Article

Digital Preservation of Deteriorating Artefacts at Buea Public Museum, Cameroon

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ABSTRACT

Traditional artefacts in African museums face unprecedented deterioration, placing cultural heritage and communities' connection to historical identity at severe risk. This paper examines the preservation crisis at Buea Public Museum in Cameroon and advocates for the urgent implementation of digital preservation strategies. This article employs heritage preservation theory, digital humanities research, and sustainable development frameworks to address the research gap. The study draws on fifteen semi-structured interviews with museum personnel and heritage professionals, participant observation, and photographic documentation collected across two 2025 fieldwork phases. Analysed using thematic and visual content analysis. The findings show that a large share of the museum's wooden, textile, and organic collections already exhibit termite, fungal, or moisture damage severe enough to threaten their survival within the current decade, underscoring the urgency of intervention. While well-resourced museum institutions are recognised for digital preservation, the study argues - as a literature-informed advocacy framework rather than as a demonstrated outcome - that African museums such as Buea Public Museum can feasibly adapt comparable low-cost strategies to sustain museum growth and development. The article suggests institutional reform, the adoption of suitable technologies, and the development of collaborative partnerships, providing a pathway to prevent irreversible loss. The article concludes that digitalisation, pursued alongside - not instead of - physical conservation and grounded in community and religious-cultural protocols, offers African museums such as the Buea Public Museum an insightful strategy for cultural heritage preservation.

Keyword: Digital preservation; Cultural heritage; Museum Documentation; Photogrammetry; Community-based Conservation.

ABSTRAK

Artefak tradisional di museum-museum Afrika menghadapi kerusakan yang belum pernah terjadi sebelumnya, sehingga menempatkan warisan budaya dan keterikatan masyarakat terhadap identitas historis mereka dalam risiko yang serius. Artikel ini mengkaji krisis pelestarian di Buea Public Museum, Kamerun, serta mengadvokasi penerapan strategi pelestarian digital secara mendesak. Artikel ini menggunakan teori pelestarian warisan budaya, kajian humaniora digital, dan kerangka pembangunan berkelanjutan untuk menjawab kesenjangan penelitian yang ada. Penelitian ini didasarkan pada lima belas wawancara semi-terstruktur dengan staf museum dan tenaga profesional di bidang warisan budaya, observasi partisipan, serta dokumentasi fotografis yang dikumpulkan melalui dua tahap kerja lapangan pada tahun 2025. Data dianalisis menggunakan analisis tematik dan analisis isi visual. Temuan penelitian menunjukkan bahwa sebagian besar koleksi museum

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yang terbuat dari kayu, tekstil, dan bahan organik telah mengalami kerusakan akibat rayap, jamur, atau kelembapan. Tingkat kerusakan tersebut cukup parah sehingga mengancam keberlangsungan koleksi dalam kurun waktu hingga akhir dekade ini. Kondisi tersebut menegaskan urgensi dilakukannya intervensi. Meskipun lembaga museum dengan sumber daya yang memadai telah dikenal menerapkan pelestarian digital, penelitian ini berargumen—berdasarkan kerangka advokasi yang disusun dengan mengacu pada literatur, bukan berdasarkan hasil yang telah dibuktikan secara empiris—bahwa museum-museum Afrika, seperti Buea Public Museum, secara realistis dapat mengadaptasi strategi serupa dengan biaya rendah untuk mendukung pertumbuhan dan pengembangan museum secara berkelanjutan. Artikel ini merekomendasikan reformasi kelembagaan, penerapan teknologi yang sesuai, serta pengembangan kemitraan kolaboratif sebagai langkah untuk mencegah hilangnya warisan budaya secara permanen. Artikel ini menyimpulkan bahwa digitalisasi, yang dilaksanakan bersamaan dengan—bukan sebagai pengganti—konservasi fisik serta berlandaskan pada protokol komunitas dan nilai-nilai sosial, keagamaan, dan budaya setempat, dapat menjadi strategi yang relevan bagi museum-museum Afrika, termasuk Buea Public Museum, dalam melestarikan warisan budaya.

Kata Kunci: Pelestarian Digital; Warisan Budaya; Dokumentasi Museum; Fotogrametri; Konservasi Berbasis Masyarakat.

1. Introduction

In In the shadowed corridors of the Buea Public Museum, traditional artefacts that once animated ceremonial life, agricultural practices, and spiritual traditions of Cameroon's South West Region of indigenous communities are silently disintegrating. For instance, wooden masks carved by remarkable artisans generations ago crumbled under the weight of termite infestation and humidity. Textiles woven with ancestral patterns fragment into irretrievable threads. Royal regalia documenting pre-colonial governance systems flake away, particle by particle, carrying with them irreplaceable historical evidence. This is not merely material decay, but it is the erasure of cultural memory, the severance of intergenerational connections, and the impoverishment of humanity's collective heritage, as accounted by a museum attendant.

The crisis facing the Buea Public Museum exemplifies a broader emergency confronting cultural institutions across Sub-Saharan Africa. While museums in developed nations invest millions in state-of-the-art preservation facilities and digitisation programs, African museums struggle with aging infrastructure, minimal budgets, insufficient expertise, and environmental conditions that accelerate deterioration (Ngulube, 2003; Bulley, 2016). This disparity represents not only a technological divide but a fundamental injustice: communities whose ancestors created these cultural treasures are systematically denied the resources to preserve them, perpetuating colonial-era patterns of cultural marginalization (Abungu, 2022). Yet within this crisis lies an opportunity to reduce the catastrophes of object deterioration in museums (see figure 1). The implementation of digital preservation technologies, which was expensive and technically complex, has now become increasingly accessible, affordable, and user-friendly (Champion, 2015). As explained by the Regional Delegate of Arts and Culture, photogrammetry can now be performed using smartphones and free software. Three-dimensional scanning equipment has dropped dramatically in cost. Cloud-based digital asset management systems offer scalable storage solutions. These technological advances create unprecedented possibilities for under-resourced museums to create comprehensive digital records of their collections before physical artefacts deteriorate beyond recognition or are lost entirely.

Figure 1. Composite images showing deteriorating artefacts.



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Source: Photographed in the Buea Public Museum, 27 August 2025.

For clarity, three terms used throughout are defined here and treated more fully in Section 5: *digital preservation* refers to the creation and long-term maintenance of digital surrogates (images, 3D models, and associated records) of physical artefacts; *photogrammetry* is a technique for reconstructing three-dimensional models from overlapping two-dimensional photographs; and a *digital asset management (DAM) system* is software used to catalogue, store, and retrieve digital files together with their descriptive metadata (Corrado & Moulaison, 2014).

This paper presents a timely and urgent case for the immediate implementation of digital preservation strategies at the Buea Public Museum. It contends that digital preservation should not be treated as a secondary or future concern, but rather as an essential component of heritage management that must proceed alongside physical conservation efforts. The argument is grounded in the recognition that ongoing delays result in the irreversible loss of cultural materials. Thus, losses that no future resources or interventions can fully recover. The paper builds its case on three central premises. First, the preservation of cultural heritage is a recognised human right and a shared global responsibility, as affirmed by key international instruments such as UNESCO's Convention Concerning the Protection of the World Cultural and Natural Heritage and the Convention for the Safeguarding of Intangible Cultural Heritage (UNESCO, 2003; Blake, 2015). Despite these frameworks, there remains a significant gap between global commitments and the resources allocated to African institutions tasked with implementing them. Second, advances in digital preservation technology have made digitization both feasible and practical within resource-constrained environments, challenging the assumption that such efforts require highly specialized infrastructure and expertise. Third, the opportunity to preserve many vulnerable objects is rapidly diminishing; once deteriorated beyond repair, these materials cannot be authentically reconstructed. As such, the paper argues for an urgent shift in preservation thinking that recognises the ethical imperative and practical viability of digital solutions for safeguarding cultural memory in African contexts.

Because many of the objects at risk are ceremonial masks, royal regalia, and ritual instruments through which Bakweri, Bakossi, Balong, Balue, Bamboko, and Bayanyi communities historically enacted spiritual authority, governance, and belief, their loss is also a loss of embodied religious practice and communal meaning-making. The paper therefore situates digital preservation not only as a museological and technological problem but as a question of religion and society: how communities sustain, transmit, and renegotiate sacred and identity-bearing knowledge once its material vessels can no longer survive in their original form.

Accordingly, the study addresses three research questions:

RQ1. What forms and extent of deterioration currently affect the collections of the Buea Public Museum, and what do they reveal about the urgency of intervention?

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RQ2. How can photography and related digital preservation technologies feasibly document and safeguard these collections under the museum's resource constraints?

RQ3. What institutional, community, and policy conditions are needed to support a sustainable, ethically and religiously appropriate digital preservation programme in this setting?

This study is distinct from, though it complements, two related publications by one of the authors on the same institution: Wihbongale (2024) and Wihbongale & Eyong (2025) examine the museum's administrative history and its educational role in history teaching between 1975 and 2023. The present article draws on newly collected primary data from two 2025 fieldwork phases and focuses specifically on the physical condition of the collections and the case for digital preservation, a question not addressed in the earlier institutional-history studies.

2. Theoretical Review

2.1. Cultural Heritage as Collective Memory and Identity

Cultural heritage constitutes tangible and intangible expressions through which communities maintain historical continuity, construct collective identity, and transmit cultural knowledge across generations (Smith, 2006; Vecco, 2010). Material artefacts serve as physical embodiments of ancestral wisdom, artistic achievement, social organization, and spiritual belief systems, functioning as "memory objects" that activate historical consciousness and cultural belonging (Halbwachs, 1992; Nora, 1989). The anthropologist Arjun Appadurai (1986) conceptualized artefacts as possessing "social lives" embedded with networks of meaning that extend far beyond their physical properties, encompassing relationships, narratives, and values that constitute cultural heritage.

