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Educational leadership readiness gap for artificial intelligence in Sub-Saharan Africa

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Abstract

The rapid integration of Artificial Intelligence into education presents significant opportunities for enhancing instructional quality, personalizing learning, and improving administrative efficiency. Despite its transformative potential, successful adoption remains contingent upon leadership readiness, particularly in contexts where digital transformation is still emerging. Existing scholarship has largely focused on technological infrastructure and pedagogical applications, while insufficient attention has been given to the preparedness of school leadership to guide Artificial Intelligence implementation. This paper addresses this gap by critically examining the current state of school leadership and the implications of leadership unpreparedness for effective technology integration. Drawing on conceptual analysis and a review of contemporary educational leadership discourse, the study explores how limited digital competence, policy alignment, and strategic vision constrain Artificial Intelligence adoption. The findings underscore the necessity of targeted leadership development initiatives that strengthen digital literacy, ethical governance, and data management capabilities. The study further highlights the importance of evaluating how leadership readiness shapes the sustainability and effectiveness of Artificial Intelligence integration. These insights contribute to policy and practice by emphasizing leadership capacity as a central determinant of responsible and effective technological transformation in education.

***Keywords*:** Artificial intelligence; digital leadership; educational technology; leadership readiness; school governance.

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1. INTRODUCTION

The rapid evolution of AI is transforming various sectors, including education (Kabanda, 2025; Kamalov et al., 2023). On a global scale, educational institutions progressively incorporate AI-driven technologies to enhance pedagogical approaches, tailor student learning experiences, and optimize administrative functions. AI is transforming the way schools operate and deliver education, from automated grading systems to adaptive learning platforms and predictive analytics. Including AI technology in education has the potential to enhance scholarly success, ensure equitable availability of learning resources, and facilitate data-informed decision-making practices (Mpofu & Chasokela, 2025).

In SSA, the adoption of AI within educational structures is marked by inconsistency and a slow rate of progress, attributable to challenges such as insufficient infrastructure, scarce tech resources, and a gap in digital skills among teachers and educational leaders. While some schools in urban areas are progressing in integrating technology, many urban and rural under-resourced schools remain technologically disadvantaged. In educational institutions where AI integration is progressively taking shape, administrators often lack both the requisite technical expertise and the strategic foresight necessary for effectively supervising and managing the deployment of AI technologies.

Indeed, the expansion of AI in the educational worldwide market is significant. Projections from Grand View Research (2024) forecast a rise from USD 5.88 billion in 2024 to USD 32.27 billion by 2030, indicating a compound annual growth rate (CAGR) of 31.2%. North America leads in adoption, holding a 38% market share in 2023, driven by strong technological infrastructure and investment. Rapid development is projected for the Asia-Pacific region, thanks to government strategies and the increasing adoption of AI in education, particularly in China, Japan, and South Korea. Advancements in personalized learning, automated administrative processes, and intelligent tutoring systems fuel the global expansion of AI in education.

On the contrary, AI in education within SSA remains at an early stage. Challenges such as inadequate infrastructure, limited access to technology, and low investment levels hinder the widespread adoption of AI in education. While some countries in the region are beginning to explore AI-driven educational solutions, progress remains slow. Indeed, Africa must be suitably equipped for the AI revolution. This is not only to address the challenges that AI presents, but also to position itself as a crucial participant in the effective application of this technology (African Union, 2024).

In addition, the Global AI Index published by Oxford Insights (Rahim et al., 2024) categorizes African nations as 'working up' and ‘nascent’ in AI investment, innovation, and execution. In 2023, Mauritius was at the forefront of the region's AI preparedness in the SSA, scoring 53.27, followed by South Africa (52.91), Rwanda (51.25), and Senegal (46.11). However, the average score for the region was very low (32.70), which indicates a readiness gap.

Leadership is essential for effectively incorporating and utilizing AI in educational settings. Indeed, it is essential to have robust leaders who can facilitate transformative changes within institutions, systems, and societies for the better (UNESCO, 2024). School leaders make critical decisions regarding technology procurement, digital curriculum integration, staff training, and resource allocation. Their preparedness and competence in understanding AI's potential and challenges significantly influence whether AI will enhance or hinder educational outcomes.

In the SSA, school leadership faces unique challenges in the era of AI-driven education. Many school leaders struggle with basic technological literacy, making it difficult to provide informed guidance on AI-

related decisions. The African Union's report on digital education from 2021 highlights that under 30% of education administrators in Sub-Saharan Africa have acquired formal training in the latest educational technologies, which incorporate AI (African Union, 2020). This lack of preparedness raises concerns about the region's ability to leverage AI effectively for educational transformation. Without digitally competent leadership, AI adoption risks becoming fragmented, inequitable, and misaligned with educational goals.

