

Strategic management of augmented reality for inclusive education in Uganda

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ABSTRACT

This study explored the strategic management of Augmented Reality (AR) technology in supporting inclusive primary education in selected districts of Northern Uganda. Using a qualitative research design, data were collected through semi-structured interviews with District Education Officers (DEOs), District Inspectors of Schools (DISs), headteachers, teachers, and learners with diverse special educational needs. Thematic analysis revealed that AR integration is guided by national policies, including the National ICT in Education Policy (2024), the Children's Act (2008), and district strategic plans emphasizing inclusive education. Findings indicated that effective AR implementation depends on strategic planning, resource mobilization, leadership, professional development, and monitoring systems such as TELA and EMIS. Challenges included limited infrastructure, inadequate teacher training, insufficient funding, and uneven access to AR tools. Despite these constraints, teachers adapted AR through peer support, collaborative learning, and audio-visual resources, improving student engagement and participation. The study underscores the critical role of leadership, policy alignment, and stakeholder collaboration in leveraging AR for inclusive education. Recommendations include targeted capacity building, improved ICT infrastructure, equitable resource distribution, and pilot programs for AR integration.

Keywords: Augmented reality, inclusive education, strategic management.

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INTRODUCTION

Educational institutions increasingly operate within dynamic environments shaped by technological innovations, policy reforms, and evolving pedagogical needs. The success of these innovations depends not only on resources but also on how staff interpret, accept, and implement new practices. In Uganda, initiatives such as the integration of Augmented Reality (AR) technology, ICT adoption, and inclusive education policies require educators and administrators to adjust traditional teaching and management practices. However, limited infrastructure, inadequate professional training, and hierarchical decision-making often impede effective adoption (Fullan, 2016; Mugisha, 2023).

Strategic management practices, including leadership, resource allocation, monitoring, and professional development, play a pivotal role in ensuring successful

technology integration. Organizational structures and cultural norms influence how educators perceive, adapt, and implement AR innovations for learners with diverse needs. Understanding these dynamics is crucial for designing inclusive and sustainable educational interventions.

Background of the study

Strategic management in education encompasses planning, leadership, resource mobilization, monitoring, and stakeholder coordination, all of which shape the adoption of technological innovations. Augmented Reality (AR) blends real-world environments with interactive digital elements, enhancing engagement, comprehension,

and inclusivity (Bacca et al., 2014). Despite its potential, AR adoption in Ugandan primary schools remains limited due to insufficient training, inadequate devices, and inconsistent policy guidance.

District Education Officers (DEOs), District Inspectors of Schools (DISs), headteachers, and teachers serve as critical actors in planning, implementing, and monitoring AR integration. Effective strategic management ensures equitable distribution of resources, fosters teacher capacity, and aligns school practices with national frameworks such as the National ICT in Education Policy (2024), Children's Act (2008), and Digital Agenda for Uganda (2021–2025).

Previous research has focused mainly on policy frameworks and ICT adoption, with limited attention to the strategic and human dimensions of AR integration in inclusive education. This study addresses that gap by exploring how strategic management practices influence AR adoption and support learners with diverse educational needs in Northern Uganda.

Statement of the problem

Although AR technology offers opportunities for inclusive and engaging learning, its adoption in Uganda's primary schools remains uneven. Schools face challenges such as insufficient devices, limited professional development, inadequate infrastructure, and low awareness among teachers and students. Strategic management at the district and school levels is critical for overcoming these barriers. Without effective leadership, resource mobilization, and monitoring, AR adoption risks being superficial, with minimal impact on learners' engagement and outcomes. This study seeks to understand how strategic management influences AR integration for inclusive education in Northern Uganda.

Purpose of the study

The primary purpose of the study is to explore how strategic management practices affect the integration and use of Augmented Reality in supporting inclusive primary education in selected districts of Northern Uganda. Specifically, it examines leadership roles, resource allocation, teacher support, and monitoring mechanisms that facilitate or hinder AR adoption for learners with diverse educational needs.

