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Original Article

DigiCulture: A Multi-Modal Gamified Mobile Information System for Preserving and Revitalising Cultural Heritage in the RIYE Regions of Ogun State

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Abstract

Background

The preservation of cultural heritage is vulnerable to dilution of oral traditions, physical decay of fragile artefacts, localised data isolation, and restricted access to physical archives. Existing digital preservation efforts often lack structured technical architectures or isolate data from active public engagement.

Objective

This paper presents DigiCulture, a mobile information system designed to systematically preserve, aggregate, and revitalise the cultural heritage across the four socio-cultural regions of Ogun State, Nigeria: Remo, Ijebu, Yewa, and Egba (RIYE).

Methods

Developed over six months using an Agile software development methodology, DigiCulture followed a two-stage research pipeline. This involved field collation of a unified corpus of 119 validated intersecting data points by Hospitality and Tourism Management (HTM) experts alongside structural Computer Science (CSC) paradigms. The mobile application was built with Flutter using a Model-View-ViewModel (MVVM) architecture, supported by a Node.js and Docker backend on Google Cloud Platform, MongoDB for schema-less data persistence, and Cloudinary for asset management. System interactions were structured around three core modules: Exploration, Events Management, and Quizzes.

Results

The resulting system successfully orchestrates multi-modal data (audio, video, images, text) across four core operations: aggregation, categorisation, retrieval, and dynamic modification. By enforcing a zero-anonymity policy and structured payload constraints, the platform maintains data provenance while optimising database indexing and response times.

Conclusion

DigiCulture demonstrates that cultural information systems can unify rigorous archival management with active, gamified user engagement. The system offers a reproducible socio-technical framework for low-resource cultural preservation and provides a foundational digital infrastructure for low-resource linguistic and cultural research globally.

Categories: Software Development, Digital Humanities, Multimedia database and information systems

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Keywords: digital humanities, human-computer interaction (hci), information systems, agile software development, cultural heritage preservation, gamification, data aggregation

Introduction

The preservation of cultural heritage is a race against time, a challenge fundamentally defined by how societies capture, store, and transmit their identity across generations [1]. Historically, the transmission of cultural knowledge has relied heavily on oral traditions [2]. While rich and deeply personal, this reliance poses a severe vulnerability: without permanent records, invaluable history is highly susceptible to being lost or diluted over time [2]. Conversely, the traditions and histories that were committed to physical writing face immediate material threats [3]. Early documentation remains fragile, highly susceptible to things like environmental decay, water damage, termites, and fire [3]. Furthermore, to protect these rare remaining artefacts, existing archives are often centralised in specific, restricted locations. This creates a steep barrier to entry, forcing researchers and cultural enthusiasts to travel relatively great distances to access them.

Compounding these structural challenges is the localised isolation of cultural data. Vital pieces of history, folklore, and tradition are frequently preserved only within specific households [4]. While these family lineages could enrich the broader cultural landscape [5], the lack of an expansive, structured framework means this information rarely reaches the general populace. Consequently, a vast amount of heritage remains siloed, inaccessible, and at risk of fading from memory.

In response to these systemic vulnerabilities, the evolving field of Digital Humanities (DH) has pioneered an epistemological transition. Modern DH paradigms have moved completely past basic, passive digitising towards creating highly collaborative, data-driven socio-technical ecosystems [6]. In the context of global heritage management, these DH frameworks serve to decentralise narrative authority, allowing marginalised, non-canonical, and underrepresented traditions to be preserved with the structural rigour traditionally reserved for mainstream historical canons [7].

To bridge these historical gaps and capture the subjective, expressive, and historical nature of human heritage under a DH lens, any modern preservation effort must account for a highly complex, multi-modal array of foundational cultural data types, each serving a distinct purpose within a cultural setting.

The first data type is audio, which captures the acoustic essence of spoken and musical heritage, serving as the primary shield against oral dilution. Within a cultural setting, audio data preserves spoken-word poetry, local dialects, oral histories, and translated proverbs, capturing the exact tonality, inflections, and pronunciations that text cannot replicate [8]. Furthermore, it archives traditional instrumentation, complex drumming rhythms, and folk songs, ensuring that the auditory identity of a community is locked into permanent storage.

For the second type, culture is deeply kinetic and performance-based, making video data indispensable for capturing living traditions. This format serves to document complex, multi-sensory events such as community festivals, coronation rites, traditional dances, and ancestral dramatic performances. By recording the movement, pacing, and collective interaction of these events, video data provides a complete, fluid record of how rituals are practised, ensuring that future generations can witness and replicate them accurately.

We also have image data with some similarities to the video data; however, it is dedicated to freezing the material and aesthetic elements of heritage in time. Image data captures high-resolution photography of physical artefacts, traditional architecture, sacred sites, and regalia. It also serves a critical purpose in documenting material culture like textiles, scarification (Ila), and ceremonial body art, preserving the visual symbols, motifs, and craftsmanship of the culture before the physical objects decay.

Finally, we have the text data that provides the structural backbone for translation, analysis, and indexing. This format serves to transcribe oral testimonies and spoken histories into written form, making them accessible for academic study and global dissemination. It includes the documentation of rare, older manuscripts that are otherwise vulnerable to fire

or water damage, while also housing written recipes for traditional cuisines, medicinal profiles of local herbs, and structured historical timelines that contextualise the culture.

The scarcity and fragmented nature of low-resourced cultural data underscore the necessity of a specialised cultural information system. The critical need for such a framework is acutely demonstrated by low-resource computational linguistic initiatives, specifically the development and classification of the RIYE Audio Dataset [8]. Computationally modelling and classifying localised dialects within these regions highlights the complete absence of centralised, curated data repositories; a severe bottleneck. This data deficit emphasises that digital preservation requires a structured information system designed to orchestrate the entire lifecycle of these multi-modal data types through four core functionalities: aggregation (pooling disparate audio, video, image, and text records into a single, unified repository) [9]; categorisation (structuring data into a multidimensional taxonomy by geographical origin and typology) [10]; retrieval (implementing optimised search and indexing protocols for global audience access) [11]; and dynamic modification (allowing authorised contributors to continuously adjust, update, and refine information as new insights emerge) [12].

Yet, documentation and dissemination through an information system only solve half the equation. For a culture to truly survive, people must feel connected to it. This necessitates linking the information system's database to interactive, gamified modules. Rather than viewing deep archival management and user engagement as mutually exclusive, modern preservation can combine the best of both worlds. Prominent information systems like *Europeana* [13] demonstrate the immense power of federated architectures for massive aggregation and cataloguing, while specialised platforms like *Locatify* [14] or *Amuseapp* [15] showcase the potential of mobile gamification through challenges and digital rewards. Merging these paradigms allows an application to ground its interactive elements directly in verified data. Practically, this creates a dynamic learning loop: as users discover and absorb new historical insights from the repository, they can seamlessly transition to a dedicated quiz session to test their knowledge, transforming passive consumption into active retention.

Deploying a multi-modal, gamified system of this nature yields a multifaceted socio-technical utility that directly addresses a diverse matrix of key stakeholders. By housing these disparate data types in a centralised, interactive ecosystem, the system delivers immediate value across societal boundaries: native communities and custodians reclaim agency over their ancestral identity [16], academic researchers gain unhindered access to structured linguistic and historical datasets [17], policy makers receive structured qualitative insights and contextual records to inform regional cultural education curricula [17], and global tourists are provided an immersive, verified gateway into regional traditions [14].

The urgency of this digital intervention is starkly apparent in regions like Ogun State, Nigeria. In areas such as the RIYE region, the combined pressures of oral dilution, restricted physical access, and cultural fragmentation have left a wealth of history unexplored, exposing local communities to identity crises and imminent cultural extinction [8]. Recognising this critical gap, the DigiCulture mobile application was developed. Conceived as a holistic digital intervention powered by a dedicated cultural information system, DigiCulture is designed to preserve, promote, and revitalise the distinct heritage of the four major socio-cultural regions of Ogun State: Remo, Ijebu, Yewa, and Egba. By integrating systematic documentation, global dissemination, a collaborative stakeholder model, and a gamified quiz framework into a singular mobile ecosystem, the application aims to safeguard the state's cultural legacy, ensuring it is not only preserved for posterity but also actively woven into the digital fabric of the modern world.

Materials And Methods

Planning

With the understanding that culture is a continuous variable, the development process of this system settled on the use of an Agile Methodology to access real-time feedback from custodians of the culture and the general public on each segment of the development process [18,19]. A period of six months was allocated to the entire development process, which included five major phases.

The first phase was Requirement Gathering and Analysis through an Ethnographic Survey due to the regionality of the dialects [20], as well as data collection to understand existing processes in the cultural preservation segment and to propose a better outlet for this information.

The second phase was System or Unified Modelling Language (UML) Design to understand the different actors and the different states within the system. This also helps to understand the sections within the app and the access different user types have.

The third phase was User Interface/User Experience (UI/UX) Design, which entails Low-Fidelity Wireframes to provide and review the skeletal mockup of the application before proceeding to the High-Fidelity Design, which includes the colours, fonts, and everything that makes up an interactive and presentable output to the users. This phase concluded with prototyping, which showed how the interaction with the app makes it easier for the users to use without friction, ranging from navigation to state management.

The next step was the development of the application, which included database management, content management, and the development of an Android app for users to interact with the system based on the UI/UX design. Finally, the last step was to test and ensure that all the requirements are met before deployment. A cogent part of the planning was selecting several infrastructures that ensure the immutability of the data the app gathers and presents, marking the definitive deployment stage depicted in Figure *1*.

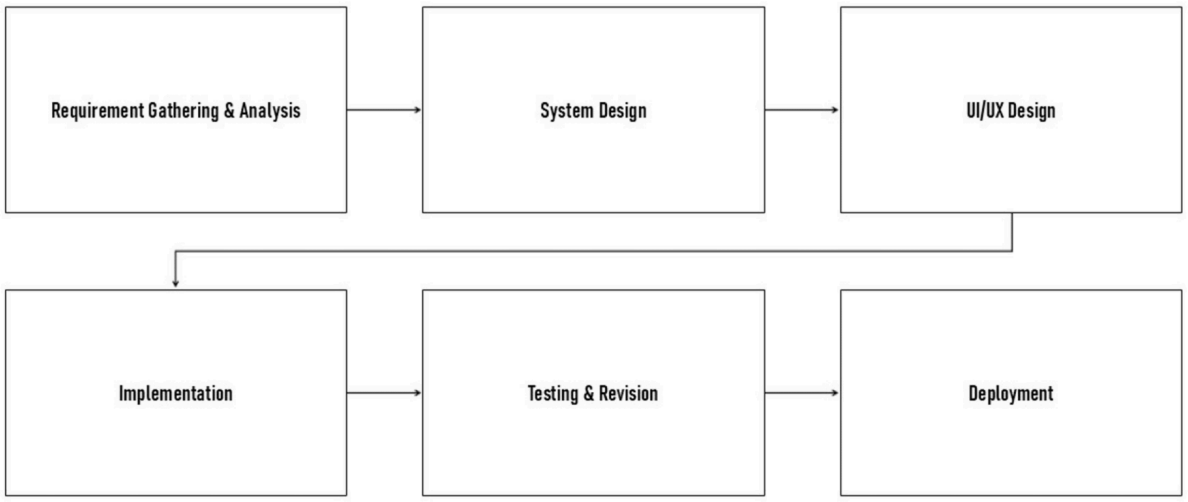

FIGURE 1: DigiCulture Software Development Workflow Diagram

Requirement gathering and analysis

As highlighted in the planning phase, certain things needed to be considered before settling on the database schema and the app functionalities, and a few steps were taken to achieve this.

First, an ethnographic study was conducted by attending cogent festivals and activities in select areas within the scope of study, immersing the team of experts in the culture of the people in those areas. This was capped with a meeting with the Council of Obas, a scheduled meeting that took place with monarchs from the four different regions in Ogun State. With firsthand information from the people as well as the monarchs representing them, they made certain requests that

informed the key concepts of this system. First, they sought a means of cultural preservation through the nation's educational curriculum; second, they mentioned the preservation of certain events within their locality; third, they highlighted the dynamics of the culture and how easy it would be to make sure that no information is lost. This informed the modularisation of the app's functionality into three major sections: Exploration, Events, and Quizzes.

Secondly, given the interdisciplinary nature of DH as the core framework for this system, two distinct departments from the Federal University of Agriculture, Abeokuta were engaged to capture complementary perspectives. The Computer Science (CSC) department was tasked with identifying the structural requirements of the information system, while the Hospitality and Tourism Management (HTM) department evaluated and validated the authentic representation of cultural elements.

The CSC department outlined field entries structured by title, region, category (tag), and text content. Concurrently, the HTM department compiled thematic topics alongside comprehensive descriptive drafts. These dual data streams were extracted from existing archives and consolidated into a unified corpus of 119 verified intersecting data points, with a sample shown in Table *1* [21].

Title	Region	Tag	Text
adalu	ijebu	food	prepare the beans: pick out de...
lisabi festival	egba	festival	a celebration of egba heritage...
bolojo	yewa	music	bọ̀lọ̀jọ̀ is an african dancin...
ebiripo	remo	food	cocoyam is grated and mixed wi...