The readiness of educational leadership within SSA constitutes a critical concern with extensive ramifications. SSA educational institutions have dealt with several barriers during their historical journey, ascribed to a fusion of historical, socio-economic, and political forces (Gbadebo, 2024). As AI continues to influence educational practices globally, SSA schools risk falling further behind if their leadership remains technologically unprepared. Schools that fail to adopt AI effectively may face challenges in delivering a competitive and high-quality education. The preparedness to implement AI within educational institutions positively influences the disposition to teach with AI tools (Ayanwale et al., 2022). Poor leadership readiness could also lead to inequitable AI adoption, where only elite or some urban schools benefit from technological advancements, while rural and underserved schools are left behind. Furthermore, unprepared leadership may struggle with managing ethical concerns related to AI use, such as student data privacy, algorithmic biases, and transparency in decision-making. Therefore, examining the readiness of SSA school leadership to navigate the AI era is crucial for fostering educational equity, ensuring the responsible implementation of AI, and promoting innovation-driven learning environments.

1.1. Purpose of study

This paper posits that educational leadership within SSA is inadequately equipped to address the demands of an AI-driven era. This situation presents a considerable obstacle to the efficient and equitable incorporation of AI technologies within the educational sector. It examines the current state of school leadership, their challenges in adopting AI, and the potential risks associated with unpreparedness. The paper also offers practical approaches for strengthening leadership capacity to foster AI-ready schools in SSA.

2. MATERIALS AND METHOD

This study employed a conceptual and qualitative approach to examine the preparedness of school leadership in Sub-Saharan Africa (SSA) for integrating Artificial Intelligence (AI) into educational settings. Data were collected through an extensive review of contemporary educational leadership literature, policy reports, and empirical studies on AI adoption in schools, focusing on digital competency, infrastructure, strategic planning, and ethical considerations. The analysis emphasized disparities in leadership readiness between urban and rural schools, challenges related to budget and resource allocation, and the extent of collaboration with EdTech companies and AI experts. Conceptual frameworks from digital leadership, instructional leadership, and innovation theory guided the evaluation, highlighting how leadership capacity influences AI adoption, equity in learning opportunities, and the sustainability of technology integration initiatives. The study further synthesized findings to identify practical leadership qualities, including visionary, proactive, collaborative, digitally competent, and ethically responsible leadership, as essential for effective AI implementation in SSA schools.

3. RESULTS

3.1. The growing role of AI in education

AI is rapidly transforming education by enhancing both administrative efficiency and instructional quality. In SSA, although AI adoption is still in its early stages, it holds significant potential to address educational challenges such as teacher shortages and learning disparities (African Union, 2024). AI deployment within the educational sector includes customized learning platforms that adapt content to fulfill the distinctive needs of individual students and advanced tutoring systems that offer tailored instructional assistance. Automated grading and assessment tools reduce the administrative workload, while predictive analytics help school leaders make data-driven decisions by identifying trends and at-risk students.

The benefits of AI integration in education are substantial despite ethical challenges, implementation constraints, and personal training. AI improves learning outcomes by delivering tailored instruction, enhances administrative efficiency through automated processes, and promotes data-informed decision-making (Khalifa & Albadawy, 2024; H. Wang et al., 2023). AI also fosters greater accessibility for students with disabilities through text-to-speech and translation tools (Mohammed & 'Nell' Watson, 2019; Salas-Pilco et al., 2022). In SSA, AI offers opportunities to expand access to education in rural areas, support policy planning, and promote lifelong learning.

In the SSA region, integrating AI into education offers significant transformative potential, despite prevailing infrastructural and technological challenges. A significant benefit is addressing severe teacher shortages, as UNESCO (2024) estimates that achieving universal basic education by 2030 will require an additional 24.4 million primary teachers and 44.4 million secondary teachers. A substantial prevalence of overcrowded classrooms characterizes the SSA and faces critical deficiencies in teaching personnel, with 90% of secondary educational institutions lacking sufficient staff. Consequently, AI-driven tutoring systems and virtual teaching aids can augment human instruction by providing individualized educational assistance and evaluative feedback. Additionally, AI-supported digital education platforms and mobile tools can help mitigate geographical disadvantages, ensuring that learners from rural and economically disadvantaged areas achieve educational levels comparable to those in urban settings. These advancements promote educational equity and expand learning opportunities across the region.

Beyond improving access, AI can enhance educational policy and lifelong learning initiatives. Predictive analytics facilitate data-driven decision-making for resource allocation, teacher deployment, and curriculum development, assisting policymakers in implementing targeted interventions. AI can also support workforce development by providing personalized learning pathways for upskilling and reskilling, addressing youth unemployment and skill gaps. Furthermore, AI-powered automation streamlines school administration by managing scheduling and attendance tracking tasks, enabling educators to concentrate more on teaching.

These innovations collectively contribute to a more efficient, inclusive, and future-ready education system in SSA. However, effective leadership is crucial for realizing these benefits. Without strategic guidance, SSA schools risk fragmented AI adoption and missed opportunities. With proper leadership preparedness, AI can become a powerful tool for improving educational equity and quality across the region.

