A National Strategy for Immersive Heritage:

A Blueprint for the Scottish Augmented Reality Tourism Platform

Executive Summary

Scotland's tourism industry, valued at around £11 billion annually, thrives on its rich heritage, stunning landscapes, and iconic landmarks like Edinburgh Castle, Loch Ness, and the Highlands.

In this modern digital era technologies such as Augmented Reality (AR), Virtual Reality (VR), and the emerging Metaverse offer new avenues to enhance visitor experiences, expand reach, and drive economic growth.

This accelerator explores how Scotland can leverage these technologies, and co-ordinates industry campaigns to promote the sector

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Executive Summary

The global visitor economy is undergoing a paradigm shift, moving from passive observation to active, immersive participation.

For Scotland, a nation defined by its rugged landscapes, deep historical narratives, and rich cultural tapestry, this transition presents both a profound challenge and an unprecedented opportunity.

The challenge lies in the increasing demand for digital integration into the visitor experience—a demand that requires significant infrastructure, technical expertise, and financial investment. The opportunity is to leverage Scotland's existing assets—its world-class heritage, advanced connectivity infrastructure, and vibrant creative industries—to become a global leader in Augmented Reality (AR) tourism.

This report presents a comprehensive market strategy and proposal for the development of a Unified National Augmented Reality Platform (UNARP). Moving beyond the fragmented, unsustainable model of "single-use" applications that currently plagues the heritage sector, this strategy advocates for a Hub-and-Spoke digital architecture. This model centralizes the high-capital technical infrastructure (the Hub) under national stewardship while empowering local communities, small towns, and regional DMOs to create and manage their own localized content (the Spokes).

Our analysis indicates that the current fragmented approach—where individual museums or towns commission bespoke apps—is economically inefficient and technically fragile. These standalone applications suffer from high attrition rates, lack of interoperability, and unsustainable maintenance costs, estimated at 15-20% of initial capital expenditure annually. By contrast, a national platform approach leverages economies of scale, ensures data interoperability, and provides a robust foundation for long-term digital preservation.

The proposed strategy aligns directly with the National Strategy for Economic Transformation (NSET) and Scotland Outlook 2030, prioritization responsible tourism, visitor dispersal, and the creation of "memorable experiences". It integrates deeply with the Digital Strategy for Scotland, utilizing the Scottish Government's "Cloud Platform Service" and adhering to open data standards to ensure secure, ethical public services.

Financially, the proposal shifts the burden of technical maintenance away from resource-constrained local authorities, allowing them to focus funding on storytelling and asset creation. We project that a national platform can be delivered with a core investment of approximately £800,000 - £1.2 million, significantly less than the

aggregate cost of disjointed regional apps. Furthermore, by utilizing the UK Shared Prosperity Fund and Creative Scotland's Multi-Year Funding, the initiative can drive capital investment directly into local supply chains, supporting creative freelancers, 3D artists, and digital historians across the country.

We utilize the town of Lanark and the New Lanark World Heritage Site as a primary prototype to demonstrate this model's efficacy. By connecting the intangible heritage of William Wallace in the town center with the industrial heritage of the mills via an AR trail, we demonstrate how digital infrastructure can drive physical footfall, extending dwell time and boosting the local economy.

This report details the technical architecture, financial modeling, operational governance, and strategic rollout required to realize this vision. It is a roadmap for a digitally augmented Scotland, where every town has the tools to tell its story to the world.

The Strategic Case for a National Platform

The Scottish tourism sector contributes approximately £11 billion annually to the economy and supports a vast network of SMEs, particularly in rural areas. However, the sector faces structural challenges that require innovative intervention.

The post-pandemic traveler seeks more than just sightseeing; they demand connection, authenticity, and immersion. Simultaneously, the industry must grapple with "over-tourism" in key hotspots like Edinburgh and Skye, while rural towns struggle to attract footfall.

The Failure of the Fragmented App Ecosystem

To understand the necessity of a national platform, one must first analyze the current state of digital heritage interpretation. Over the past decade, numerous funding streams have supported digital tourism projects. While well-intentioned, this has resulted in a fragmented landscape of standalone mobile applications.