TABLE 1: CSC-HTM Aggregated Dataset (Sample)

CSC-HTM, Computer Science-Hospitality and Tourism Management

The point of intersection between the topics catalogued by the HTM department and the raw textual contents gathered by the CSC department validated the system's feasibility for effectively capturing cultural data. Furthermore, analysing and aggregating the categories identified in a revised standalone CSC record established a clear 270-row taxonomy for data storage and indexing, essential for optimising efficient retrieval within the final information system. The complete schema is outlined in Table *2* and extended in Table *3* with corresponding serial numbers (S/N) to provide a comprehensive picture of the sample data.

S/N	Region	LGA	Town/Wards	Food	Clothing	Dance	Religion

1	EGBA	Odeda	Odeda	pounded yam, lafun, gari, efo riro, assorted soups with smoked fish/goat.	Aso-oke, agbada (men), iro & buba and gele (women); modern clothing day-to-day.	Egbe (age-grade) style parades for major events	Christianity, Islam, and African Traditional religion
2	EGBA	Odeda	Osiele	yam, cassava (gari), stews and soups typical of southern Ogun towns.	(Aso-oke/Ankara) for weddings/funerals; Western clothes for daily life.	community drum ensembles, funeral and wedding dances.	Christianity, Islam, and African Traditional religion
3	EGBA	Odeda	Oluga	agrarian diet (yams, cassava, vegetables) — many households eat farm-produced staples.	Yoruba ceremonial attire is used for important social rites; everyday modern clothing otherwise.	community festivals and ceremonies feature local drum dances;	Christianity, Islam, and African Traditional religion
4	EGBA	Odeda	Olugbo	typical rural Yoruba staples (yam, lafun, soups)	Aso-oke/iro & buba at ceremonies; modern wear daily.	standard local drum dances and age-grade performances	Christianity, Islam, and African Traditional religion

TABLE 2: CSC Keywords and Geospatial Dataset (Sample)

CSC, Computer Science

S/N	Festivals	Music/Instruments/Performing Arts	Language	Dialect	GIS Location	Leadership

1	local town/farm harvest days and participation in broader regional festivals (Odeda Day)	talking drum, bata, sekere, local praise-singing; recorded Yoruba popular music.	Yoruba	Egba	7°13′N, 3°31′E	Oba, Chiefs
2	local town days, harvest gatherings; ties into Egba cultural calendar	talk/drum ensembles and recorded Yoruba music commonly played at events.	Yoruba	Egba	7°13′N, 3°31′E	Oba, Baale
3	local kingdom/town events (e.g., Oluga kingdom day).	local drumming, praise singers; modern recorded Yoruba music at social events	Yoruba	Egba	7°13′N, 3°31′E	Oba
4	local observances and participation in regional Egba festivities	talking drum, bata and vocal praise tradition.	Yoruba	Egba	7°13′N, 3°31′E	Olu, Oba

TABLE 3: CSC Keywords and Geospatial Dataset (Sample) - Extension

CSC, Computer Science

The categories were further compared with the existing studies, which confirmed the viability of a select few under the premise of cultural heritage [22]. Among the selected and final categories of Festival, Food, Music, Language, Cultivation, Trade, Dress, and Handicraft, the Language category stood out by highlighting the possibilities of combining some other categories under the language umbrella, including folklore, naming conventions and history, among others, which has been confirmed to point to the same topic under language, giving the data being stored better cohesion [22]. A case could also be made for grouping Cultivation or Handicraft under Trade, but not all that is cultivated is exported [23]; likewise, Handicrafts are distinguished from trade in that farm tools made, for instance, are not necessarily exported [24].

Their interconnections are not lost on this system, however; they are viewed from a one-to-many perspective implemented via an embedded array. A single row of information contains an array of categories, rather than forcing the row to fit a strict one-to-one mapping with a single string entry [25].

Thirdly, due to the scarcity of data [8] and regional sparsity of collection points - a spatial challenge reflected in broader Nigerian demographic mapping models [26] and highlighted through the Independent National Electoral Commission (INEC)'s mapping of different regions - an important requirement for this system was to provide open-source crowdsourcing where people can contribute to the library of RIYE elements from their different locations, effectively launching the first step in a robust end-to-end information system. The sparsity of the regions was further confirmed through the spatial visualisation of Ogun State administrative wards in Figure *2*. The map was rendered by the authors using official open-access administrative boundary data compiled by INEC before the 2023 General Elections, and is hosted in a public repository alongside the requirements analysis dataset [21].

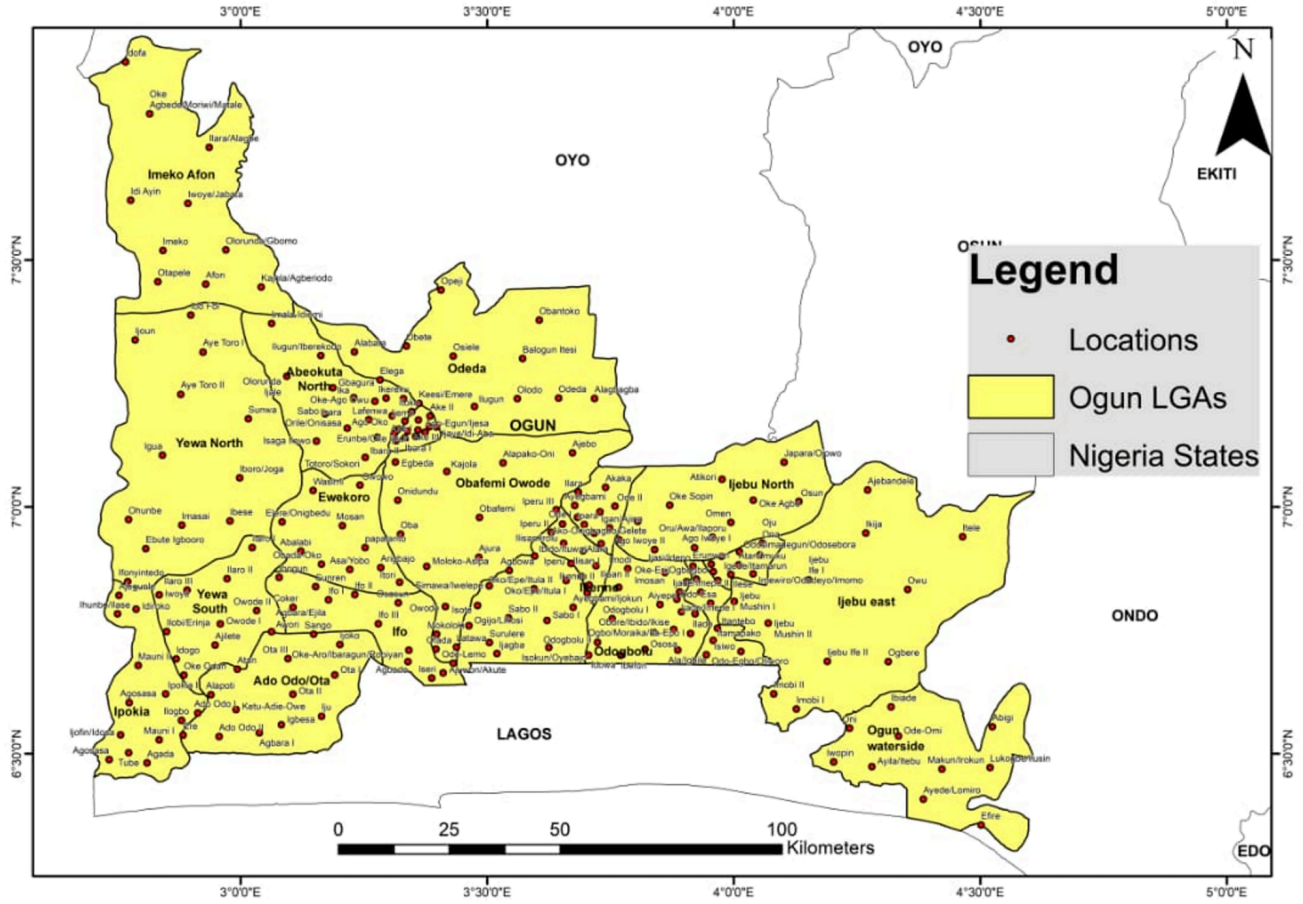

FIGURE 2: Ogun State Wards

Finally, while the crowdsourcing aspect is being considered, people using the app to retrieve information could be exposed to incomplete or misrepresented information. To tackle this issue, the case of zero anonymity has been highlighted as a major requirement to ensure full accountability and to also prevent incessant manipulation of existing information by attributing entries directly to different users [27]. Beyond data accuracy, incorporating secondary sources into crowdsourced repositories introduces complex intellectual property and copyright considerations. To resolve potential infringement while maintaining open research standards, a dual-corpus licensing and data sanitisation framework was instituted:

Data Sanitisation & Licensing: Primary field data gathered directly with domain experts is distributed under the Creative Commons Attribution 4.0 (CC BY 4.0) license. Secondary exploratory texts are governed by Creative Commons Attribution-NonCommercial 4.0 (CC BY-NC 4.0), with all third-party media links purged before public repository indexing to prevent link rot and copyright violations.

Fair Use & Transformative Implementation: Factual cultural records (regional recipes, festival timelines, dialect taxonomies) constitute non-copyrightable domain facts. The gamified quiz engine synthesises these factual inputs into original assessment logic, representing a transformative, non-commercial educational implementation under fair use provisions.

Architectural Separation: To ensure platform self-sustainability without compromising open science ethics, a strict firewall separates the non-commercial Heritage Engine from prospective commercial modules. Commercial features rely exclusively on organiser-submitted assets governed by explicit opt-in Terms of Service.

Design and implementation

Due to the flexible nature of the agile methodology, the development process adopted in this system combines the Design and Implementation phases into iterative feature-driven loops rather than rigid, sequential software development lifecycle (SDLC) stages [28]. As highlighted in the planning phase, this current phase includes the Low-Fi, High-Fi, Database/UML Design, as well as Prototyping & Development. Since every process is intertwined, the design and implementation are best addressed by the sections highlighted in the requirement gathering phase: Exploration, Events, and Quizzes, alongside User Management and a Personalised Home Page.

Exploration

This section provides insight into different cultural elements, where users can create, retrieve, and update this information and is visualised in Figure *3*.

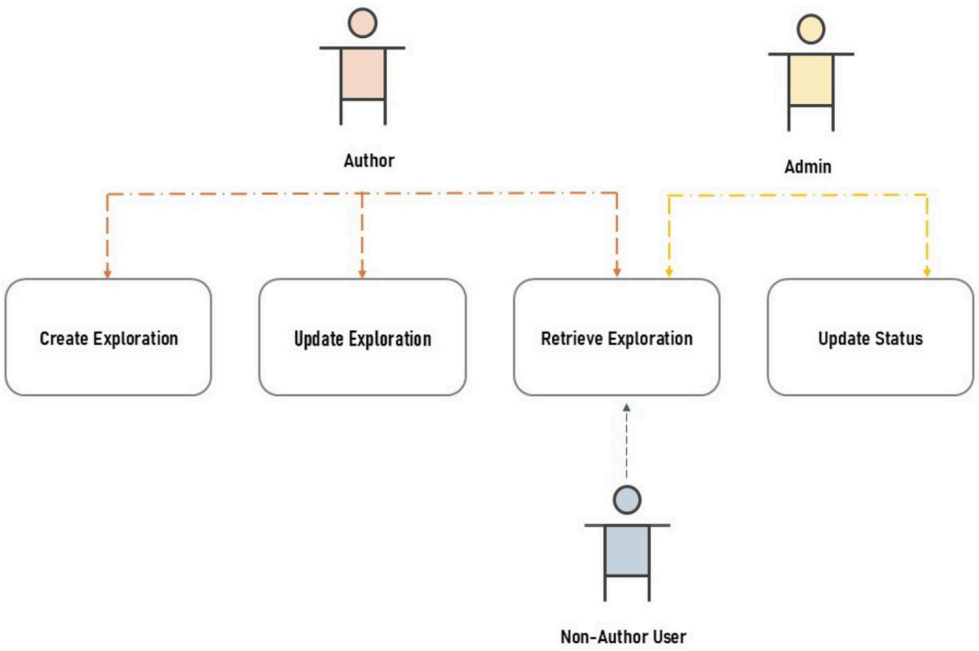

FIGURE 3: Exploration Section - Use Case Diagram

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The data collected and presented in this phase matches the data collected by the CSC and HTM groups in the requirement gathering phase, including Exploration Title, Region, Categories (because certain cultural elements could span across different categories), Cover Image (for visual identification), Media (which includes Audio, Video, and Images), and Text Content (which is important for people to read about the topic even in the absence of media files).

The text content was restricted to 750 characters to ensure readability through a mixture of brevity and fullness, an oxymoron that also ensures the size of the text is below 1 KB, making it easier for the database to index and search through promptly [29]. The audio and video are uploaded directly from the device storage, while images are given the option to be uploaded via an instant camera shot or from the gallery. The difference in approach lies in the typical editing process certain videos or audio require before being published, necessitating the delegation of the editing process to the personal device of the users before uploading the media.