3.2. The current state of school leadership in Sub-Saharan Africa

3.2.1. Limited digital competency

One of the most significant challenges hindering the effective adoption of AI in SSA schools is the limited technological expertise and digital competency (Baguma et al., 2023). Indeed, school administrators ought to function as principal leaders who assess and advocate for suitable technologies that will augment and facilitate educational practices, ultimately resulting in elevated levels of student success (Sposato, 2025; Yu & Prince, 2016). However, many educational administrators within the region lack the requisite competencies and expertise for comprehending, assessing, and effectively applying artificial intelligence technologies. Indeed, when educators lack fundamental comprehension of the accessibility and implementation of AI-driven pedagogical approaches, this may delay their willingness to embrace such innovations (Nja et al., 2023; Raftoulis, 2021). With little to no formal training in AI or digital tools, these leaders often struggle to make informed decisions regarding AI integration. This lack of expertise creates a leadership gap, where schools miss out on opportunities to harness AI's full potential. Also, without robust digital competencies, educational administrators cannot provide adequate direction and assistance to educators and personnel, slowing down AI integration.

The digital competency gap is particularly evident in the inconsistent or superficial use of technology in schools. Many leaders are unfamiliar with AI-driven educational tools (Maina & Kuria, 2024; Yu & Prince, 2016), such as personalized learning platforms, predictive analytics, and automated assessment systems. Consequently, they exhibit a reduced predisposition to advocate for the assimilation of groundbreaking technologies or to incorporate them into educational institutions' strategic frameworks. Instead, schools often adopt basic or outdated digital solutions that fail to significantly enhance learning outcomes. The absence of technological foresight significantly constrains educational institutions' capacity to utilize AI for data-informed decision-making, improved operational efficiency, and individualized learning experiences.

AI technologies are reshaping leaders' Continuing Professional Development (CPD) (Sposato, 2025). Unlike their counterparts in more technologically advanced regions, many SSA school leaders have limited access to digital literacy programs or AI-focused training workshops. Consequently, they remain ill-equipped to lead digital transformation efforts. Without structured and ongoing CPD opportunities, school leaders are unlikely to keep pace with rapid technological advancements, preventing them from implementing AI effectively.

3.2.2. Policy and infrastructure challenges

The lack of clear policies and inadequate infrastructure is a significant barrier to the effective adoption of AI in SSA schools (Maina & Kuria, 2024). In many countries across the region, national education policies (Sposato, 2025) have not yet evolved to include comprehensive guidelines or frameworks for AI integration. As a result, schools operate without clear standards or regulations governing the use of AI technologies. This policy gap leaves school leaders without the necessary direction or support to implement AI-driven initiatives effectively. Schools often adopt AI tools piecemeal or experimentally without clear guidelines, undermining their long-term sustainability and impact.

In addition to weak policies, insufficient infrastructure presents a significant challenge. Numerous educational institutions in SSA lack fundamental technological resources, including dependable internet connectivity, contemporary computing systems, and cloud-based infrastructures, which are imperative for operating AI-powered applications (Kabanda, 2025). In rural and underserved areas, unstable electricity

supply and low internet penetration further limit the feasibility of AI adoption. Even when schools gain access to AI tools, infrastructure deficiencies prevent them from fully utilizing or maintaining these technologies. This creates a situation where only well-funded or urban schools benefit from AI advancements, deepening the digital divide.

In addition, the absence of data governance policies poses privacy and security risks (Baguma et al., 2023). Since AI systems often rely on large volumes of student data for learning analytics and predictive modeling, the lack of strong data protection regulations increases the risk of data misuse or breaches. Many SSA schools do not have standardized data privacy protocols, making them vulnerable to unauthorized access or exploitation of sensitive student information. Without proper policies, schools are also unable to evaluate the ethical implications of AI adoption, which can lead to the unintentional reinforcement of biases or discriminatory practices.

The financial constraints associated with weak infrastructure further hinder AI adoption. Many SSA countries allocate limited budgets to educational technology, making it difficult for schools to invest in AI-compatible systems or upgrade existing infrastructure. Even when schools manage to adopt AI tools, the lack of technical support and maintenance leads to inefficiencies, as administrators are unable to address technical issues promptly. The absence of long-term funding models prevents schools from sustaining AI-driven programs, resulting in short-lived or ineffective implementations. Also, psychological obstacles, including technophobia (apprehension toward technology) and digital anxiety prevalent among educational administrators, may obstruct AI implementation.