- **High Attrition:** A bespoke AR app commissioned for a specific museum or trail often has a lifespan of less than three years. Without a dedicated maintenance budget, these apps fail to keep pace with operating system updates (iOS and Android), rendering them unusable.

- **Poor User Experience:** Visitors touring Scotland do not wish to download a new 500MB application for every town they visit. The friction of downloading, installing, and learning a new interface for a 30-minute experience leads to low adoption rates.
- **Economic Inefficiency:** Every standalone project incurs duplicate costs for cloud hosting, developer fees, and app store management. A simple AR app with basic features costs between £30,000 and £50,000. If twenty Scottish towns commission separate apps, the total expenditure exceeds £1 million, with no shared data or interoperability.

The Digital Tourism Scotland evaluation highlighted the market failure in digital capability among tourism SMEs and the need for continued intervention. A national platform addresses this by removing the technical burden from the individual business or town.

The Hub-and-Spoke Architecture: A Sustainable Model

The proposed solution adopts a Hub-and-Spoke architecture, a model proven in logistics and cloud computing to optimize efficiency and reduce costs.

- The Hub (National Level): This is the core technical infrastructure. It includes the application shell, the Content Management System (CMS), the cloud hosting environment, and the Visual Positioning System (VPS) integration. It is managed by a central consortium (e.g., VisitScotland, HES, and tech partners). The Hub handles security updates, OS compatibility, and global API integrations.
- The Spokes (Regional Level): These are the content layers. Each region—whether a city like Dundee or a rural area like The Borders—acts as a "tenant" on the platform. They are responsible for the creative content: the stories, the voiceovers, the specific 3D assets, and the local marketing.

This model democratizes access to high-end technology. A small community trust in the Highlands cannot afford a £100,000 AR development project. However, under this model, they would only need to fund the content creation—a fraction of the cost—while the expensive technical infrastructure is provided as a national utility.

Strategic Alignment with National Goals

This strategy is not developed in isolation; it is deeply embedded in the broader policy landscape of the Scottish Government.

- Scotland Outlook 2030: This strategy calls for "memorable experiences" and sustainable visitor management. The AR platform directly supports this by allowing DMOs to guide visitors away from congested sites toward hidden gems using digital wayfinding.
- Digital Strategy for Scotland: The refreshed strategy emphasizes secure, ethical, and inclusive digital public services. By building a shared public sector component, we align with the directive to reduce duplication and create "common approaches" to data and technology.
- National Strategy for Economic Transformation (NSET): The platform fosters an entrepreneurial culture by creating a marketplace for local digital creatives. It supports the "Place" priority by revitalizing town centers through digital placemaking.

The Shift to Values-Based Tourism

Modern tourists are increasingly "values-based," seeking sustainable and authentic experiences. AR offers a unique mechanism to deliver this without physical impact.

- Sustainability: Traditional interpretation requires physical signage, which degrades and clutters the landscape. AR is "zero-footprint" infrastructure. It allows for rich interpretation in sensitive ecological zones (e.g., The Flow Country, national nature reserves) without disturbing the environment.
- Inclusivity: The platform can offer multi-language support and accessibility features (audio description, high contrast modes) instantly, ensuring that Scotland's heritage is accessible to a diverse global audience.

Global Competitiveness

Other nations are aggressively investing in this space. South Korea, for example, has integrated AR into its national heritage strategy, allowing visitors to visualize lost architecture and engage with natural history in immersive ways. For Scotland to maintain its position as a premier global destination, it must match this digital maturity. We have the assets—the Rae Project by HES provides a massive library of 3D data—and the connectivity, with 5G innovation hubs in rural and urban areas. The missing piece is the unifying platform to bring these assets to the visitor.

Technical Architecture and Innovation

The success of the National Augmented Reality Platform depends on a robust, scalable, and future-proof technical architecture. This section outlines the specific technologies, data standards, and integration strategies required to build the "Hub."

Core Positioning Technology: The Hybrid VPS Approach

Standard GPS is insufficient for high-quality AR tourism. GPS accuracy typically drifts by 5-10 meters, which breaks the immersion when trying to overlay a digital character on a specific statue or doorway.