Specific objectives

- i. To examine the strategic management practices that guide AR integration in primary schools.
- ii. To analyze how leadership and decision-making influence the adoption of AR for inclusive education.

- iii. To identify challenges faced by district officials, school leaders, and teachers in AR implementation.
- iv. To explore strategies that enhance the effective use of AR for learners with diverse educational needs.
- v. To propose recommendations for aligning strategic management with AR integration in primary education.

Research questions

- i. What strategic management practices guide the integration of AR in primary schools?
- ii. How do leadership and decision-making processes influence AR adoption for inclusive education?
- iii. What challenges impede the effective use of AR technology in primary schools?
- iv. How do teachers and school leaders support the use of AR for learners with special educational needs?
- v. What strategies can improve AR adoption and its impact on inclusive education in Uganda?

Significance of the study

The study contributes theoretically by providing empirical insights into the role of strategic management in technological innovation for inclusive education. Practically, it offers actionable guidance for policymakers, school leaders, and educators on optimizing leadership, resource allocation, teacher training, and monitoring to enhance AR adoption and improve learning outcomes for all learners.

Scope of the study

The study focuses on strategic management practices influencing AR integration in selected primary schools, including planning, leadership, resource distribution, professional development, and monitoring. Data were collected from selected districts in Northern Uganda, covering the period 2019–2025, during initial AR pilot implementations and ICT integration initiatives.

LITERATURE REVIEW

This section reviews literature related to strategic management, Augmented Reality (AR) technology, and inclusive education in primary schools. It examines theoretical perspectives and empirical studies to understand how leadership, resource allocation, policy frameworks, and organizational practices influence the adoption of AR for learners with diverse educational needs. The review highlights how strategic management interacts with institutional culture, leadership, and professional development to facilitate or hinder technology

adoption. The chapter also identifies gaps in current research, emphasizing the need to explore human, managerial, and technological dimensions of AR integration in Northern Uganda.

Theoretical review

Schein's (2017) Organizational Culture Model serves as a foundational framework for understanding institutional readiness for innovation. The model identifies three levels of culture: artifacts, espoused values, and underlying assumptions. Artifacts include visible structures, routines, and technology use; espoused values are the stated norms and goals regarding inclusion and innovation; and underlying assumptions are unconscious beliefs guiding staff behavior. These layers influence teachers' and administrators' perceptions, interactions, and responsiveness to AR integration.

Complementing Schein, Kotter's (2012) Change Management Model emphasizes leadership, communication, and alignment between strategy and culture for effective adoption of new initiatives. Together, these frameworks illustrate that successful AR implementation depends on understanding cultural dynamics, fostering trust, and providing clear guidance and support to staff. Scholars such as Fullan (2016) and Alvesson and Sveningsson (2015) further argue that organizational culture shapes motivation, behavior, and coping strategies during technological change.

Additionally, Lewin's (1947) Force Field Analysis and the McKinsey 7S Framework provide insights into resistance and alignment within institutions. Lewin emphasizes unfreezing old practices, introducing new strategies, and refreezing behaviors, while the McKinsey 7S model highlights the importance of strategy, structure, systems, shared values, style, staff, and skills in achieving alignment. Bandura's (1977) Social Learning Theory complements these by explaining how teachers and leaders internalize behaviors through observation, mentorship, and modeling, which is critical for technology adoption in schools.

Strategic management in inclusive education

Strategic management encompasses planning, leadership, resource mobilization, support supervision, and monitoring of AR initiatives. Effective management ensures equitable distribution of AR devices, targeted teacher training, and integration of technology into inclusive pedagogy. Empirical studies suggest that leadership engagement, participatory decision-making, and structured professional development are central to successful AR adoption (Lamaro et al., 2023; Mugisha, 2023).

National policies, including the National ICT in Education

Policy (2024), the Digital Agenda for Uganda (2021–2025), and the Children's Act (2008), provide frameworks for equitable access to technology for learners with special needs. District education offices and school administrators play key roles in aligning resources, training, and monitoring mechanisms to facilitate AR integration.