3.2.3. Inequities in AI readiness between urban and rural schools

The Global South encounters considerable disparities in the integration of AI within the education sector. Consequently, the procrastination in the incorporation of AI technologies within educational institutions exacerbates the pre-existing digital divide (Abulibdeh et al., 2023; Bentley et al., 2024). Significant disparities between urban and rural schools mark the level of school leadership preparedness for AI adoption in SSA. Undoubtedly, AI's progressive integration into educational systems amplifies the technological divide between urban and rural educational entities in SSA. While urban schools often benefit from better infrastructure, funding, and access to digital resources, rural schools face significant disadvantages in AI readiness. This disparity creates unequal learning opportunities, as students in urban areas gain exposure to AI-powered tools, while their rural counterparts are left behind. With better-equipped schools, urban students are more likely to benefit from personalized learning platforms, adaptive assessments, and AI-enhanced teaching methods, gaining a technological edge in their education.

In contrast, rural schools struggle with fundamental infrastructure limitations, such as unreliable electricity, poor internet connectivity, and outdated or insufficient devices (Assefa et al., 2024; Khan et al., 2024; Thelma et al., 2024). These challenges prevent them from adopting and effectively using AI tools. Even when educational programs leveraging AI are deployed, educational institutions in rural areas frequently exhibit a deficiency in technical support and personnel training, which are requisite for efficacious execution. Consequently, learners residing in rural regions experience constrained exposure to AI-enhanced educational experiences, thereby diminishing their opportunities for tailored instruction, digital competency advancement, and data-driven pedagogical interventions.

The unequal distribution of leadership capacity further exacerbates the resource disparity between urban and rural schools (Hardwick-Franco, 2019; Mangione et al., 2024; Sutherland et al., 2023). Indeed, urban

educational institutions tend to possess leaders and administrators who are more proficient in technological advancements, rendering them more capable of executing and supervising AI integration. These leaders often have access to professional development programs, technology partnerships, and educational networks, which enhance their AI readiness. In contrast, rural school leaders frequently lack access to training opportunities (Thelma et al., 2024), leaving them ill-prepared to lead digital transformation efforts. This leadership gap further widens the digital readiness divide, making it harder for rural schools to keep pace with AI advancements.

Furthermore, funding disparities between urban and rural schools reinforce the inequity in AI adoption. Urban schools, which are often located in economically stronger regions, are more likely to receive government funding, corporate partnerships, or donor support for technology initiatives (Thelma et al., 2024). This financial advantage allows them to invest in AI-compatible infrastructure, staff training, and ongoing technical support. On the other hand, rural schools frequently operate on limited budgets, making it difficult to invest in AI tools or maintain technological upgrades. As a result, AI integration becomes concentrated in wealthier, urban areas, while rural schools remain technologically disadvantaged.

3.2.4. Lack of collaboration with EdTech companies and AI experts

Another factor limiting school leadership's readiness to adopt AI in SSA schools is the limited collaboration between school leadership, EdTech companies, and AI experts. However, many schools in SSA operate in isolation from the EdTech sector, missing out on valuable opportunities for technology transfer, capacity building, and customized AI solutions. Without these partnerships, schools struggle to adopt, implement, and sustain AI technologies effectively.

The lack of collaboration limits access to innovative AI tools and resources (Maina & Kuria, 2024). Innovative educational technology companies and AI specialists consistently create state-of-the-art educational tools, encompassing customized learning environments, sophisticated tutoring frameworks, and AI-driven assessment tools. In regions with strong school-edTech partnerships, schools benefit from early access to emerging technologies and customized solutions tailored to their specific needs. However, in SSA, the absence of such collaboration means that many schools rely on outdated or generic technologies that do not address the region's unique educational challenges. This lack of access reduces schools' ability to leverage AI for enhanced learning outcomes and operational efficiency.

Furthermore, limited collaboration prevents knowledge transfer and skills development (Maina & Kuria, 2024). When school leaders fail to engage with EdTech companies and AI experts, they miss out on technical training, workshops, and knowledge-sharing opportunities. Collaboration with industry professionals would allow school leaders and educators to stay informed about the best practices, technological trends, and implementation strategies (Witthöft et al., 2024). Without this external support, SSA school leaders remain technologically isolated and unable to make informed decisions about AI adoption. The lack of specialized oversight significantly impedes educational institutions' capacity to assess AI tools, evaluate their efficacy, and address potential hazards, including issues related to privacy or biases inherent in algorithms.

The financial constraints of SSA schools further contribute to the lack of collaboration. Numerous educational institutions within this geographical region function under constrained financial allocations, thereby complicating the establishment of collaborative relationships with private-sector educational technology enterprises, frequently requiring substantial financial commitments. As a result, school leaders miss out on public-private collaborations that could provide them with subsidized AI solutions, technical

support, and access to industry-grade platforms. Schools are forced to rely on their limited internal capacity without external partnerships, which slows down AI adoption and reduces its effectiveness.

3.2.5. Limited budget and resource allocation

Effective AI integration requires significant financial investment in infrastructure, training, and maintenance. However, many schools in SSA face budgetary constraints and lack the financial planning skills necessary to allocate resources efficiently for AI adoption. Indeed, the allocation of financial resources is a pivotal determinant for numerous other facets of an educational system (Baguma et al., 2023; Maina & Kuria, 2024). The availability of financial resources influences various components, including accessibility, compensation for educators, and the development of educational infrastructures (Zickafoose et al., 2024).