For African communities, traditional artefacts carry particular significance as repositories of pre-colonial histories often marginalised or distorted in written colonial records (McGregor et al., 2025). These objects represent indigenous epistemologies, governance systems, and cultural practices that survived colonialism's disruptions, serving as tangible connections to ancestral knowledge systems. The loss of such artefacts through deterioration thus represents not merely physical decay but epistemological erasure, silencing of alternative ways of knowing, being, and organising society that challenge dominant Western paradigms (Abungu, 2022).

Heritage preservation theory has evolved significantly from earlier preservationist approaches focused exclusively on physical conservation toward more holistic frameworks emphasizing cultural significance, community participation, and living heritage (Ahmad, 2006; Labadi & Long, 2010). Laurajane Smith's (2006) influential "authorized heritage discourse" critique challenged the notion that heritage preservation should be exclusively controlled by professional experts, arguing instead for recognition of community voices, alternative heritage values, and democratised heritage practices. This theoretical evolution has profound implications for digital preservation advocacy, suggesting that digitization initiatives must center community needs, values, and participation rather than imposing externally determined priorities.

2.2. The Imperative of Preservation: Ethics and Intergenerational Justice

Heritage preservation is grounded in the ethical principles of intergenerational responsibility and collective stewardship (Lowenthal 1985; Harvey 2001). Present generations have a moral obligation to safeguard cultural heritage for future generations (Weiss 1989; Blake 2015). Jonas's (1984) imperative of responsibility further argues that technological capacity creates an ethical duty to preserve endangered heritage, making digitization a vital strategy where physical conservation is limited. These obligations are reinforced by the UNESCO World Heritage Convention (1972) and the Convention for the Safeguarding of the Intangible Cultural Heritage (2003), although inadequate resources continue to hinder their effective implementation, particularly in developing countries (Meskell 2015). The curators claim that when this ethical framework is applied to digital preservation, it means that there are obligations to use digitisation technology to protect endangered heritage, especially objects, when physical preservation is insufficient or impractical.

2.3. Digital Preservation: Concepts, Potentials, and Paradigm Shifts

Digital preservation involves creating and maintaining long-term digital representations of cultural heritage through technologies such as photography, photogrammetry, 3D scanning, and metadata creation (Corrado and Moulaison 2014; Cameron and Kenderdine 2007; Kalay

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et al. 2008). Unlike physical conservation, digitization preserves information about artefacts by generating digital surrogates that remain accessible even if the originals deteriorate (Chowdhury 2010). These digital records enhance preservation by supporting distributed storage, wider accessibility, computational analysis, and long-term safeguarding of cultural heritage (Vincent et al. 2015). Digital humanities research demonstrates that digitization has transformed heritage preservation by expanding public access and engagement with cultural collections (Terras et al. 2013; Schreibman et al. 2016). Initiatives such as Europeana and Google Arts & Culture have enhanced global access to museum collections (Navarrete and Borowiecki 2017; Agostino et al. 2020; Samaroudi et al. 2020). However, scholars caution that digitization alone does not ensure effective preservation, highlighting the need for digital sustainability, high-quality metadata, respect for source communities, and equitable access to digital heritage (Christen 2012; Atkinson and Whatley 2015; Waterton and Watson 2015).

2.4. African Museums in Global Context: Challenges and Possibilities

African museums operate within distinctive historical, economic, and political contexts that shape preservation challenges and possibilities (Kreps, 2008). Colonial legacies profoundly influence contemporary museum practices, as many African museums were established during colonial periods primarily to document colonized peoples for European audiences rather than serve indigenous communities (Conn, 2010). Post-independence, African nations inherited museum infrastructures designed for colonial purposes, requiring fundamental reconceptualization to serve decolonized societies (Coombes, 2003). Contemporary African museums face persistent challenges in preserving cultural heritage, including inadequate storage facilities, poor environmental controls, limited funding, insufficient conservation expertise, and weak institutional support (Ngulube 2003). These constraints are exacerbated by tropical climatic conditions that accelerate the deterioration of organic materials. Studies further indicate that many museum collections remain at risk due to inadequate management, limited storage capacity, and environmental degradation (ICCROM and UNESCO 2011). In Cameroon, fluctuating temperature and humidity have intensified insect infestation, mould growth, and the deterioration of wooden and metal artefacts (Besaka 2024), while the COVID-19 pandemic further reduced museum resources and conservation capacity (Salazar 2021). Despite these constraints, African heritage professionals have developed context-specific preservation approaches that emphasise community participation, indigenous knowledge, and sustainable conservation practices (Munjeri 2004; Ndoro 2005). The increasing availability of affordable digital technologies presents new opportunities for African museums to overcome infrastructural limitations and strengthen heritage preservation, demonstrating that resource constraints need not inevitably lead to the deterioration or loss of cultural heritage (Jeffrey 2015; Mbembe 2015).

3. Method

3.1. Research Design

This study adopts a qualitative case study design to examine how photography contributes to the digital preservation of deteriorating museum objects and the construction of digital memory at the Buea Public Museum. The design enables an in-depth exploration of heritage preservation practices, technological adoption, institutional challenges, and stakeholders' experiences within their natural context.

3.2. Study Area

The study was conducted at the Buea Public Museum in the Southwest Region of Cameroon over two phases (March–August 2025 and December 2025). As one of the country's oldest public museums, it preserves archaeological, ethnographic, historical, artistic, and natural heritage collections. Despite its historical significance, many artefacts have deteriorated due to climatic conditions, inadequate conservation facilities, biological agents, and limited financial resources, making the museum an appropriate case for investigating the role of photography and digital technologies in heritage preservation.

3.3. Population and Selection Criteria

The target population comprised individuals possessing direct knowledge of museum collections, conservation practices, and digital documentation. These included museum curators, conservators, museum attendants, digitisation personnel, heritage professionals, photographers, interns, and officials responsible for museum management. In line with

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qualitative research conventions, informants were identified through purposive selection rather than probability sampling, so as to capture participants whose roles and lived experience were directly relevant to the study objectives. Inclusion criteria required that a prospective informant (i) held, or had previously held, a formal role connected to the museum's collections, conservation, or digitisation activities, or was a recognised heritage professional or official with institutional knowledge of the museum; and (ii) was willing and available to be interviewed for 45–60 minutes and to be photographed or to permit photography of relevant objects. Individuals whose contact with the museum was purely incidental (for example, casual visitors with no sustained engagement) were excluded, with the single exception of the visitor-book entry cited in Section 4.2, which is treated as documentary rather than interview data.

These participants were selected because they had extensive knowledge associated with institutional preservation policy, conservation strategies, photographic documentation, and object deterioration. This technique ensured that the data came from informed people who could offer in-depth explanations of the research issue. Fifteen informants, distributed across three age groups - young (20–35), adult (36–50), and elder (51 and above) - were interviewed for this study, and each interview lasted between forty-five (45) and sixty (60) minutes.

Table 1. Summarises the profile of the fifteen informants by role category and age group.

No	Role category	Young (20–35)	Adult (36–50)	Elder (51+)	Total
1	Curator / retired curator	0	1	2	3
2	Museum attendant	1	2	1	4
3	Digitisation personnel	2	1	0	3
4	Heritage professional / official	0	1	1	2
5	Photographer	1	1	0	2
6	Intern	1	0	0	1
	Total	**5**	**6**	**4**	**15**

3.4. Data Sources

The study relied on both primary and secondary data. Primary sources included Semi-structured interviews with museum personnel and heritage professionals, participant observation of museum collections, storage facilities, and conservation practices, photographic documentation of deteriorating museum objects, field notes documenting preservation conditions and digitisation processes and direct observations of museum exhibitions and storage environments. Secondary sources comprised scholarly books, peer-reviewed journal articles, archival records, dissertations, museum catalogues, conservation reports, UNESCO publications, and digital preservation policies, previous studies on museum digitisation, photogrammetry, and cultural heritage. The integration of multiple data sources enabled methodological triangulation and strengthened the credibility of the findings.

Triangulation type and timing. The study used data-source triangulation - combining interviews, participant observation, photographic documentation, and documentary analysis - rather than investigator or methodological triangulation. Data from these four sources were collected concurrently within each fieldwork phase (i.e., interviews and observation of the same storage areas and objects took place in the same visit) and were then cross-checked against one another during coding and analysis: where an informant's account of a deterioration pattern could be corroborated by a photograph or a documentary record (an accession register or conservation report), the finding was treated as more strongly supported; where sources diverged, this is noted in the text rather than resolved by omission.

3.5. Interview Guide

Semi-structured interviews followed a common guide organised around five domains: (i) institutional history and role in relation to the museum's collections; (ii) observed condition and deterioration patterns of specific artefact categories; (iii) existing conservation and storage practices and their perceived adequacy; (iv) awareness of, and attitudes toward, digital documentation technologies; and (v) views on community and cultural protocols that should govern digitisation and access. Questions within each domain were adapted in wording and order to the informant's specific role.

3.6. Data Collection Techniques

Data were collected through semi-structured interviews, participant observation, photographic documentation, and documentary analysis. Semi-structured interviews with

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museum professionals explored conservation challenges, digitisation practices, and the role of photography in preserving endangered collections. Participant observation provided first-hand evidence of artefact deterioration, conservation practices, exhibitions, and storage conditions. High-resolution photographs documented the physical condition of museum objects and served as visual data for assessing preservation needs. Documentary analysis of museum records, accession registers, conservation reports, institutional documents, and relevant policy frameworks provided historical context and corroborated the empirical findings.

3.7. Validity and Reliability

To enhance the validity and reliability of the findings, the study adopted the qualitative criteria proposed by Lincoln and Guba (1985). The study ensured trustworthiness through credibility, transferability, dependability, and confirmability. Credibility was enhanced through methodological triangulation of interviews, participant observation, photographic documentation, and documentary analysis. Transferability was achieved through detailed descriptions of the research context and participants, while dependability was ensured by systematically documenting data collection and analytical procedures. Confirmability was strengthened by grounding interpretations in multiple sources of empirical evidence, ensuring that the findings reflected participants' perspectives rather than researcher bias.