Furthermore, successful strategic management requires continuous evaluation and adaptation of school plans to address emerging challenges. Schools that embed AR initiatives into curriculum planning, assessment strategies, and pedagogical approaches tend to achieve higher adoption and sustainability. Effective strategic management also involves stakeholder engagement, including parents, local communities, and NGOs, to ensure inclusive support for technology-enabled learning. Studies indicate that institutional readiness, such as availability of technical support, teacher proficiency, and alignment with curricular goals, is critical for the effective implementation of AR in inclusive classrooms (Johnson and Adams, 2020). Therefore, strategic management is not only about resource allocation but also about creating an organizational environment that supports innovation and inclusion.

Leadership and organizational culture

Leadership shapes organizational culture and promotes technology adoption by modeling desired behaviors, mentoring staff, providing guidance, and recognizing achievements. Transformational and instructional leadership styles foster innovation, professional growth, and adaptive school cultures (Bryk et al., 2010; Fullan, 2016). Participatory leadership encourages ownership, reduces resistance, and promotes effective implementation of AR in classrooms. Empirical evidence from Uganda indicates that leaders who combine instructional guidance with transformational vision achieve higher staff engagement and technology adoption success (Lamaro et al., 2023).

In addition, distributed leadership, where responsibility is shared among teachers, coordinators, and administrators, has been shown to strengthen organizational resilience and foster innovation in technology use (Harris, 2014). Schools with distributed leadership structures provide opportunities for staff to co-develop AR lesson plans, mentor colleagues, and contribute to decision-making processes, increasing engagement and reducing resistance to change.

Leadership also involves creating a culture of continuous learning. Principals and coordinators who prioritize professional development, peer observation, and reflective practices encourage teachers to experiment with AR tools confidently. This culture of learning supports risk-taking, creativity, and adaptation, which are essential in inclusive classrooms where students have diverse learning needs.

Challenges in technology adoption for inclusion

Schools face challenges such as limited AR devices, poor infrastructure, inadequate teacher training, insufficient policy guidance, and resistance among staff unfamiliar with technology. Addressing these challenges requires continuous professional development, mentorship, peer support, and participatory planning to ensure equitable and effective AR integration (Ngugi and Karanja, 2024).

Another challenge is the digital literacy gap among both teachers and learners, which can slow adoption and reduce the effectiveness of AR in supporting inclusive learning. Furthermore, socio-economic disparities among students may limit access to home-based AR resources, potentially exacerbating educational inequalities.

Institutional resistance also arises from entrenched teaching practices, high teacher workloads, and limited time for lesson planning. Addressing these barriers requires clear leadership, ongoing technical support, and school-wide strategies that integrate AR seamlessly into teaching and learning processes. Research suggests that collaboration, peer mentoring, and pilot testing of AR interventions can mitigate resistance and enhance teacher confidence (Johnson and Adams, 2020).

Conceptual framework

The conceptual framework illustrates the relationship between strategic management, leadership, organizational culture, and AR adoption for inclusive education. Strategic planning, resource allocation, and monitoring interact with culture and leadership to shape teacher readiness and student engagement. Feedback loops allow lessons from implementation to inform leadership decisions, professional development, and policy adjustments, creating adaptive, learning-oriented schools capable of sustaining inclusive technology initiatives.

Moreover, the framework highlights the role of teacher collaboration, mentoring, and professional learning communities in reinforcing AR adoption. Organizational culture, including shared vision, innovation, and commitment to inclusion, acts as both a mediator and a moderator, influencing the extent to which strategic management practices result in successful integration.

The framework also emphasizes contextual factors such as rural-urban disparities, policy environment, and community involvement. Understanding these contextual variables is essential for designing AR initiatives that are not only technologically effective but also socially and culturally responsive.

Summary

This section reviewed literature on strategic management,

leadership, and AR integration in inclusive primary education. Key factors such as leadership engagement, participatory decision-making, professional development, resource allocation, and alignment with policy frameworks emerged as central to successful adoption. Challenges like limited infrastructure, low teacher capacity, digital literacy gaps, and resistance highlight the need for culturally responsive and strategically managed approaches. These insights provide a foundation for analyzing empirical data on AR integration and inclusive education in Northern Uganda.