The SSA region accounted for 21% of the global school-age population in 2022. However, this region represented only 1.6% of the global public education expenditure (UNESCO, 2024). The integration of ICT into educational systems saw a boost with the support of the World Bank, particularly amid the COVID-19 outbreak. However, questions remain about resource distribution for supporting EdTech programs, particularly in areas like SSA, where educational systems have traditionally faced substantial challenges (Salimi, 2025). As a result, AI initiatives in SSA schools often suffer from underfunding or inconsistent financial support. Inadequate budgeting leads to poor infrastructure investments, where schools purchase AI tools without considering the long-term costs of maintenance, technical support, and staff training.

Also, school leaders with limited financial literacy may struggle to prioritize AI-related spending appropriately. Instead of strategically investing in capacity-building programs for staff and leaders, funds may be allocated toward short-term technology acquisitions with limited educational value. This reactive spending approach reduces the return on investment (ROI) of AI initiatives (Kejriwal, 2023), leading to wasted resources and minimal impact on educational outcomes.

Moreover, unequal resource distribution exacerbates the problem. Urban schools with better funding and access to donor support are more likely to afford AI implementation, while rural and underprivileged schools remain unable to invest in similar technologies. This financial disparity deepens the digital divide, further marginalizing students in resource-poor regions (Cwala, 2022).

3.2.6. Lack of vision and strategic planning

One of the most significant concerns regarding school leadership preparedness in SSA is the lack of a clear vision and strategic planning for AI adoption (Baguma et al., 2022). Effective AI integration requires long-term planning, clear goals, and alignment with broader educational objectives. Indeed, in today's corporate arena, organizations that do not actively engage in innovation, sourcing, or the incorporation of advanced technologies confront the danger of obsolescence in a comparatively limited timeframe. Therefore, fostering an environment that promotes technological innovation and developmental strategies is essential for organizational leaders (Daft and Armstrong 2021). However, many school leaders in SSA operate without comprehensive strategies for incorporating AI into their institutions. This lack of foresight results in fragmented and inconsistent AI adoption, where schools implement isolated AI tools without a coherent roadmap or clear educational outcomes.

Moreover, the absence of strategic planning leads to reactive rather than proactive leadership. Many organizations devote most of their time to responding to unexpected changes instead of proactively anticipating and planning for such events (Bouhali et al., 2015). School administrators often wait for

government directives or external initiatives to introduce AI, rather than driving innovation from within. Consequently, when AI adoption eventually occurs, it is often rushed and disorganized, failing to yield meaningful educational benefits. Without a well-defined vision, educational administrators encounter challenges in prioritizing AI initiatives, distributing resources efficiently, and evaluating AI's influence on the quality of education. This haphazard approach hampers the long-term sustainability and scalability of AI-driven educational reforms.

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3.2.7. Ethical and privacy concerns

As schools in SSA begin experimenting with AI-driven solutions, ethical and privacy issues emerge as a significant concern (Baguma et al., 2022; Khalifa & Albadawy, 2024). School leaders who are unprepared for AI adoption may inadvertently overlook or mishandle sensitive ethical considerations, such as data privacy, algorithmic bias, and student surveillance. In many SSA countries, data protection laws are either underdeveloped or poorly enforced, leaving schools with minimal guidance on managing AI-related privacy risks.

For instance, AI systems used for student monitoring and performance analytics often collect and analyze large volumes of personal data. Due to the lack of robust data governance frameworks, there is a considerable likelihood of unauthorized access, data compromises, or the improper utilization of student information. School leaders who lack awareness of these risks may implement AI tools without conducting thorough privacy assessments, potentially compromising the security of student data (Kabanda, 2025). Additionally, algorithmic biases in AI systems present another ethical concern. AI models trained on biased or incomplete datasets can produce unfair or discriminatory outcomes, particularly against marginalized groups. School leaders with limited AI expertise may fail to detect or mitigate algorithmic biases, resulting in inequitable treatment of students. For example, biased AI-based grading systems could unfairly disadvantage certain demographic groups, reinforcing existing educational disparities.

Furthermore, student surveillance through AI-powered monitoring systems raises questions about privacy and consent. In SSA, where data protection policies are often inadequate, school leaders may struggle to establish transparent policies regarding data usage and consent, putting students' privacy at risk. The inability to address these ethical issues undermines trust in AI adoption and creates legal and reputational risks for educational institutions.

