

# Stamp-Based Gamification as Low-Tech Immersive Media in Museums

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**Abstract:** In the field of immersive media and user experience, museums are increasingly understood as hybrid media environments in which physical space, narrative structures, and interactive interfaces jointly shape the visitor's experience. Gamification has emerged as a key tool in this process; however, its immersive function—particularly in non-digital forms—remains insufficiently theorized. This article analyzes the stamp-based gamification model ("passport with stamps", hereafter SBM) as a form of low-tech immersive media that structures visitor movement, attention, and motivation across different museum contexts.

The study employs a qualitative cross-case analysis combined with a research through design (RtD) approach, examining multiple institutions, including natural history, archaeological, historical, and literary museums, as well as educational observatories. Empirical material consists of project documentation and systematic observations of visitor behavior, interpreted through predefined UX criteria. Immersion is operationalized through three user experience modes—cognitive, aesthetic, and narrative—captured via indicators such as route completion, dwell time, and interaction style.

Findings indicate that stamp-based gamification mediates immersion in a context-dependent manner. Route completion rates range from 78% among adult visitors in narratively structured museums to 42% among children in visually fragmented natural history settings, revealing significant variation in how the same mechanic supports different immersive outcomes. The results show that materiality, bodily action, and temporal sequencing play a central role in sustaining engagement, even in the absence of digital technologies.

The study contributes to immersive media and UX theory by arguing that low-tech, embodied, and temporally structured interactions can function as immersive media when they are coherently integrated into spatial and narrative scenarios. Based on the comparative analysis, the article proposes theoretically grounded design principles for low-tech immersive media, emphasizing alignment with spatial logic, bodily engagement, and control over experiential rhythm.

**Keywords:** Immersive media, Gamification, Museum UX, Stamp-based model, Embodied interaction, Museum studies, Low-tech interaction.

## 1. INTRODUCTION

In the field of immersive media and user experience, museums are increasingly considered hybrid media environments, where physical space, narrative, and interactive interfaces collectively shape the visitor experience. This approach extends beyond the classical concept of the museum as a repository of objects, framing it as a dynamic, scenario-organized participatory environment.

Gamification has established itself as a key tool in this process, yet it often remains under-theorized regarding its immersive function. In this article, we analyze the stamp-based gamification model ("passport with stamps", hereafter SBM) as a form of low-tech immersive media that structures movement, attention, and motivation. The term 'cultural capital' refers here to the skills, knowledge, and dispositions that shape audience engagement (Bourdieu, 1986). While immersive media theory often emphasizes digital technologies, recent studies (Sangamuang et al., 2025; Mavrin et al., 2023) show that low-tech embodied

interactions can achieve comparable cognitive, aesthetic, and narrative immersion.

## 2. THEORETICAL FRAMEWORK

### 2.1. Immersive Media Beyond Digital

Traditional definitions of immersive media are primarily associated with VR, AR, and XR technologies. However, from a broader theoretical perspective, immersion is understood as a state of sustained cognitive, bodily, and emotional engagement (Brown & Cairns, 2004). Low-tech immersive media are defined here as materially embodied, temporally structured interaction systems that generate sustained experiential engagement without reliance on digital augmentation.

Museum gamification represents a form of low-tech immersion, in which: physical movement functions as a navigational interface; objects serve as interactive nodes; game tasks act as mechanisms for sustaining attention (Deterding et al., 2011; Nicholson, 2015; Johnson et al., 2020).

Recent studies confirm that low-tech, embodied interactions can foster comparable immersion to high-tech solutions, particularly when temporal and

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spatial rhythms are intentionally designed (Kim *et al.*, 2019; Smith & Lee, 2021; Sangamuang *et al.*, 2025). This perspective contrasts with technology-centric theories of immersion, highlighting that engagement depends on scenario design, bodily interaction, and materiality, not only digital sophistication.

## 2.2. User Experience and Scenario Design

From a UX theory perspective, experience is formed not by isolated elements but by the overall scenario of interaction (Hassenzahl, 2010; Law *et al.*, 2018). In the museum context, this means that the route, dwell time, anticipation, and conclusion are as important as the content itself.

The stamp-based model can be understood as a UX framework that transforms the museum into a “walkable interface.” Its design aligns narrative progression, spatial movement, and user actions, enabling scenario-driven immersion even without digital technologies.

This alignment ensures that visitors’ cultural capital influences their experience, producing varied engagement patterns across age groups and motivations (Bourdieu, 1986).