To achieve the "magic" of persistent AR, the platform must utilize Visual Positioning Systems (VPS). VPS uses the camera to "see" buildings and landmarks, comparing them against a 3D map to determine the user's position with centimeter-level accuracy.

We propose a Hybrid VPS Strategy to account for Scotland's diverse geography:

- **Urban Areas (Google Geospatial API):** In cities like Edinburgh, Glasgow, and Aberdeen, Google Street View data is comprehensive and frequently updated. The Google Geospatial API allows developers to anchor content globally using this existing data. It is highly scalable and requires zero manual scanning, making it the cost-effective choice for urban centers.
- **Rural & Heritage Sites (Niantic Lightship VPS):** In rural areas, hiking trails, or inside castle courtyards where Street View cars cannot reach, we will utilize Niantic Lightship. This technology allows local users (rangers, community groups) to create their own "scans" of a location using a smartphone. These scans are uploaded to create a localized 3D map, enabling AR experiences in the most remote parts of the Highlands.
- **Integration Logic:** The UNARP app will intelligently switch between these providers. When a user opens the app in George Square (Glasgow), it utilizes the Google API. When they arrive at a remote standing stone in Orkney, it switches to the downloaded Lightship VPS map.

The Digital Twin: 3D Asset Management

A critical component of the platform is the content itself. High-fidelity 3D models are required to bring history to life. Scotland is uniquely positioned due to the Rae Project by Historic Environment Scotland (HES), which is systematically digitizing the nation's heritage assets.

- Asset Pipeline: The platform will integrate with the HES digital repository. When a

visitor is at Skara Brae, the app should be able to stream a lightweight version of the official laser scan data.

- Optimization: Raw laser scan data is too heavy for mobile networks. The "Hub" must include an automated pipeline to decimate (compress) these gigabyte-sized point clouds into mobile-optimized formats (glTF/USDZ) that can be rendered on a standard smartphone.
- Open Standards: To ensure longevity, all data will adhere to Open Heritage 3D standards. This ensures that the data is not locked into a proprietary format and can be used for educational and research purposes in the future.

Connectivity: Leveraging 5G Infrastructure

The richness of the AR experience is often bottlenecked by mobile network bandwidth. High-fidelity textures and audio require significant data transfer. The Scotland 5G Centre has established innovation hubs across the country, specifically targeting tourism use cases.

- Streaming vs. Downloading: In 5G-enabled zones (e.g., the Dundee waterfront or Glasgow city center), the platform will support "Cloud Rendering." This allows the heavy graphical processing to happen on an edge server, streaming the video feed to the user's phone. This preserves battery life and allows for photorealistic visuals.
- Offline Capability: For rural areas with poor connectivity (the "not-spots"), the platform must support a rigorous "Offline Mode." Users will be prompted to "Download the Lanarkshire Pack" while on Wi-Fi at their hotel or a visitor center. This ensures the experience is unbroken even when the signal is lost.

Data Architecture and Open Data Integration

The platform will function not just as a content delivery system, but as a data aggregation tool, built on the principles of the Scottish Cities Alliance Smart Cities cluster.

- Integration with VisitScotland DMS: The AR view will be populated with live data from VisitScotland's destination management system. If a user points their phone at a street, they will see floating icons for "VisitScotland Quality Assurance" accredited businesses, pulling descriptions and ratings via API.
- Open Data Output: The system will generate anonymized datasets on visitor behavior—dwell times, route choices, and heatmaps. This data will be published (in aggregate) via Open Data Scotland portals, allowing local authorities and

transport planners to make evidence-based decisions about infrastructure needs.

User Interface (UI) and Accessibility

The UI must be modular. While the core navigation remains consistent (to reduce the learning curve), the "skin" of the app should adapt to the region.

- The "Chameleon" Interface: When in the Highlands, the UI theme might reflect the natural color palette of the landscape. In Glasgow, it might adopt a vibrant, modern "City Style." This gives local regions a sense of ownership over their "slice" of the platform.
- Accessibility First: Following the Inclusive Design principles, the app will feature high-contrast modes for the visually impaired, screen-reader compatibility, and "seated mode" for users with limited mobility (allowing them to explore the AR scene without physically walking around).

