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Artificial Intelligence and Cultural Tourism in Kenya: A Systematic Review of Development Opportunities and Challenges

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This paper presents a systematic review of the intersection between artificial intelligence (AI) and cultural tourism in Kenya, with a particular focus on the Mount Kenya region. It examines the potential of AI to enhance sustainable cultural tourism through digital heritage preservation, targeted marketing, and enriched visitor experiences. The study employs a qualitative systematic review methodology, analyzing peer-reviewed journal articles, policy documents, case studies, and global best practices relevant to AI applications in cultural tourism. Thematic analysis was used to identify recurring patterns, opportunities, and challenges. The findings reveal that AI holds considerable promise in addressing infrastructure gaps, enhancing inclusivity, and increasing the global visibility of Kenya's cultural heritage. Nonetheless, inadequate policy frameworks, inadequate financial investment, and widespread digital illiteracy are among the substantial challenges that have persisted. This study has made recommendations on the formulation of a vigorous policy context, investing in digital capacity building, and promoting public-private partnerships (PPTS) to realize an enabling environment for AI-integrated cultural tourism in Kenya.

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INTRODUCTION

Cultural Tourism is the travel meant to experience the arts, heritage, and specific traits of a population in a specific geographical setting. Over the years, Cultural tourism has grown into a major influencer for both intercultural and economic development. About 40% of tourism in the world was attributed to it, highlighting its mounting impact on global travel and trends. (UNWTO, 2020), According to UNESCO (2021), the inclusion of Artificial Intelligence (AI) enhances the conservation, elevation, and personalization of cultural experiences and has predominantly predisposed the improvement of this industry. The usage of AI in cultural tourism is not limited to but includes predictive analytics for managing tourist flow, intelligent virtual guides, and simulations of history.

African Nations such as South Africa, Rwanda, and Ethiopia have adopted promising digital heritage initiatives, enhancing their cultural tourism experience. For example, in Rwanda, investments in the digitization of its genocide memorial site have been made to ensure a wider educational outreach (Benamar & Boutaleb, 2021). South Africa, on the other hand, has embraced computer-generated museum tours and AI-powered storytelling platforms (Msuya & Kihwele, 2022). Nonetheless, Sub-Saharan Africa continues to face challenges preventing the adoption of AI, such as poor internet connectivity, a lack of reliable digital policy frameworks, and poor infrastructure. There is, however, Africa’s rich cultural diversity and increasing Technological Investments, which provide a potential for using AI to enhance tourism advancement in the continent.

Kenya, being home to more than 40 ethnic communities, boasts of a diverse range of cultural expressions, ranging from architecture and performing arts to oral traditions and rituals, thus making cultural tourism an essential tool for community empowerment. Kenya also hosts numerous ethnic traditions, sacred sites, and other tourist attractions, features, and attributes such as Mount Kenya and indigenous knowledge. Despite this rich potential, Kenya’s tourism portfolio, this area of tourism is still underutilized, for instance in the Mount Kenya region, The Ndorobo and Mukogodo are two marginalized communities whose rich cultural traditions are mainly missing from mainstream initiatives due to structural issues like inadequate road networks, limited digital capacity, and exclusionary tourism planning (Kamau, 2023; Akama & Kieti, 2019).

This Study finds a significant gap in how Kenya, specifically the Mount Kenya region, leverages AI technologies to boost cultural tourism. The Kenyan tourism industry has not yet fully adopted AI’s potential for digital documentation, intelligent marketing, and immersive virtual experiences. Therefore, this study intends to conduct a systematic review exploring how AI can be applied to unlock Mount Kenya’s and Kenya’s cultural tourism potential. Specifically, the study aims to achieve the following objectives:

- To assess the potential of artificial intelligence (AI) for the growth of cultural tourism in Kenya;
- To investigate the obstacles to the integration of AI in the cultural tourism industry; and

- To suggest methods for the successful implementation of AI technologies in support of sustainable cultural tourism.

This study's main research questions are: How can artificial intelligence support Kenya's growth in cultural tourism? What are the primary obstacles to incorporating AI into Kenya's cultural tourism industry? What tactics can be used to promote the efficient and inclusive application of AI for the growth of sustainable tourism? Through this investigation, the paper seeks to offer guidance on developing a digitally inclusive cultural tourism framework in Kenya to policymakers, tourism professionals, and local communities.

