

Observatory on Cultural Heritage: Real Adoption of Digital Tools

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Abstract— This paper proposes a Digital Observatory for cultural heritage to measure real adoption of digital tools in museums and archaeological parks. The observatory integrates multi-source analytics, visitors surveys and longitudinal evaluation to assess adoption, engagement, economic impact and perceived value, guiding evidence-based investment, policy and audience-centred digital strategies for sustainability.

Keywords— Digital observatory; Cultural heritage; Smart museums; Archaeological parks; Cultural marketing

I. INTRODUCTION

Digital transformation in the cultural heritage sector has accelerated over the last decade. In Italy, more than 60% of museums already provide digital services such as online ticketing, mobile apps or augmented-reality experiences [1]. Nevertheless, technological adoption does not necessarily translate into effective use by visitors.

Archaeological parks exemplify this gap: pilot initiatives such as e-Archeo introduced immersive virtual and augmented reality experiences, yet recent studies indicate that active visitor engagement with these solutions remains limited [2].

This divergence between supply and actual use raises a central question: how can the degree of digital tool utilization in cultural heritage be measured systematically? The proposed response is the establishment of a digital observatory designed to collect, analyse and inform strategic investment decisions.

II. CONCEPTUAL FRAMEWORK

Observatories are established instruments in domains such as tourism and economics for monitoring complex phenomena through structured indicators. In the cultural domain, the Osservatorio Innovazione Digitale per la Cultura at Politecnico di Milano already monitors aspects such as ticketing, collection digitization and AI adoption [3]. However, existing initiatives tend to emphasise technological availability rather than actual visitor use.

Extending this approach requires integrating adoption metrics, engagement indicators and perceived value measures. Literature in cultural marketing highlights that digitalisation is not merely a technical upgrade but a transformation of the relationship between institutions and publics; therefore, the

observatory must include satisfaction, loyalty and digital reputation indicators to capture the full value chain [4].

III. METHODOLOGICAL DESIGN FOR A DIGITAL OBSERVATORY

The observatory is conceived as an integrated analytical system that captures both quantitative and qualitative dimensions of digital use in cultural heritage. The methodological design comprises three interdependent components: typology and sampling, multi-source data collection and longitudinal evaluation.

1. Typology and Sampling

Institutions are classified into meaningful categories (national museums, local museums, archaeological parks, open-air heritage sites). This typological stratification enables comparative analysis across contexts with different resource endowments, visitor profiles and governance models.

2. Multi-source Data Collection

Data acquisition combines administrative and behavioural sources: online ticketing logs, web analytics for institutional websites, app download and usage statistics, audioguide session logs, telemetry from AR/VR installations and structured visitor surveys. Social listening and sentiment analysis on public channels complement institutional data to capture reputation and perceived value. The observatory emphasises standardized data schemas and interoperable metadata to enable aggregation and cross-site comparability.

3. From Availability to Actual Use

The observatory distinguishes between the mere presence of a digital tool and its effective adoption. For each instrument, the following indicators are proposed: (a) **adoption rate** (percentage of visitors who access or download the tool); (b) **engagement metrics** (session duration, feature usage, repeat interactions); (c) **conversion metrics** (online ticket purchases, upsell to paid digital services); (d) **satisfaction and perceived impact** (survey scores, qualitative feedback). For example, knowing that a museum offers a mobile app is insufficient; the observatory records how many visitors download it, average session length and user ratings to assess real uptake.

4. Longitudinal and Contextual Analysis

A longitudinal evaluation model tracks indicators over time and correlates them with external variables such as tourist flows, marketing campaigns, public funding cycles and

seasonal patterns. This approach enables the identification of transient phenomena (e.g., spikes due to temporary exhibitions) versus sustained behavioural change attributable to a digital intervention.

5. Ethics, Privacy and Data Governance

The observatory adopts privacy-by-design principles and anonymisation techniques for behavioural data. Data governance rules and consent mechanisms are defined to comply with applicable regulations and, to ensure trust among participating institutions and visitors.

IV. PRELIMINARY EMPIRICAL OBSERVATIONS AND MARKETING PERSPECTIVE

The available studies provide an initial approximation:

- Approximately 70% of Italian museums offer online ticketing [3]
- Augmented and virtual reality solutions are present in roughly 30% of museums, yet actual visitor use is low [2].
- Digitalisation increases institutional attractiveness, improving the attraction of both domestic and international visitors [5]
- From a marketing perspective, digitalisation strengthens loyalty and competitive differentiation, enabling museums to position themselves as innovative actor [4]

In archaeological parks, the introduction of immersive technologies has increased perceived value and interpretative richness, but robust evidence on their contribution to overall visitor experience and repeat visitation remains limited [2]. These preliminary findings reinforce the need for an observatory that measures not only the availability of tools but also their actual use and their cultural and economic impact.

V. STRATEGIC IMPLICATIONS AND CONCLUSIONS

The proposed digital observatory addresses a concrete managerial and policy problem: the persistent gap between technological supply and effective visitor use. Many institutions adopt digital tools driven by technological availability or sectoral trends rather than by evidence of impact on visitor experience. A structured observatory would generate actionable intelligence for cultural managers and policy-makers, enabling resource allocation based on demonstrated adoption, engagement and value creation.

By combining behavioural metrics with qualitative assessments and marketing indicators (loyalty, reputation, perceived value), the observatory would support three strategic functions: (1) **prioritisation of investments** toward technologies with proven uptake and impact; (2) **design optimisation** of digital services to maximise accessibility and user satisfaction; (3) **policy evaluation**, by linking digital

interventions to broader objectives, such as inclusion, education and sustainable tourism.

From a marketing perspective, measuring engagement and reputation provides insights into how digital tools mediate the relationship between institutions and publics. Metrics on repeat usage, advocacy (e.g., recommendations on social media) and conversion enable the assessment of long-term value beyond immediate operational gains. Consequently, the observatory becomes a decision-support platform that aligns technological innovation with audience development strategies and the objectives of smart cities.

In sum, the observatory is proposed as a knowledge and governance infrastructure capable of guiding the digital transformation of cultural heritage toward sustainable, people-centred outcomes. Its adoption would reduce the risk of misallocated investments, enhance the evidence base for cultural policy and foster a more transparent dialogue between institutions, funders and communities.

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