The Economic Model and Funding Ecosystem

The transition from a project-based funding model to a sustainable platform model requires a rethinking of how digital infrastructure is financed. This section outlines the costs, the return on investment (ROI), and the funding mechanisms available to deliver the UNARP.

National Platform Development Costs (The Hub)

The initial Capital Expenditure (CapEx) to build the "Hub" is significant but represents a one-time investment that replaces millions in duplicated spending.

Estimated National Platform Development Budget (Year 1)

Cost Component	Description	Estimated Cost Range
Platform Architecture	Development of core iOS/Android application shells, VPS integration, and modular UI framework.	£400,000 - £600,000

Cloud Infrastructure	Setup of scalable AWS/Azure environment, spatial anchors database, and Content Delivery Network (CDN).	£100,000 - £150,000
Headless CMS	Development of a user-friendly, web-based portal for DMOs to upload content (text, audio, 3D).	£150,000 - £250,000
Data Integration	API development for VisitScotland DMS, HES archives, and Transport Scotland open data.	£75,000 - £100,000
Security & Compliance	GDPR auditing, penetration testing, and integration with ScotAccount for user identity.	£50,000 - £80,000
Project Management	Agile delivery management, stakeholder engagement, and technical oversight.	£80,000 - £120,000
Total Year 1 CapEx		£855,000 - £1,300,000

Analysis: This investment is comparable to the cost of 20-25 standalone town apps (at ~£50k each). However, unlike standalone apps, this platform provides a foundation for every town in Scotland to onboard at a marginal cost.

Regional Implementation Costs (The Spokes)

Once the Hub is operational, the cost for a region to join becomes purely operational (content creation). This lowers the barrier to entry for small communities.

Regional Implementation Cost Breakdown (Per Small Town)

Item	Description	Cost Estimate
Creative Strategy	Narrative design, scriptwriting, and historical research.	£3,000 - £5,000

3D Asset Production	Photogrammetry of 3-5 key sites (e.g., market cross, statue) and 3D modeling of lost heritage.	£5,000 - £10,000
Audio Production	Professional voiceover recording, sound design, and translation (Gaelic/Scots).	£2,000 - £4,000
Configuration	Uploading content to CMS, placing AR anchors on-site (calibration walks).	£2,000 - £3,000
Physical Signage	Installation of QR code markers/plaques to trigger downloads/experiences.	£1,500 - £2,500
Total Per Town		£13,500 - £24,500

Comparative Insight: A community can launch a high-end AR tourism product for under £25,000. This fits comfortably within the thresholds of many community grants (e.g., National Lottery Awards for All).

The Operational Revenue Model

To ensure the platform does not rely solely on government grants forever, a hybrid revenue model is proposed.

- Local Authority Subscription: Each participating Local Authority pays an annual "Platform Maintenance Fee" (e.g., £5,000). This pooled income covers the cloud hosting and OS updates managed by the Hub team.
- Commercial Partnerships: The platform can offer "Premium Business Listings." While basic listings are free (via VisitScotland), local businesses can pay a micro-fee to have an "AR Voucher" float above their shop, offering a discount to app users.
- Freemium Content: While the core heritage trails are free, the platform can support premium "Adventure Packs" (e.g., a "Murder Mystery" game in Edinburgh's Old Town) sold for £2.99, with revenue split between the content creator and the platform.

Funding Sources and Grant Alignment

Securing the capital for this initiative requires a strategic alignment with current funding

landscapes.

- UK Shared Prosperity Fund (UKSPF): This is the primary source for capital infrastructure. The project aligns with Investment Priority E1 (Town Centre Improvements) and E6 (Support for local arts, culture, heritage). Local authorities in places like Glasgow and Aberdeenshire are actively allocating UKSPF funds for "pride in place" initiatives.
- Creative Scotland Multi-Year Funding: The platform creates a canvas for digital artists. Creative Scotland's expanded funding (an additional £34m in 2025/26) prioritizes innovative, sustainable cultural delivery.
- Heritage Horizon Awards: For major regional implementations (e.g., a "Highlands & Islands" wide rollout), the Heritage Horizon Awards offer grants of over £5 million for transformative heritage projects.
- CivTech Challenge: The Scottish Government's CivTech programme is the ideal procurement vehicle. A "Challenge" could be launched: "How can technology enable sustainable visitor dispersal through immersive storytelling?" This allows the government to crowdsource the best technical solution from agile SMEs rather than relying on large, slow IT vendors.

