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Architecture and Urban Design
Milano Leonardo Campus

ARCHITECTURAL HERITAGE NARRATIVE DESIGN BASED ON VIRTUAL HERITAGE ETHNOGRAPHY (VHE): A CASE STUDY OF LE DUE TORRI DI BOLOGNA

Supervisor: Prof. Corinna Rossi

Author: Yan Jiahao

Student ID: 275882

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Abstract

Contemporary architectural heritage is increasingly marked by a condition of "absence": while many sites remain highly visible, they are gradually detached from concrete spatial experience and everyday relations, becoming simplified cultural symbols shaped by conflict, structural crises, and expert-led narratives. This thesis argues that the challenge of architectural heritage extends beyond technical conservation to the ways in which heritage is interpreted, experienced, and reconnected with the public.

In response, the thesis proposes Virtual Heritage Ethnography (VHE), a narrative design framework for digital heritage reinterpretation, and tests it through Le Due Torri di Bologna. Integrating architectural spatial analysis, critical heritage theory, and ethnographic methods, the framework follows three stages: Excavation, Interpretation, and Integration. It constructs a design-oriented archive through literature review and fieldwork, identifies the Towers' relational characteristics, and translates them into narrative and interactive scenes. Two comparable digital prototypes are developed: a Control version centered on architectural information and historical facts, and a VHE version centered on exploration, active judgment, and the organization of heritage relations. User testing evaluates their effects on relational understanding, emotional engagement, meaning-making, and willingness to act.

The results suggest that an effective heritage narrative depends on the combined design of scenes, narrative structures, and experiential mechanisms. Compared with the Control prototype, the VHE prototype preserves basic comprehension while enhancing emotional engagement, perception of multiple meanings, willingness to visit, and understanding of the relationship between the Two Towers and urban life. The thesis contributes an operable research-design framework and expands the theoretical and practical scope of digital heritage interpretation.

Keywords: Architectural heritage; Virtual Heritage Ethnography (VHE); heritage narrative design; affect and agency; Bologna Due Torri

Abstract

Il patrimonio architettonico contemporaneo è sempre più segnato da una condizione di "assenza": molti siti, pur restando altamente visibili, si separano progressivamente dall'esperienza spaziale concreta e dalle relazioni quotidiane, diventando simboli culturali semplificati, modellati da conflitti, crisi strutturali e narrazioni guidate dagli esperti. Questa tesi sostiene che la sfida del patrimonio architettonico non riguardi solo la conservazione tecnica, ma anche i modi in cui il patrimonio viene interpretato, vissuto e riconnesso al pubblico.

In risposta, la tesi propone la Virtual Heritage Ethnography (VHE), un quadro di progettazione narrativa per la reinterpretazione digitale del patrimonio, e lo verifica attraverso il caso delle Due Torri di Bologna. Integrando analisi spaziale architettonica, teoria critica del patrimonio e metodi etnografici, il quadro si articola in tre fasi: Excavation, Interpretation e Integration. Esso costruisce un archivio orientato al progetto attraverso revisione della letteratura e lavoro sul campo, individua le caratteristiche relazionali delle Torri e le traduce in scene narrative e interattive. Vengono sviluppati due prototipi digitali comparabili: una versione Control, centrata su informazioni architettoniche e fatti storici, e una versione VHE, centrata su esplorazione, giudizio attivo e organizzazione delle relazioni patrimoniali. Il test con gli utenti ne valuta gli effetti sulla comprensione relazionale, sul coinvolgimento emotivo, sulla costruzione di significato e sulla disponibilità ad agire.

I risultati suggeriscono che una narrazione efficace del patrimonio dipende dalla progettazione integrata di scene, strutture narrative e meccanismi esperienziali. Rispetto al prototipo Control, il prototipo VHE preserva la comprensione di base e rafforza il coinvolgimento emotivo, la percezione di significati molteplici, la disponibilità a visitare il sito e la comprensione del rapporto tra le Due Torri e la vita urbana. La tesi contribuisce con un quadro operativo di ricerca e progettazione e amplia l'ambito teorico e pratico dell'interpretazione digitale del patrimonio.