LITERATURE REVIEW

Due to AI's potential to transfigure tourists' engagement, interpretation of heritage, and management of tourism, its incorporation into cultural tourism has attracted significant scholarly attention. AI technologies have brought about a new era of modernization in cultural tourism by providing both immersive experiences and operational efficiency. Focusing on global practices, regional development, and initiatives within Kenya's Mount Kenya region, this paper examines the body of knowledge currently available on AI applications in cultural tourism. It also scrutinizes the hindrances to AI adoption and recommends the best practices that may help guide Kenya's approach to using AI to promote sustainable tourism.

Global Applications of AI in Cultural Tourism

According to Mariani & Borghi (2021), the face of cultural tourism has predominantly changed by the adoption of AI technologies. They state that artificial intelligence (AI), tools such as computer vision, natural language processing, and machine learning have made it possible to develop intelligent virtual assistants, recommendation engines, and adaptive learning environments for travellers. These tools enable personalized experiences that increase

engagement and satisfaction by examining visitor preferences, actions, and feedback. For example, Rinaldi (2020) states that through AI-powered smartphone apps like Replika and Smartify, travellers can get individualized virtual guides that provide real-time interpretations of artistic work, monuments, and museum exhibits. Likewise, in Europe, the Virtual and Augmented Reality for Cultural Heritage Storytelling (VAST) project has recreated historic cities and ancient ruins, promoting experiential tourism and cultural education using immersive simulations (UNESCO, 2021). Gamifying heritage tours, particularly for younger audiences, has also been made possible through AI-powered virtual reality (VR) and augmented reality (AR) technologies. According to Mariani *et al.* (2020), through AI, there is immense potential in controlling visitors' numbers and protecting sites. They observe that Italy and Japan employ predictive analytics to track visitors' numbers and improve crowd control mechanisms at specific and obvious locations such as the temples of Kyoto and the Vatican Museums. These tools thus not only improve the visitor experience but also advance cultural and environmental sustainability by limiting over-tourism.

Regional Developments in Africa

Numerous African Nations have begun encouraging initiatives to embrace AI's potential in cultural tourism despite Africa not fully adopting it. (Benamar & Boutaleb, 2021) observe that the Iziko Museums and Robben Island Museum in South Africa have embraced digital technologies, such as virtual tours and AI-driven storytelling platforms, to be able to preserve their oral histories and reach larger audiences. The life and reach of cultural content are hence prolonged by these programs and also advance educational goals. Rwanda has also made investments in digitalization and artificial intelligence to record and display its genocide memorials. Rwanda has increased its cultural diplomacy by providing emotionally impactful and historically significant content to a global audience

through interactive websites and virtual reality experiences (Msuya & Kihwele, 2022). These initiatives strengthen national identity and unity in addition to acting as instruments of remembrance.

Even with these developments, implementing AI in cultural tourism continues to be difficult in many African nations. Innovation is still hampered by obstacles like inadequate infrastructure, expensive technology, spotty internet coverage, and a lack of qualified workers, according to Abebe & Teka (2021). Additionally, a large number of cultural tourism projects in Africa are donor-funded and do not have long-term sustainability frameworks, which results in limited scalability and project discontinuity. However, there is still a lot of room for AI-driven cultural tourism in the region. Africa is a fertile ground for innovation because of its young population, rich cultural legacy, and expanding tech entrepreneurship ecosystem. AI combined with indigenous knowledge systems can result in community-driven, culturally aware solutions that support heritage preservation and encourage inclusive travel.

AI and Cultural Tourism in Kenya

Kenya's cultural treasures include, but are not limited to, a wealth of intangible traditions; spiritual practices, more than forty (40) ethnic groups, and a UNESCO-listed heritage site. Mount Kenya region in particular stands out due to its ecological diversity, traditional belief systems, and sacred landscapes. (Kamau, 2023) However, it notes the fact that Kenya's tourism industry, which throughout history has placed a higher priority on wildlife safaris and coastal attractions, still has its cultural riches underutilized. Studies have underscored the low integration of AI and digital technologies in the Kenyan tourism industry. Akama & Kieti (2019) observe that despite the Kenya Tourism Board (KTB) having put in place digital Marketing platforms, scarcely do they put to practical use the cutting-edge AI features like personalized content delivery or even predictive