RESEARCH METHODOLOGY

This chapter presents the research methodology employed to explore the influence of strategic management on the adoption of Augmented Reality (AR) technology in supporting inclusive primary education in Uganda. It outlines the research philosophy, approach, design, population, sampling techniques, data collection instruments, data analysis procedures, trustworthiness, ethical considerations, and limitations and delimitations. Emphasis is placed on rigor, credibility, and alignment with the study objectives. The methodology was carefully selected to capture the managerial, technological, and human dimensions of AR integration in primary schools. Given that the study focused on teachers' and leaders' experiences, perceptions, and practices regarding AR adoption, a qualitative, interpretive approach was deemed most appropriate (Creswell and Poth, 2018; Saunders et al., 2019).

Research philosophy

The study was grounded in an interpretivist research philosophy, which views reality as socially constructed and context-dependent. Interpretivism posits that individuals' perceptions, experiences, and social interactions shape their understanding of organizational phenomena (Saunders et al., 2019). The adoption of AR technology in inclusive classrooms is influenced by institutional culture, leadership practices, teacher attitudes, and resource availability. Adopting an interpretivist lens enabled the study to explore how teachers and school leaders interpret, implement, and negotiate strategic management practices in AR integration.

Interpretivism also allowed the inclusion of diverse perspectives across hierarchical levels, providing nuanced insights into how strategic decisions, leadership behaviors, and school culture interact to facilitate or hinder AR adoption (Creswell and Poth, 2018). This approach emphasizes subjective meaning-making, making it suitable for studying complex interactions between technology, pedagogy, and institutional management.

Research approach

A qualitative research approach was employed to investigate the phenomena under study. This approach was appropriate because AR adoption in inclusive education is influenced by teachers' perceptions, attitudes, professional experiences, and interactions within the school environment (Patton, 2015). Qualitative methods allowed the researcher to capture these subjective experiences, identify patterns in strategic management practices, and understand contextual factors shaping AR integration.

The qualitative approach facilitated in-depth exploration of both individual and collective experiences, enabling identification of core themes that inform theory and practice. It also provided flexibility to adapt data collection methods as insights emerged, ensuring a comprehensive understanding of how strategic management practices influence AR adoption.

Research design

The study adopted a phenomenological research design, focusing on the lived experiences of teachers and school leaders regarding strategic management and AR integration in inclusive classrooms (Moustakas, 1994). Phenomenology is ideal for uncovering the essence of experiences, emphasizing how participants interpret, understand, and respond to technology adoption initiatives within their institutional context.

This design allowed for the identification of patterns, similarities, and differences in participants' narratives, revealing how leadership practices, strategic planning, and organizational culture influence AR integration. Phenomenology also captured emotional, cognitive, and behavioral dimensions of technology adoption, providing a deep understanding of factors facilitating or hindering successful implementation.

Population of the study

The population consisted of teachers, school leaders, and administrative staff from selected primary schools in Northern Uganda. Participants included classroom teachers implementing AR-based lessons, headteachers and deputy headteachers responsible for school management, and curriculum coordinators overseeing inclusive education practices.

Including participants across multiple roles ensured diverse representation of experiences, acknowledging that responses to strategic management and AR adoption vary based on professional responsibilities, leadership involvement, and exposure to technology initiatives (Creswell and Poth, 2018).

Sample and sampling technique

Purposive sampling was employed to select participants with direct experience of AR integration and inclusive education practices, ensuring the inclusion of information-rich cases (Patton, 2015). Maximum variation sampling captured diversity in school size, location, resources, and leadership styles, enabling triangulation of perspectives (Guest et al., 2020).

The final sample consisted of twenty participants, including classroom teachers, school leaders, and curriculum coordinators. The sample size was sufficient to reach thematic saturation, the point at which additional data did not yield new insights (Moustakas, 1994).