Parole chiave: patrimonio architettonico; Virtual Heritage Ethnography (VHE); progettazione narrativa del patrimonio; affetto e agency; Due Torri di Bologna

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Chapter 1 Introduction

1.1 Research Background: The Narrative Challenges of Architectural Heritage Today

1.1.1 Heritage in Contemporary Crisis

Today, cultural heritage is facing multiple challenges caused by political conflicts, environmental risks, urban transformation, and aging infrastructure. These challenges often first appear as a form of absence. Some heritage sites become inaccessible because they are destroyed or closed for a long time. Others still exist physically, but under rapid urbanization, mass tourism, and media exposure, they are gradually reduced to landmarks, tourist attractions, or objects of knowledge. In this situation, the richer relationships between architectural heritage and the public are simplified and replaced by fixed ways of narration.

First, there is a break in the connection caused by physical absence. Many heritage sites are either disappearing or becoming permanently inaccessible. This can be due to disasters, such as the destruction of *the Ancient City of Aleppo* in Syria, or due to safety risks, such as the long-term closure of the *Torre Garisenda* and *Torre degli Asinelli* in Bologna, Italy. When people can no longer access these places, their direct relationship with heritage is interrupted. This not only limits physical access, but also weakens the role of heritage as a site of memory. As Halbwachs pointed out, collective memory depends on stable social frameworks and physical environments[1]. When heritage can no longer be experienced, used, or perceived, its connection to public memory becomes weaker.

At the same time, a more hidden but more common problem is social absence—a situation where the building still exists, but its meaning is fading. Heritage does not disappear physically, but its relationship with the public is gradually reshaped and simplified. Many buildings are still highly visible in the city, but they lose their connection to everyday life and social context and then become objects that can only be recognized, viewed, and

[1] HALBWACHS M. *On Collective Memory*[M]. COSER L A, ed. Chicago: University of Chicago Press, 1992: 40, 204-207.

consumed. However, everyday practice is essential for keeping heritage alive. When heritage is separated from daily life, people's interaction with it is often limited to taking photos, checking in on social media, or passively receiving information. It becomes difficult to reach a deeper understanding, emotional connection, and meaningful engagement.

The Wukang Mansion in Shanghai is a clear example (see Fig. 1.1). Designed in 1924 by the Hungarian architect *László Hudec*, it once represented Shanghai's modernization and its unique cosmopolitan culture. Today, however, it is largely treated as a social media check-in spot. Many visitors take photos from its well-known angle, but few understand its historical background or its connection to Shanghai's *Haipai culture*.



Figure 1.1 Bologna's Due Torri and Shanghai's Wukang Mansion

Source: Photographs by the author

This suggests that, across different historical moments and spatial contexts, the relational gap caused by absence places architectural heritage in a narrative issue. This condition may further lead to a form of memory displacement, in which architectural

heritage becomes a hollow shell detached from its former meanings, the original relationship between the community and the heritage is weakened or forgotten, and collective identity is consequently displaced. Heritage is then reduced from a living social process to a "thing of the past," interpreted and presented through fixed representational frames.

1.1.2 The Paradox of the Digital Age: Hyper-visibility and the Loss of Meaning

Since the late twentieth century, heritage conservation has increasingly combined with digital technologies such as computer vision. Digital tools—especially 3D reconstruction and virtual reality (VR)—have often been seen as a *Noah's Ark* for saving endangered heritage. In this context, Virtual Heritage (VH) has developed as an interdisciplinary field concerned with the use of digital and interactive technologies to represent, interpret, and communicate cultural heritage, including virtual environments and augmented reality applications[2]. Its main goal is to recreate inaccessible heritage in a realistic way and bring it closer to the public via digital experiences.

However, this development has also created a paradox. On one hand, technologies such as laser scanning and real-time rendering allow us to create highly detailed and visually impressive digital environments—what can be called hyper-visibility. On the other hand, this strong focus on visual accuracy can lead to ocularcentrism, where vision becomes the dominant way of understanding heritage. This creates a gap between academic documentation and public understanding.

This gap often appears in two forms. One focuses too much on reconstructing physical appearance. It produces accurate digital models but removes the social meaning, emotional context, and human experience behind them. As a result, heritage becomes a precise but lifeless digital object. The other focuses too much on visual effects and immersion, creating attractive but shallow experiences that treat heritage as entertainment or spectacle. Although these two approaches seem different, they share the same problem: they treat heritage mainly as something to look at, rather than something that carries relationships and meaning.

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[2] CHAMPION E. *Playing with the Past: Heritage, Interactivity and Experience Design in Virtual Worlds*[M]. London: Springer, 2011: 17-26, 157-176. DOI: 10.1007/978-1-84996-501-9.