An automatic compression of 75% was applied to the audio and images across the board, including the cover image, while videos with a size of over 5 MB were compressed to a low quality. These steps were taken to ensure that the files being uploaded by the users do not exceed a combined maximum of 30 MB and a count of six media files in total, to keep each file under 5 MB. The media section shows these restrictions to help guide the users on the upload process and is collapsible for users to put the section in their purview rather than getting overwhelmed with information, especially on a mobile device. Figure *4* captures the different states the system passes through for a successful media upload.

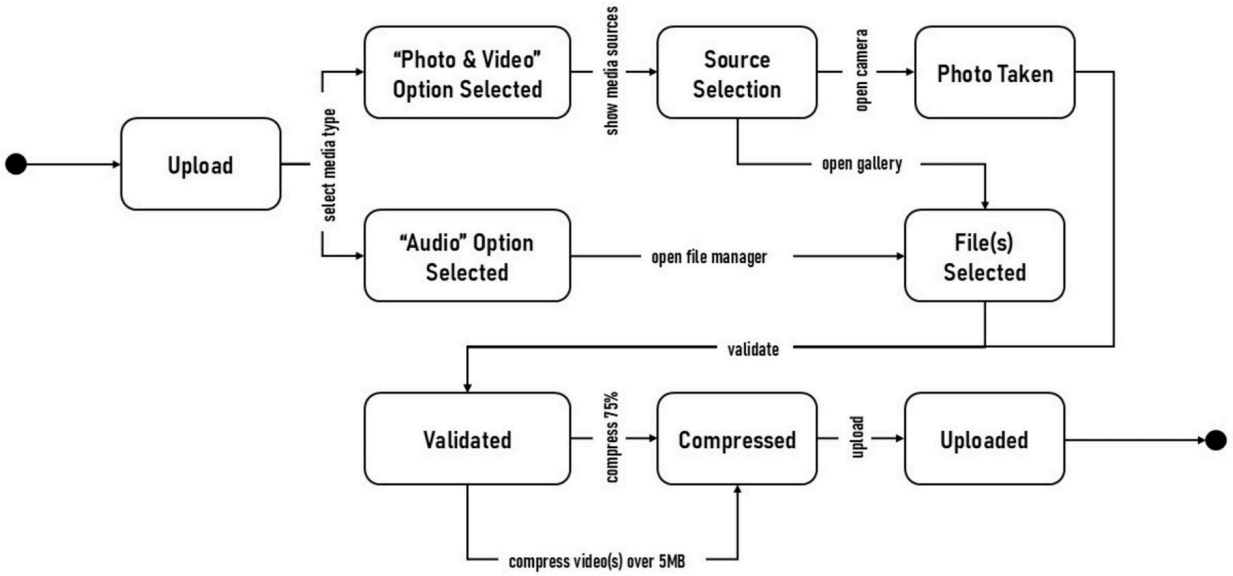

FIGURE 4: Media Upload - State Machine Diagram

The exploration title, categories, region, and cover image are housed within the same metadata box, with the categories appearing at the top right for users to tap and edit, followed by the region at the bottom left, and an editable Exploration title directly below the region selection. Within this box, the space to add a cover image exists in the background to efficiently maximise screen real estate. There is a call to action in the form of an add button that invites the user to tap it, bringing up a modal bottom sheet prompting the user to take a picture as a cover image or upload one from the gallery. Once added, it stays in the background with a white overlay of 10% to make the text above visible but still ensure that the users can see that the selected image has been added to their exploration.

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Another consideration made was to exclude the semantics of the foreground elements from that of the cover image, ensuring that regardless of what is tapped, the functionalities do not interfere. This also makes it possible for users to tap the regions on the box that do not contain text and change the image assigned to the exploration as visualised in Figure *5*.

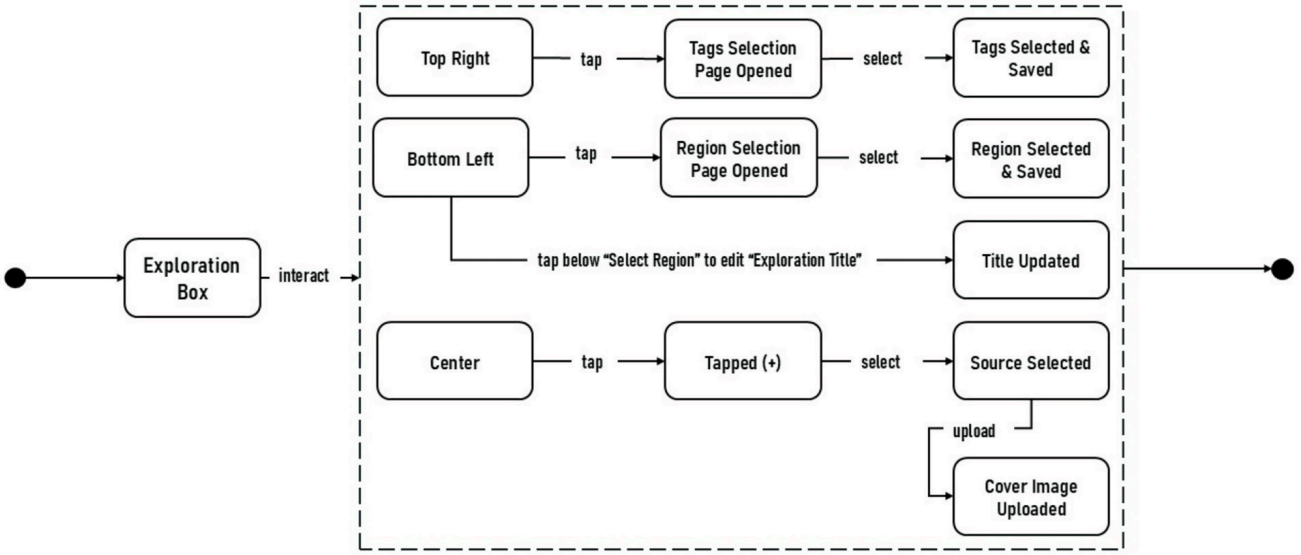

FIGURE 5: Exploration Metadata Box - State Machine Diagram

A distinction exists between the textual presentation on the metadata box for the creation page and the view of the exploration: on the creation page, the text is black and the background is whitish, while on the view page, the text is white and the background consists of a black gradient to make sure that the background cover image is clear enough without compromising the readability of the foreground text in the case of an exceptionally bright cover image. Finally, the field for entering the textual content is an ample space, giving users creative freedom within the limit of 750 characters as shown in Figure *6*. This limit is actively signalled to the user through a counter at the bottom of the field.

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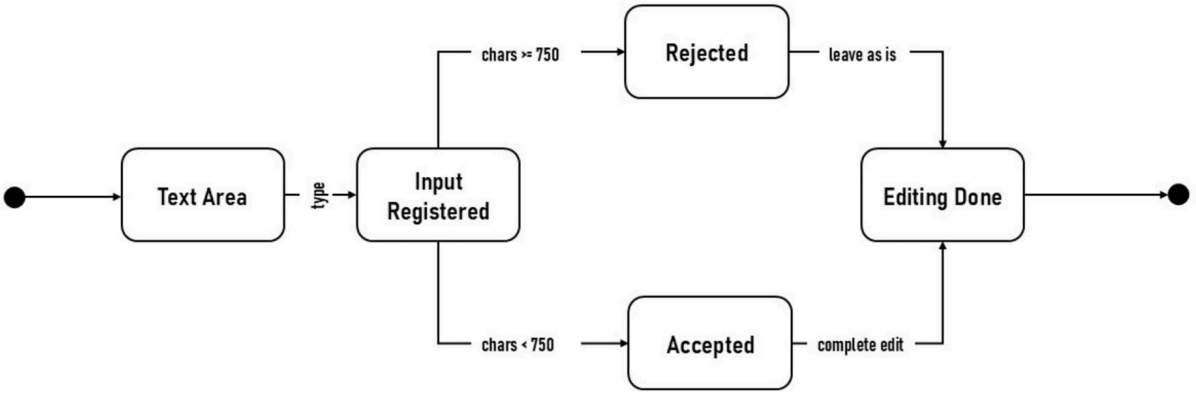

FIGURE 6: Text Area - State Machine Diagram

When exploration drafts lack the required cover image, the first image in the media section is selected. If no image media exists, it checks the video within the media section and generates a thumbnail from the video as the cover image. Figure *7* captures the three different outcomes for this operation.

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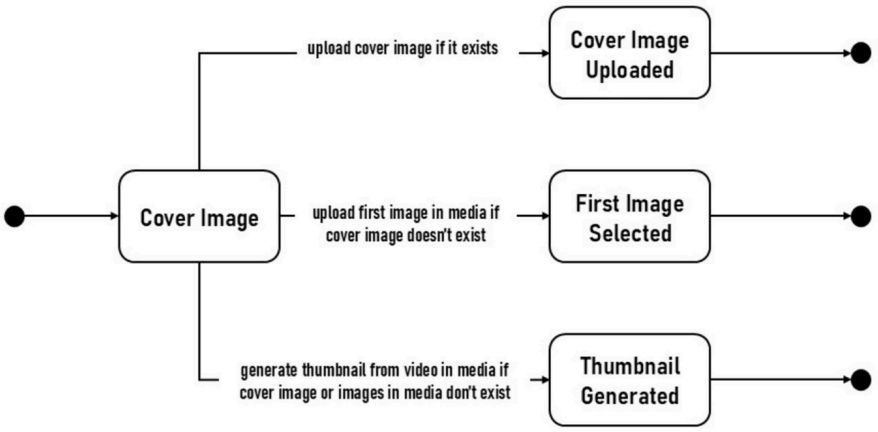

FIGURE 7: Cover Image (Pre-Save) - State Machine Diagram

While explorations can be created and fetched at random, users can streamline the information they pull with filters. The first type of filter is on the home page, where tapping a category leads users to the exploration page as shown in Figure *8*, with a list of information from that single category.

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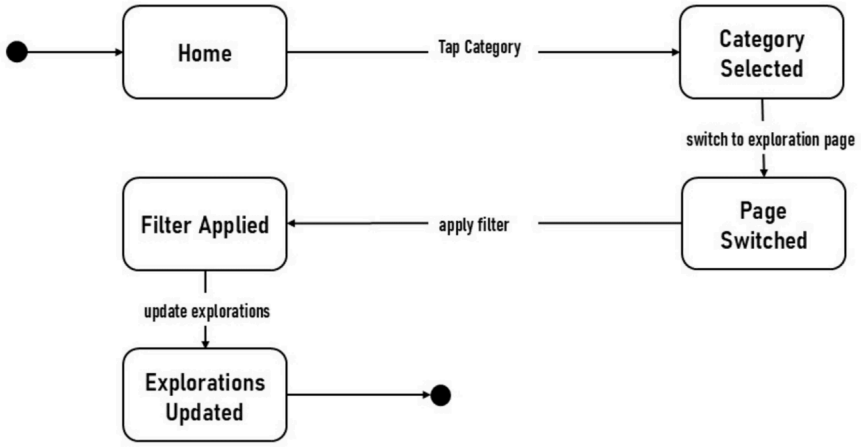

FIGURE 8: Homepage Category Filters - State Machine Diagram

An alternative approach mapped out in Figure *9* involves tapping the icon beside the search bar, which opens a filter page split into two tabs: one for filtering by a single RIYE region and the other for selecting a category, with buttons to cancel or apply changes intentionally.

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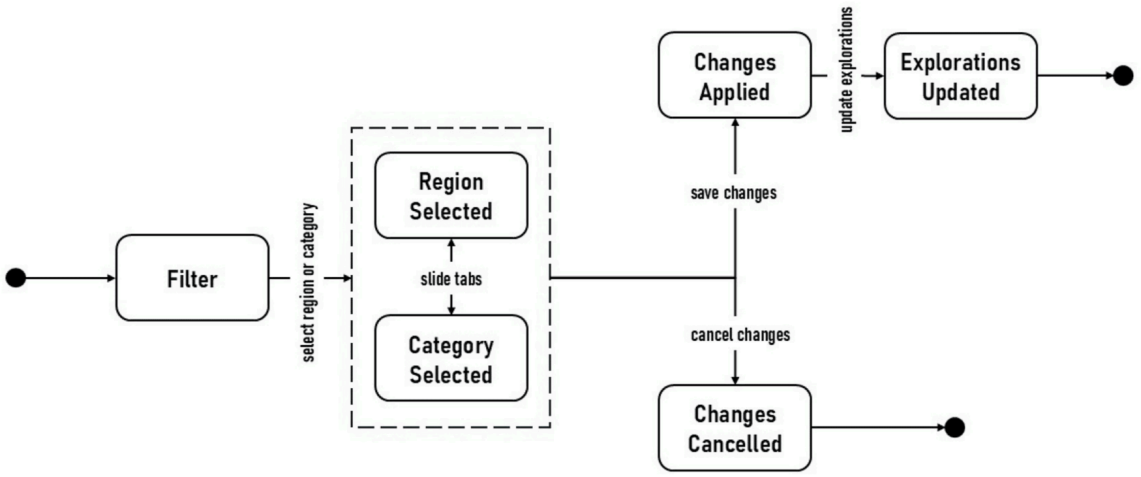

FIGURE 9: Exploration Filter - State Machine Diagram

To indicate active filters, the filter icon features a badge showing the number of selected filters. Additionally, a search bar is available on the home screen and the exploration page to address situations where filters might be too restrictive, following the flow in Figure *10*. The search trims the query by removing leading and trailing whitespace, splitting multi-word queries with spaces, and traversing the database with matched patterns for each extracted word in the region, category, exploration title, or body.

