AI adoption patterns and outcomes. Thematic analysis identified five primary challenge categories, presented in Table 2.

Table 2. Thematic Analysis of Challenges and Opportunities in South African AI Adoption

Theme	Key Challenges	Specific SA Context	Opportunities
Infrastructure & Connectivity	Limited bandwidth, unreliable electricity, device scarcity, and high data costs	Load-shedding disrupts online learning; rural students lack connectivity; many students share devices.	Mobile-first tools, offline capabilities, low-bandwidth solutions, and device-lending programs
Equity & Access	Digital divide, socio-economic disparities, unequal device access, data poverty	Legacy of educational inequality: students from disadvantaged backgrounds face multiple barriers	Targeted support programs, subsidized data, community access points, and inclusive design
Policy & Governance	Absence of national AI education policy, inconsistent institutional guidelines, unclear academic integrity standards	Reactive rather than proactive policies; focus on restriction over enablement	Co-created policies, stakeholder engagement, regional policy frameworks, shared governance models
Capacity & Preparedness	Limited faculty AI literacy, insufficient training, lack of technical support, and pedagogical integration gaps	Under-resourced professional development; competing faculty demands	Faculty development programs, communities of practice, peer learning, and external partnerships
Academic Integrity & Ethics	Plagiarism concerns, assessment validity, bias in AI systems, data privacy, and transparency issues	Cultural factors shape integrity perceptions; limited institutional capacity for detection.	Assessment redesign, AI literacy education, ethical frameworks, and transparent AI use policies

Detailed challenge analysis: (1) Infrastructure constraints: South Africa's infrastructure challenges—including unreliable electricity supply (load-shedding), limited broadband connectivity in rural areas, and high data costs—create fundamental barriers to AI adoption. These constraints disproportionately affect students from disadvantaged backgrounds and rural institutions, limiting the reach of cloud-based AI tools that assume constant connectivity; (2) Digital inequality: The persistent digital divide in South Africa means that AI adoption risks exacerbating existing educational inequalities. Students from low-income households often lack personal devices, rely on shared family computers or mobile phones, and face data poverty that restricts their ability to access AI tools freely. This creates a two-tier system where privileged students leverage AI for enhanced learning while disadvantaged students fall further behind; (3) Policy vacuum: The reviewed literature consistently identifies the absence of comprehensive AI policies at both national and institutional levels as a critical barrier. Most South African universities have responded to generative AI reactively, often with restrictive policies focused on preventing academic misconduct rather than enabling responsible innovation. This policy vacuum creates uncertainty for both students and educators regarding appropriate AI use; (4) Capacity and preparedness gaps: Many South African educators lack training in AI tools, pedagogical integration strategies, and assessment redesign approaches. Professional development opportunities are limited, and institutions struggle to provide adequate technical support for AI implementation. This capacity gap slows adoption and limits the effectiveness of AI integration efforts; (5) Academic integrity concerns: Generative AI has intensified longstanding academic integrity challenges in South African higher education. Educators worry about students submitting AI-generated work as their own, while students express confusion about boundaries between appropriate assistance and academic misconduct. Traditional plagiarism detection tools are often ineffective for AI-generated content, requiring new approaches to assessment design and integrity enforcement.

Innovations and Opportunities

Despite significant challenges, the literature documents promising innovations and opportunities specific to the South African and broader African context.

Several African-developed AI tools demonstrate context-aware design that addresses infrastructure and linguistic challenges :

- SuaCode: A mobile-first coding education platform designed for low-bandwidth environments, enabling programming education on basic smartphones.
- AutoGrad: An automated grading system for graphical and interactive coding assignments, providing scalable feedback for large computer science classes.
- Kwame and Kwame for Science: Bilingual AI teaching assistants that provide domain-specific tutoring in multiple African languages, addressing linguistic diversity.
- Brilla AI: An AI system designed to compete in quiz competitions, demonstrating African capacity for advanced AI development.

These innovations represent high-novelty contributions that address contextual constraints through mobile-first design, bilingual capabilities, and domain-specific optimization.