3.8. Methods of Data Analysis

Data was analysed using thematic and visual content analysis. Interview transcripts, field notes, and documentary materials were coded manually, following Braun and Clarke's (2006) six-phase thematic analysis procedure: familiarisation with the data, generation of initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final analysis. No qualitative data analysis software (CAQDAS) was used; codes were developed and organised in a coding framework maintained by the author and cross-checked against the raw transcripts during the reviewing-themes phase. Photographic data were analysed separately to assess artefact condition, deterioration patterns, conservation needs, and the role of photography in digital preservation. Integrating visual and textual data provided a comprehensive interpretation of museum preservation practices and photography's contribution to digital heritage management.

3.9. Ethical Considerations

Ethical principles guided the study throughout. The study received ethical clearance from [Institution's Research Ethics Committee, reference number to be inserted by author] in addition to the permissions described below. Permission was obtained from the relevant museum authorities, and participants provided informed consent after being informed of the study's purpose and their right to withdraw at any stage. Confidentiality was maintained through the use of pseudonyms or occupational descriptors for all informants, and this same standard has been applied consistently to the museum-visitor comment cited in Section 4.2, which is now attributed only as “Museum Visitor” rather than by name. Interview data and photographs were securely stored for academic purposes only. Museum collections were photographed with institutional approval, and the study adhered to ethical standards for cultural heritage research, including respect for intellectual property rights.

4. Results

4.1. The Crisis at Buea Public Museum: Documenting, Deterioration, and Loss

4.1.1. Institutional Context and Collection Significance

The Buea Public Museum, located in the capital of Cameroon's South West Region, serves as the primary custodian of cultural heritage for diverse indigenous communities, including the Bakweri, Bakossi, Balong, Balue, Bamboko, Bayanyi, and related ethnic groups (Museum Attendants, interviews, 2025). Established during the post-independence period in 1975, following the government decree of 1972 opening museums in all the provinces. The objective is to preserve and display country's cultural heritage. The museum houses collections acquired through donations, purchases, seizures, and collaborations with local chiefdoms, classified into antiquities and ethnographic objects that document pre-colonial governance, artistic traditions, spirituality, and everyday life (Nkwi and Warnier 1982; Ndambi 2004; Wihbongale 2024; Wihbongale and Eyong 2025). The museum is found in a small space in the delegation building, about 8m by 5m (see figure 2). Those who have served in the museum include one curator and

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five museum attendants. For example, Mr. Ngole Peter (1975-2002) was the lone curator, while the following served as museum attendants: Achimbi Grace (2003-2007), Ekwoge Margaret (2007-2011), Njualem Quinta Lekeaka (2012-2023), Njie Esongo Josephine (2023-2026), and Kpuyuf Mary Benita Lamnyuy (2026-present).

Figure 2. Buea Public Museum Building



Source: Photographed by Researcher, 27 August 2025.

The museum's collections include thousands of artefacts of diverse categories such as ceremonial masks, royal regalia, agricultural tools, musical instruments, textiles, household objects, and ritual items. These artifacts provide crucial material evidence for understanding African societies, which are often underrepresented in written colonial histories, and reveal cultural complexity, technological innovation, and social organization (Chilver & Kaberry, 1967; Ardener, 1996). For local communities, these objects hold profound significance beyond their status as museum pieces (see figure 3). They embody ancestral connections, spiritual meanings, and collective cultural identity. The deterioration or loss of such artifacts impacts not only historical preservation but also ongoing cultural practices, disrupting the vital link between tangible heritage and living traditions (Banda et al., 2024).

4.1.2. Environmental and Infrastructural Challenges

The Buea Public Museum operates in environmental conditions that are significantly detrimental to the preservation of artefacts. Located in an equatorial climate zone, Buea experiences consistently high temperatures (24-28°C annual average) and humidity levels frequently exceeding 80%, creating ideal conditions for biological deterioration of organic materials (Pinniger, 2015). These climatic factors are compounded by infrastructural limitations that compromise preservation capacity. The museum building, constructed decades ago, lacks modern climate control systems essential for maintaining stable temperature and humidity levels (Museum Curator, interview, 2025). Ventilation relies primarily on natural airflow, which is insufficient to regulate moisture content or prevent fungal growth. Storage areas experience significant daily and seasonal environmental fluctuations that accelerate material degradation through repeated expansion-contraction cycles and provide favorable conditions for insect infestations (Strang & Kigawa, 2009). According to Museum Attendants (interviews, 2025), during the rainy seasons, humidity levels in storage areas can reach saturation. This promotes mold growth and accelerates the decay of wooden objects among the displayed objects inside the museum.

According to Interns (interviews, 2025), inadequate storage infrastructure further compromises artefact preservation. Overcrowded storage, limited pest control, outdated lighting, and inadequate funding expose collections to physical damage, insect infestation, and photochemical deterioration. Although museum staff remain committed to conservation, limited resources and insufficient training in preventive conservation constrain effective preservation efforts. These challenges have contributed to the progressive deterioration of the collections, a concern reflected in a visitor's observation: “Everything is good, but some objects have gotten bad” (Museum Visitor, Visitor Book entry, 1984).

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Figure 3. Interior Photographs of Buea Public Museum Storage Facility.



Source: Photographed in the Buea Public Museum, 27 August 2025.

4.1.3. Evidence of Deterioration: Material Breakdown and Cultural Loss

Physical assessment of the Buea Public Museum collection reveals extensive deterioration affecting substantial portions of the holdings. In the course of conducting my research, the following categories document observed damage patterns that demand urgent intervention (shown in Figure 4).

4.1.3.1. Wooden Artefacts

Traditional artefacts, including masks, carved figures, and ceremonial objects, exhibit significant deterioration. Termite infestation has caused extensive internal tunnelling, compromising structural integrity, while active insect activity is evident from surface boreholes. High moisture conditions have facilitated fungal decay, resulting in softening, discolouration, and material loss. Fluctuating humidity has further induced cracking, accelerating degradation (Museum Conservator, interview, 2025). Consequently, several historical artefacts have lost decorative elements or become too fragile for handling or display.

4.1.3.2. Textiles

According to the former Regional Delegate of Arts and Culture (interview, 2025), textile artefacts, including traditional bags and ceremonial garments, are experiencing severe degradation. Fibres have become highly fragile, with insect damage causing extensive loss and perforation. Mold staining and acidic deterioration have led to discolouration, yellowing, and brittleness. Several culturally significant textiles have fragmented beyond recognition, resulting in the loss of evidence of indigenous weaving techniques and symbolic design systems.

4.1.3.3. Organic Materials

According to Digitisation Personnel (interview, 2025), artefacts constructed from leather, plant fibers, bone, and other organic materials exhibit advanced deterioration. Leather objects have become desiccated and brittle, with surfaces powdering and fragmenting. Plant fiber basketry and mats depict biological attack, with fungi and bacteria breaking down cellulosic structures. Animal bone objects have developed surface cracks and have darkened due to chemical changes. Many of these materials have reached a state where conservation intervention would be extremely costly, technically complex, and potentially impossible given the extent of damage.

4.1.3.4. Metal Objects

Although less vulnerable than organic materials, metal artefacts, including iron tools, brass ornaments, and bronze ceremonial objects, are accelerated by corrosion in high humidity. Iron implements display active rust that progressively consumes original metal, resulting in loss of form and detail. Bronze objects have developed thick corrosion products, withering surface decorations, and inscriptions. Without intervention, many metal artefacts will corrode to the point of losing all diagnostic features and cultural information (Heritage Professional, interview, 2025).

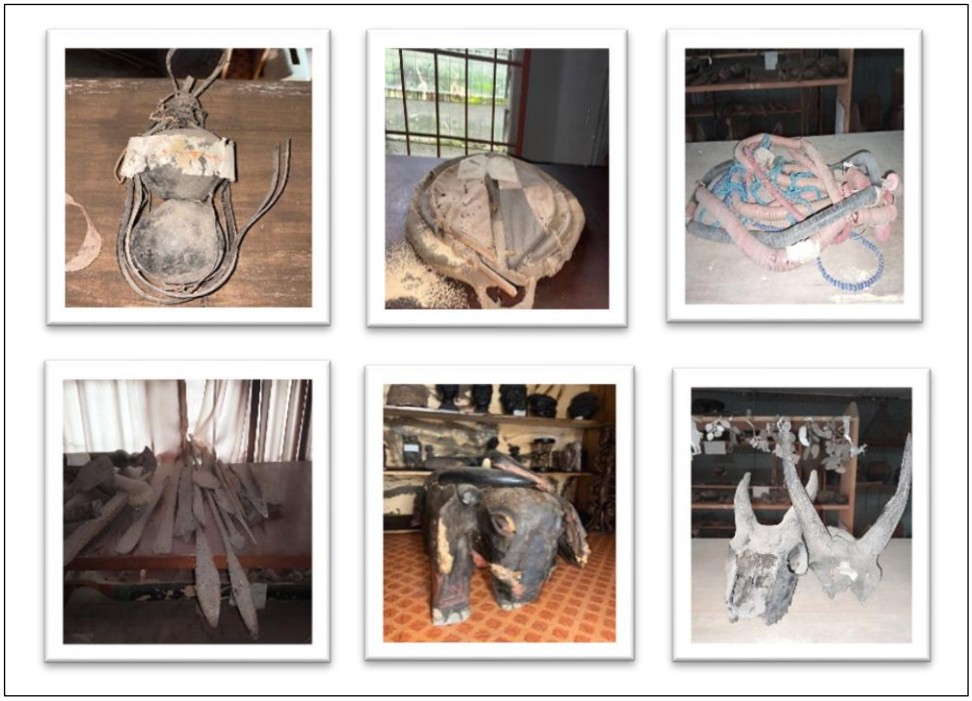
4.1.3.5. Painted and Polychromed Objects

Photographer's observations (interview, 2025) revealed significant deterioration of ceremonial masks, sculptures, and polychrome artefacts. Paint flaking, pigment fading, and the breakdown

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of binding media have caused the loss of important decorative and symbolic features. This deterioration not only damages the physical integrity of the objects but also erodes the cultural knowledge embedded in their materials, craftsmanship, and visual designs (Ingold 2007), underscoring the urgent need for improved conservation and preservation at the Buea Public Museum.