3.3. Practical leadership qualities to promote AI technology integration

Scholars have meticulously catalogued various leadership paradigms that support the integration of technological advancements within educational frameworks, including visionary leadership, digital leadership, and transformational leadership. Indeed, successfully implementing digital tools in schools requires strong and strategic leadership. School leaders play a pivotal role in shaping a culture that embraces technology, ensuring educators and students can effectively leverage digital resources for improved learning outcomes (Kabanda, 2025; Wang, 2021). However, with the leadership styles evoked, school leaders must develop other traits to help them navigate the AI-driven era. By standing for these qualities, school leaders

can navigate challenges, inspire their teams, and create a sustainable framework for school digital transformation.

3.3.1. Visionary leadership

A school leader with visionary thinking understands that technology integration is not just about using digital tools but about transforming teaching and learning to better meet the needs of 21st-century students (Baguma et al., 2023; Brooks & Normore, 2018). These educational leaders formulate and disseminate a coherent and persuasive vision regarding the potential of technology to augment instructional practices, enhance student engagement, and prepare learners for the increasingly digital landscape. They synchronize this vision with the institution's primary mission and enduring educational objectives, ensuring that the incorporation of technology occurs strategically rather than in a chaotic manner. By establishing precise objectives for digital transformation, they furnish a comprehensive roadmap that directs educators, students, and various stakeholders in their journey toward technology adoption.

In addition to having a long-term perspective, visionary leaders anticipate future trends in educational technology and proactively prepare their schools for upcoming advancements (Bouhali et al., 2015). They stay informed about emerging technologies such as AI, virtual reality, and adaptive learning platforms, considering how these innovations might enhance education. Instead of merely responding to technological advancements as they occur, educational institutions strategically align themselves as pioneers in adoption, thereby facilitating their students to acquire a competitive edge in an ever-evolving digital landscape. This proactive mindset helps institutions remain relevant and adaptable in an evolving educational landscape.

3.3.2. Reactive and proactive leadership

Organizations show significant variations in their responsiveness to organizational challenges, even when functioning within similar task environments or addressing similar issues (Lin & Carley, 1993). When tackling obstacles, leaders can choose to respond reactively or take a more proactive stance in their decision-making. Thus, the impact of reactive and proactive leadership on organizations is significant and deeply influences various dimensions, including organizational culture and performance outcomes (King & Teo, 2000). Leadership, particularly reactive and proactive leadership styles, plays a crucial role in managing this transformation effectively.

Reactive Leadership is characterized by a response-oriented approach, wherein leaders predominantly engage with circumstances as they emerge (Larson et al., 1986; Lin & Carley, 1993), rather than anticipating them in advance. This style is often rooted in short-term thinking and prioritizes crisis management over strategic planning. In uncertain or unexpected events, reactive leaders can shine by making quick decisions and responding promptly to immediate threats. They can maintain operations during turbulent periods. In AI integration, this style is crucial for managing immediate concerns such as data privacy violations, algorithmic bias, and ethical dilemmas.

For instance, if an AI tool used for grading is found to produce unfair results, reactive leaders can act swiftly to suspend its use and investigate the issue. Similarly, they are instrumental in responding to stakeholder resistance, technical failures, or sudden regulatory changes. By offering timely solutions and ensuring minimal disruption to teaching and learning, reactive leadership helps maintain the stability of the educational environment during periods of technological change. However, an excessive dependence on reactive leadership may lead to a highly stressful organizational environment, wherein employees perceive themselves as perpetually engaged in a damage-control mode. This phenomenon may also precipitate

inconsistent decision-making processes and the failure to capitalize on potential opportunities due to insufficient anticipation. Although this style may appear efficient in the immediate context, it reduces innovative capacity.

In contrast, Proactive Leadership emphasizes anticipating problems and opportunities and preparing systems, people, and policies in advance (Larson et al., 1986; Lin & Carley, 1993). These leaders are future-focused, strategic, and deliberate in their actions. This leadership style is essential for strategic planning related to AI integration. Proactive leaders develop long-term visions, create comprehensive implementation roadmaps, and invest in infrastructure and training to enhance institutional capacity. They also play a crucial role in shaping the ethical and policy frameworks that govern the deployment of AI in educational environments.

Also, proactive leaders cultivate a culture of innovation and adaptability, encouraging educators and students to embrace new technologies with confidence and purpose. By initiating pilot projects, forming partnerships with technology firms, and supporting AI research, proactive leadership ensures that institutions are keeping pace with technological change and actively leading it. Employees involved in a proactive leadership context usually sense a boost in empowerment, recognition, and enthusiasm for fostering the organization's progress. Because proactive leaders always think several steps ahead, their organizations are typically more resilient and better positioned to navigate organizational changes (King & Teo, 2000; Tiwari & Fahrudin, 2024). Nonetheless, adopting a proactive approach may necessitate additional resources and occasionally encounter opposition from team members who prefer the existing norms.

Both reactive and proactive leadership styles are vital and should not be viewed in isolation. While reactive leadership helps institutions cope with unforeseen problems and stabilize operations, proactive leadership ensures long-term growth and resilience. Together, they can enable educational institutions to navigate the complexities of AI integration more effectively, balancing short-term responsiveness with long-term vision. SSA educational leaders who can adopt both approaches will be better positioned to harness AI's full potential, ensuring that it enhances learning, supports teaching, and advances educational equity and innovation.