Virtual Treasure Hunts: Gamifying Discovery

To drive active engagement beyond passive observation, the platform will integrate a "Virtual Treasure Hunt" layer. Inspired by the global success of apps like Pokémon GO and Ingress, this module gamifies the visitor experience, incentivizing users to explore specific geographic "zones" (town centers, businesses, or nature trails) to collect digital rewards.

The Mechanics of Engagement

This feature utilizes the same Niantic Lightship technology used for the platform's positioning system but deploys it for gameplay.

- Adventure Labs: Based on the "Adventure Lab" model, DMOs can create multi-stage scavenger hunts where users must physically visit a location to unlock a clue or digital stamp. This effectively guides footfall along a desired route.

- Digital Collectibles: Instead of catching monsters, visitors might "collect" historical figures, mythical creatures (e.g., "Find the 5 Faeries of Fife"), or clan badges. These collectibles are anchored to specific GPS coordinates or VPS-activated landmarks.
- The "Snatch" Model: Implementing a competitive element where users can "claim" a virtual parcel at a location (e.g., a castle) and must hold it (by staying in the town) to unlock a real-world prize, increasing dwell time.

The "Sponsored Location" Business Model

Crucially, this layer introduces a powerful B2B monetization strategy that directly benefits local economies.

- Businesses as "Game Zones": Local businesses (cafés, gift shops, hotels) can pay a subscription or micro-fee to become "Sponsored Locations" or "Refuel Stations" within the game map.
- In-Game Incentives: When a player visits a sponsored café to "recharge" their digital energy, they receive a push notification for a real-world discount (e.g., "10% off coffee for Trail Explorers"). This model was successfully pioneered by McDonald's Japan with Pokémon GO, which drove 500 million visitors to sponsored locations.
- Smart Scheduling: The platform can allow businesses to "boost" their location during quiet times (e.g., Tuesday afternoons), dropping rare digital items at their venue to attract footfall when they need it most.

Implementation Strategy: "The Great Scottish Quest"

To launch this feature, we propose a national campaign: The Great Scottish Quest.

- Concept: A nationwide hunt for the "Lost Regalia" of Scotland. 100 digital artifacts hidden across the country, from the Borders to Shetland.
- Community Creation: Utilizing the "Spoke" model, local communities design the clues for their own area, ensuring the content is authentic and drives traffic to local hidden gems rather than just famous landmarks.
- Platform: This functionality will be a core module of the UNARP, available to all participating regions as a "switch-on" feature, requiring no new app development for the towns.

Operational Implementation: The "Spoke" Model

Building the technology is only half the battle. The success of the UNARP relies on the ability of non-technical stakeholders—community councils, local historians, and small business owners—to populate it with compelling content. This section details the operational "Spoke" model.

The Community Heritage Digital Content Toolkit

We propose the creation of a standardized Community Heritage Digital Content Toolkit, modelled on the work of CAHG Scotland. This toolkit will serve as the "manual" for any town wishing to join the platform.

- Module 1: Narrative Design. How to write for AR. Unlike a guidebook, AR scripts must be punchy, audio-led, and spatially aware. The toolkit will provide templates for "Character-led Tours" (e.g., "Let Mary Queen of Scots guide you").
- Module 2: Asset Capture. A guide to "Do-It-Yourself" digitization. With modern smartphones (LiDAR-enabled iPhones), local volunteers can scan small artifacts (statues, gravestones) themselves. The toolkit will explain the photogrammetry process: lighting, angles, and software (e.g., Polycam).
- Module 3: Legal & Ethics. Guidance on copyright (who owns the story?), GDPR (filming in public spaces), and cultural sensitivity (consulting with relevant groups before telling their stories).

The Role of Interface and Academia

To bridge the skills gap, we will leverage Interface, the organization connecting Scottish business with academia.