Figure 4. Close-up photographs documenting specific deterioration types such as termite damage in wooden masks, fungal growth on artefacts, textile fragmentation, and surface loss on painted objects



Source: Photographed in the Buea Public Museum, 27 August 2025.

4.1.4. The Cost of Inaction: Quantifying Cultural Loss

The prevalence of artefact deterioration extends beyond the museum, undermining cultural identity, education, research, and tourism. The loss of heritage weakens community memory, deprives researchers and educational institutions of valuable primary sources, and diminishes cultural tourism potential (Timothy and Boyd 2003; Light 2015). It also contributes to cultural impoverishment by reducing opportunities for intercultural understanding. Evidence from the Buea Public Museum indicates that many artefacts have reached a critical state of deterioration, highlighting the need for digital preservation as a complementary strategy to document and safeguard cultural heritage for future generations (Licciardi and Amirtahmasebi 2012).

5. Digital Preservation Solutions: Technologies, Applications, and Accessibility

5.1. Evolution and Democratization of Digital Preservation Technologies

Over the past two decades, digital preservation technologies have shifted from costly, specialist systems to increasingly accessible tools suitable for resource-constrained institutions (Champion, 2015). Earlier approaches relied on high-resolution photography and expensive 3D laser scanning technologies requiring significant financial and technical capacity (Yuen, 2017; Edl et al., 2018). This limited adoption to well-funded institutions such as the Smithsonian Institution, British Museum, and Louvre, thereby reinforcing global inequalities in heritage preservation.

Since 2010, digital technologies have significantly democratized access to preservation tools. Advances such as high-quality smartphone imaging, structure-from-motion photogrammetry, cloud storage, and open-source software have reduced costs and technical barriers (Vincent et al., 2015; Münster et al., 2017; Odeh et al., 2015; Rosa et al., 2017). As a result, institutions like the Buea Public Museum can implement digital preservation with modest resources. Consequently, the primary challenges have shifted from financial and technical limitations to organisational, informational, and policy-related constraints (Atkinson & Whatley, 2015).

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5.2. Core Digital Preservation Technologies for Museum Applications

Recently, several digital capture technologies (see figure 5) have offered particular promise for museums like the Buea Public Museum, balancing quality, affordability, and practical feasibility. These technologies will be covered in more detail subsequently.

5.2.1. Digital Photography

High-resolution photography remains a foundational digital preservation method, capturing detailed visual information on artefact condition, textures, and decorative features (Styliani et al., 2009). Contemporary cameras and smartphones enable effective documentation through standardized protocols involving multiple angles, consistent lighting, and colour calibration (Prantl et al., 2017). In resource-constrained contexts, photography is cost-effective, accessible, and requires minimal technical expertise, while producing manageable digital outputs suitable for research and public engagement (Friedman, 2018). Although limited to a two-dimensional representation, it provides sufficient documentation and a basis for more advanced techniques.

5.2.2. Photogrammetry

It is also referred to as Structure-from-Motion (SfM) photogrammetry, which enables three-dimensional documentation by reconstructing 3D models from overlapping images (Westoby et al., 2012). Using multiple photographs, software triangulates shared features to generate accurate models, with user-friendly tools such as Agisoft Metashape, RealityCapture, and Meshroom requiring minimal technical expertise (Snavely et al., 2008; Münster et al., 2017; Sapirstein, 2018). Image capture can be conducted with standard cameras or smartphones, and processing can be completed on basic hardware or cloud platforms, making it suitable for resource-constrained settings. Photogrammetry captures full 3D geometry, enabling virtual interaction, precise measurement, and enhanced research and educational applications (Scopigno et al., 2011). Compared to photography, it provides richer documentation of artefacts such as masks and carved figures, preserving their form even when deterioration occurs physically.

5.2.3. Structured Light and Laser Scanning

More sophisticated three-dimensional capture technologies, including structured light scanning and laser scanning, offer higher accuracy and resolution than photogrammetry (Bernardini & Rushmeier, 2002). These technologies project light patterns or laser beams onto objects and measure reflections to calculate precise three-dimensional coordinates, generating extremely detailed digital models (Blais, 2004). Though expensive, structured light scanners have become less costly, with handheld devices now costing several thousand dollars. This is crucial for museums with limited resources. However, this is potentially feasible through grants or partnerships (Guidi et al., 2014). Some institutions have successfully implemented scanner-sharing arrangements or mobile digitization units that travel between museums, distributing costs across multiple institutions (Krassanakis et al., 2018).

5.2.4. Digital Asset Management Systems

Creating digital files without systems for organizing, preserving, and providing access to digital assets undermines long-term preservation objectives (Corrado & Moulaison, 2014). Digital Asset Management (DAM) systems provide databases for storing, cataloging, and retrieving digital files along with associated metadata describing artifacts, capture parameters, and cultural contexts (Chowdhury, 2010). Contemporary DAM solutions range from open-source platforms such as Omeka and Collective Access (specifically designed for cultural heritage collections) to cloud-based commercial services like Content DM and Preservica (Hope, 2022). Open-source options offer zero licensing costs while providing robust functionality suitable for most museum applications. Cloud-based systems eliminate the need for institutional server infrastructure while providing scalable storage expanding as collections grow (Malempati, 2025).

5.3. Practical Implementation Considerations for Resource-Constrained Contexts

Effective digital preservation in resource-constrained contexts such as the Buea Public Museum requires a pragmatic, phased approach that accounts for limited resources and technical capacity. Prioritising artefacts based on cultural significance, condition, and community value enables early impact, builds institutional confidence, and supports stakeholder engagement (Navarrete & Borowiecki, 2017; Jeffrey, 2015). Technology selection should align with

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institutional capacity, balancing quality and feasibility, with accessible tools such as smartphone-based photogrammetry and open-source software offering practical alternatives (Daboye et al., 2019; Akubue, 2000). Sustainable implementation depends on building internal capacity through staff training, local collaboration, and community engagement, reducing reliance on external expertise (Ngoepe & Ngulube, 2013; Styliani et al., 2009). Digital workflows should accommodate limited infrastructure through low-cost solutions such as offline software, external storage, and mobile digitisation units (Di Angelo et al., 2018). Emphasising open access and community participation ensures broader educational and cultural impact, while respecting indigenous knowledge systems through appropriate access controls (Christen, 2012; Anderson & Christen, 2013). Ultimately, success depends on institutional commitment and stakeholder support rather than technological availability.

Figure 5. Diagram illustrating the digital preservation workflow from artefact selection through capture, processing, storage, and access/dissemination.



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6. Implementation Framework: A Roadmap for Digital Preservation at Buea Public Museum

6.1. Strategic Planning and Institutional Commitment

Successful digital preservation at the Buea Public Museum requires strong institutional commitment embedded within a clear strategic planning framework. A comprehensive Digital Preservation Strategic Plan should define vision, objectives, priorities, resources, timelines, and evaluation mechanisms, and also incorporate participatory input from museum staff, communities, and institutional partners (Corrado & Moulaison, 2014; Navarrete & Borowiecki, 2016). Establishing measurable targets such as digitisation outputs, digital infrastructure development, and enhanced access supports accountability and impact assessment. For example, the plan must specify clear, measurable goals such as documenting 500 artifacts through photography within two years, creating 3D models of 100 culturally significant objects, establishing a digital asset management system, developing virtual exhibition platforms, and implementing community access initiatives. Sustainable implementation depends on dedicated resource allocation, including personnel, equipment, training, and operational funding, with institutional leadership playing a central role in advocacy and planning (Ngoepe & Ngulube, 2014). Effective governance through a Digital Preservation Committee ensures oversight, quality control, and alignment with institutional and community values (Anderson & Christen, 2013). Additionally, formalised policies on workflows, metadata standards, access, and intellectual property are essential for the long-term sustainability of digital preservation initiatives.

6.2. Technical Infrastructure Development

Establishing appropriate technical infrastructure constitutes a foundational implementation step. For the Buea Public Museum, we recommend a modular, scalable approach that begins with basic infrastructure and could be expanded as resources increase and capacity grows.

6.2.1. Initial Equipment Requirements

- Digital camera (DSLR or mirrorless) with macro lens capability: $800-1,500
- Smartphone with high-quality camera as backup/supplementary tool: $300-600
- Laptop computer with adequate processing capacity (16GB RAM, dedicated graphics): $1,000-1,500
- External hard drives (minimum 4TB total for redundant backup): $200-300
- Basic lighting equipment (LED panels or continuous light kit): $300-500
- Photography backdrop materials and color reference charts: $100-200
- Handheld structured light scanner (optional, for priority artifacts): $3,000-5,000
- Total estimated initial investment: $2,700-9,600 (depending on optional equipment)

This investment, while significant for resource-constrained institutions, remains orders of magnitude lower than costs for climate-controlled storage facilities or comprehensive conservation treatments. Equipment costs can be reduced through donated equipment, shared resource arrangements with partner institutions, or phased procurement as funds become available (Webb et al., 2022).

6.2.2. Software Selection

- Photogrammetry: Meshroom (open-source) or 3DF Zephyr Free
- Photo editing: GIMP or Adobe Lightroom (affordable subscription)
- Digital Asset Management: Omeka S or CollectiveAccess (open-source)
- 3D viewing and sharing: Sketchfab (free tier available)
- Office productivity: LibreOffice (open-source)

Open-source software eliminates licensing fees while providing robust functionality. Active user communities offer troubleshooting support, tutorials, and ongoing development, ensuring long-term viability (Ahmad & Tripathi, 2024).