Data collection techniques and instruments

Multiple data collection techniques were used to enhance validity and triangulate findings:

Semi-structured interviews: Explored teachers' and leaders' experiences with AR adoption, perceptions of strategic management practices, and professional development needs. Open-ended questions allowed for in-depth exploration of key objectives (Kallio et al., 2016).

Non-participant observation: Conducted in classrooms to observe AR integration, teacher-student interactions, and the influence of leadership and strategic management on practice. An observation checklist guided documentation of behaviors, routines, and engagement (Angrosino, 2007).

Document review: School records, strategic plans, training logs, and inclusive education policies were examined to contextualize findings from interviews and observations. A structured review template facilitated systematic extraction of relevant information, providing triangulation and credibility (Bowen, 2009).

Data analysis

Data from interviews, observations, and documents were analyzed using thematic analysis (Braun and Clarke, 2006). The process involved familiarization with the data, initial coding of significant statements and behaviors, and grouping codes into overarching themes reflecting strategic management practices, leadership influence, and AR adoption experiences. Themes were reviewed and refined for coherence, relevance, and depth. NVivo software was used for data management, coding, and organization, ensuring systematic analysis and traceability of results.

Trustworthiness

Trustworthiness was ensured by addressing credibility, transferability, dependability, and confirmability (Lincoln and Guba, 1985).

Credibility: Achieved through member checking, prolonged engagement, and triangulation of data sources.

Transferability: Ensured through detailed descriptions of schools, participants, and contextual factors.

Dependability: Maintained via an audit trail documenting methodological decisions and changes.

Confirmability: Achieved through reflexive journaling and triangulation to minimize researcher bias.

Ethical considerations

Ethical protocols were strictly followed. Informed consent was obtained from all participants. Confidentiality and anonymity were maintained by removing personal identifiers. Participants retained the right to withdraw at any stage without penalty. Data were securely stored, and sensitive topics were approached with care. Ethical approval was obtained from the relevant institutional review board prior to data collection.

Limitations and delimitations

Findings were context-specific, reflecting participants' interpretations, and may not be generalizable to all primary schools in Uganda. Resource constraints limited the number of schools and participants. Data reflected a snapshot in time and may not capture long-term adoption trends. The study focused on teachers, leaders, and coordinators, excluding students and parents. Only three data collection techniques, interviews, observations, and document review, were employed. The research examined experiences between 2020 and 2025, aligned with major AR and inclusive education initiatives in Uganda.

FINDINGS

This chapter presents the findings from the study on the strategic management of Augmented Reality (AR) technology to support inclusive primary education in selected districts in Northern Uganda. Data were collected from District Education Officers (DEOs), District Inspectors of Schools (DISs), Head Teachers, Teachers, and Learners with Special Educational Needs (LSEN).

Qualitative data were analyzed using NVivo 12 Plus. Interview and focus group transcripts were imported into the software and analyzed through thematic analysis, involving open coding, axial coding, and theme development. NVivo nodes were created to capture

recurring ideas, and coding queries and cross-case comparisons were used to identify patterns across participant groups. The findings presented in this chapter are therefore derived from NVivo-generated themes, supported by verbatim quotations. The major themes include strategic planning and policy frameworks, leadership and coordination, resource mobilization and capacity building, monitoring and evaluation, teacher adaptation and classroom practices, learner experiences, and challenges in the strategic management of AR technology.

Strategic planning and policy frameworks

NVivo analysis identified "Strategic Planning and Policy Alignment" as a dominant theme, with frequent coding references from DEOs and DISs. Coding comparison queries showed that district-level participants referred more consistently to national policy frameworks than school-based participants.