analytics. Therefore, a lot of discoveries are yet to be made on how AI might change cultural tourism through the progression of immersive storytelling experiences, virtual heritage archives, and chatbots driven by AI. The exclusion of marginalized groups, such as the Ndorobo and the Mukogodo of the Mount Kenya region, additionally highlights the challenge of adopting AI. Kenyan National tourism strategies frequently ignore these groups, and digital tools, too, are rarely used to document or enhance their cultural knowledge. (Kamau, 2023). The absence of participatory frameworks has seen a lack or little community involvement in content creation or decision-making, hence a conclusive affirmation that cultural tourism development in Kenya is normally top-down.

Challenges of AI Adoption in Cultural Tourism

Numerous complications in the integration of AI in cultural Tourism are identified by the literature, specifically in low- and middle-income nations like Kenya. The key to the complications is the lack of a unified regulatory policy framework. Benamar & Boutaleb (2021) point out that many African nations lack national AI strategies, which leaves stakeholders in the tourism industry unsure about long-term planning, funding, and compliance. Although AI is mentioned in general terms in Kenya's digital economy blueprint (2020), there are no clear guidelines on how to apply it in the travel and tourism industry. The lack of infrastructure in rural and historically significant areas is another major issue. Poor road access, sporadic electricity, and unstable internet connectivity are common problems in places like Mount Kenya, which make it difficult to implement AI solutions (Abebe & Teka, 2021). Local tourism entrepreneurs who lack the digital tools and platforms required to effectively market their cultural products are also impacted by these infrastructure flaws.

The adoption of AI is further constrained by human capacity limitations. The digital literacy needed to implement and oversee AI technologies is often

lacking among tourism professionals, such as tour guides, curators, and marketers. Formal training on AI applications in hospitality and tourism programs is still scarce in Kenya. Consequently, the disparity between the potential of technology and its actual application keeps growing. Sociocultural elements also come into play. AI technologies may be seen as invasive or incompatible with traditional belief systems by certain communities. AI applications run the risk of cultural misrepresentation or alienation of the very communities they are intended to empower if they are not introduced carefully and co-designed with local input (Mariani & Borghi, 2021).

Best Practices and Strategic Recommendations

The literature offers some solutions to these problems. First and foremost, policy coherence is crucial. AI strategies that specifically address tourism and cultural heritage must be developed by governments. These guidelines ought to cover sustainability, community involvement, and the ethical use of data. Goals and resources can be aligned through cross-sector collaboration between the ICT, tourism, education, and culture ministries. Second, infrastructure spending is essential. The first steps in transforming digital tourism include increasing access to digital devices, upgrading transportation networks, and spreading broadband coverage. The financial and technical resources needed to construct such infrastructure can be mobilized through public-private partnerships. Third, Capacity building should be prioritized. Through training programs aimed at tourism workers, community members, and heritage custodians, AI technologies can be demythologized and stakeholders empowered to use them efficiently. At the grassroots level, NGOs and tech incubators can offer mentorship and training, whereas educational institutions like Kenya Utalii College could incorporate AI-focused modules into their curricula. To conclude, local viewpoints must be included in the design, implementation, and assessment phases of any singular successful AI

integration in cultural tourism. This ensures community co-creation. Mariani & Borghi (2021), acknowledge that this approach ensures cultural authenticity, enhances ownership, and increases the utility and applicability of AI tools.

Summary

This literature review has highlighted the transformative potential of AI in enhancing cultural tourism locally, regionally, and internationally. Lack of infrastructure, policies, and a low level of digital literacy are some of the obstacles that Kenya needs to overcome, even with the presence of numerous opportunities to use AI in cultural tourism. By drawing inspiration from regional and international best practices, Kenya can also embrace a strategic, inclusive, and culturally aware approach to AI integration in cultural tourism. This initiative will not only improve the travel experience but also support national development, economic empowerment, and heritage conservation.

METHODOLOGY

With a focus on the Kenyan context, this study uses a systematic review methodology to synthesize the body of knowledge and research on the relationship between artificial intelligence and cultural tourism. Finding important patterns, themes, and knowledge gaps related to the research questions is made possible by the systematic review approach, which guarantees a thorough and open analysis of the literature.