Emerging Opportunities

The reviewed literature identifies several opportunity areas for AI in South African higher education: (1) Personalized learning at scale: Adaptive learning systems offer potential to address diverse student needs and learning styles in large, heterogeneous classes characteristic of South African universities (Funda, et.al; 2024). When implemented with attention to equity and access, these systems could support more inclusive education; (2) Scalable feedback mechanisms: Automated assessment tools can provide rapid, consistent feedback in contexts where large class sizes strain faculty capacity. This is particularly valuable in South African universities where student-to-faculty ratios often exceed international norms; (3) Multilingual support: AI-powered translation and bilingual teaching assistants can support South Africa's linguistic diversity, enabling instruction and support in multiple official languages. This addresses a critical equity concern in a multilingual nation; (4) Distance and blended learning enhancement: AI tools can enhance distance and blended learning modalities, particularly important for South African universities serving geographically dispersed student populations (Funda, et.al; 2024). AI-powered chatbots and virtual assistants can provide 24/7 support for distance learners; (5) Research and innovation capacity building: Engagement with AI in education can build broader AI research and development capacity in South African universities, contributing to national 4IR readiness (Funda, et.al; 2024), ; (6) Regional collaboration: The concentration of AI education research in South Africa, Egypt, and Nigeria suggests opportunities for pan-African collaboration, knowledge sharing, and shared infrastructure development. Regional partnerships could reduce duplication and accelerate context-appropriate AI development.

This systematic review reveals that AI adoption in South African higher education is characterized by a paradox: widespread student use of generative AI tools coexists with limited institutional deployment, fragmented policies, and persistent infrastructure barriers. The findings challenge simplistic narratives of either technological determinism or resistance, instead revealing a complex socio-technical landscape where adoption is shaped by infrastructure constraints, institutional capacity, policy environments, and socio-economic inequalities.

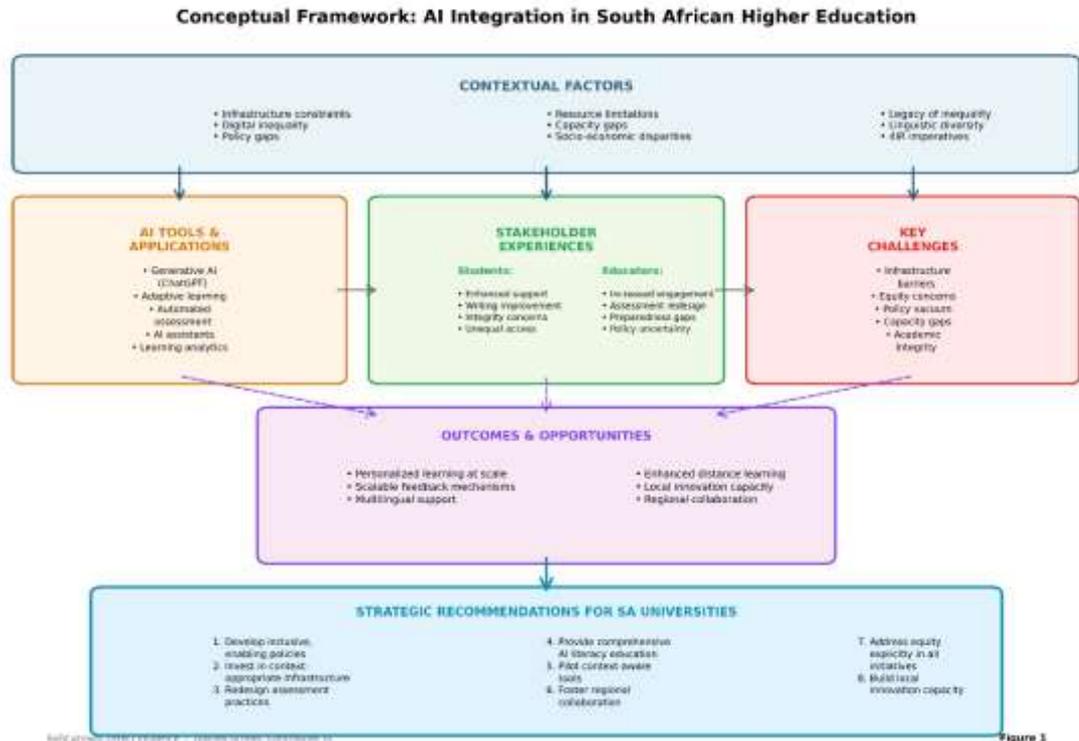


Figure 3. Conceptual Framework for AI Integration in South African Higher Education

Figure 1. Conceptual framework illustrating the relationships between contextual factors, AI tools and applications, stakeholder experiences, key challenges, outcomes and opportunities, and strategic recommendations for AI integration in South African higher education institutions.