6.2.3. Physical Space Configuration

Dedicate a small room or area as a digitization studio with a stable table or platform for artifact positioning, a backdrop system for consistent photographic documentation, lighting setup providing even, controlled illumination, a computer workstation for image processing and quality control, and secure storage for digital equipment. Studio space need not be elaborate; a converted office or storage room of 10-15 square meters provides adequate workspace. Climate

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control, while desirable, is not essential for the digitization studio itself, though equipment should be protected from extreme humidity (Di Angelo et al., 2018).

6.2.4. Digital Storage and Backup

Implement a 3-2-1 backup strategy: maintain three copies of all digital assets, stored on two different media types, with one copy stored off-site (Corrado & Moulaison, 2014). For the Buea Public Museum, this might involve a primary working storage on an external hard drive connected to the processing computer, a secondary backup on an additional external hard drive stored securely on museum premises, and an off-site backup via a cloud storage service (Google Drive, Dropbox, or a specialized cultural heritage platform) or a hard drive stored at a partner institution. Cloud storage costs have decreased substantially, with services offering terabytes of storage for modest monthly fees. Alternatively, partnerships with academic institutions or government IT departments might provide server space at reduced or no cost (Webb et al., 2018).

6.3. Capacity Building and Training Programs

Technical infrastructure means little without trained personnel capable of operating equipment and managing workflows. Comprehensive capacity-building programs must address multiple skill domains.

6.3.1. Technical Skills Training

- Digital photography fundamentals (exposure, lighting, composition, color management)
- Photogrammetry workflow (image capture protocols, software operation, model processing)
- Metadata creation and data management
- Digital file formats, compression, and quality standards
- Basic computer maintenance and troubleshooting

Training delivery could combine multiple modalities: online courses through platforms like Coursera or YouTube tutorials; hands-on workshops led by external experts or university partners; peer-to-peer learning among staff members; and ongoing mentorship from experienced practitioners in other institutions (Styliani et al., 2009).

6.3.2. Conceptual Knowledge Development

Beyond technical skills, staff require an understanding of digital preservation principles, cultural heritage documentation ethics, intellectual property considerations, and community engagement approaches. This conceptual foundation ensures digitization serves meaningful preservation and access objectives rather than becoming a mere technical exercise (Christen, 2012).

6.3.3. Community Capacity Building

Training should extend beyond museum staff to community members, creating broader preservation awareness and engagement. Workshops teaching elders to document traditional knowledge, students to create digital models, and artists to access digital collections for inspiration democratize digital preservation while strengthening community ownership (Anderson & Christen, 2013).

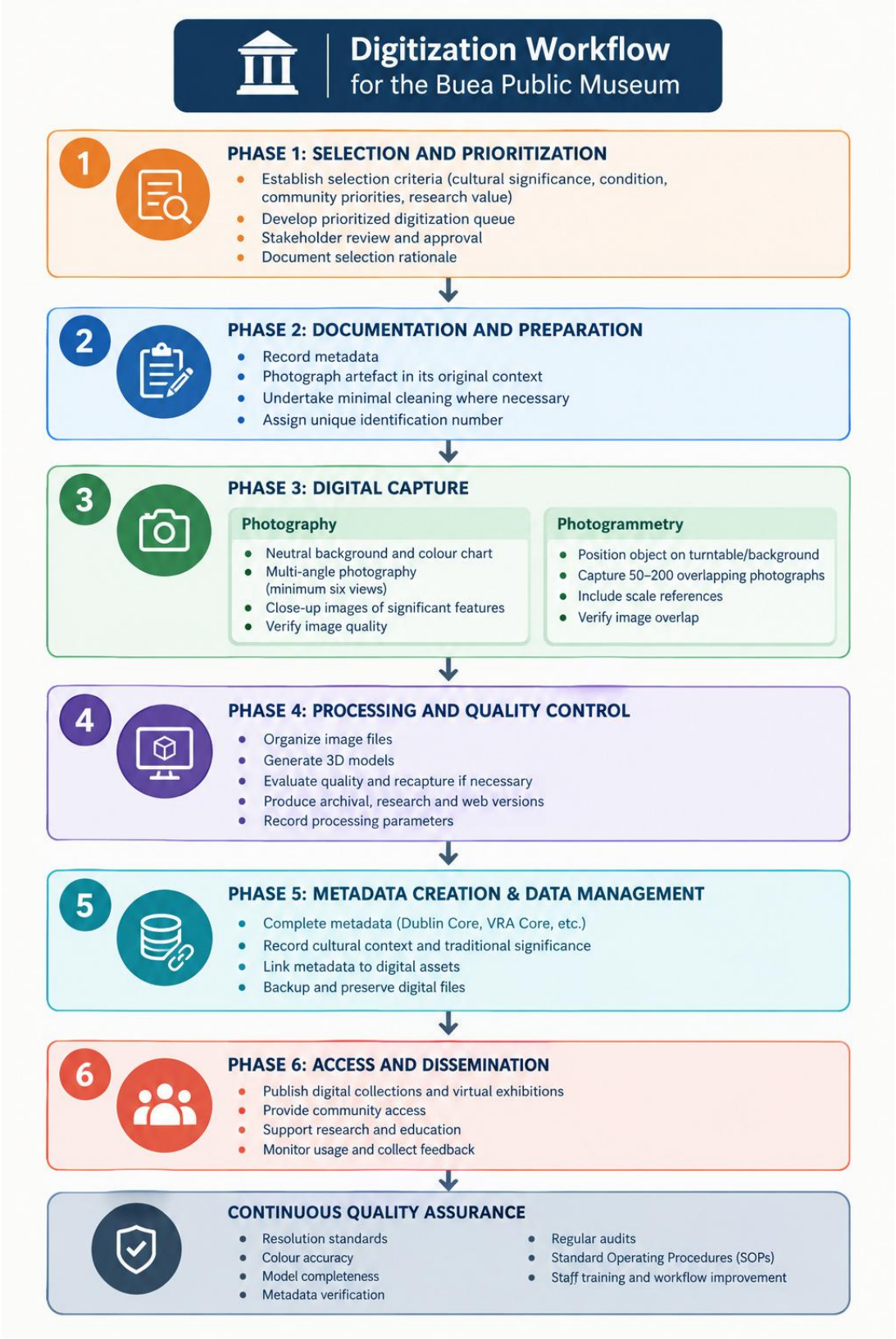
Partnerships with institutions such as the University of Buea, and other Cameroon universities, or international organizations (UNESCO, ICCROM, ICOMOS) could provide training expertise, potentially at subsidized or no cost through cultural cooperation programs. Regional museum networks offer opportunities for shared training programs, distributing costs across multiple institutions while building professional communities of practice (Herne, 2006).

6.4. Workflow Development and Quality Standards

Systematic workflows ensure consistent quality, efficiency, and sustainability. The proposed digitization workflow for the Buea Public Museum (Figure 6) illustrates six interconnected phases: artefact selection and prioritization; documentation and preparation; digital capture through photography and photogrammetry; processing and quality control; metadata creation and digital asset management; and access and dissemination. Continuous quality assurance underpins all phases through adherence to established standards for image resolution, colour accuracy, metadata completeness, documentation, and regular workflow audits to ensure consistency, sustainability, and long-term preservation (Jones and Beagrie 2003).

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Figure 6. Proposed digitization workflow for the Buea Public Museum.



6.5. Community Engagement and Cultural Protocols

Digital preservation initiatives should prioritise community participation, cultural sensitivity, and equitable benefit-sharing with source communities (Christen, 2012; Anderson & Christen, 2013). At the Buea Public Museum, this requires collaborative engagement with traditional leaders and community stakeholders to define digitisation priorities in line with indigenous

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values (Smith, 2006). Because a large share of the affected objects are ritual and religious items, cultural sensitivity protocols must in practice function as religious protocols: identifying which masks, regalia, or ritual instruments carry restricted spiritual meaning, consulting the relevant custodians or secret societies before any image or 3D model is captured, and applying differentiated access controls (public, community-only, or restricted) accordingly. Cultural sensitivity protocols convey the spiritual meanings, and social restrictions must guide the identification, consultation, and controlled access of sensitive materials, supported by frameworks such as Traditional Knowledge (TK) Labels (Munjeri, 2004; Anderson & Christen, 2013). Beyond consultation, communities should be empowered as co-managers of digital heritage. Digitisation efforts should deliver tangible benefits, including expanded access, educational resources, and opportunities for cultural tourism. Integrating intangible heritage such as oral traditions and ritual practices enhances contextual depth and supports the preservation of vulnerable cultural knowledge (Bouchenaki, 2003)..

7. Discussion

This paper's contribution is applied and contextual rather than theoretical: it does not propose a new theory of heritage but demonstrates how existing heritage-preservation and digital-humanities theory can be operationalised for one resource-constrained, religiously significant African collection. In relation to the study's three research questions, the findings indicate that (RQ1) deterioration at the Buea Public Museum is advanced and, for a substantial share of wooden, textile, and organic artefacts, is already close to irreversible; (RQ2) low-cost photography and photogrammetry are technically feasible under the museum's resource constraints, though organisational and policy barriers currently exceed the technical ones; and (RQ3) sustainable implementation depends less on equipment than on institutional leadership, phased capacity building, and community and religious-custodial consent over what is digitised and who may access it.

7.1. Technical and Infrastructure Challenges

Technical and architectural limitations remain major concerns in implementing digital preservation within resource-constrained environments. One of the most common objections is that museum staff lack the technical expertise required for digitization and that external specialists are either unavailable or too costly. However, this challenge is increasingly manageable as modern digital preservation tools have become user-friendly and supported by free online training materials. Evidence from similar institutions shows that staff with no prior experience can acquire necessary technical competencies within a few months through focused capacity-building initiatives (Webb et al., 2022). Partnerships with universities can provide access to skilled students and faculty, while regional or national digitization centers can offer mentorship and technical support. More so, with institutional commitment and training, the learning curve is both realistic and achievable.