DEOs and DISs reported that AR initiatives were aligned with national frameworks, including the National ICT in Education Policy (2024), the Digital Agenda for Uganda (2021–2025), the Children's Act (2008), and the National Development Plan IV. One DEO emphasized the inclusive principle embedded in these policies:

"All children matter and no child should be discriminated against." (DEO2, 16th Oct 2025)

Similarly, DIS1 noted that district plans incorporate ICT as a pillar for inclusion, encouraging schools to adopt technology to support all learners. However, NVivo coding revealed fewer references to AR-specific planning at the school level. Head Teachers indicated that inclusive practices were guided by broader ICT policies rather than clear AR operational strategies:

"We follow general ICT policies, but AR is not yet specifically planned for." (HTR2, 16th Oct 2025)

This finding highlights a gap between district-level strategic intent and school-level operationalization.

Leadership and coordination

The theme "Leadership and Coordination" emerged strongly across DEO, DIS, and HTR interviews. NVivo node frequency analysis showed leadership to be a key enabler of AR adoption.

DEOs and DISs described their roles in planning, coordinating inspection activities, mobilizing resources, and providing supervision through e-inspection systems. One DEO explained:

“I do plan for the department, coordinate the inspectorate to the district administration, and mobilize more resources that can be allocated to the different sectors within the education department.” (DEO1, 14th Oct 2025)

Head Teachers reported leading AR integration by creating awareness among teachers, encouraging innovation, and coordinating with development partners. Teachers’ responses, as revealed through NVivo cross-case analysis, showed that participatory and supportive leadership styles enhanced motivation and readiness to adopt AR tools. Leadership that combined transformational vision with instructional guidance was perceived as effective in promoting inclusive and innovative practices.

Resource mobilization, distribution and capacity building

NVivo thematic analysis generated the theme “Resource Mobilization and Capacity Constraints.” DEOs frequently referenced partnerships with organizations such as UNICEF, World Vision, and LABE, which supported the provision of computers, tablets, and AR-related tools.

Resource allocation was guided by enrolment data, registration records, and learner needs, particularly for learners with disabilities:

“Learners with special needs like the blind are given assistive devices like Braille to ease their learning.” (DEO1, 14th Oct 2025)

Head Teachers described using participatory budgeting, equity principles, and collaborations with NGOs and Parent–Teacher Associations to manage limited resources. However, NVivo coding showed strong co-occurrence between resource shortages and implementation challenges. Teachers emphasized insufficient AR devices, unreliable electricity, and poor internet connectivity.

Capacity building emerged as a weakly coded but critical sub-theme. Most teachers reported limited or no formal training in AR, relying instead on personal initiative or prior ICT knowledge:

“I have not received training in AR lessons but I use a smartphone out of my personal initiative.” (TR1, 14th Oct 2025)

Monitoring and evaluation

The NVivo theme “**Monitoring and Evaluation Mechanisms**” was prominent in DEO and DIS interviews. Participants reported using **EMIS and TELA dashboards**

to monitor teacher attendance, learner enrollment, and inclusion of learners with special needs.

“Monitoring includes capturing data on learners with special needs.” (DIS2)

At the school level, Head Teachers reported classroom observations, learner feedback, and performance tracking. However, NVivo analysis revealed minimal references to **AR-specific monitoring indicators**, suggesting that monitoring systems are not yet fully aligned with emerging digital technologies:

“We plan to develop indicators specifically for AR in the future.” (HTR3, 16th Oct 2025)

Teacher adaptation and classroom practices

The theme “**Teacher Adaptation and Pedagogical Practices**” emerged primarily from teacher interviews. NVivo coding showed frequent references to the use of smartphones and downloaded AR applications, particularly in English and Science lessons.

Teachers reported using peer support, group work, and audio-visual adaptations to include learners with reading difficulties and other special needs:

“Putting learners in groups creates friendship and reduces participation barriers.” (TR2)

Teachers further indicated that AR enhanced learner engagement, participation, and comprehension. Assessment methods included observation, quizzes, and learner feedback. Overall, NVivo sentiment analysis reflected positive perceptions of AR’s influence on learning outcomes.

Learner experiences with AR technology

Analysis of LSEN focus group data in NVivo generated the theme “Enhanced Engagement amid Unequal Access.” Learners reported limited and inconsistent exposure to AR, with some schools providing tablets or smartphones only occasionally.