3.3.3. Innovative mindset

An innovative mindset is essential for school leaders who want to foster a culture of creativity and experimentation in technology integration (Kin & Kareem, 2019; Paxton & van Stralen, 2015). These leaders encourage teachers to explore new digital tools, instructional strategies, and blended learning approaches without fear of failure. By endorsing an approach centered on trial and error, they foster an environment where educators are encouraged to take risks and gain insights from their practical experiences. Additionally, they promote the implementation of pilot initiatives in which selected groups of educators assess new technologies before they are applied more broadly. Thus, they assist the institution in enhancing its strategies based on empirical feedback.

In addition to fostering innovation among teachers, these leaders also encourage students to develop digital literacy and problem-solving skills (Abdurrohman & Hidayati, 2024). They advocate for project-based learning, coding programs, and digital storytelling initiatives that help students engage with technology in meaningful ways. By incorporating technological tools in educational settings, educators enable students to transition from mere recipients to proactive creators of digital content. Furthermore, innovative school

leaders establish partnerships with ed-tech companies, universities, and other institutions to bring cutting-edge technology and expertise into the classroom.

3.3.4. Digitally competent leaders

In an era where digital advancements increasingly shape education, educational administrators must exhibit proficiency in digital competencies to navigate the complexities of the digital transformation process skillfully. This encompasses a comprehensive understanding of digital instruments and their implementation within pedagogical environments (Håkansson, Lindqvist & Pettersson, 2019). Digital competence goes beyond merely using technology; it encompasses the strategic integration of technology to enhance teaching, learning, and administration (Kaya-Kasikci et al., 2023).

A digitally competent leader knows how to integrate technology in a meaningful way rather than using it for its own sake (Berkovich & Hassan, 2024; Kaya-Kasikci et al., 2023). This entails developing digital strategies that align with educational goals, ensuring that technology enhances learning outcomes and student engagement (Berkovich & Hassan, 2024). Schools risk implementing technology without proper leadership and clear objectives, which can lead to wasted resources and ineffective teaching practices.

3.3.5. Instructional leadership

Instructional leadership requires school leaders to go beyond administrative tasks and actively guide teachers on effectively integrating technology into their instruction. The school principal, as an educational leader, is instrumental in developing the AI paradigm (Hejres, 2022). These leaders recognize that technology is intended to augment pedagogical methodologies instead of supplanting them. They collaborate extensively with educators to determine the most effective strategies for using digital tools in significant ways. They provide instructional coaching, organize professional learning communities, and facilitate discussions on how technology can support differentiated instruction, student engagement, and formative assessment (Berkovich & Hassan, 2024).

By modelling best practices in educational technology, instructional leaders demonstrate their commitment to digital transformation. Whether through leading technology-driven workshops, using digital platforms for communication, or incorporating technology into staff meetings, they set an example for teachers to follow. Indeed, school principals' initiatives as instructional leaders predominantly focus on improving the educational process, evaluating the progress of the curriculum, and incorporating technologies strongly connected with learning theories (Hejres, 2022; Ouyang & Jiao, 2021). Their active involvement in instructional practices helps build credibility and trust, making teachers more willing to embrace new technologies. These leaders also collaborate with IT specialists to ensure that technology implementation aligns with the school's curriculum and pedagogical goals.

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3.3.6. Collaborative and team-oriented

Effective technology integration is not a solo effort. It it requires collaboration between administrators, teachers, IT staff, students, and parents. Educational administrators who emphasize collaborative practices foster an environment where all relevant stakeholders are engaged in the decision-making processes about

utilizing technological resources. The capacity for innovation is profoundly heightened when individuals from different disciplines, backgrounds, and areas of expertise interact and share their thinking (Bouhali et al., 2015; Kin & Kareem, 2019). They establish technology committees that include representatives from different departments to discuss implementation strategies, challenges, and possible solutions (Hew & Brush, 2007; Witthöft et al., 2024). This inclusive approach ensures everyone's perspectives are considered, leading to more effective and sustainable technology adoption.

Furthermore, collaborative leaders facilitate professional learning communities where educators can share best practices, learn from one another, and discuss challenges in using technology (Preston & Barnes, 2017; Soia et al., 2024). They encourage team teaching, co-planning sessions, and peer mentoring programs that allow teachers with varying levels of digital proficiency to support one another. By fostering a strong sense of teamwork, these leaders ensure that technology integration is a collective effort, leading to greater commitment and success across the school.