## 3. RESEARCH QUESTIONS AND HYPOTHESES

### Research Question 1

How does stamp-based gamification affect the level and type of immersion in different museum contexts?

#### Hypothesis H1:

The stamp-based model increases immersion, but the type of immersion (cognitive, aesthetic, narrative) varies according to the institutional and spatial context.

### Research Question 2

How do different audiences interact with the same gamification mechanism?

#### Hypothesis H2:

Age, cultural capital, and visitor motivation lead to different UX patterns, even when the game structure is identical.

### Research Question 3

Can stamp-based gamification be considered a form of immersive media without digital technologies?

#### Hypothesis H3:

Yes – provided that the game “coordinates spatial movement and experiential sequencing” in a coherent scenario, functioning as immersive media (Kim *et al.*, 2019; Smith & Lee, 2021).

## 4. METHODOLOGY

The study employs a qualitative cross-case analysis of multiple institutions (as described in the attached file):

- Natural History Museum
- Archaeological Museum
- National Historical Museum
- National Gallery “Square 500”
- National Literary Museum (network of sites)
- Scientific and educational institutions (observatory)

The analysis is based on:

- Project documentation
- Visitor behavior observations
- Defined goals, KPIs, and expected outcomes
- Comparative interpretation of UX effects

Observations included 120 visitors, with 2–3 coders per site, observed for 2–4 hours per day over three weeks. Multiple coders independently verified classifications to mitigate observer bias. Ethical approval was obtained, and participants provided informed consent. Project documentation was analyzed using content analysis to complement direct observation.

### Operationalization of UX Modes

To systematically capture different immersive experiences, observed visitor behaviors were categorized into three UX modes: cognitive, aesthetic, and narrative immersion. Each mode was identified based on specific actions, engagement patterns, and interactions with the stamp-based gamification elements. Behaviors were coded according to the following criteria: dwell time, number of stamps collected, attentional focus on exhibits, and interaction style (*e.g.*, exploratory, completion-oriented, interpretative). This operationalization enhances methodological replicability and allows the same framework to be applied across different institutions, while integrating quantitative results where possible.

Table 1 summarizes the coding scheme linking observed behaviors with UX modes and KPIs, now explicitly referenced in the Results section.

**Table 1: Operationalization of UX Modes**

UX Mode	Observed Behavior	Relevant KPI	Notes / Interpretation
Cognitive Immersion	Fast exploration, checking off stamps, short stops at exhibits	% route completed, dwell time per stop	Focused on task completion rather than narrative content
Aesthetic Immersion	Slower pace, prolonged observation, engagement with visual elements	Average dwell time, number of stamps	Emphasizes materiality, visual engagement, embodied attention
Narrative Immersion	Following exhibition story, linking exhibits, reflective actions	Route completion, dwell time, comments	Emphasizes story continuity and meaning-making

Legend / Notes: Behaviors were coded using direct observation and project documentation. Multiple coders independently verified the classification to ensure reliability.

## Design Research Perspective

Beyond qualitative cross-case analysis, the study follows research through design (RtD) approach. The stamp-based gamification model is not only an object of analysis but also a research artifact through which knowledge about immersive experience is generated. In this sense:

- Design serves as a method for investigation.
- Variations between museums are treated as contextual experiments.
- Observed UX effects are interpreted as design insights, not incidental outcomes (Smith & Lee, 2021; Kim *et al.*, 2019).

This approach allows linking empirical data with theoretical insights on immersive media beyond digital technologies.

## 5. ANALYSIS AND RESULTS

### 5.1. Immersion through Movement: Space as a Scenario Interface

A key empirical finding is that stamp-based gamification reorganizes movement, transforming free wandering into a scenario-driven experience. However, this occurs differently depending on the spatial logic of the institution.

In the Archaeological Museum, 78% of visitors completed the route with all stamps, whereas in the Natural History Museum for children, completion dropped to 42%, demonstrating context-dependent effects on immersion, thereby supporting H1.

In natural history museums, movement is initially fragmented, guided by visual stimuli and short attention episodes. The stamp-based model introduces a route, often perceived as externally imposed. Observations show that for children, this leads to rapid loss of interest after the initial “collecting” phase, marking a point of decline in immersive engagement. Here, gamification

functions as a temporary catalyst but does not stabilize long-term immersion.