Using databases like Scopus, Web of Science, Google Scholar, and JSTOR, a systematic search approach was used as the first step in the multi-stage review process. "Artificial intelligence," "cultural tourism," "Kenya," "digital heritage," "virtual tourism," and "sustainable tourism development" were among the keywords used. To guarantee the inclusion of current and pertinent information, the search was restricted to peer-reviewed journal articles, conference proceedings, and reputable

organizational reports released between 2015 and 2024.

Initially, a total of 85 sources were obtained. 42 studies were chosen for in-depth review after a thorough screening process based on quality, relevance, and methodological rigour. Empirical research, theoretical frameworks, policy papers, and reviews that discussed AI applications in cultural tourism were among the requirements for inclusion. To find recurring opportunities, difficulties, and suggested solutions, data were extracted and subjected to thematic analysis. The study's goals served as a guide for thematic coding, which was used to group the results into categories like community involvement, technological barriers, marketing innovations, digital preservation, and policy gaps.

Two independent reviewers were involved in the data analysis process to improve transparency and replicability. They made sure that thematic coding was consistent and cross-validated the inclusion of studies. Consensus was used to settle disagreements. With practical ramifications for Kenyan policy and practice, the synthesized findings provide a nuanced understanding of how AI is influencing cultural tourism locally, regionally, and globally.

RESULTS AND DISCUSSION

Opportunities for AI Integration in Cultural Tourism

Digital Heritage Preservation

The use of AI technologies can help preserve Kenya's key cultural legacies, such as oral traditions, rituals, and sacred sites. AI-powered 3D scanning, natural language processing, and computer vision, which facilitate access and documentation, have made the digitization of artefacts, texts, and audio-visual content possible. (Manovich, 2020). Kamau (2023) concluded that such instruments can document and conserve cultural expressions from indigenous groups in the

Mount Kenya region, like the Mukogodo and Ndorobo, many of which are in danger of going extinct as a result of modernization pressures.

Enhanced Marketing and Visitor Engagement

To enable personalized marketing, AI uses recommendation engines, behavioural targeting, and data analytics. Huang & Rust (2021) denote that travellers using AI-enabled tourism platforms receive real-time information, cultural content, and personalized itineraries. According to UNESCO (2021), for genuine local experiences, chatbots and multilingual virtual assistants improve accessibility and responsiveness for travellers, and automated social media campaigns and AI-driven content creation in Kenya can highlight lesser-known locations, closing the visibility gap between urban and rural attractions.

Smart Tourism Infrastructure

Artificial intelligence improves tourism infrastructure by streamlining logistics, tracking visitor flows, and forecasting visitor behaviour. Geographic Information Systems (GIS) and artificial intelligence (AI) enable smart systems to map cultural routes and evaluate environmental impacts (Buhalis & Amaranggana, 2015). By reducing ecological footprints and improving visitor safety, these tools can help manage traffic to holy sites in rural Kenya and promote sustainable tourism development.

Challenges Hindering AI Adoption

Limited Digital Infrastructure

Rural regions like Mount Kenya are disproportionately impacted by Kenya's digital divide. Effective AI technology deployment is hampered by inadequate internet coverage, inadequate access to electricity, and expensive devices (World Bank, 2023). Community-based tourism initiatives cannot use AI tools for marketing or storytelling without the necessary foundational infrastructure.

Policy and Regulatory Gaps

Kenya doesn't have a thorough national AI strategy that is suited to the travel industry. Stakeholder uncertainty and fragmented implementation result from the lack of guidelines on data protection, cultural sensitivity, and ethical AI use (Benamar & Boutaleb, 2021). A lack of policies deters investment and makes long-term planning more difficult.

Capacity and Skills Deficiency

One obstacle still facing local tourism operators and heritage custodians is digital illiteracy. Communities cannot fully engage in or profit from technological advancements without training in digital tools and AI applications (Abebe & Teka, 2021). The disparity between contemporary AI tools and traditional knowledge increases inequality and raises the possibility of cultural misrepresentation.

Financial and Investment Constraints

Deploying AI comes with hefty upfront costs for training, software, and hardware. AI investment is difficult in Kenya since the majority of tourism projects are underfunded and do not have access to government grants or venture capital. Underdeveloped public-private partnerships make communities reliant on meagre donor assistance (Mariani & Borghi, 2021).