As a result, even though digital models become more realistic, they do not necessarily help people build deeper connections with heritage. Many projects make heritage look clearer and more accessible, but they do not answer a key question: do people better understand how heritage relates to themselves, to others, and to everyday life? If not, then this clarity only simplifies heritage in another way. It recreates the appearance but not the meaning.

1.2 Research Questions and Objectives

As discussed above, current mainstream narrative approaches to architectural heritage often emphasize the material dimension while overlooking the presentation of intangible information. As Laurajane Smith points out through the concept of *Authorized Heritage Discourse (AHD)*[3], heritage is often defined by experts and institutions. In this framework, heritage is treated as a material object with historical value, and its meaning is decided mainly through professional knowledge. The public, in contrast, usually takes the role of viewer or receiver.

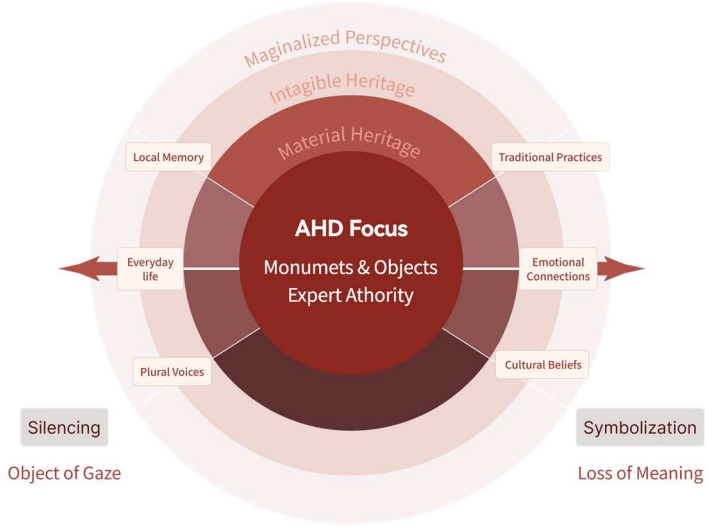


Figure 1.2 Focus and Blind Spots in Mainstream Heritage Narratives and Discourse

Source: Drawn by the author

[3] SMITH L. *Uses of Heritage*[M]. London: Routledge, 2006. DOI:10.4324/9780203602263.

In this situation, everyday experiences, local memories, and diverse voices are often ignored (see fig.1.2). Heritage meaning is shaped by authority, and the relationship between people and heritage becomes a one-way process: people look at it and learn about it. When heritage is reduced to monuments or landscape objects, its complex social meaning is weakened. This makes it harder to create emotional connections or motivate actions.

This problem also appears in digital heritage. Many virtual heritage projects still present heritage as something to observe rather than something to engage with. People may be able to enter a virtual space, but they do not necessarily feel connected to it. As a result, even though heritage becomes visible again, its emotional and social meaning is still missing.

Based on this observation, this research shifts its focus from the conventional concern with how digital technologies can produce increasingly realistic reconstructions of architectural heritage to the question of how virtual heritage narratives today can move beyond the dominance of AHD, visual restoration, and monument-oriented display, and instead reorganize architectural heritage narratives around relationships. In other words, this study is less concerned with how the public can see heritage more clearly than with how narrative design can guide them beyond the recognition of a landmark or the reception of historical knowledge, toward an active perception and judgment of the relationships, emotions, and meanings embedded in architectural heritage. Through this process, the public's agency in participating in the definition of heritage meaning can be restored, allowing stronger cultural and emotional bonds with the past to be established.

To achieve this, a more humanism-centered and relation-focused framework is needed.

This study therefore asks:

When the relationship between heritage and the public is reduced to passive viewing and information consumption, how can we develop a different narrative approach—one that encourages active understanding, emotional engagement, and willingness to act?

More specifically:

- What key dimensions define a relationship-based virtual heritage narrative?
- How can these dimensions be organized into a framework for analysis and design?
- In digital environments, how do space, narrative structure, and interface design influence perception, understanding, and emotion?

1.3 Research Methods and Technical Route

To address the questions above, this study develops and proposes *Virtual Heritage Ethnography (VHE)* as an original interdisciplinary methodological framework for architectural heritage narrative design. This framework brings together architectural spatial theory, critical heritage studies, and ethnographic-oriented approaches across both physical and digital spaces. Through a design-led research process, it explores a more relational way of narrating virtual heritage, aiming to rebuild cultural and emotional connections between the public and heritage in digital environments (see fig. 1.3).