Unreliable infrastructure, including inconsistent electricity, poor internet connectivity, and limited facilities, also constrains implementation. Nonetheless, digital preservation workflows can be designed to adapt to such realities using offline-capable software, portable equipment, solar power systems, and flexible work schedules (Di Angelo et al., 2018). Tasks such as data uploads can be batched during stable connectivity, while primary processing can occur offline. Similar approaches have been successfully implemented by African institutions operating under comparable conditions (Jeffrey, 2015).

Concerns about technical obsolescence and digital sustainability are frequently exaggerated, but common digital formats such as JPEG, TIFF, OBJ, and PLY have remained stable for decades, ensuring long-term accessibility (Corrado & Moulaison, 2014). Multiple redundant backups and cloud-based migration systems further mitigate data loss risks. When managed according to best practices, digital sustainability challenges are minimal compared to the irreversible deterioration of physical artefacts (Champion, 2015). Thus, digital preservation represents a pragmatic and achievable solution despite infrastructural and technical limitations.

7.2. Financial and Resource Constraints

Financial constraints pose significant challenges to digital preservation in museums, particularly where resources are already limited. However, digitisation should be understood as complementary to, rather than competing with, traditional conservation. Although initial investments are required, these can be addressed through targeted funding, grants, and phased

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implementation strategies that prioritise essential infrastructure and scale progressively (Navarrete & Borowiecki, 2016). From a cost-benefit perspective, digital preservation reduces the risk of irreversible information loss, which would be far more costly to reconstruct (Throsby, 2001). Concerns about competing priorities can be mitigated through integrated approaches that align digital and physical conservation efforts. Digital surrogates safeguard informational value, while parallel funding streams and collaborative initiatives enable digitisation to advance alongside core preservation activities (Styliani et al., 2009).

7.3. Cultural and Institutional Concerns

Cultural and institutional concerns pose significant challenges to digital preservation in museums. Key risks include cultural appropriation and loss of community control over traditional knowledge, as digitisation may enable unauthorised use or misrepresentation of sensitive materials. Mitigation requires access controls, adherence to cultural protocols, and appropriate intellectual property frameworks, including tools such as Traditional Knowledge (TK) Labels and community co-management to ensure indigenous authority over digital heritage (Christen, 2012; Anderson & Christen, 2013). Concerns about the loss of physical engagement with artefacts are addressed by positioning digital preservation as complementary rather than substitutive. Digital surrogates enhance access, support research, and safeguard information, while physical conservation remains central (Cameron & Kenderdine, 2007; Champion, 2015). Institutional resistance further constrains adoption, necessitating leadership commitment, staff training, and integration of digitisation into core museum functions to ensure sustainable implementation (Marty, 2007).

7.4. Addressing Skepticism Through Evidence and Examples

Skepticism concerning digital preservation feasibility in resource-constrained African contexts is often rooted in limited awareness of successful precedents. Numerous African heritage digitization initiatives demonstrate that challenges, while real, are surmountable. The Zamani Project at the University of Cape Town has documented heritage sites and artefacts across Africa using laser scanning and photogrammetry, training African professionals and students in digital preservation techniques (Zamani Project, n.d.). The West African Museums Programme supported digitization initiatives across multiple West African museums, developing regional capacity and demonstrating feasibility (Bedaux, 2000). Google Arts & Culture partnerships with museums in South Africa, Kenya, and elsewhere have created virtual exhibitions and digital collections accessible globally (Murito, 2019; University of Pretoria, 2021). The Museum of Archaeology and Anthropology at Cambridge University digitized significant African collections through collaborative projects with source communities, demonstrating partnership models (Cambridge University Museum of Archaeology and Anthropology, 2021). These examples prove that African institutions can successfully implement digital preservation despite resource constraints. Success factors include starting with an achievable scope, leveraging partnerships and external expertise, pursuing dedicated funding, building internal capacity progressively, and maintaining focus on community benefit and cultural appropriateness (Jeffrey, 2015; Ngoepe & Ngulube, 2014).

7.5. National and International Regulatory Context

Beyond institutional and technical capacity, the pace of digital preservation in Cameroon is shaped by the surrounding legal framework. Cameroon's cultural heritage is governed primarily by Law No. 2013/003 of 18 April 2013 on the Protection of Cultural Heritage, which recognises both tangible and intangible heritage and sets out a general duty to protect, improve, and transmit it, but stops short of prescribing specific digitisation, inventory, or digital-preservation obligations for individual institutions (Flaure & Hafis, 2025). At the international level, Cameroon ratified the 1972 UNESCO World Heritage Convention and, in 2008, the 2003 UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage (UNESCO, 1972, 2003). This creates a familiar pattern also observed elsewhere in the region: broad normative commitments exist at the national and international level, but the absence of a dedicated digital-heritage policy, standards, or ring-fenced budget line leaves implementation to the discretion and resourcefulness of individual museums such as Buea Public Museum. This gap reinforces the recommendation, developed further in Section 7.5 of the Implementation Framework above, that the Ministry of Arts and Culture adopt a national digital heritage programme with defined standards and dedicated funding, rather than leaving digitisation to ad hoc institutional initiative.

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7.6. Urgent Recommendations: A Call to Action

The evidence presented in this study underscores the urgency of addressing preservation challenges facing the Buea Public Museum and the practical feasibility of implementing sustainable digital preservation solutions. Many artefacts are undergoing irreversible deterioration, yet available technologies help to improve the curation of objects to document and safeguard them before vital cultural information is permanently lost. This situation demands an immediate coordinated action among multiple stakeholders to ensure that heritage preservation becomes a strategic and sustainable institutional practice.

For the Buea Public Museum, decisive leadership and structured planning are paramount. In the immediate term (0–6 months), the museum should appoint a Digital Preservation Coordinator and establish a multidisciplinary Digital Preservation Committee comprising staff, community representatives, and academic partners. Conducting a comprehensive assessment of the museum's collections to identify the most endangered artefacts will enable prioritization of urgent digitization efforts. Simultaneously, a three-year Digital Preservation Strategic Plan should be developed with precise objectives, timelines, and resource needs. Early partnership engagement with the University of Buea and capacity-building initiatives through free online resources will lay the foundation for sustainable operations. Within the next 6–18 months, the museum should secure essential equipment through grants or partnerships, launch a pilot project digitizing 50–100 priority artefacts, and implement a digital asset management system. Developing standard operating procedures and creating an initial online exhibition will further demonstrate the program's value. In the medium term (18–36 months), the museum should expand digitization efforts, strengthen community engagement, pursue sustainable revenue strategies, and advocate for the inclusion of digital preservation within institutional budgets.

The Cameroon Ministry of Arts and Culture has a pivotal role in embedding digital preservation within national cultural policy frameworks. It should recognize digital heritage preservation as a national priority by allocating dedicated budgets and a sustainable National Digital Heritage Program to provide technical support, training, and infrastructure to museums across the country. Legal frameworks should be established to protect digital heritage while promoting appropriate access, and national standards should ensure consistency and interoperability across institutions. The Ministry should also encourage collaboration among museums, universities, technology firms, and international organizations to apply for incentives and recognition schemes for institutions prioritizing digitization.

The University of Buea and other academic institutions can support these efforts by providing technical expertise, equipment or tools, and lobbying for student involvement in digitization projects. Following up on integrating digital heritage preservation into relevant curricula such as archaeology, anthropology, museum studies, and computer science would strengthen academic engagement. Research on digitization methodologies and community impacts, with training workshops for museum professionals, would help build regional expertise. Academic institutions can also facilitate international collaborations and integrate heritage digitization into service-learning or internship programs.

Traditional authorities and local communities must be actively engaged in setting priorities and contributing traditional knowledge supporting digital documentation. Their participation in training and advocacy ensures that cultural values guide preservation efforts and that communities benefit through education, identity reinforcement, and economic opportunities. Finally, international development partners, technology companies, and heritage organizations should align support mechanisms to advance digital preservation in Africa. Development agencies can provide grants, facilitate partnerships, and fund research on sustainable digitization practices. Technology firms can contribute through equipment donations, localized software solutions, and technical support, while international heritage bodies like UNESCO, ICCROM, and ICOM can provide training, establish standards, and foster regional networks. Collectively, these actions will ensure that the Buea Public Museum and similar institutions safeguard cultural heritage effectively for future generations.

8. Conclusion

The artefacts of the Buea Public Museum constitute vital expressions of cultural identity, social memory, religious practice, and historical continuity. Their deterioration represents not only material loss but also the erosion of indigenous knowledge systems and collective heritage, underscoring the urgent need for sustainable preservation strategies. Evidence indicates that the museum faces significant threats from environmental factors, inadequate infrastructure, and limited technical and financial capacity, placing many collections at risk of irreversible loss.

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Advances in digital preservation technologies, including photogrammetry and digital asset management systems, provide practical and accessible solutions for safeguarding collections, even in resource-constrained contexts. Digital preservation complements physical conservation by ensuring long-term documentation, enhancing access, and supporting research and education. As such, it constitutes both an ethical responsibility and a strategic necessity grounded in intergenerational equity. Despite challenges such as limited expertise, funding constraints, and institutional resistance, successful initiatives demonstrate that these barriers can be mitigated through phased implementation, capacity building, and collaborative partnerships. The adoption of context-sensitive, community-driven frameworks offers a sustainable pathway for preserving cultural heritage. In answering the three research questions set out in the Introduction, the study concludes that deterioration at the Buea Public Museum is already severe (RQ1), that low-cost digital documentation is technically feasible (RQ2), and that its sustainability depends on institutional leadership, phased capacity building, and religiously and culturally informed community consent (RQ3). In this regard, the Buea Public Museum can serve as a model for similar institutions, highlighting the imperative of proactive intervention to secure cultural memory for future generations.