In contrast, in archaeological and historical museums, the route is already implicitly embedded in the exhibition narrative. Stamps do not compete with spatial logic but reinforce it. Movement is experienced as progress in the narrative rather than as mechanical task completion. This leads to longer dwell times, lower rates of premature route termination, and higher route completion—empirical support for H1.

In the networked structure of the National Literary Museum, movement extends beyond institutional walls. Urban space becomes a media layer, and the stamp-based model functions as a tool for extended immersion, blurring boundaries between museum and environment. This case demonstrates that immersive media can be spatially distributed and low-tech, thus supporting H3 (Kim *et al.*, 2019).

“These findings confirm H1 by demonstrating that immersion is not uniformly amplified but contextually modulated.” For instance, while stamps extend dwell time and reinforce narrative immersion in the Archaeological Museum, the effect is short-lived in the Natural History Museum for children, showing context-dependent variability as hypothesized in H1.

### 5.2. Materiality, Time, and Embodied Immersion

Empirical data clearly show that the physical materiality of the passport and stamps is not a minor detail but a key UX factor. Stamping functions as a ritualized gesture marking progress and adding bodily weight to the experience.

At “Square 500,” layered stamping technique (“kasane-ozhi”) transforms gamification from navigational logic into aesthetic logic. Visitors slow their pace, spend more time on individual artworks, and perceive the passport as a visual artifact rather than merely a game carrier. This design demonstrates that immersion can be enhanced through control of time

and rhythm in the experience, rather than by increasing stimuli (Brown & Cairns, 2004; Falk & Dierking, 2013; Johnson *et al.*, 2020).

### 5.3. Motivation, Anticipation, and UX Scenarios

Analysis of different audiences reveals that stamp-based gamification activates various motivational modes, conceptualized as UX scenarios:

For children and families, the collector logic dominates. Stamps are perceived as trophies, and immersion is exploratory but fragile. Without a clearly structured environment, interest quickly dissipates.

For adult visitors, stamps function as markers of completion. Immersion is less playful and more cognitive—a sense of “traveled path” and semantic coherence. Average dwell time for adults completing the stamped route is 25 minutes, while for children it is around 12 minutes, demonstrating differentiated UX modes across age groups and motivational profiles.

Culturally engaged audiences, particularly in artistic and literary contexts, perceive the stamp-based model as co-authorship. The passport becomes a personal archive of experience, and the UX mode is interpretative. Exploratory UX for children is mainly cognitive and experimental immersion, adults’ UX is primarily narrative, and culturally engaged audiences experience aesthetic and interpretative immersion, confirming context-dependent variability as predicted in H1 (Law *et al.*, 2018; Kim *et al.*, 2019).

These observations not only confirm H2 but also show that the same design artifact produces different immersive experiences depending on the visitor’s cultural capital. For example, stamps function as trophies for children but as markers of completion for adults, illustrating H2 regarding different UX patterns across audiences.

### 5.4. Stamp-Based Gamification as Design Knowledge

This approach demonstrates H3: even without digital technologies, the mechanic “coordinates spatial movement and experiential sequencing,” thereby transforming a passive UX artifact into immersive media.

As a design research result, the analysis allows formulation of several design principles for immersive, low-tech media. Each principle can be applied in other low-tech contexts. For example, “control over rhythm” may involve pacing tasks to visitor flow or sequencing stamps to maintain attention.

The principles:

1. Gamification mechanics should follow, not force, spatial logic.
2. Materiality and bodily action are critical for deep immersion.
3. Control over rhythm is more important than quantity of stimuli.
4. The same mechanism should accommodate multiple UX modes (Smith & Lee, 2021; Kim *et al.*, 2019).

These principles contribute to museum studies and broader immersive media design.

## 6. DISCUSSION

The comparative analysis indicates that stamp-based gamification functions not as a universal tool for increasing engagement but as a mediator of experience, which can enhance, transform, or in some cases limit pre-existing characteristics of the institutional context. This observation is significant for the field of immersive media and user experience, as it challenges the technological determinism often present in studies of immersion (Falk & Dierking, 2013; Mavrin *et al.*, 2023).

### 6.1. Transferability of Design Principles

The results show that stamp-based gamification functions not as a universal engagement tool but as a mediator of experience. While the principles apply well to urban museums with homogeneous audiences, smaller regional institutions may need adaptation due to limited spatial flexibility and fewer exhibits. Fully digital platforms remove the physical and bodily components central to low-tech immersive experiences. Hybrid approaches can preserve embodied and temporal qualities through tangible interaction points or virtual cues.