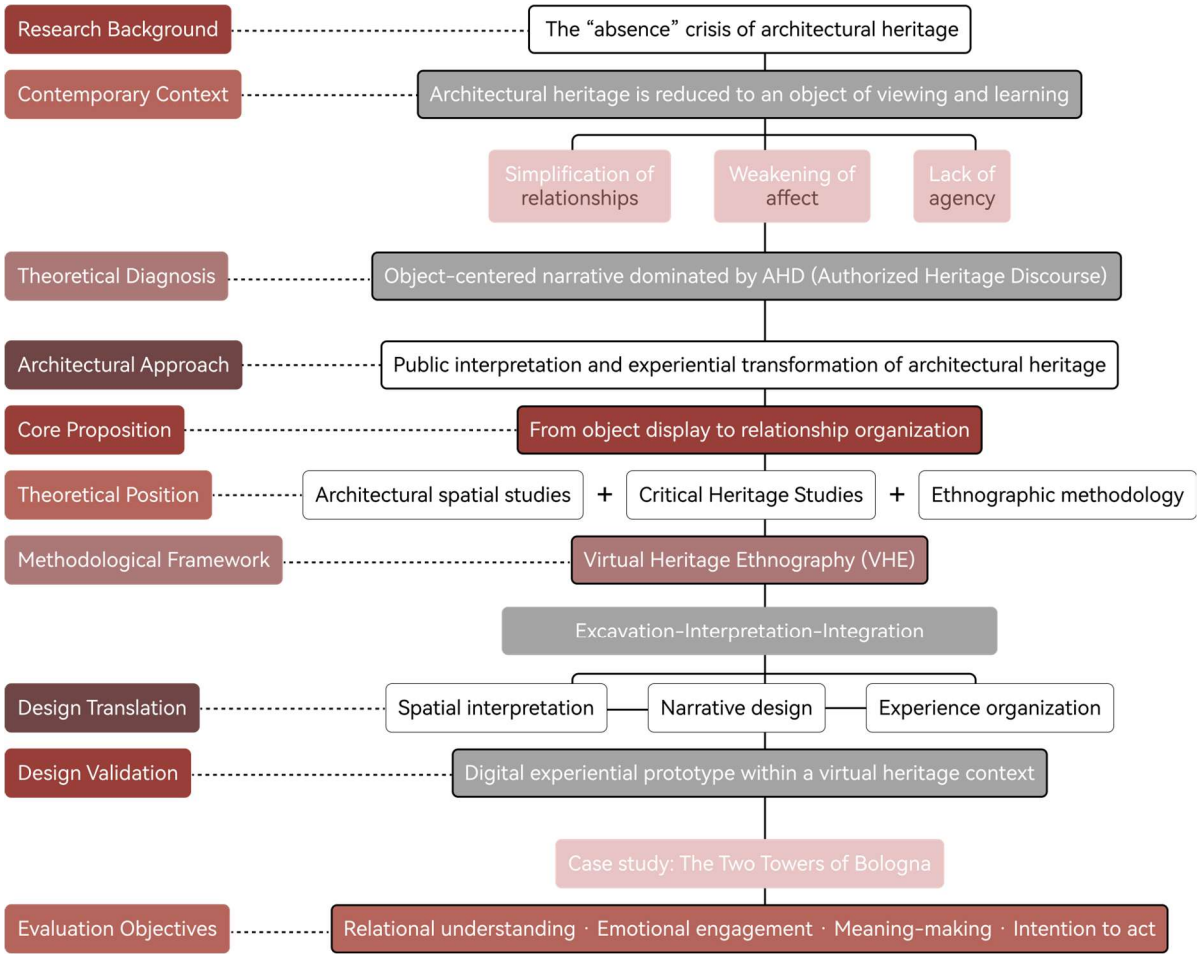


Figure 1.3 Core Conceptual Framework of the Research

Source: Drawn by the author

The methodological foundation of VHE comes from the intersection of ethnography and spatial studies. Ethnography focuses on understanding cultural practices and everyday life through observation and contextual research.

At the same time, space—including digital space—not only carries social structures and cultural meaning, but also plays an active role in shaping social relationships. Based on this, this study treats architectural heritage itself as the field site and understands the digital environment as a relational field that can hold narrative, memory, and emotion, rather than just a tool for reproducing historical information.

Structurally, the VHE framework is organized into three connected stages: Excavation, Interpretation, and Integration. These three stages form both the research process and an iterative loop of knowledge production.