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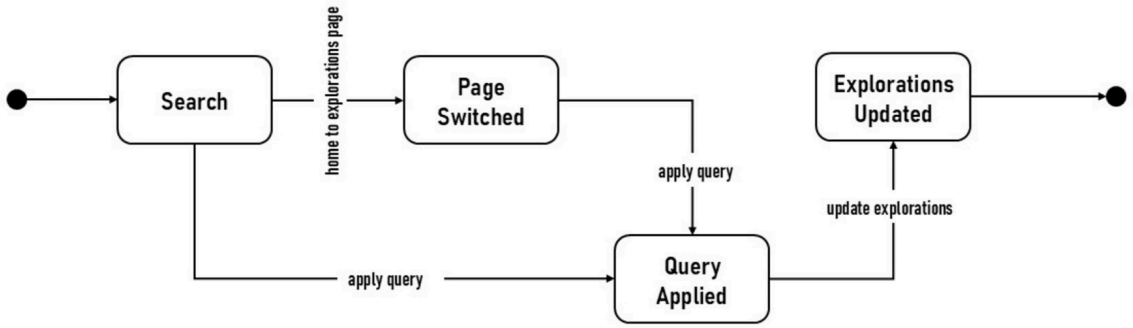

FIGURE 10: Exploration Search - State Machine Diagram

Events

To capture happenings around a certain region, often geared towards promoting the culture, the system entails a means of registering events on the app to create awareness, with Figure *11* providing insight into the use cases within this section.

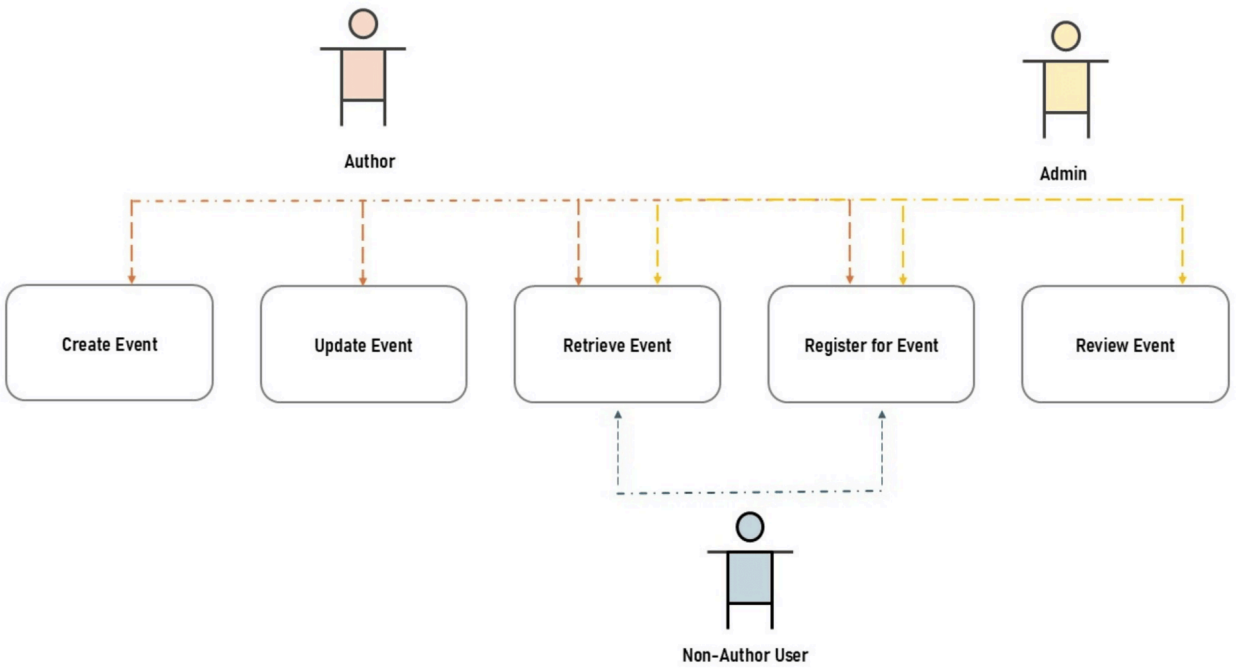

FIGURE 11: Events Section - Use Case Diagram

The structure for this section draws certain inspirations from the Exploration section with the inclusion of an Event Title, Cover Image, and Description. The difference lies in the fact that there is no other media apart from the cover image, as it is expected that for an event to exist, an exploration exists independently, giving full media details to the event.

Events also share categories with explorations, but instead of allowing multiple categories, selection is restricted to a single category to ensure accurate cataloguing and to disabuse the minds of people who might be tempted to select 'Festival' in addition to what they select. This is to build an understanding of events as not being restricted to Festivals alone, especially in a cultural setting [30].

Events feature a specific location, time, and date, which are reflected in the design of this module via a custom-built calendar. To preserve the customisation of the calendar when changing the month or year without pop-ups, vertical drag detection was applied to the month and year, respectively, to go to the previous or next month or year, as outlined in Figure *12*. Accidental swipes were mitigated by applying a differential threshold to the drag velocity (distance and duration) as well as subtle haptic feedback to ensure intentional actions and trackability for the users.

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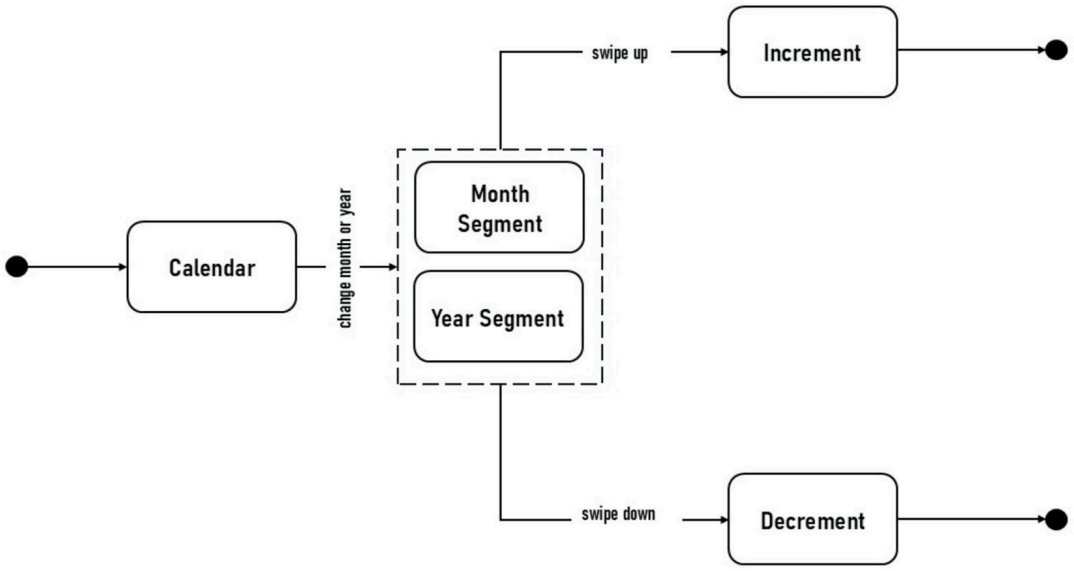

FIGURE 12: Calendar - State Machine Diagram

Besides creating an event, users can also view events by simply selecting a date on the calendar, and they are presented with a list of events for that day. They can then proceed to get more insight into a particular event they are interested in and ultimately register for the event to add it to their list of upcoming events as the date approaches. It involves a step-by-step approach visualised in Figure *13*.

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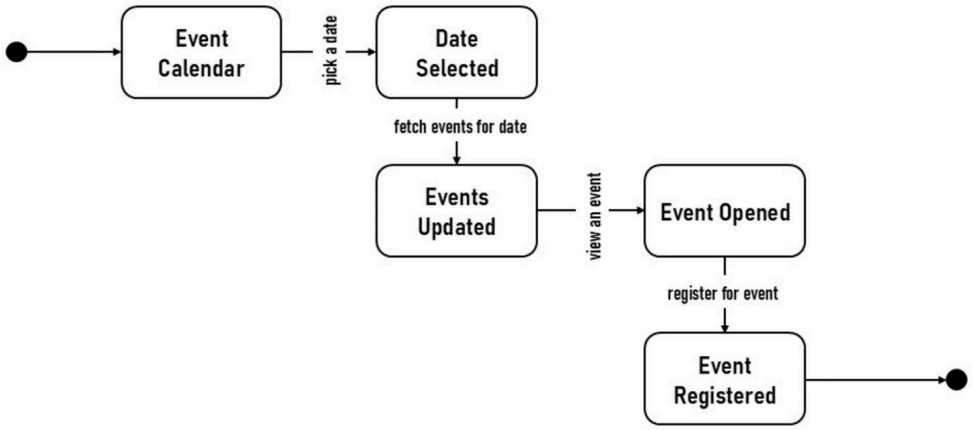

FIGURE 13: Events Retrieval and Registration - State Machine Diagram

Quizzes

While incorporating the system functionalities into the educational curriculum is a nuanced process due to the state's multiculturalism [31,32], a gamified segment was integrated where users can test their knowledge and track user experience (XP) as a reward, with an overview of the section laid out in Figure *14*.

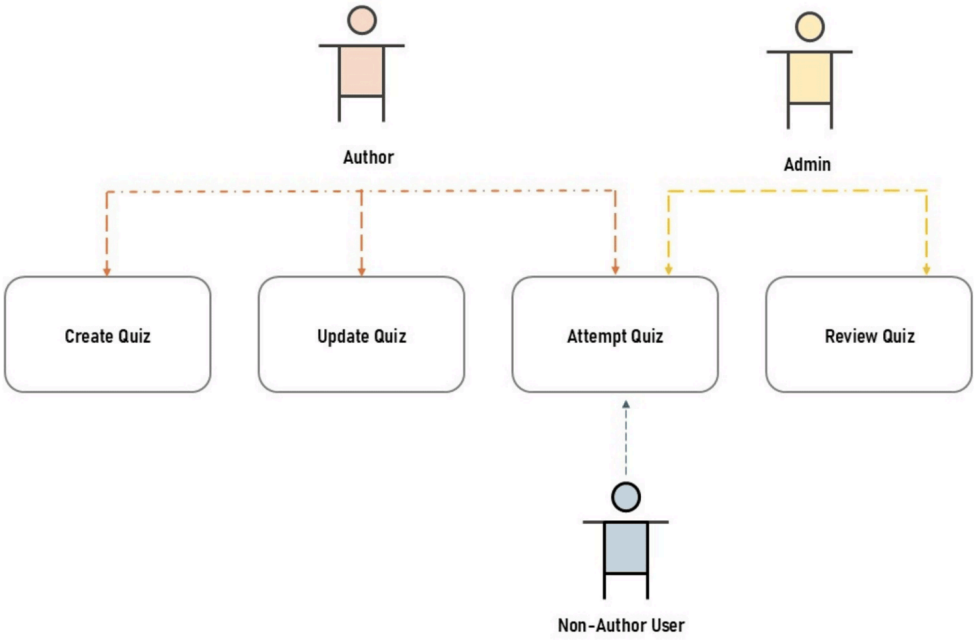

FIGURE 14: Quiz Section - Use Case Diagram

To make this segment immersive and appealing to younger generations, buttons were designed with an elevated, play-induced look, applying a less opaque white background on a fully opaque primary colour (like red and green) to create a shadowy effect resembling a physical button. Within the quiz session, users can see their remaining questions, working towards a definitive goal through multiple-choice questions. Once an option is tapped, the selection is marked green if right, or red if wrong, with the correct answer instantly marked green for on-the-go learning. After answering, a 'Next' button appears, giving users a pause before continuing. The entire process of attempting a quiz session is illustrated in Figure *15*.

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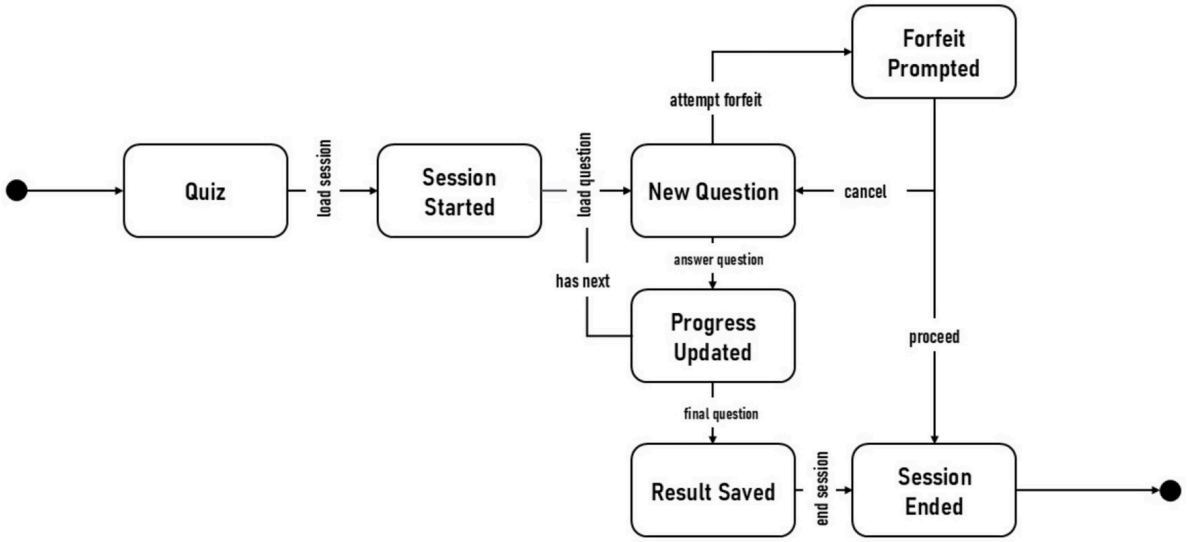

FIGURE 15: Quiz Attempt - State Machine Diagram

Attempting quizzes means that quizzes have to exist in the system. To this end, users are encouraged to author new quizzes by filling in a title, the question, options, and the correct answers. Options are added via a checkmark suffix, and authors can add or delete multiple questions by interacting with expandable indexed cards. Once completed, quizzes are saved in bulk by clicking 'Publish' to avoid pinging the server for every individual edit, resulting in a final status of 'Published' as highlighted in Figure *16*.