Future research should empirically test these adaptations to refine design guidelines for broader applicability.

### 6.2. Stamp-Based Gamification as a Media Layer, Not an Add-On

The stamp-based model functions as a media layer superimposed on space and content, rather than existing autonomously. Users interact with the ecosystem of stimuli, not just a single interface.

For example, in archaeological and historical museums, stamps channel existing interest into

longer-lasting cognitive immersion. In natural history museums, where visual stimulation is high, the stamp-based model attempts to impose order on fragmented perception, but with limited success for younger audiences.

This supports the thesis that immersion must be deliberately designed according to context (Brown & Cairns, 2004; Smith & Lee, 2021).

### 6.3. Physical Gamification as a Form of Embodied Immersion

Another contribution is showing that the stamp-based model represents embodied immersive media, where walking, searching, pausing, and stamping are constitutive actions, not ancillary behaviors (Dourish, 2001; Sangamuang *et al.*, 2025).

Hybrid implementations collecting quantitative data (dwell time, route completion, repeat visits) reveal tensions between tactile satisfaction of stamping and abstract efficiency of digital interfaces, highlighting limits of digitalization in cultural contexts (Mavrin *et al.*, 2023).

### 6.4. Different UX Modes Within the Same Mechanic

Analysis of age- and motivation-based differences shows that the stamp-based gamification activates multiple UX modes:

- Exploratory (children and families)
- Completion-oriented (adult visitors)
- Interpretative and co-authorship (culturally engaged audiences)
- Instrumental and repeat-use oriented (digital implementations)

The same gamification structure can function as a game, educational tool, or cultural interface, supporting scenario-based and context-dependent immersion.

### 6.5. Theoretical Contribution

This study repositions immersive media as a structural property of designed interaction rather than a technological attribute. It offers a reconceptualization of immersion beyond digital frameworks, highlights low-tech embodiment as a media layer, and advances a scenario-based UX framing of immersive experience.

## 7. METHODOLOGICAL LIMITATIONS

This study has several notable methodological limitations:

1. The analysis relies primarily on qualitative observations and project documentation rather than experimentally controlled conditions, limiting causal attribution between gamification and behavioral changes.
2. KPIs (participation %, dwell time, route completion, repeat visits) provide behavioral but partial insight into subjective experience (Smith & Lee, 2021; Sangamuang *et al.*, 2025).
3. The study predominantly covers urban institutions with similar audiences, limiting geographic and cultural transferability (Mavrin *et al.*, 2023).

## 8. DIRECTIONS FOR FUTURE RESEARCH

Based on limitations, future research could:

1. Combine qualitative and experimental UX methods, such as A/B testing stamp placement versus narrative quality, to isolate immersion effects.
2. Analyze hybrid physical–digital models, including comparative studies of physical, digital, and combined implementations (Kim *et al.*, 2019; Sangamuang *et al.*, 2025).
3. Examine long-term cultural behavior effects, *e.g.*, habitual cultural consumption or loyalty.
4. Explore AI-assisted personalization in immersive media, while preserving embodied interaction.

## 9. CONCLUSION

This study analyzes the stamp-based gamification model as a form of immersive media in museum contexts, demonstrating that immersion is not solely a function of digital technologies but results from scenario-designed interaction between space, materiality, and user action. Through comparative analysis of different institutional and spatial configurations, the study shows that stamp-based gamification structures visitor movement, attention, and anticipation, enhancing cognitive, aesthetic, and narrative immersion. Context- and user-dependent variability proves critical, showing multiple UX scenarios and challenging one-dimensional notions of the “user.”

The study contributes to museum and gamification research and to broader UX and HCI methodology, emphasizing low-tech yet physically and temporally engaging design. Design principles include following spatial logic, engaging the body, and controlling

experiential rhythm, applicable to hybrid and small-scale institutions.

## FUNDING

This study was partially funded by the Bulgarian Ministry of Education and Science under the National Science Fund, Competition for Fundamental Scientific Research 2024, Contract No. КП-06-H85/3 dated December 5, 2024.

## CONFLICT OF INTEREST

The author declares no conflict of interest. The data supporting the findings of this study are available from the author upon reasonable request. The author would like to thank the anonymous reviewers for their valuable comments.

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<https://doi.org/10.65638/2978-8811.2026.02.01>

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