Figure 1 presents a conceptual framework synthesizing the key dimensions of AI integration in South African higher education. The framework illustrates how contextual factors (infrastructure constraints, digital inequality, policy gaps, resource limitations, capacity gaps, socio-economic disparities, legacy of inequality, linguistic diversity, and 4IR imperatives) shape the adoption and use of AI tools, stakeholder experiences, and implementation challenges. These elements collectively contribute to outcomes and opportunities, which in turn inform strategic recommendations for South African universities.

Three overarching insights emerge from the synthesis. First, student-driven adoption outpaces institutional readiness: students are actively using generative AI tools like ChatGPT for learning support, often without clear institutional guidance or support. This bottom-up adoption creates both opportunities and risks, requiring institutions to move from reactive restriction to proactive enablement. Second, context matters profoundly: the South African reality of infrastructure constraints, digital inequality, and resource limitations means that AI adoption strategies must be fundamentally different from those in well-resourced developed-country contexts. Generic international frameworks require substantial adaptation to address local realities. Third, innovation emerges from constraint: the development of mobile-first, bilingual, and low-

bandwidth AI tools demonstrates that contextual challenges can drive innovation when local developers engage with real-world problems.

5.1 Theoretical Implications

The findings support and extend the theoretical frameworks guiding this review. From a Technology Acceptance Model perspective, the evidence confirms that perceived usefulness and ease of use drive student adoption of AI tools (Funda, et.al; 2024). However, the South African context reveals that acceptance is mediated by additional factors, including access barriers, data costs, and digital literacy, suggesting that TAM requires expansion to account for infrastructure and equity dimensions in resource-constrained contexts.

Diffusion of Innovation Theory helps explain the uneven spread of AI across South African institutions. Better-resourced universities with stronger technical capacity and innovation cultures demonstrate higher adoption rates, while under-resourced institutions lag. However, the theory's emphasis on relative advantage and compatibility must be qualified: even when AI tools offer clear advantages, infrastructure barriers and capacity gaps can prevent diffusion.

The social justice and equity framework proves essential for understanding AI adoption in South Africa. The findings demonstrate that without explicit attention to equity, AI risks exacerbating existing educational inequalities. The digital divide, socio-economic disparities, and unequal access to devices and connectivity mean that AI adoption can create a two-tier system where privileged students benefit while disadvantaged students fall further behind. This underscores the imperative for equity-centered AI policies and implementation strategies.

5.2 Practical Implications for South African Universities and others

The findings yield several practical implications for institutions like Durban University of Technology seeking to integrate AI responsibly and effectively:

1. **Develop inclusive, enabling AI policies:** Rather than restrictive policies focused solely on preventing academic misconduct, institutions should develop comprehensive AI frameworks that acknowledge legitimate educational uses while establishing clear boundaries. Policies should be co-created with students, faculty, and educational technologists, and should explicitly address equity and access concerns.
2. **Invest in context-appropriate infrastructure:** Institutions should prioritize infrastructure investments that address local constraints, including subsidized data for students, device-lending programs, offline-capable tools, and low-bandwidth solutions. Partnerships with telecommunications providers and government agencies can help address connectivity barriers.
3. **Redesign assessment practices:** The availability of generative AI necessitates fundamental rethinking of assessment design. Institutions should shift toward process-oriented assessments, authentic tasks, oral examinations, and AI-aware rubrics that preserve learning objectives while acknowledging AI's role as a learning tool. Faculty development programs should support educators in assessment redesign.
4. **Provide comprehensive AI literacy education:** Both students and faculty require education in AI capabilities, limitations, appropriate uses, and ethical considerations. AI literacy should be integrated into orientation programs,

academic development courses, and faculty professional development initiatives.