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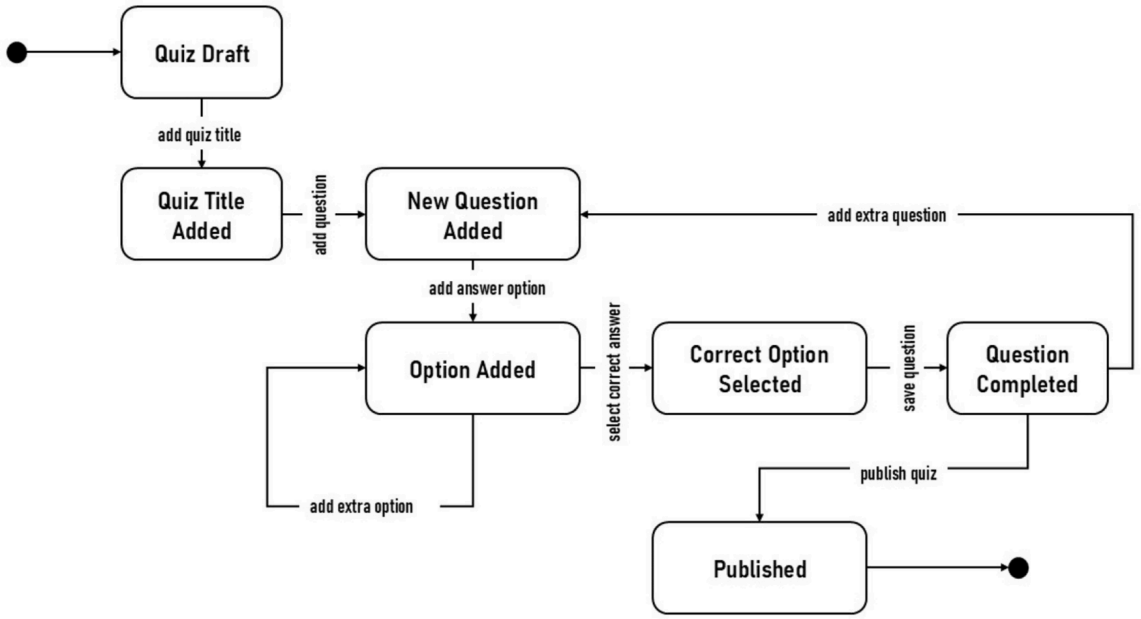

FIGURE 16: Quiz Draft - State Machine Diagram

User management

While contributions are open to the general public, the principle of zero anonymity attributes application actions to specific users for accountability and personalisation. Authentication is provided during onboarding through Email Sign Up or Google Sign In. The email sign-up consists of two pages logically grouped by semantics: the first for email and full name, and the second for a unique, customisable username and a password field equipped with a visibility toggle to allow users to verify the entry implicitly.

First-time email users are then prompted once to select their regions and categories of interest. For users signing in with Google, an account is created with an auto-generated username. Unlike email registration, the freshness of an account that uses Google Sign In could not be actively tracked. A solution was implemented to check if the account's creation time was within 5 seconds from the current time; if so, the interest screen is displayed. Users who bypass this can manually update their interests in the settings later. This, among other things that make up the user onboarding process, is shown in Figure *17*.

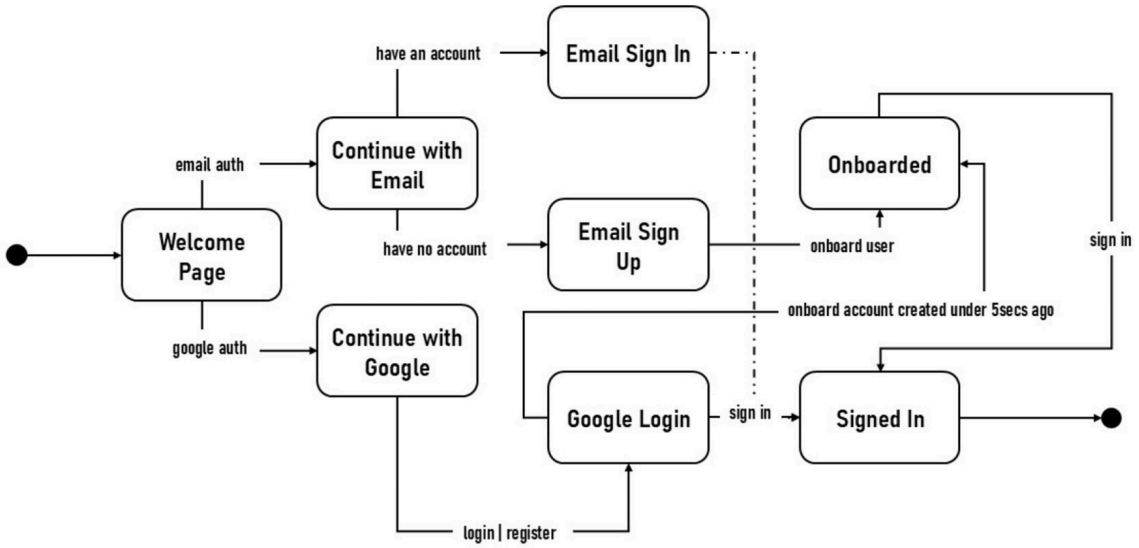

FIGURE 17: User Onboarding - State Machine Diagram

The personalised home page displays a maximum of five upcoming events tied to user interests, a search bar, top five exploration recommendations, and category filters. Implicitly, the system grants role-based access control for content moderation. All users can contribute and view all entries, but entries are initially marked as pending and are subject to an admin review as post-publish moderation.

Admins are separated per region to prevent cross-regional interference. Each region is assigned multiple admins to prevent moderation bottlenecks if an individual admin becomes inactive. To maintain strict accountability, admins can only update the exploration status; any changes to the actual content must be executed solely by the original author.

Settings

The settings aspect helps users actively maintain their standing within the system. The initial page includes the owner's corner (profile picture, name, email), and tiles for contributions, support, password changes, and logging out.

Profile: Users can view and edit their profile, including updating their profile picture via the camera or gallery, and adjusting their categories and regions of interest. State changes are saved locally while being made and pushed in bulk via a 'Save Changes' button to prevent exhausting server queries. The nested nature of the profile management is shown in Figure *18*.

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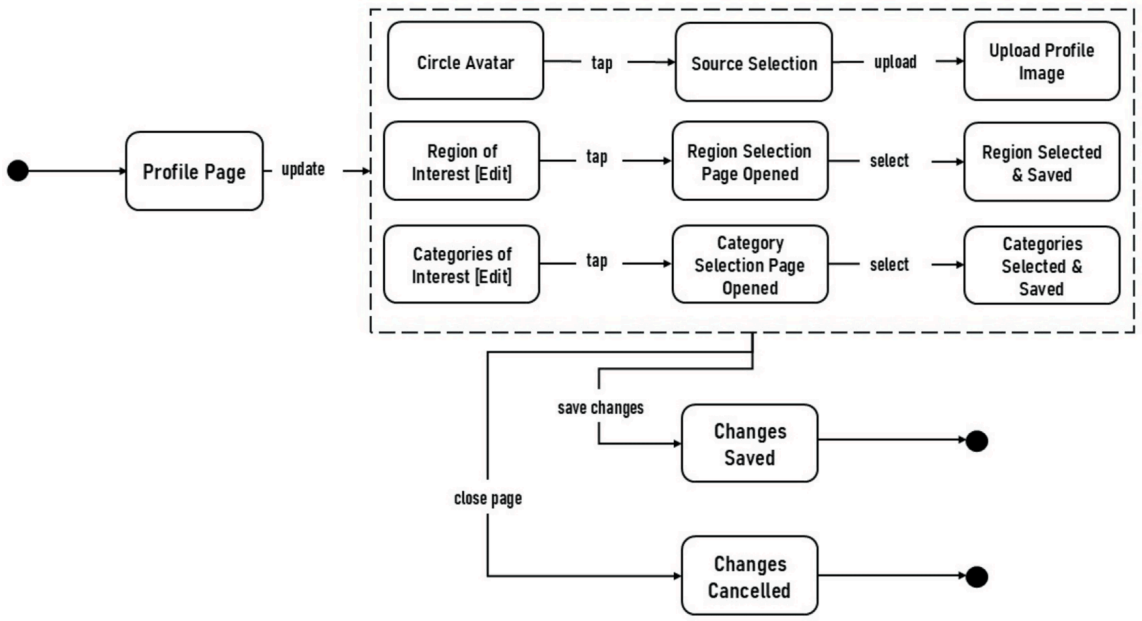

FIGURE 18: Profile Update - State Machine Diagram

My Contributions: Users can view their created explorations, events, and quizzes, partitioned by tabs in descending order of update time. Editing a contribution utilises the same interface as its creation, but sends the entry back to a PENDING status. Users can also create new contributions directly from this screen depending on the active tab.

Support: A support page is included where the name and email fields are pre-populated using the user's identity. Because single quotes could affect the encoding of the JSON support request body being sent by email, an escape character (\) was applied before occurrences of single quotes to format the request as intended. This provision is in place for readers and authors alike to escalate issues in the application or suggest improvements to the system.

Change Password: When an admin account is transferred, this section balances ease with security by requiring the old password alongside the new password. However, the feature is not restricted to admins alone; all app users can change their passwords. The fields utilise the same toggle visibility feature as the registration process, negating the need for duplicate confirmation fields.

Log Out: This clears the user's session entirely, requiring a fresh login upon return.

General overview

Certain principles were applied across the board for a better user experience, most notably state management. Explorations, events, and quizzes are fetched once from the server and stored in the app's memory. For the homepage, all information fetching is done concurrently using Dart's (Flutter's base programming language) '*Future.wait*', ensuring users get an instant view of all upcoming events and recommendations.

To optimise resources and loading speeds for images fetched via a Content Delivery Network (CDN), a cache was implemented to store images in memory after the initial load, meaning that the system does not continually pull from the network every time the state changes as users scroll or open a new page.

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Furthermore, a 'pull-down-to-refresh' mechanism was implemented on every list-based page (home, explorations, events, quizzes) to fetch fresh data from the server without requiring an app restart. On the exploration page, data pulls are limited to 15 entries per request with no infinite scroll, establishing a structured, bounded consumption session that encourages mindful engagement before a user manually requests new content via a *pull-down-to-refresh* mechanism.

Design system

While the functional makeup has been addressed, other design elements bring the system to life.

Spacing: Visual hierarchy is defined through specific spacing metrics in units of pixels (px): 2px to 4px separates text from related icons; 8px spaces related elements vertically (e.g., label and text field); 12px separates prefix/suffix icons; 16px is the standard horizontal and vertical padding applied across every screen; 20px to 24px separates images from text in empty states; 32px creates standalone boundaries around empty states; and 40px to 48px is used for composite nested elements.

Typography: The app utilises the Lora font, a serif typeface evoking the historical architecture and vintage homes of Ogun State with its contrast, utilising Semibold (600), Medium (500), and Regular (400) weights. Font sizes span Headings (1-6), Body (Large, Small, Extra Small), and Caption (Large, Small).

Colours: The primary colour is red, symbolising the energetic feel of the Yoruba 'Ata' and Sango regalia, utilised for primary buttons, tabs, and error indicators. The secondary colour is green, representing native plants like *jute* leaf (Ewedu), used to indicate success and active categories. The accent colour is yellow, matching the RIYE mascot introduced in 2005 ahead of the 2006 Gateway Games by the state governor, Otunba Gbenga Daniel, under the President Olusegun Obasanjo administration. The yellow colour is mixed with white to create an off-white, low-strain background. Dark grey replaces stark black text to reduce eye strain over the off-white background, while lighter greys are utilised for subtext and placeholders.

Reusable Components: Implementing the Don't Repeat Yourself (DRY) principle via a Model-View-ViewModel (MVVM) architecture, a Singleton instance handles dependency injection across the active application lifecycle for persistent logic. Reusable View components, such as the Exploration Card, Event Card, and Category structures, adapt dynamically to different parameters across multiple screens without code restructuring. The ViewModel ensures that components like 'Categories of Interest' function seamlessly, reflecting their respective parameters whether applied for filtering data, creating a contribution, or updating a user profile [33,34].