Where AR was available, learners reported improved understanding, motivation, and retention:

“It helps me a lot. When I see things moving on the screen, I remember them better.” (LSEN8, 21st Oct 2025)

However, NVivo coding also highlighted persistent challenges related to accessibility, device shortages, and inadequate infrastructure, which limited equitable participation among learners.

Challenges in the strategic management of AR

The theme “Systemic Challenges in AR Integration” emerged as one of the most densely coded nodes across all participant groups. Key challenges included limited digital infrastructure, unreliable electricity, poor internet connectivity, and inadequate physical accessibility, such as ramps and accessible latrines.

Human capacity constraints were also prominent, with many teachers lacking training in ICT and AR tools, resulting in low digital literacy and occasional resistance to technology. Financial limitations further constrained procurement, maintenance, and sustainability of AR initiatives. NVivo analysis also revealed a lack of clear AR-specific policy guidance, limiting structured implementation.

Participants recommended capacity building, improved infrastructure, clearer policy frameworks, increased resource allocation, and pilot projects to model effective AR integration (HTR4, 17th Oct 2025; DEO1, 14th Oct 2025).

By integrating NVivo-assisted thematic analysis into the presentation of findings, this chapter demonstrates that while there is strong policy intent, leadership support, and recognition of AR’s potential for inclusive education, implementation remains constrained by limited resources, inadequate teacher capacity, and weak operational policies. The use of NVivo strengthens the credibility and transparency of the findings by systematically linking participant voices to analytically derived themes.

DISCUSSION

Strategic planning and policy alignment

The findings indicate that AR adoption in inclusive education is significantly influenced by national and district-level policies. Aligning AR initiatives with frameworks such as the National ICT in Education Policy (2024) and the Children’s Act (2008) ensures that inclusion, equity, and access are prioritized. Strategic planning facilitates resource mobilization, goal setting, and coordinated action, which are crucial for technology adoption in schools (Fullan, 2016; Kotter, 2012).

Furthermore, the literature emphasizes that policy alignment alone is insufficient; schools require operational plans that translate national guidelines into actionable strategies. For example, UNESCO (2019) highlights that technology integration in low-resource contexts demands localized planning, accounting for teacher capacity, infrastructure availability, and learner diversity. Studies in Sub-Saharan Africa also demonstrate that policy-practice gaps often emerge when schools lack clear guidelines or implementation monitoring (Mtebe and Raisamo, 2014; Mugisha, 2023).

Strategic planning should also incorporate risk

assessment and contingency measures. AR adoption in rural Ugandan districts is constrained by infrastructural challenges, including unreliable electricity and limited internet connectivity. Incorporating adaptive strategies into school plans can mitigate these constraints, aligning with Kotter’s (2012) change management principles emphasizing proactive risk management and iterative planning.

Leadership as a catalyst for innovation

Leadership emerged as a key determinant of AR adoption, confirming prior studies that transformational and instructional leadership positively influence technology integration (Bryk et al., 2010; Fullan, 2016). Leaders not only provide vision but also create conditions for teacher experimentation, collaboration, and professional growth. Participatory and distributed leadership models further enhance technology adoption by fostering shared ownership and accountability (Harris, 2014).

The literature also notes that leadership must address both the technical and pedagogical dimensions of technology adoption. According to Al-Busaidi (2008), effective educational leaders integrate ICT tools in ways that support curriculum goals and learner-centered pedagogies. In inclusive classrooms, leadership involves promoting differentiated instruction and adaptive strategies to support learners with diverse needs.

Empirical studies underscore the importance of continuous mentoring, supervision, and feedback in sustaining technology adoption. For instance, Oye et al. (2012) found that schools with active leadership engagement had higher teacher confidence and more consistent technology use. In the Ugandan context, DEOs and headteachers who model technology use and coordinate AR-related training act as catalysts for cultural change, fostering acceptance of innovations in schools resistant to technological disruption.