3.3.7. Adaptability and flexibility

The ever-changing nature of technology requires school leaders to be adaptable and open to continuous learning. New tools, platforms, and teaching methods emerge regularly, and a leader who is rigid in their approach may hinder progress. Adaptable leaders remain open to new ideas and adjust their strategies as needed, ensuring that their schools stay up to date with technological advancements (Schulze & Pinkow, 2020; Tiwari & Fahrudin, 2024). They are not afraid to revise policies, reallocate resources, or modify implementation plans based on emerging needs and challenges.

In addition to being flexible themselves, these leaders can encourage teachers to adopt a growth mindset when integrating technology into their instruction. They offer avenues for educators to explore innovative digital tools and implement modifications informed by student feedback and educational outcomes. By creating an environment where flexibility is valued, they help teachers overcome resistance to change and build confidence in their ability to use technology effectively (Kin & Kareem, 2019).

3.3.8. Professional development advocate

One of the most significant barriers to successful technology integration is a lack of proper training and support for teachers. Educational leaders who emphasize the significance of professional development recognize that merely offering access to technological resources is insufficient; educators need both the expertise and competencies to use these tools effectively (Whalen, 2020). They allocate resources to facilitate continuous professional development initiatives. This includes workshops, webinars, certification programs, and peer mentoring activities, to ensure that educators acquire the necessary confidence and expertise in the utilization of educational technology (Ertmer et al., 2012).

Beyond formal training sessions, professional development advocates create a culture of ongoing professional growth by encouraging reflective practice and collaboration (Theodorio et al., 2024). They foster learning communities where educators can share experiences, discuss challenges, and exchange ideas about incorporating technology into their instructional practices. By making professional development a core component of the school's technology plan, leaders empower teachers to embrace digital tools as an integral part of their instruction.

3.3.9. Ethical and responsible leadership

As schools integrate more technology, issues related to data privacy, cybersecurity, and digital citizenship become increasingly important. Ethical school leaders take proactive steps to ensure that students' and teachers' data are protected by implementing policies that safeguard against cyber threats and unauthorized access (Kabanda, 2024). They additionally instruct students on responsible internet usage, digital ethics, and online safety, equipping them with the necessary skills to navigate the digital environment adeptly.

Additionally, accountable leaders promote the principle of equitable access to technological resources. They guarantee that every student, regardless of their socioeconomic background, has equitable access to the benefits of digital education. They endeavor to bridge the digital divide by providing essential resources, including subsidized technological devices and internet access initiatives, to ensure no student is marginalized.

4. CONCLUSION

AI has significant potential to transform education in SSA, enhancing teaching quality, streamlining administrative processes, and bridging educational gaps. However, the effectiveness of this transformation largely depends on school leadership's readiness to oversee and facilitate AI adoption. These challenges include aligning AI with local cultural values, addressing infrastructure deficits, and providing teachers with adequate training. Resolving these challenges requires a comprehensive approach that acknowledges both international technological innovations and the unique educational demands of community contexts.

This paper highlights the current state of school leadership in SSA, revealing significant gaps in technological competence, strategic planning, and resource mobilization. The discussion also underscores pressing concerns about leadership unpreparedness, including fragmented AI implementation, widening digital inequities, and weakened learning outcomes. Furthermore, it examines the broader implications of inadequate leadership, including privacy risks, financial inefficiencies, and staff resistance, all of which can hinder the potential benefits of AI integration.

This paper proposes best practices for educational leadership that aim to effectively integrate AI into education in SSA, ensuring that SSA educational institutions fully leverage the benefits of AI-enhanced teaching practices. Visionary leadership, proactive and reactive leadership, adaptability, flexibility, and advocacy for professional development are among the best practices necessary for effective leadership in integrating AI in education in the SSA region.

Modern educational leadership in SSA must possess skills in AI, strategic planning, and ethical decision-making processes. Leadership development initiatives should prioritize enhancing digital competencies among administrative personnel and cultivating a progressive mindset. Additionally, regional and national policies must focus on AI capacity-building in educational leadership, providing schools with the necessary infrastructure, funding, and support systems. Without proactive leadership development, the promise of AI in SSA education will remain largely unexploited, widening the educational divide between tech-enabled and underserved schools.

While this paper has addressed key concerns regarding leadership preparedness for AI adoption in SSA, many areas need further exploration to deepen understanding and inform policy and practice. Empirical studies could assess how leadership readiness directly influences the effectiveness of AI adoption in schools in SSA. This could involve comparative analyses between schools with well-prepared versus unprepared leadership to measure differences in student learning outcomes, operational efficiency, and AI sustainability.

Given the amplified ethical and privacy risks associated with AI, further research could explore how school leaders in SSA navigate data protection, student privacy, and algorithmic bias. This could include evaluating the effectiveness of existing privacy policies and ethical guidelines in adopting AI. Also, research could focus on the impact of AI adoption on educational equity in SSA. Studies could examine whether schools with stronger leadership capacity are better able to leverage AI for improved learning outcomes, while under-resourced schools experience further marginalization. This could help policymakers design inclusive AI policies that prevent the widening of educational disparities.

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