Results And Discussion

Development and deployment setup

The realisation of the DigiCulture platform required a robust, modern technology stack tailored to the multi-modal and crowdsourced demands of DH research. The development and deployment infrastructure was strategically selected to balance rapid prototyping, data flexibility, cross-platform scalability, and high-speed media delivery.

The visual and structural prototyping of the application was executed using Figma, allowing for the iterative development of low-fidelity wireframes, high-fidelity layouts, and interactive prototypes that shaped the exploration, event, and quiz modules [35,36].

The mobile application was developed in Flutter for the Android operating system via the Google Play Store; Flutter's cross-platform reactive framework ensures that the codebase maintains architectural parity, making future pivots or expansions to iOS seamless.

Server-side logic was built using Node.js, providing a scalable, asynchronous runtime environment capable of handling concurrent client requests, authentication workflows, and administrative role-based access controls. To ensure containerisation and seamless cloud scalability, the backend was containerised using Docker and deployed to Google Cloud Platform.

For data persistence, MongoDB was selected over traditional SQL alternatives because its schema-less, document-oriented structure offers the necessary flexibility. This flexibility helps store complex, nested cultural 'documents', such as multi-categorical arrays and variable text-media pairings, without rigid relational constraints [37]. To manage heavy multi-modal media assets, Cloudinary was integrated as a CDN.

The design, implementation, and deployment of the DigiCulture platform yield significant insights into the intersection of DH, Human-Computer Interaction (HCI), and Information Systems (IS). By translating abstract cultural concepts into a structured, highly interactive mobile ecosystem, this research demonstrates that cultural preservation requires more than passive digitisation; it necessitates a socio-technical framework optimised for user cognition, system scalability, and data integrity. The outcomes of this system are discussed subsequently, mapping specific architectural and design choices to foundational HCI and IS principles to highlight the study's significance.

Qualitative evaluation and agile refinement

The deployment and iterative testing of the DigiCulture platform provided critical insights that directly refined the SDLC, demonstrating how continuous user feedback reshaped the agile implementation loop. During the initial deployment phases, closed beta testing on the Google Play Store with 12 designated internal testers over a mandatory 14-day evaluation window revealed operational friction points that necessitated immediate architectural adjustments.

For instance, initial testing of the media upload workflow highlighted that unrestricted file sizes and uncompressed multi-modal uploads severely degraded application performance on resource-constrained mobile devices and variable local networks. This performance limitation directly informed the final agile requirement to integrate an automated 75% compression protocol for images and audio, along with strict payload ceilings, to ensure optimal performance without sacrificing media quality.

Similarly, testing of the calendar interface under typical usage conditions revealed that standard drag actions led to accidental user inputs. This feedback loop drove the implementation of a refined differential threshold for drag velocity paired with subtle haptic feedback, bridging the gap between theoretical UI design and practical user ergonomics.

Furthermore, testing the Google Sign-In authentication flow exposed a tracking gap regarding account freshness and initial interest selection. Observations during user testing led to the implementation of a time-threshold verification check (under 5 seconds after account creation) to dynamically trigger the onboarding interest prompt, demonstrating that real-time testing is vital for maintaining personalisation algorithms in crowdsourced architectures. Through these iterative cycles, testing transformed the agile process from a linear sequence into a responsive, feedback-driven review loop that continuously aligned software behaviour with regional user realities.

Integrating information systems for cultural data resilience

From an IS perspective, the primary challenge of cultural preservation is managing multi-modal data (text, image, audio, video) while ensuring data provenance and system efficiency. The decision to enforce strict constraints such as capping text content at 750 characters, applying 75% automatic compression to audio and images, and maintaining a 30 MB maximum payload per upload is firmly rooted in IS principles of Database Optimisation and Storage Efficiency [38]. Restricting text size to under 1 KB ensures rapid database indexing and high-speed retrieval, critical for an application intended for areas with potentially varying network bandwidths.

Furthermore, the implementation of a 'Zero Anonymity' policy addresses the IS principle of Information Quality and Data Provenance [39]. In crowdsourced systems, the risk of misinformation or data vandalism is high. By permanently attributing every entry to an authenticated user and employing Role-Based Access Control where contributions are marked as 'pending' until reviewed by region-specific administrators, the system establishes a verifiable chain of custody for cultural artefacts. This maintains the structural rigour expected of historical canons while allowing the database to scale organically.

At the architectural level, adhering to the DRY principle through a MVVM architecture with Singleton dependency injection provides robust System Modularity and Maintainability [40]. Coupled with concurrent data fetching (Future.wait) and aggressive CDN image caching, the system drastically minimises server queries and network latency, proving that heavy cultural repositories can be sustainably managed on mobile architectures.

Human-computer interaction: cognitive ergonomics and error prevention

To ensure the system is accessible to a diverse user base, numerous HCI principles were embedded into the interaction design. The rationale for making the media upload section collapsible was based on Cognitive Load Theory [41], specifically to reduce visual clutter to prevent users from becoming overwhelmed during the data entry process. Figure *19* shows the contrasting effect of the media upload section in different states.

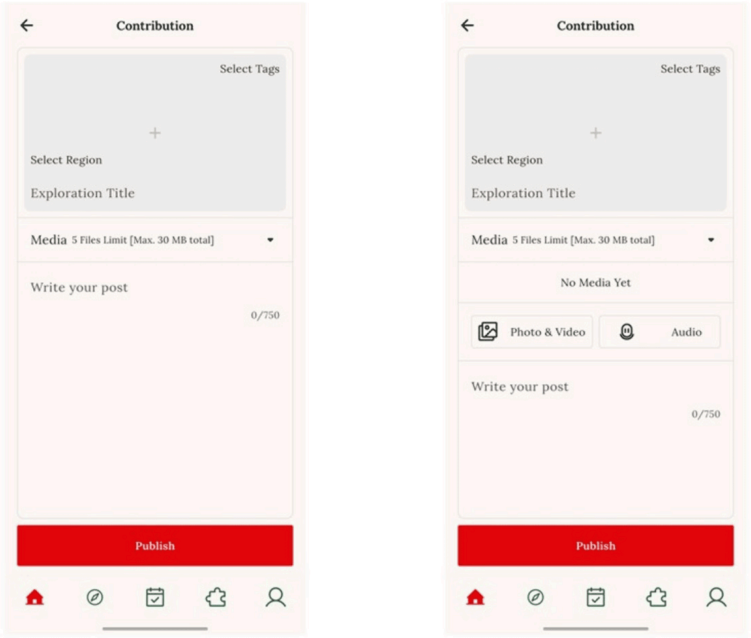

FIGURE 19: Collapsible Media Section - Cognitive Load Theory

Similarly, limiting exploration data pulls to 15 entries per refresh respects Hick's Law and information chunking, giving users a manageable consumption window and preventing cognitive fatigue [42]. Figure *20* emphasises the brevity and reduced cognitive fatigue resulting from adherence to the aforementioned principles.

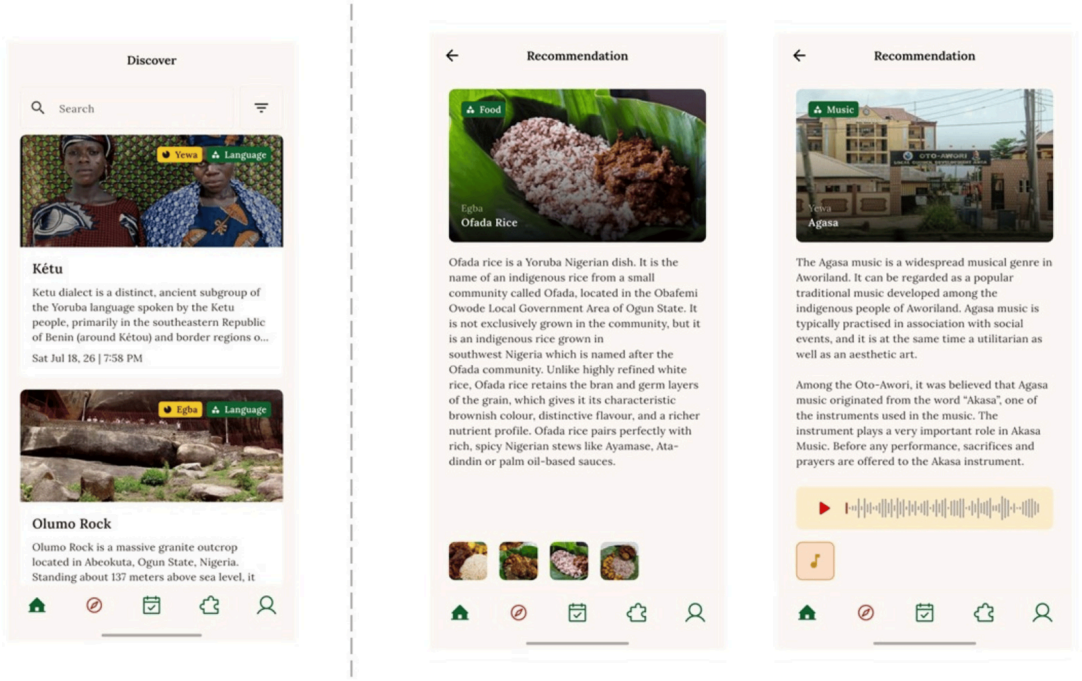

FIGURE 20: Exploration Data - Hick's Law and Information Chunking

The application actively employs the HCI principle of Error Prevention and System Forgiveness. For example, if a user fails to upload a mandatory cover image, the system automatically checks for alternative images or generates a video thumbnail to prevent a submission block. Similarly, replacing the traditional 'confirm password' field with a visibility toggle streamlines interaction efficiency by trusting user verification over redundant data entry. The preview of the first media image at the bottom and its direct comparison to the cover image at the top in Figure *21* show how the system handles these situations. Figure *21* also shows the visible and obscured state of the password field to help users avoid errors.

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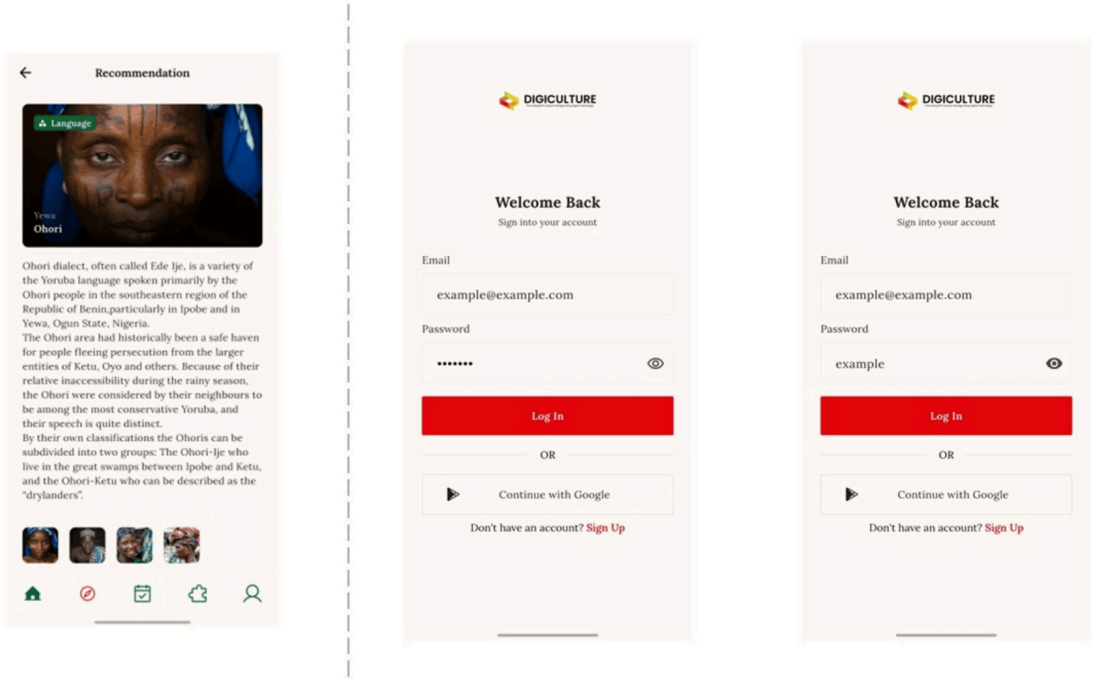

FIGURE 21: Recommendation and Authentication - Error Prevention and System Forgiveness

Navigation mechanics also rely heavily on motor control theories such as Fitts's Law [43]. An example is the custom calendar implementation, which utilises vertical drag detection rather than pop-ups, but introduces a differential threshold for drag velocity and subtle haptic feedback. Overall, these design choices actively mitigate accidental user inputs (slips), ensuring that system navigation feels intentional, predictable, and physically responsive. Besides the gesture detection applied to the calendar shown in Figure *22*, the alert pop-up in the second image also introduces intentionality when closing a contribution draft to re-emphasise the application of the aforementioned theory in mitigating slips.