Resource allocation and capacity building

The study highlights that equitable resource allocation and capacity building are critical for AR adoption. Consistent with Fullan (2016), strategic management involves ensuring that resources, including devices, software, and internet access, are accessible to all learners, especially those with special educational needs. Collaboration with NGOs, government programs, and local communities facilitates resource distribution but does not fully address inequities in access.

Teacher capacity is particularly critical. The literature indicates that professional development programs tailored to AR and inclusive pedagogy increase teacher confidence and promote effective classroom integration (Johnson and Adams, 2020; Tondeur et al., 2017). Peer mentoring and

professional learning communities further support skill acquisition, enabling teachers to experiment with AR in low-risk environments.

Moreover, resource allocation must consider sustainability. Studies in developing countries highlight that many technology interventions fail due to inadequate maintenance, lack of technical support, and absence of budgeted replacements (Mtebe and Raisamo, 2014; Ngugi and Karanja, 2024). A strategic approach to capacity building integrates continuous training, technical support, and equitable access to ensure that AR adoption is sustainable and inclusive.

Monitoring and evaluation

Monitoring and evaluation (M&E) emerged as a central theme, aligning with Kotter's (2012) principle of structured feedback and Fullan's (2016) emphasis on evidence-informed decision-making. While existing EMIS and TELA dashboards provide general oversight, AR-specific indicators are lacking, limiting the ability to assess learner engagement, comprehension, and inclusivity outcomes.

The literature underscores that technology integration requires robust M&E frameworks capturing both quantitative and qualitative data (UNESCO, 2019; Johnson and Adams, 2020). This includes tracking device usage, learner progress, teacher adaptation strategies, and classroom interactions. Additionally, feedback loops are essential, allowing district and school leaders to refine strategies, provide targeted support, and inform policy adjustments.

Effective M&E also involves stakeholder participation. Involving teachers, learners, and parents in data collection and evaluation fosters ownership and responsiveness, enhancing the likelihood of sustained AR adoption (Patton, 2015; Ngugi and Karanja, 2024). Contextualized M&E systems, sensitive to rural-urban disparities, socio-economic differences, and learners' special needs, are critical for promoting equitable and impactful AR use.

Teacher and learner experiences

Teachers in the study employed adaptive strategies, including peer support, collaborative learning, and audio-visual enhancements, to overcome limited training and device availability. These practices align with Bandura's (1977) social learning theory, which emphasizes observational learning and modeling. Teachers' proactive adaptations demonstrate resilience and reflect the importance of agency in technology adoption.

Learner experiences indicate that AR enhances engagement, motivation, and comprehension, consistent with empirical studies showing that interactive digital content improves learning outcomes in science, mathematics, and literacy (Bacca et al., 2014; Ibáñez and

Delgado-Kloos, 2018). For learners with disabilities, AR provides multisensory experiences that support understanding and memory retention, addressing accessibility challenges often overlooked in conventional instruction.

However, the literature warns that inconsistent access to devices and infrastructural constraints may exacerbate educational inequities (Mtebe and Raisamo, 2014; Mugisha, 2023). Strategic management must therefore address both access and pedagogical integration, ensuring that technology benefits all learners rather than reinforcing existing gaps.

Challenges and recommendations

Challenges identified in the study, insufficient devices, inadequate teacher training, limited policy guidance, and infrastructure deficits mirror findings in broader literature on ICT adoption in developing contexts (Ngugi and Karanja, 2024; Mtebe and Raisamo, 2014). Overcoming these challenges requires coordinated strategies combining leadership, capacity building, infrastructure investment, and policy development.

The literature suggests that pilot programs and model schools serve as effective mechanisms to demonstrate AR's potential, foster teacher confidence, and generate contextualized best practices (Johnson and Adams, 2020; UNESCO, 2019). Partnerships with NGOs and the private sector can provide supplementary resources, but sustainability depends on institutional ownership, government support, and integration into routine school operations.

Ultimately, strategic management in AR integration requires a holistic approach that addresses human, technological, and organizational dimensions, ensuring that inclusive education goals are met while fostering innovation, teacher agency, and learner engagement.

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