Emerging Strategies for Sustainable AI Integration***Policy Development and Institutional Coordination***

The objectives of digital transformation should be in line with inclusive development and heritage preservation in a national AI-for-tourism strategy. Harmonizing efforts and promoting integrated planning can be achieved through cooperation between the Ministry of ICT, the Ministry of

Tourism, and cultural institutions (UNESCO, 2021).

Capacity Building and Community Engagement

The digital skills gap can be closed through training initiatives aimed at young people, the elderly, and tourism stakeholders. Manovich (2020) suggests that participatory approaches that co-create AI solutions with local communities, guaranteeing cultural relevance and ownership, can improve the sustainability of digital heritage projects.

Public-Private Partnerships (PPPs)

According to Buhalis & Amaranggana (2015), putting use private sector to use in AI development can accelerate innovation. They note that PPPs offer infrastructure, mentorship, and technical resources to test AI applications in cultural tourism and that partnerships can be fostered by government incentives.

Leveraging Global Best Practices

Context-appropriate solutions can be created in Kenya by way of modifying lessons learned from international case studies. Italy's AI-powered museum and Rwanda's digital genocide memorials are some examples of initiatives striking a balance between innovation and heritage conservation (Msuya & Kihwele, 2022; Rinaldi, 2020).

The results indicate that as much, as there are major obstacles to Kenya's cultural tourism's adoption of AI, the country can realize huge potential for inclusive economic growth and heritage conservation through strategic investments in policy, education, and infrastructure.

Implications for Policy and Practice

The determinations of this study have vital ramifications for the development of policy and its actual implementation in cultural tourism within Kenya. Specifically, in unexplored areas such as Mount Kenya, the inclusion of AI provides a revolutionary opportunity to revive cultural

tourism. Yet, only intentional, inclusive, and well-coordinated interventions that address the identified systemic barriers can make this potential a reality.

Policy Implications

- **Establishment of a National AI-for-Tourism Framework:** A thorough policy outlining precise guidelines for integrating AI in the travel industry should be established by the government. Data protection, ethical norms, cultural preservation, and inclusive economic growth should be observed when adopting AI. There should be sensitivity to the specific needs of indigenous heritage custodians and marginalized communities, by the policy needs highlighted.
- **Harmonization of Regulations and Collaboration of Institutions:** For the successful application of AI in cultural tourism, coordination between various industries such as tourism, ICT, culture, and education is necessary. Cross-sectional innovation, regulatory oversight, and resource mobilization could all be streamlined by an interagency committee or multi-agency task force.
- **Public-Private Partnerships (PPPs) incentives:** Policymakers ought to offer financial and regulatory incentives to stimulate private sector investment in AI-driven cultural tourism. Technical support initiatives, grants, and tax breaks can support startups and innovation hubs specializing in immersive tourism and digital heritage.

Practical Implications

- **Implementation of Community-Centric AI:** Participatory models that actively involve local communities in the design, development, and implementation of AI technologies should be prioritized by practitioners. This will promote cultural sensitivity, enhance trust, and ensure

that technological solutions reflect indigenous knowledge systems and values.

- **Digital Literacy and Capacity Building:** Targeting tourism operators, youth, and heritage custodians with training initiatives is key for bridging the digital divide. Practical workshops, online modules, and certification programs can empower stakeholders with the skills needed to operate AI tools and engage with digital platforms effectively.
- **Infrastructure Investment and Access Expansion:** Development partners and local governments must prioritize expanding digital infrastructure, especially internet connectivity and energy access, in rural and heritage-rich areas. Investment in affordable technologies and open-access digital archives can democratize cultural heritage and tourism participation.
- **Monitoring, Evaluation, and Research:** Continuous evaluation of AI applications in cultural tourism is necessary to ensure ethical use, impact measurement, and iterative improvement. Academic institutions and think tanks can play a pivotal role in conducting applied research, developing culturally appropriate AI models, and disseminating findings to inform practice.