- The "Digital Heritage Intern" Pipeline: We propose a formal partnership with institutions like the University of the West of Scotland (UWS), Glasgow School of Art, and Abertay University.
    - Mechanism: A town (e.g., Lanark) identifies a need for a complex 3D reconstruction (e.g., the lost castle). Through Interface, they are matched with a 3rd-year student or PhD researcher in game design or digital heritage.
    - Benefit: The student gets a real-world portfolio piece. The town gets high-quality assets at a fraction of the commercial rate (often funded via

Innovation Vouchers).
    - Case Study Precedent: Smartify's collaboration with UWS via Interface successfully developed XR infrastructure, proving this academic-commercial model works.

Onboarding Process for a New Town

1. Expression of Interest: Local Authority/Community Trust submits a request to the National Steering Group.
2. Feasibility Scan: A "Tech Scout" (potentially a regional 5G hub partner) visits to assess connectivity and VPS suitability.
3. Funding Lock: The town secures the ~£20k content budget (via UKSPF or local funds).
4. Creative Workshop: A facilitated session with local historians and businesses to map the "User Journey."
5. Production Sprint: 12-week period of asset creation (writing, recording, scanning).
6. Soft Launch & Calibration: Testing the AR anchors on-site.
7. Go Live: Marketing campaign integrated into VisitScotland's regional promotion.

Strategic Pilot: Lanarkshire & The Wallace Trail

To prove the efficacy of the UNARP model, we propose a pilot project in Lanarkshire. This region represents a microcosm of Scotland's tourism challenges: a "honeypot" site (New Lanark WHS) disconnected from a struggling town center, rich but "invisible" heritage (William Wallace), and a need for economic regeneration.

The Challenge: The "Missing Link"

New Lanark World Heritage Site attracts over 300,000 visitors annually. However, the vast majority drive directly to the site and leave without visiting the town of Lanark, just 1.5 miles away. The town center struggles with footfall, despite having a deep connection to William Wallace (who married and started his rebellion there). The heritage assets—Wallace's house, the old church, the castle—are physically gone or ruinous, making traditional sightseeing underwhelming.

The Solution: The "Wallace & Weaver" AR Trail

This pilot will create a gamified AR trail that physically connects the town center to the World Heritage Site, incentivizing walking and exploration.

Location 1: The Wallace Gap Site (Castlegate)

- Current State: An empty gap site between buildings, marked by murals and a sword sculpture.
- The AR Experience: Superimposition AR. The user points their phone at the mural. The mural "peels away" to reveal a 3D reconstruction of the medieval townhouse of Marion Braidfute (Wallace's wife).
- Narrative: A virtual Marion appears in the doorway, inviting the user to hear the story of the English Sheriff Heselrigg. This emotional storytelling anchors the user in the personal tragedy that sparked the Wars of Independence.
- Tech: Marker-based tracking using the existing mural as the anchor.

Location 2: Lanark Castle (Castlebank Park)

- Current State: A public park with bowling greens; no visible castle remains.
- The AR Experience: Geo-located AR. Standing on the bowling green, the user sees a massive, full-scale digital reconstruction of the 12th-century wooden Motte and Bailey castle rising around them.
- Gamification: Users participate in a "Virtual Lanimer." Based on the Lanimer Day tradition of checking the boundary stones, users must find hidden digital "March Stones" scattered around the park. Collecting them unlocks a discount voucher for a café in the town center.
- Tech: Niantic Lightship VPS for precise placement of the castle walls on the grass.

Location 3: The Clyde Walkway (The Connection)

- The AR Experience: "The Industrial Path." As the user walks down the steep hill toward New Lanark, AR "Ghost Workers" (weavers, children) are seen walking alongside them, carrying bales of cotton.
- Nature Integration: At the Falls of Clyde viewpoint, an AR overlay highlights the diverse wildlife. Real-time data from the Scottish Wildlife Trust (badger sightings, river levels) is pulled into the view.

Detailed Pilot Budget

Using the "Spoke" cost model, the Lanark pilot is costed as follows:

Lanark Pilot Project Budget

Item	Detail	Cost
Drone Survey	Photogrammetry of Castlebank topography and Castlegate gap site.	£3,000
3D Reconstruction	Historical modeling of Lanark Castle & Braidfute House (High LOD).	£8,500
Character Animation	Motion capture & modeling for Marion Braidfute avatar.	£5,000
Audio Production	Scripting, voice actors (local accents), and soundscapes.	£3,000
Platform Fee	Setup & Integration on National Platform (waived for pilot).	£0
Marketing	Physical trail markers and launch event.	£2,500
Project Mgmt	Coordination by Lanark Community Development Trust.	£4,000
Total		£26,000

Funding Strategy: This amount falls within the UK Shared Prosperity Fund allocation for South Lanarkshire Council (Communities & Place).