This study has four principal limitations that should inform how its findings are read. First, it is a single-institution case study, and the specific deterioration patterns, resource constraints, and community protocols described for the Buea Public Museum may not generalise directly to other African museums with different climates, collections, or governance arrangements. Second, the sample of fifteen informants, while appropriate for an in-depth qualitative case study, is small, and the findings should be read as illustrative of the range of perspectives at this institution rather than as statistically representative. Third, the author's dual role as researcher, photographer, and heritage advocate creates a risk of advocacy bias, particularly in the framing of the recommendations in Sections 5 and 6; this risk is partly mitigated by grounding the technology and implementation discussion explicitly in prior published literature and comparable case studies, and by clearly separating the empirically grounded Results in Section 4 from the literature-informed advocacy framework in Sections 5 and 6, but it cannot be eliminated entirely. Fourth, informant attributions in Section 4 are reported by role and year rather than by named individual or exact interview date, in keeping with the confidentiality protocol described in the Ethical Considerations; more precise attribution is available in the author's raw field records and can be shared with the editor on request.

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11. Ethics Statement

This study received ethical clearance from [Institution's Research Ethics Committee, reference number], in addition to permission from the Regional Delegation of Arts and Culture and museum authorities described in the Methods section

12. Conflicts of Interest

The author(s) declared no conflict of interest.

References

Abankwah, R., Huang, Q., Abankwah, J. M., & Armah, L. (2020). Museum challenges and survival in a digital age: A case study of the Ghana National Museum. Museum Management and Curatorship, 35(1), 15–32. https://doi.org/10.1080/09647775.2019.1607743

Abungu, G. O., & Ndoro, W. (Eds.). (2022). Cultural heritage management in Africa: The heritage of the colonized. Routledge. https://doi.org/10.4324/9781003199144

African Sustainable Tourism Organization. (2024, December 2). The impact of climate change on African museums and landmarks: Challenges and strategies for resilience. https://www.linkedin.com/pulse/impact-climate-change-african-museums-

Copyright © 2026, Indonesian Journal of Religion and Society

landmarks-strategies-asto
Agostino, D., Arnaboldi, M., & Lampis, A. (2020). Italian state museums during the COVID-19 crisis: From onsite closure to online openness. Museum Management and Curatorship, 35(4), 362–372. https://doi.org/10.1080/09647775.2020.1790029
Ahmad, N., & Tripathi, N. (2024). Benefits, challenges, and implications of open-source software for health-tech startups: An empirical study. In S. Hyrynsalmi, J. Münch, K. Smolander, & J. Melegati (Eds.), Software business (Lecture Notes in Business Information Processing, Vol. 500, pp. 281–296). Springer. https://doi.org/10.1007/978-3-031-53227-6_19
Ahmad, Y. (2006). The scope and definitions of heritage: From tangible to intangible. International Journal of Heritage Studies, 12(3), 292–300. https://doi.org/10.1080/13527250600604639
Akubue, A. (2000). Appropriate technology for socioeconomic development in third world countries. The Journal of Technology Studies, 26(1), 33–43.
Anderson, J., & Christen, K. (2013). "Chuck a copyright on it": Dilemmas of digital return and the possibilities for traditional knowledge licenses and labels. Museum Anthropology Review, 7(1–2), 105–126.
Appadurai, A. (Ed.). (1986). The social life of things: Commodities in cultural perspective. Cambridge University Press.
Ardener, E. (1996). Kingdom on Mount Cameroon: Studies in the history of the Cameroon coast, 1500–1970. Berghahn Books.
Atkinson, S., & Whatley, S. (2015). Digital archives and open archival practices. Convergence: The International Journal of Research into New Media Technologies, 21(1), 3–7. https://doi.org/10.1177/1354856514560292
Banda, L. O. L., Banda, C. V., Banda, J. T., & Singini, T. (2024). Preserving cultural heritage: A community-centric approach to safeguarding the Khulubvi Traditional Temple, Malawi. Heliyon, 10(18), e37610. https://doi.org/10.1016/j.heliyon.2024.e37610
Bedaux, R. M. A. (2000). Museums and archaeology in West Africa, and: Museums and the community in West Africa (Review). Research in African Literatures, 31(4), 166–168. https://doi.org/10.1353/ral.2000.0101
Bernardini, F., & Rushmeier, H. (2002). The 3D model acquisition pipeline. Computer Graphics Forum, 21(2), 149–172. https://doi.org/10.1111/1467-8659.00574
Besaka, T. (2024, September 3). Caring for collections in a changing world: Case study of the National Museum of Cameroon. International Institute for Conservation of Historic and Artistic Works.
Blais, F. (2004). Review of 20 years of range sensor development. Journal of Electronic Imaging, 13(1), 231–244. https://doi.org/10.1117/1.1631921
Blake, J. (2015). International cultural heritage law. Oxford University Press.
Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa
Bulley, F. N. (2016). Opportunities and challenges of digitizing museum collections: A case study of the Ghana National Museum, Accra (Master's thesis, University of Ghana). University of Ghana Digital Collections. http://197.255.68.203/handle/123456789/21283
Cambridge University Museum of Archaeology and Anthropology. (2021). [Re:] Entanglements: Colonial collections in decolonial times. https://maa.cam.ac.uk/re-entanglements-colonial-collections-decolonial-times-22-june-2021-17-april-2022
Cameron, F., & Kenderdine, S. (Eds.). (2007). Theorizing digital cultural heritage: A critical discourse. MIT Press.
Champion, E. M. (2015). Critical gaming: Interactive history and virtual heritage. Routledge. https://doi.org/10.4324/9781315574981
Chilver, E. M., & Kaberry, P. M. (1967). Traditional Bamenda: The pre-colonial history and ethnography of the Bamenda Grassfields. Ministry of Primary Education and Social Welfare.
Chowdhury, G. G. (2010). From digital libraries to digital preservation research: The importance of users and context. Journal of Documentation, 66(2), 207–223. https://doi.org/10.1108/00220411011023625
Christen, K. (2012). Does information really want to be free? Indigenous knowledge systems and the question of openness. International Journal of Communication, 6, 2870–2893.
Conn, S. (2010). Do museums still need objects? University of Pennsylvania Press.

Copyright © 2026, Indonesian Journal of Religion and Society

Coombes, A. E. (2003). History after apartheid: Visual culture and public memory in a democratic South Africa. Duke University Press.
Corrado, E. M., & Moulaison, H. L. (2014). Digital preservation for libraries, archives, and museums. Rowman & Littlefield.
Di Angelo, L., Di Stefano, P., & Guardiani, E. (2018). Search for the optimal UAV configuration for cultural heritage applications. Drones, 2(4), 36. https://doi.org/10.3390/drones2040036
Edl, M., Mizerák, M., & Trojan, J. (2018). 3D laser scanners: History and applications. Acta Simulatio, 4(4), 1–5. https://doi.org/10.22306/asim.v4i4.54
Flaure, M. T. E., & Hafis, M. (2025). How Cameroonian cultural heritage is rich but neglected: A critical analysis of the roles and responsibilities of various stakeholders. Malaysia Architectural Journal, 7(6), 88–101.
Friedman, J. (2018, February 26). Affordable camera gear for beginners. Jess Friedman Photography. https://www.jessfriedman.com/affordable-camera-gear-for-beginners
Guidi, G., Russo, M., & Angheleddu, D. (2014). 3D survey and virtual reconstruction of archaeological sites. Digital Applications in Archaeology and Cultural Heritage, 1(2), 55–69. https://doi.org/10.1016/j.daach.2014.01.001
Halbwachs, M. (1992). On collective memory (L. A. Coser, Trans.). University of Chicago Press. (Original work published 1950)
Harvey, D. C. (2001). Heritage pasts and heritage presents: Temporality, meaning and the scope of heritage studies. International Journal of Heritage Studies, 7(4), 319–338. https://doi.org/10.1080/13581650120105534
Herne, S. (2006). Communities of practice in art and design and museum and gallery education. Pedagogy, Culture & Society, 14(1), 1–17. https://doi.org/10.1080/14681360500487512
Hope, M. (2022, March 10). Digital asset management (DAM) and digital preservation: What's the difference? https://www.michaelhope.me/dam-vs-digital-preservation
Ingold, T. (2007). Materials against materiality. Archaeological Dialogues, 14(1), 1–16. https://doi.org/10.1017/S1380203807002127
Jeffrey, S. (2015). Challenging heritage visualisation: Beauty, aura and democratisation. Open Archaeology, 1(1), 144–152. https://doi.org/10.1515/opar-2015-0008
Jonas, H. (1984). The imperative of responsibility: In search of an ethics for the technological age. University of Chicago Press.
Jones, M., & Beagrie, N. (2003). Preservation management of digital materials: A handbook. Digital Preservation Coalition.
Kalay, Y. E., Kvan, T., & Affleck, J. (Eds.). (2008). New heritage: New media and cultural heritage. Routledge.
Krassanakis, V., Pereira da Silva, M., & Ricordel, V. (2018). Monitoring human visual behavior during the observation of unmanned aerial vehicles (UAVs) videos. Drones, 2(4), 36. https://doi.org/10.3390/drones2040036
Kreps, C. (2008). Appropriate museology in theory and practice. Museum Management and Curatorship, 23(1), 23–41. https://doi.org/10.1080/09647770701865345
Labadi, S., & Long, C. (Eds.). (2010). Heritage and globalisation. Routledge.
Licciardi, G., & Amirtahmasebi, R. (Eds.). (2012). The economics of uniqueness: Investing in historic city cores and cultural heritage assets for sustainable development. World Bank Publications.
Light, D. (2015). Heritage and tourism. In E. Waterton & S. Watson (Eds.), The Palgrave handbook of contemporary heritage research (pp. 144–158). Palgrave Macmillan. https://doi.org/10.1057/9781137293565_9
Lincoln, Y. S., & Guba, E. G. (1985). Naturalistic inquiry. Sage Publications.
Lowenthal, D. (1985). The past is a foreign country. Cambridge University Press.
MacDonald, L., Hosseininaveh, A. A., & Robson, S. (2014). Photogrammetric analysis of a heritage ceiling. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, XL-5, 379–383. https://doi.org/10.5194/isprsarchives-XL-5-379-2014
Malempati, M. (2025). Cloud-based infrastructure as the backbone of scalable financial intelligence platforms. SSRN. https://doi.org/10.2139/ssrn.5330916
Marty, P. F. (2007). Museum websites and museum visitors: Before and after the museum visit. Museum Management and Curatorship, 22(4), 337–360. https://doi.org/10.1080/09647770701757708