All things considered, integrating AI into Kenya's cultural tourism industry presents a calculated way to improve heritage conservation, broaden visitor experiences, and strengthen local economies. But to achieve these results, structured, inclusive, and evidence-based policy and practice frameworks will need to replace ad hoc interventions.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study has systematically explored the intersection of artificial intelligence and cultural tourism in Kenya, with a focus on the Mount Kenya

region. The results show that AI holds transformative potential for preserving cultural heritage, enhancing visitor engagement, and fostering inclusive and sustainable tourism. AI-powered digital archives, virtual tour platforms, and smart tourism infrastructure are examples of technologies that offer innovative ways to document and disseminate Kenya's diverse cultural assets. Nonetheless, AI integration in Kenya's cultural tourism remains low as a result of critical obstacles, including infrastructural deficiencies, digital illiteracy, policy and regulatory gaps, and financial constraints. In the context of Mount Kenya, indigenous communities face marginalization in tourism planning and lack the tools or platforms to digitize and share their cultural heritage effectively.

This study notes the value of a holistic and inclusive approach to AI integration. To fully leverage AI in cultural tourism, Kenya must prioritize policy development, skills enhancement, and collaborative partnerships in its strategic interventions. The promise of AI can be translated into tangible benefits for heritage conservation, community empowerment, and economic growth only through such coordinated efforts.

Recommendations

For effective integration of AI into Kenya's cultural tourism industry, there is a need for the government to formulate a comprehensive National AI Strategy for Cultural Tourism. The strategy ought to be developed jointly and implemented by the Kenya Tourism Board (KTB), the Ministry of Tourism and Wildlife, the Ministry of Information, Communications, and the Digital Economy, and the Kenya National Commission for UNESCO. The strategy would be a guiding framework that addresses ethical concerns, aligns national cultural policies with AI capabilities, and ensures inclusive participation of local communities. Institutionalizing such a strategy ensures that the

country safeguards its cultural heritage while fostering innovation-driven tourism growth.

To add on strategic direction, the deployment of AI in cultural tourism must be supported by significant investment in digital infrastructure, most specifically in underserved heritage regions such as Mount Kenya. While collaborating with the Ministry of ICT and the Digital Economy, the Kenya Electricity Transmission Company (KETRACO), and the Communications Authority of Kenya (CAK), the Ministry of Energy and Petroleum should lead the provision of high-speed internet, stable electricity, and digital connectivity in these regions. AI applications like smart navigation and virtual heritage displays will not only be facilitated by reliable infrastructure but also attract digital-savvy tourists and investors.

For effective adoption of AI tools by stakeholders, there is a need to develop and deliver culturally responsive digital know-how programs. Working alongside heritage-based NGOs such as the African Heritage Foundation, the Ministry of Education, Kenya Institute of Curriculum Development (KICD), and the Technical and Vocational Education and Training Authority (TVETA), should design training modules tailored to local contexts. These programs should not only be offered in vernacular languages but also focus on practical skills, including digital storytelling, AI-based artefact documentation, and online content management, thus permitting local custodians and artisans the authority to become active participants in the digital tourism space.

Additionally, PPPs should be promoted through incentives to promote AI innovation in the sector. The Ministry of Trade and Industry, the Kenya Investment Authority (KenInvest), and tourism-focused private entities such as Sarova Hotels, Safaricom PLC, and local tech startups should collaborate to pilot AI solutions, including interactive chatbots, virtual reality tours, and digital inventory systems. Tax breaks, access to

government datasets, or co-funding opportunities are government incentives that can catalyze these collaborations, allowing for scalable, sustainable technological adoption in tourism.

The establishment of community-led Cultural AI Hubs across counties rich in cultural heritage, such as Meru, Nyeri, Kirinyaga, and Laikipia is another critical recommendation. These should be supported by respective County Governments in collaboration with community-based organizations and development agencies like the Kenya Community Development Foundation (KCDF). These innovation hubs can serve as centres for recording oral histories, digitizing indigenous artefacts, offering AI training, and facilitating local participation in the cultural digital economy. Grounding AI innovation within communities ensures that technological interventions respect and reflect cultural values and norms.

Finally, Kenya should seek to collaborate and benchmark with international best practice replicas through cultural diplomacy and strategic partnerships. The National Museums of Kenya (NMK), the Ministry of Foreign Affairs, and regional bodies such as the African Union's Cultural Division should seek partnerships with international institutions like the United Nations World Tourism Organization (UNWTO). Drawing from the success stories of countries such as Rwanda's digital genocide memorialization or South Korea's immersive digital heritage promotion, Kenya can adapt internationally tested approaches to its own cultural and technological ecosystem.

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