Expected Impact

- Dwell Time: Increasing the average visitor stay in Lanark town by 90 minutes.
- Economic Conversion: If 5% of New Lanark's visitors (15,000 people) are converted to the town center and spend £15 (lunch + coffee), the annual economic impact is £225,000.
- ROI: The project pays for itself in economic impact within the first 3 months of the season.

Governance, Risks, and Future Horizon

The shift to a platform model requires a clear governance structure to ensure stability, security, and ethical alignment.

Governance Structure

A National Digital Heritage Steering Group will be established to oversee the platform.

- Strategic Lead (VisitScotland): Responsible for the user experience, brand alignment, and marketing strategy. They own the "front end".
- Heritage Custodian (HES): Responsible for the integrity of the data. They act as the "Curatorial Gatekeeper," ensuring that historical reconstructions are accurate and culturally appropriate.
- Technical Authority (CivTech/Scotland 5G Centre): Responsible for the platform's stability, cyber security, and connectivity infrastructure.
- Local Representation (COSLA): Ensuring that the needs of local authorities are met and that the platform remains accessible to all regions.

Data Ethics and Privacy

AR involves cameras filming public spaces. This raises GDPR concerns.

- Privacy by Design: The platform will process VPS data locally on the device where possible, sending only feature points (mathematical abstractions) to the cloud, not raw images.
- No Scrape Policy: Adhering to VisitScotland's T&Cs, the platform will explicitly prohibit the harvesting of user data for third-party AI training.
- Identity: Integration with ScotAccount ensures that user data is handled securely and transparently.

Risk Management

Key Risks and Mitigation

Risk Area	Description	Mitigation Strategy

Digital Exclusion	Not all users have AR-capable phones.	Graceful Degradation: The app must offer a "2D Mode" (images/audio) for older phones. Physical "Fixed AR" viewfinders (LCD screens) installed at key sites like Lanark Castle.
Connectivity	Poor signal in rural areas.	Offline First Architecture: Mandatory offline mode. Wi-Fi hotspots installed at trailheads (funded via broadband vouchers).
Content Accuracy	"Disneyfication" of history.	Curatorial Board: HES approval required for all "reconstruction" assets. Community toolkit emphasizes historical sourcing.
Vendor Lock-in	Dependency on one tech provider.	Open Standards: Mandate Open Heritage 3D data formats. Modular architecture allows swapping VPS providers (e.g., Lightship to Google) if needed.

The Future Horizon: AI and The Metaverse

The UNARP is built for today but ready for tomorrow.

- Generative AI: Future updates could include AI-driven historical characters that can answer user questions (e.g., "William, why did you attack the Sheriff?") using a knowledge base of verified historical facts.
- The Metaverse: The 3D assets created for the mobile app (the castle, the townhouse) form the building blocks of a future "Virtual Scotland" in the Metaverse. Researchers or students in Tokyo could explore Lanark Castle in VR, driving future physical visitation.

Conclusion

Scotland stands on the brink of a digital renaissance. The technology to overlay our rich past onto our present is no longer science fiction; it is a mature, deployable tool. However, the current trajectory of fragmented, single-use apps is a cul-de-sac. It wastes resources and fails to deliver a coherent visitor experience.

This report proposes a bold correction: a Unified National Augmented Reality Platform.

By centralizing the heavy lifting—the coding, the cloud, the positioning—and democratizing the creative process, we unleash the storytelling potential of every community in Scotland.

The economic argument is irrefutable: for the cost of a dozen failed apps, we can build a permanent national asset. The pilot in Lanarkshire demonstrates the tangible power of this model: connecting a world-class site with a local town, driving footfall, and breathing life into invisible history.

The recommendation is clear. The Scottish Government, through its agencies, should immediately commission the development of the Hub, empowering the people of Scotland to tell their stories in the medium of the 21st century.