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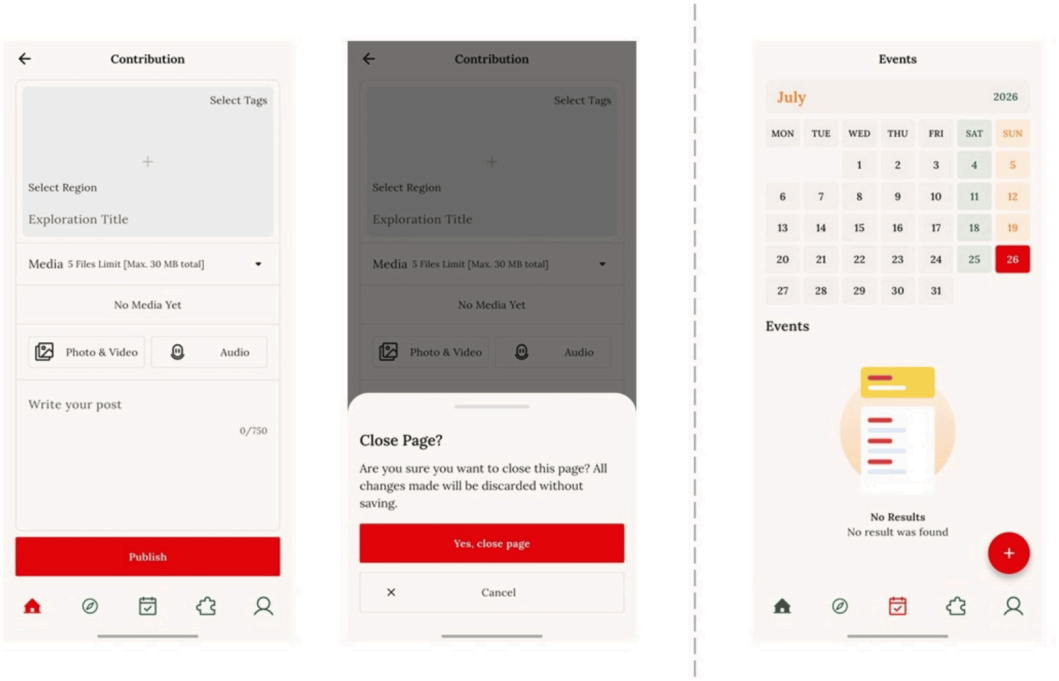

FIGURE 22: Navigation Alert and Custom Calendar - Fitts's Law

Cultural semiotics and aesthetic-usability

A major contribution of this paper is the localisation of the Aesthetic-Usability Effect, which posits that users perceive more aesthetically pleasing designs as easier to use. DigiCulture translates regional history into UI components through Cultural Semiotics [44]. The typographic selection of the Lora font mimics the vintage architectural carvings and woodwork of Ogun State, establishing an immediate visual tone of historical gravity.

Colour psychology is highly localised as highlighted within the design system. By mixing yellow accents with white to create a low-strain, off-white background reminiscent of aged manuscripts, and substituting stark black text with dark grey to reduce eye strain, the system harmonises accessibility with deep cultural resonance.

Furthermore, applying strict spacing metrics (from 2 pixels to 48 pixels) leverages the Gestalt Principle of Proximity, ensuring users instinctively understand the semantic relationships between distinct visual elements [45]. The visual tone, colour psychology, and visual hierarchy are evident in the app snapshots within Figure *23*.

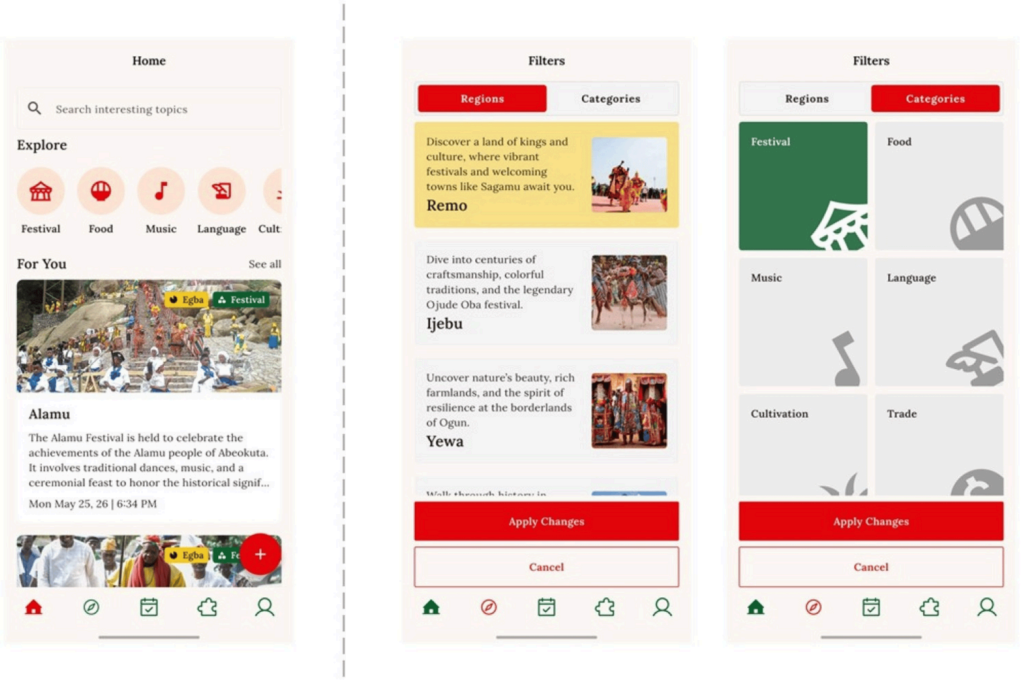

FIGURE 23: Homepage and Filters - Aesthetic-Usability Effect, Cultural Semiotics and Gestalt Principle of Proximity

Gamification and user motivation

To bridge the gap between archival storage and user engagement, the quiz module was designed using Self-Determination Theory and gamification principles [46]. The buttons were designed with an elevated, shadowy look, employing skeuomorphism to create a sense of Perceived Affordance [47]. This design invites interaction by mimicking physical, play-induced buttons as shown in Figure *24*, rather than formal examination interfaces.

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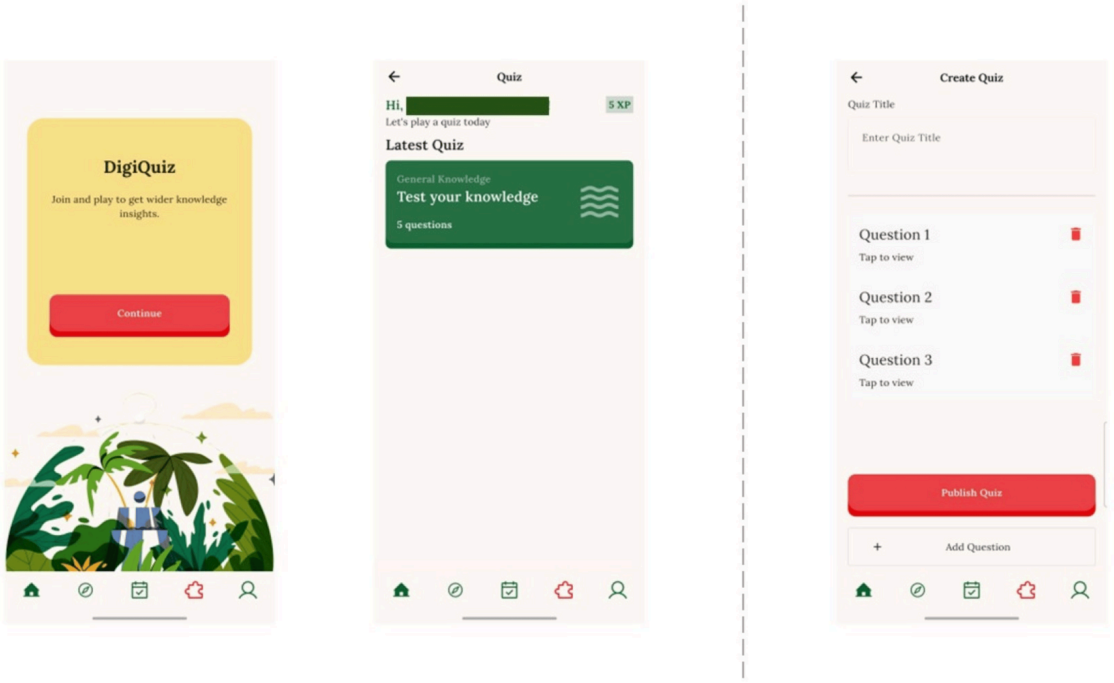

FIGURE 24: Quiz Homepage and Quiz Creation - Self-Determination Theory and Perceived Affordance

The inclusion of visible question counters and immediate visual feedback (correct answers turning green, incorrect turning red) adheres to the heuristic of Visibility of System Status [48]. By rewarding users with Experience Points (XP) for interaction, the system transitions passive readers into active learners, enforcing a continuous feedback loop that builds user competence and motivation. Figure *25* actively captures the signal each state sends to the users during the quiz sessions.

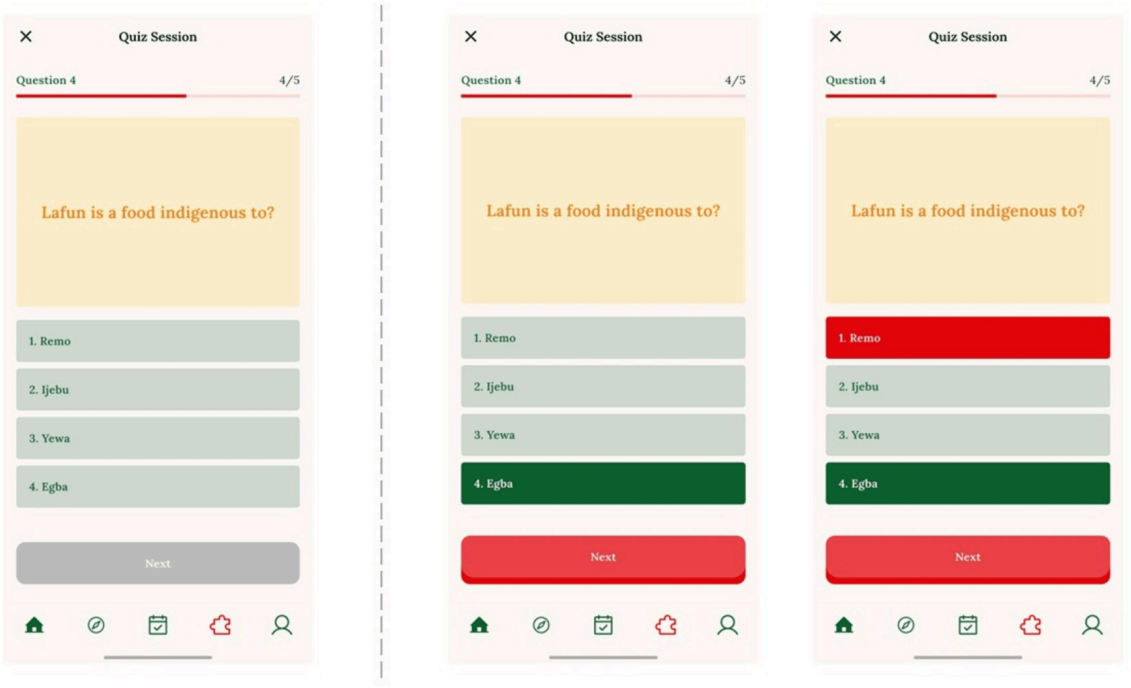

FIGURE 25: Quiz Progression - Visibility of System Status

Real-world usage and comparative analysis

To fully contextualise the DigiCulture platform, its operational impact and architectural approach must be evaluated against existing digital preservation paradigms. In real-world deployment, the platform shifts cultural documentation from institutional silos to community-driven stewardship within the four RIYE regions of Ogun State.

Field application demonstrates that by utilising mobile crowdsourcing coupled with strict zero-anonymity accountability, local custodians, academic researchers, and regional tourists can actively document ephemeral oral histories, festivals, and linguistic variations that traditional archives frequently fail to capture.

When compared to existing large-scale aggregators such as Europeana, which excel in institutional cataloguing and federated asset management [13], DigiCulture addresses a distinct operational gap. While global platforms often operate with high technical barriers and generalised schemas that dilute local nuances, DigiCulture provides a specialised, low-resource mobile framework tailored specifically to regional dialects and multi-modal cultural topologies.

Furthermore, unlike commercial mobile tools like Locatify [14] or Amuseapp [15] that prioritise pure entertainment or tourism without data provenance, DigiCulture successfully integrates gamified user engagement (via the quiz module and XP tracking) directly with verified, role-moderated archival data. This comparative advantage proves that mobile systems can simultaneously maintain academic rigour, ensure structural data integrity, and drive active community participation.

Limitations

While the DigiCulture system presents a robust socio-technical framework for cultural preservation, certain limitations within the current iteration must be acknowledged. First, the deployment is constrained by its platform availability; the application was developed exclusively for the Android operating system. This design choice, while practical for rapid prototyping and regional smartphone market demographics, temporarily excludes iOS users, potentially limiting the maximum volume of crowdsourced contributions.

Secondly, because the ethnographic data gathering, system design, and software engineering were conducted independently, the initial scope of the project was subject to resource constraints. Consequently, the active data seeding and cultural scope were geographically restricted to the four major socio-cultural regions of the RIYE framework within Ogun State (Remo, Ijebu, Yewa, and Egba).