Copyright © 2026, Indonesian Journal of Religion and Society

Mbembe, A. (2015). Decolonizing knowledge and the question of the archive. Wits Institute for Social and Economic Research, University of the Witwatersrand.
McGregor, J., Shiweda, N., & Stylianou, N. (2025). Decolonial futures for African collections: Making connections and the quest for repair: An introduction. Third Text, 38(4–5), 389–403. https://doi.org/10.1080/09528822.2025.2450917
Meskell, L. (2015). Transacting UNESCO World Heritage: Gifts and exchanges on a global stage. Social Anthropology, 23(1), 3–21. https://doi.org/10.1111/1469-8676.12100
Munjeri, D. (2004). Tangible and intangible heritage: From difference to convergence. Museum International, 56(1–2), 12–20. https://doi.org/10.1111/j.1350-0775.2004.00453.x
Münster, S., Kamposiori, C., Friedrichs, K., & Kröber, C. (2018). Image libraries and their scholarly use in the field of art and architectural history. International Journal on Digital Libraries, 19(4), 367–383. https://doi.org/10.1007/s00799-017-0222-2
Murito, C. (2019, October 30). Google for Kenya: Preserving our culture, and helping Kenyan businesses to grow. Google Africa Blog. https://blog.google/intl/en-africa/company-news/inside-google/google-for-kenya-preserving-our-culture
Navarrete, T., & Borowiecki, K. J. (2017). Changes in cultural consumption: Ethnographic collections in Wikipedia. Cultural Trends, 26(4), 347–364. https://doi.org/10.1080/09548963.2017.1383905
Ndambi, I. A. (2004). The management of cultural resources in Cameroon public museums (Doctoral dissertation, University of Yaoundé I, Cameroon).
Ndoro, W. (2005). The preservation and presentation of Great Zimbabwe. UCL Institute of Archaeology.
Ngoepe, M., & Ngulube, P. (2013). The role of records management in corporate governance in the public sector in South Africa. South African Journal of Information Management, 15(2), 1–8. https://doi.org/10.4102/sajim.v15i2.575
Ngulube, P. (2003). Preservation and access to public records and archives in South Africa (Doctoral dissertation, University of KwaZulu-Natal). URI http://hdl.handle.net/10413/11402
Nkwi, P. N., & Warnier, J.-P. (1982). Elements for a history of the Western Grassfields. Department of Sociology, University of Yaoundé.
Nora, P. (1989). Between memory and history: Les lieux de mémoire. Representations, 26, 7–24. https://doi.org/10.2307/2928520
Odeh, M., Warwick, K., & Garcia-Perez, A. (2015). The impacts of cloud computing adoption at higher education institutions: A SWOT analysis. International Journal of Computer Applications, 127(4), 1–7. https://doi.org/10.5120/ijca2015906367
Pinniger, D. (2015). Integrated pest management in cultural heritage. Archetype Publications.
Prantl, L., Brandl, D., & Ceballos, P. (2017). A proposal for updated standards of photographic documentation in aesthetic medicine. Plastic and Reconstructive Surgery Global Open, 5(8), e1389. https://doi.org/10.1097/GOX.0000000000001389
Republic of Cameroon. (2013). Law No. 2013/003 of 18 April 2013 on the Protection of Cultural Heritage in Cameroon.
Rosa, C. A., Craveiro, O., & Domingues, P. (2017). Open source software for digital preservation repositories: A survey. International Journal of Computer Science & Engineering Survey, 8(3), 21–39. https://doi.org/10.5121/ijcses.2017.8302
Salazar, N. B. (2021). Existential vs. essential mobilities: Insights from before, during and after a crisis. Mobilities, 16(1), 1–15. https://doi.org/10.1080/17450101.2020.1866320
Samaroudi, M., Echavarria, K. R., & Perry, L. (2020). Heritage in lockdown: Digital provision of memory institutions in the UK and US of America during the COVID-19 pandemic. Museum Management and Curatorship, 35(4), 337–361. https://doi.org/10.1080/09647775.2020.1810483
Sapirstein, P. (2018). A high-precision photogrammetric recording system for small artifacts. Journal of Cultural Heritage, 31, 33–45. https://doi.org/10.1016/j.culher.2017.10.011
Schreibman, S., Siemens, R., & Unsworth, J. (Eds.). (2016). A new companion to digital humanities (2nd ed.). Wiley-Blackwell.
Scopigno, R., Callieri, M., Cignoni, P., Corsini, M., Dellepiane, M., Ponchio, F., & Ranzuglia, G. (2011). 3D models for cultural heritage: Beyond plain visualization. Computer, 44(7), 48–55. https://doi.org/10.1109/MC.2011.196
Smith, L. (2006). Uses of heritage. Routledge.
Smithsonian Institution. (2020). Digitization strategic plan 2020–2025. Smithsonian Institution.

Copyright © 2026, Indonesian Journal of Religion and Society

Snavely, N., Seitz, S. M., & Szeliski, R. (2008). Modeling the world from Internet photo collections. International Journal of Computer Vision, 80(2), 189–210. https://doi.org/10.1007/s11263-007-0107-3

Strang, T. J., & Kigawa, R. (2009). Combating pests of cultural property (Technical Bulletin No. 29). Canadian Conservation Institute.

Styliani, S., Fotis, L., Kostas, K., & Petros, P. (2009). Virtual museums: A survey and some issues for consideration. Journal of Cultural Heritage, 10(4), 520–528. https://doi.org/10.1016/j.culher.2009.03.003

Terras, M., Nyhan, J., & Vanhoutte, E. (Eds.). (2013). Defining digital humanities: A reader. Ashgate.

Throsby, D. (2001). Economics and culture. Cambridge University Press.

Timothy, D. J., & Boyd, S. W. (2003). Heritage tourism. Pearson Education.

UNESCO & ICCROM. (2011, December 26). UNESCO-ICCROM museum storage survey results. Asia-Europe Foundation (ASEF). https://culture360.asef.org/news-events/unesco-iccrom-museum-storage-survey-results/

UNESCO. (1972). Convention concerning the protection of the world cultural and natural heritage. UNESCO.

UNESCO. (2003). Convention for the safeguarding of the intangible cultural heritage. UNESCO.

University of Pretoria. (2021, August 11). UP Museums becomes first university museum in South Africa to bring iconic museum collections online on Google Arts & Culture. https://www.up.ac.za/news/post_3003003-up-museums-becomes-first-university-museum-in-south-africa-to-bring-iconic-museum-collections-online-on-google-arts-culture

Vecco, M. (2010). A definition of cultural heritage: From the tangible to the intangible. Journal of Cultural Heritage, 11(3), 321–324. https://doi.org/10.1016/j.culher.2010.01.006

Vincent, M. L., Gutierrez, M. F., Coughenour, C., Manuel, V., Bendicho, L. M., Remondino, F., & Fritsch, D. (2015). Crowd-sourcing the 3D digital reconstructions of lost cultural heritage. In 2015 Digital Heritage (Vol. 1, pp. 171–172). IEEE. https://doi.org/10.1109/DigitalHeritage.2015.7413863

Waterton, E., & Watson, S. (Eds.). (2015). The Palgrave handbook of contemporary heritage research. Palgrave Macmillan.

Webb, E. K., Robson, S., Macdonald, L., Garside, D., & Evans, R. (2018, May). Spectral and 3D cultural heritage documentation using a modified camera. In ISPRS TC II Mid-term Symposium: Towards Photogrammetry 2020. International Society for Photogrammetry and Remote Sensing.

Weiss, E. B. (1989). In fairness to future generations: International law, common patrimony, and intergenerational equity. Transnational Publishers.

Westoby, M. J., Brasington, J., Glasser, N. F., Hambrey, M. J., & Reynolds, J. M. (2012). 'Structure-from-Motion' photogrammetry: A low-cost, effective tool for geoscience applications. Geomorphology, 179, 300–314. https://doi.org/10.1016/j.geomorph.2012.08.021

Wihbongale, L. A. (2024). The Buea Public Museum, 1975–2016. In N. K. Takor, R. T. Talla, & I. S. Womei (Eds.), Heritage and history in Africa: Social and ethno-historical perspectives on heritage elements in Cameroon (pp. 167–180). Langaa Research and Publishing CIG.

Wihbongale, L. A., & Eyong, A. K. (2025). Museums as centers for education and research in teaching history: A case study of the Buea Public Museum, Cameroon, 1975–2023. Indonesian Journal of Religion and Society, 7(2), 119–131. https://doi.org/10.36256/ijrs.v7i2.580

Winter, T. (2014). Beyond Eurocentrism? Heritage conservation and the politics of difference. International Journal of Heritage Studies, 20(2), 123–137. https://doi.org/10.1080/13527258.2012.736403

Yuen, D. (2017). The digitization of photographic albums at the Victoria and Albert Museum and other London-based cultural institutions (Master's thesis, Ryerson University). Ryerson University Digital Repository. https://digital.library.ryerson.ca/islandora/object/RULA%3A6821

Zamani Project. (n.d.). About the Zamani Project. University of Cape Town. https://zamaniproject.org/about.

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