5. Pilot context-aware tools: Institutions should pilot locally developed or adapted AI tools designed for African contexts, such as mobile-first platforms, bilingual assistants, and low-bandwidth solutions. Rigorous evaluation of these pilots should inform scaling decisions.

6. Foster regional collaboration: South African universities should engage in regional partnerships to share AI policies, tools, datasets, and best practices. Collaborative approaches can reduce duplication, pool resources, and accelerate context-appropriate AI development.

7. Address equity explicitly: All AI initiatives should include explicit equity analyses and mitigation strategies. This includes targeted support for disadvantaged students, universal design principles, and monitoring of differential impacts across student populations.

5.3 Comparison with International Literature

The South African findings both align with and diverge from international AI education literature. Consistent with global trends, South African students and educators recognize AI's potential for personalization, engagement, and efficiency. Academic integrity concerns are similarly prominent across contexts. However, the South African context reveals challenges largely absent from developed-country literature: infrastructure unreliability, data poverty, device scarcity, and profound digital inequality. These contextual factors fundamentally shape adoption patterns and outcomes, requiring different implementation strategies than those documented in North American or European studies. The emergence of mobile-first and low-bandwidth AI tools in African contexts represents innovations rarely discussed in international literature, which typically assumes robust connectivity and device access.

This comparison underscores the importance of context-specific research and the limitations of applying international frameworks uncritically to resource-constrained environments.

5.5 Limitations and Future Research

This review has several limitations that suggest directions for future research. First, the focus on peer-reviewed literature may exclude recent innovations and practices not yet documented in academic publications. Future research should incorporate grey literature, institutional reports, and practitioner perspectives. Second, the review synthesizes existing studies but does not include primary data collection. Future research should conduct in-depth case studies at specific South African institutions, including Durban University of Technology, to document implementation processes, outcomes, and lessons learned.

Third, the rapid pace of AI development means that findings may quickly become outdated. Ongoing research is needed to track emerging tools, evolving practices, and changing perceptions. Fourth, the review identifies limited quantitative evidence on AI's impact on learning outcomes in South African contexts. Future research should employ rigorous experimental and quasi-experimental designs to assess effectiveness.

Finally, the review reveals significant gaps in understanding of specific populations and contexts: rural universities, historically disadvantaged

institutions, specific disciplinary contexts, and the experiences of students with disabilities. Future research should address these gaps through targeted studies.

IV. CONCLUSION AND RECOMMENDATIONS

This systematic literature review provides the first comprehensive qualitative synthesis of AI adoption in South African higher education, revealing a complex landscape characterized by student-driven adoption, institutional uncertainty, persistent infrastructure barriers, and emerging local innovations. The findings demonstrate that while AI tools offer transformative potential for personalization, engagement, and scalability, realizing this potential in the South African context requires explicit attention to equity, infrastructure constraints, policy development, and capacity building.

The novelty of this review lies in its focused examination of everyday AI applications in the South African context, foregrounding the voices and experiences of local students and educators while identifying uniquely African innovations that address contextual challenges. The synthesis reveals that generic international frameworks require substantial adaptation to address South African realities, and that context-aware tool development can produce innovative solutions to infrastructure and linguistic challenges.

For institutions like Durban University of Technology, the findings offer actionable guidance: develop inclusive AI policies through stakeholder engagement, invest in context-appropriate infrastructure, redesign assessments to preserve learning objectives, provide comprehensive AI literacy education, pilot locally developed tools, foster regional collaboration, and address equity explicitly in all AI initiatives. These recommendations provide a roadmap for responsible, effective AI integration that harnesses transformative potential while mitigating risks.

As South African higher education navigates the Fourth Industrial Revolution, AI represents both opportunity and challenge. The path forward requires moving beyond reactive restriction to proactive enablement, from imported solutions to context-aware innovation, and from technology-centered to equity-centered implementation. This review contributes to that journey by synthesizing current evidence, identifying gaps, and offering practical recommendations grounded in South African realities.

Future research should build on this foundation through in-depth institutional case studies, rigorous impact evaluations, and ongoing documentation of emerging practices and innovations. As AI continues to evolve rapidly, sustained research attention is essential to ensure that South African higher education harnesses AI's potential to advance educational quality, equity, and social justice.

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