Finally, relying on an open-source crowdsourcing model in low-resource environments introduces inherent software engineering challenges regarding initial data sparsity [8]. In rural areas where network bandwidth is variable and digital literacy is still developing, bridging the gap between physical cultural custodians and the digital interface requires continuous, on-the-ground facilitation before the platform can achieve a self-sustaining critical mass of data.

Future work

Addressing these limitations directly informs the trajectory for future software engineering enhancements aligned with the broader epistemological goals of DH. A core objective within contemporary DH is to dismantle centralised, hegemonic archives by decentralising narrative authority and giving marginalised or underrepresented communities the technical tools to curate their own heritage [7]. An immediate technical priority for DigiCulture is the development of a cross-platform or progressive web application architecture to eliminate operating system barriers, thereby broadening global accessibility and accelerating crowdsourced data acquisition across diverse demographics.

From an architectural perspective, future work will focus on scaling the platform's backend infrastructure and data management protocols to support global DH research frameworks. As the volume of multi-modal entries (audio, video, high-resolution imagery, and text) grows across the four RIYE regions, the system's storage and retrieval mechanisms must evolve to support federated data architectures. Future iterations will explore implementing advanced database indexing strategies, optimising dynamic query processing for low-bandwidth environments, and refining real-time content moderation workflows within the MVVM framework to maintain data provenance.

Additionally, to fulfil the DH imperative of inclusive, borderless digital preservation, future software development will focus on enhancing offline-first software architectures. Incorporating robust local data caching and background synchronisation will allow users and global researchers in remote, low-resource field locations to document, archive, and analyse cultural artefacts without an active internet connection, automatically syncing with the cloud repository once network connectivity is restored. This ensures that DH tools remain resilient, equitable, and accessible at the very points of cultural origin.

Conclusions

This paper contributes to CSC and DH by presenting a reproducible blueprint for low-resource cultural preservation. While traditional archives isolate data and modern applications often prioritise pure engagement over historical accuracy, DigiCulture successfully integrates the two. By directly linking ethnographic field requirements to IS database optimisation and HCI cognitive design, this research demonstrates that cultural information systems can be academically rigorous, highly scalable, and deeply resonant with local communities. Furthermore, this methodological and architectural framework facilitates specialised low-resource linguistic and cultural research, providing foundational infrastructure for projects such as RIYE audio dialect classification and supporting the digitisation of underrepresented, highly nuanced socio-cultural datasets globally.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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Disclosures

Human subjects: All authors have confirmed that this study did not involve human participants or tissue.

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- **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work.
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Data Availability Statements

The data (and/or code) supporting this study are openly available in https://dx.doi.org/10.17632/v9gdz3k7zg.1 at 10.17632/v9gdz3k7zg.1, reference v9gdz3k7zg.

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References

1. Siliutina I, Tytar O, Barbash M, Petrenko N, Yepyk L: Cultural preservation and digital heritage: challenges and opportunities. Amazonia Investiga. 2024, 13:262-273. 10.34069/ai/2024.75.03.22
2. Malapane OL, Chanza N, Musakwa W: Transmission of indigenous knowledge systems under changing landscapes within the vhavenda community, South Africa. Environmental Science & Policy. 2024, 161:103861. 10.1016/j.envsci.2024.103861
3. Tomova N: On the importance of physical preservation and protection of documents and archives. IATED. 2022, 5700-5703. 10.21125/inted.2022.1464
4. Kaya O: The intergenerational transmission of collective action within the Kurdish diaspora in Switzerland: An analysis of socio-political dynamics. Current Psychology. 2025, 44:9648-9663. 10.1007/s12144-025-07724-z
5. Martínez-Avella M, Jiménez-Aguilar C: Social, cultural and institutional forces in corporate and patrimonial states and their relations with corporate governance: a North-South contrast. Journal of Management History. 2025, 31:64-87. 10.1108/jmh-02-2024-0017
6. Georgopoulou MS, Troussas C, Triperina E, Sgouropoulou C: Approaches to Digital Humanities Pedagogy: a systematic literature review within educational practice. Digital Scholarship in the Humanities. 2025, 40:121-137. 10.1093/llc/fqae054
7. Karpouzis K: AI, digital humanities, and the legacies of colonial power. Computational Methods for the Digital Humanities. Learning and Analytics in Intelligent Systems. Karpouzis K, Skarpelos Y (ed): Springer, Cham; 2026. 57:73-85. 10.1007/978-3-032-05099-1_4

8. Folorunso DA, Folorunso O, Thompson OO: RIYE audio classification: A 1D-CNN baseline for Ogun State Yoruba dialects. Cureus Journal of Computer Science. 2026, 3:1-13. 10.7759/s44389-026-00134-7
9. Wen T: Data aggregation. Encyclopedia of Big Data. Schintler LA, McNeely CL (ed): Springer, Cham; 2022. 260-263. 10.1007/978-3-319-32010-6_296
10. Kundisch D, Muntermann J, Oberländer AM, Rau D, Röglinger M, Schoormann T, Szopinski D: An update for taxonomy designers. Business & Information Systems Engineering. 2022, 64:421-439. 10.1007/s12599-021-00723-x
11. Hambarde KA, Proença H: Information retrieval: Recent advances and beyond. IEEE Access. 2023, 11:76581-76604. 10.1109/access.2023.3295776
12. Chand SP: Methods of data collection in qualitative research: Interviews, focus groups, observations, and document analysis. Advances in Educational Research and Evaluation. 2025, 6:303-317. 10.25082/aere.2025.01.001
13. Capurro C, Severo M: Mapping European digital heritage politics: An empirical study of Europeana as a web-based network. Heritage & Society. 2026, 19:136-156. 10.1080/2159032x.2023.2266801
14. Peter K, Kanengoni T, Hwaire T, Winschiers-Theophilus H: Windhoek smart city hunt app: Designing for citizen engagement. Proceedings of the 6th ACM SIGCAS/SIGCHI Conference on Computing and Sustainable Societies, Association for Computing Machinery. 2023, 84-89. 10.1145/3588001.3609365
15. Hong S, Hwang E, Lee HK: Deriving criteria for inclusive AI in museum environments: an abductive approach and case analysis. Frontiers in Human Dynamics. 2026, 8:1799182. 10.3389/fhumd.2026.1799182
16. Heersmink R: Materialised identities: Cultural identity, collective memory, and artifacts. Review of Philosophy and Psychology. 2023, 14:249-265. 10.1007/s13164-021-00570-5
17. Hylland OM, Berge OK, Haugsevje ÅD: On digital cultural value: What does research tell us?. Cultural Trends. 2025, 1-19. 10.1080/09548963.2025.2495757
18. Abbas K, Shamim Q: Adapting to a new era: Cultural evolution in response to globalization, technological advancements, and environmental changes. Insights-Journal of Life and Social Sciences. 2023, 1:15-21.
19. Anifa M, Ramakrishnan S, Kabiraj S, Joghee S: Systematic review of literature on agile approach. NMIMS Management Review. 2024, 32:84-105. 10.1177/09711023241272294
20. Balsas CJL: Spatializing culture: The ethnography of space and place by Setha Low (review). Environment, Space, Place. 2023, 15:151-156. 10.1353/spc.2023.a903433
21. Folorunso O, Folorunso D, Popoola G, Thompson O: RIYE textual and geospatial corpus: An aggregated multidialectal dataset for low-resource language processing. Mendeley Data. 2026, V1:10.17632/v9gdz3k7zg.1
22. Emoruwa OT: The role of Yorùbá language education in bridging the gap in moral restructuring for national development. Journal of Advanced Research in Education. 2025, 4:43-51. 10.56397/jare.2025.07.07
23. Jones EO: Indigenous knowledge management practices in subsistence farming: A comprehensive evaluation. Sustainable Technology and Entrepreneurship. 2024, 3:100058. 10.1016/j.stae.2023.100058
24. Hasanah U, Sukoco BM, Supriharyanti E, Wu W-Y: Fifty years of artisan entrepreneurship: a systematic literature review. Journal of Innovation and Entrepreneurship. 2023, 12:46. 10.1186/s13731-023-00308-w
25. Kim M, Lee H, Chung YD: Multi-dimensional data compression and query processing in array databases. IEEE Access. 2022, 10:111528-111544. 10.1109/access.2022.3215525
26. Ajakaiye OO, Anumudu FE, Akinola AO, Okagbue HI, Peter NJ: Residential mobility and its effect on voter turnout in Surulere, Lagos, Nigeria. IOP Conference Series: Earth and Environmental Science. 2022, 993:012002. 10.1088/1755-1315/993/1/012002
27. Corsi G, Seger E, Ó hÉigeartaigh S: Crowdsourcing the mitigation of disinformation and misinformation: The case of spontaneous community-based moderation on Reddit. Online Social Networks and Media. 2024, 43-44:100291. 10.1016/j.osnem.2024.100291
28. Hossain MI: Software development life cycle (SDLC) methodologies for information systems project management. International Journal For Multidisciplinary Research. 2023, 5:1-36. 10.36948/ijfmr.2023.v05i05.6223
29. Ramu VB: Optimizing database performance: Strategies for efficient query execution and resource utilization. International Journal of Computer Trends and Technology. 2023, 71:15-21. 10.14445/22312803/ijctt-v71i7p103

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30. Amosco NS, Galigao RP: Social integration through cultural events. Pantao (International Journal of the Humanities and Social Sciences). 2024, 4:45-58. 10.69651/pijhss030409

31. Oluwadele LB, Adediran A, Olaogun SM: Ethnic and cultural diversity in Nigeria: A panacea for national development or decapitation?. Integrity Journal of Arts and Humanities. 2023, 4:62-70. 10.31248/ijah2023.076

32. Obiakor FE: Multicultural education in Nigeria. Daedalus. 2024, 153:221-233. 10.1162/daed_a_02113

33. Giretti A: Clean code and clean architecture for easy unit testing. The Unit Testing Practice Cookbook. Apress, Berkeley, CA, USA; 2025. 11-26. 10.1007/979-8-8688-1454-9_2

34. Suarez-Carvajal F-E, Lobo-Quintero R, Santoyo J, Pinzon-Castellanos J, Gamba-Gonzalez Y: MVVM in the era of modern Android: A systematic literature review and taxonomy of architectural trade-offs. CLEI Electronic Journal. 2026, 29:8. 10.19153/cleiej.29.2.8

35. Tiana AH, Prasetyo RT, Yulistiawan BS, Masruriyah AFN: Enhancing application design for integrated evaluation through user-centered prototyping with Figma. Jurnal Mandiri IT. 2025, 14:203-214.

36. Hussain H, de Vries M: Advancing improvements to enterprise systems with a participatory system dynamics method using Figma. South African Journal of Industrial Engineering. 2025, 36:255-273.

37. Božić R: Advantages and challenges of NoSQL compared to SQL databases: A systematic literature review. Zbornik radova Ekonomskog fakulteta Brčko. 2022, 16:11-20. 10.7251/zrefb2216011b

38. Bansal PK: Database security and performance optimization in modern information systems. Intesab Aalami. 2024, 12:21-26.

39. Pan B, Stakhanova N, Ray S: Data provenance in security and privacy. ACM Computing Surveys. 2023, 55:1-35. 10.1145/3593294

40. Thompson G: Software design modularity assessment in legacy systems. High-Performance Distributed Computing Review. 2024, 11:19-23.

41. Chen O, Paas F, Sweller J: A cognitive load theory approach to defining and measuring task complexity through element interactivity. Educational Psychology Review. 2023, 35:63. 10.1007/s10648-023-09782-w

42. Cho H, Hong Y, Kim W: HickStudy: Designing a user interface for a Hick's Law-based information processing speed test app. Adjunct Proceedings of the 38th Annual ACM Symposium on User Interface Software and Technology. 2025, 147:1-3. 10.1145/3746058.3758441

43. Xiao H, Sun Y, Duan Z, et al.: A study of model iterations of Fitts' law and its application to human-computer interactions. Applied Sciences. 2024, 14:7386. 10.3390/app14167386

44. Udris-Borodavko N, Oliinyk V, Bozhko T, Budnyk A, Hordiichuk Y: Aesthetics and semiotics in 21st century visual communications: Pedagogical and sociocultural aspects. Research Journal in Advanced Humanities. 2023, 4:22-40. 10.58256/rjah.v4i4.1144

45. Hsiang TM, Liao WM: A study about visual movement of applying proximity of Gestalt psychology on straight line. International Conference on Kansei Engineering & Emotion Research. Communications in Computer and Information Science. Tsai Tw, Chen K, Yamanaka T, Koyama S, Schütte S, Mohd Lokman A (ed): Springer, Singapore; 2024. 2313:289-303. 10.1007/978-981-97-9890-2_23

46. Luarn P, Chen C, Chiu Y: Enhancing intrinsic learning motivation through gamification: a self-determination theory perspective. The International Journal of Information and Learning Technology. 2023, 40:413-424. 10.1108/ijilt-07-2022-0145

47. Wu Z, Bao Y, Jin T: Cognitive differences of younger and older adults in skeuomorphic or flat icons. Ergonomics. 2026, 69:1052-1067. 10.1080/00140139.2025.2501249

48. Gejandran P, Abdullah N: Gamification in e-learning: A systematic review of benefits, challenges, and future possibilities. Journal of Logistics, Informatics and Service Science. 2024, 11:84-104. 10.33168/jliss.2024.0206

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