The first stage, **Excavation**, focuses on building a knowledge base for heritage narratives through literature review, fieldwork, and the organization of ethnographic materials. This stage begins with a systematic review of key theories, including critical heritage studies, ethical and evidential issues in virtual heritage, ethnography and memory studies, as well as digital narrative and exhibition design. Through this review, the study clarifies a shift in virtual heritage practice—from object-focused to relational approaches. At the same time, taking Bologna's Due Torri as the main case, this study analyzes its historical context and current discourse through field investigation, academic sources, and historical documents. Based on this, a narrative asset list is developed to support later design.

The second stage, **Interpretation**, focuses on transforming the materials from the first stage into narrative structures through digital storytelling and immersive, concept-driven prototyping. This study adopts a comparative design strategy and develops two different digital narrative prototypes based on the same materials. The first is the *Control Prototype*, which presents historical facts and architectural information in a structured way. The second is the *VHE Prototype*, which seeks to construct a more relational narrative structure through a critically informed narrative perspective and more immersive forms of interaction.

The third stage, **Integration**, focuses on user experience and emotional response. The comparative evaluation focuses on the screen-based versions of the Control and VHE prototypes. Through exploratory evaluation, this stage examines how the two narrative models influence participants' understanding and emotional engagement. It also uses

questionnaires to measure emotional reactions, level of interest, and changes in attitudes toward heritage preservation. By analyzing the feedback, this study explores how virtual heritage narratives can create emotional resonance and build connections in digital environments.

Through these three stages, the research forms an iterative path from knowledge collection to narrative construction and then to experience evaluation. This method highlights the relationship between research, design, and experience: ethnographic and historical materials provide the basis for narrative design; narrative prototypes are experienced by users; and user feedback helps refine and improve the framework.

1.4 Research Object and Scope of the Field

This study focuses on the iconic urban heritage of Bologna, Italy (see fig.1.4)—Torre degli Asinelli and Torre Garisenda—as its main object of narrative practice. The theoretical framework also builds on the author's previous immersive LBVR exhibition project *Shanghai 1924*, using this experience to develop, test, and reflect on the VHE framework.



Figure 1.4 Bologna's Due Torri and Their Protective Enclosure

Source: Photographs by the author

These two towers are commonly known as Le Due Torri, located at Porta Ravegnana in the historic center of Bologna. They are important remains of medieval urban power structures and symbols of family identity. In the Middle Ages, Bologna was known as a city

of towers because of its dense tower landscape. Over time, due to urban development and structural issues, most towers disappeared or were demolished. The Asinelli and Garisenda towers are among the most representative surviving examples.

In recent years, the towers themselves have faced new preservation challenges. Due to long-term leaning and material aging, Torre Garisenda was identified in 2023 as having serious structural risks, and the surrounding area was closed off. Although local authorities have organized a technical team for restoration, progress has been delayed due to funding and management issues. As a result, the area around the towers remains inaccessible. This situation makes the Due Torri a typical case of architectural heritage that is visible but not accessible, while also revealing a condition of absence at both physical and social levels and the narrative predicament that follows from it. The towers are still part of the urban landscape, but people gradually lose the possibility of experiencing them directly in everyday life. Instead, they can only access them through museums and official narratives. The homogenization of these narratives further reinforces the Authorized Heritage Discourse. It is within this context that the Due Torri provides an urgent and relevant research field for exploring a new relationship-centered method of virtual heritage narrative.

Fieldwork is an important part of the VHE method. Based on the conditions of this study, the field area focuses on the core urban environment around the towers (see below fig.1.5). The central area is Porta Ravegnana and the space around the tower bases. In addition, several nearby urban nodes closely related to the towers are included in the study, such as Piazza della Mercanzia, the Via Rizzoli axis, and the route leading to Piazza Maggiore. These locations together form the main visual scenes, pedestrian routes, and public interfaces through which the towers are experienced today. They are also important spaces where local memory and everyday perception are formed.

It should be noted that, given the objective conditions of research time, spatial distance, and site accessibility, the ethnographic practice carried out in this study takes the form of a hybrid ethnographic approach oriented toward architectural heritage narrative design. It combines short-term field observation, spatial documentation, and the excavation of online materials in order to identify spatial experiences, public perceptions, and relational clues that can support later narrative translation and prototype design.

At the same time, this study does not limit the Due Torri to just physical towers

themselves or to a fixed urban area in a traditional architectural sense. Instead, they are understood as a relational field made up of buildings, spaces, historical events, public perception, and crisis conditions.

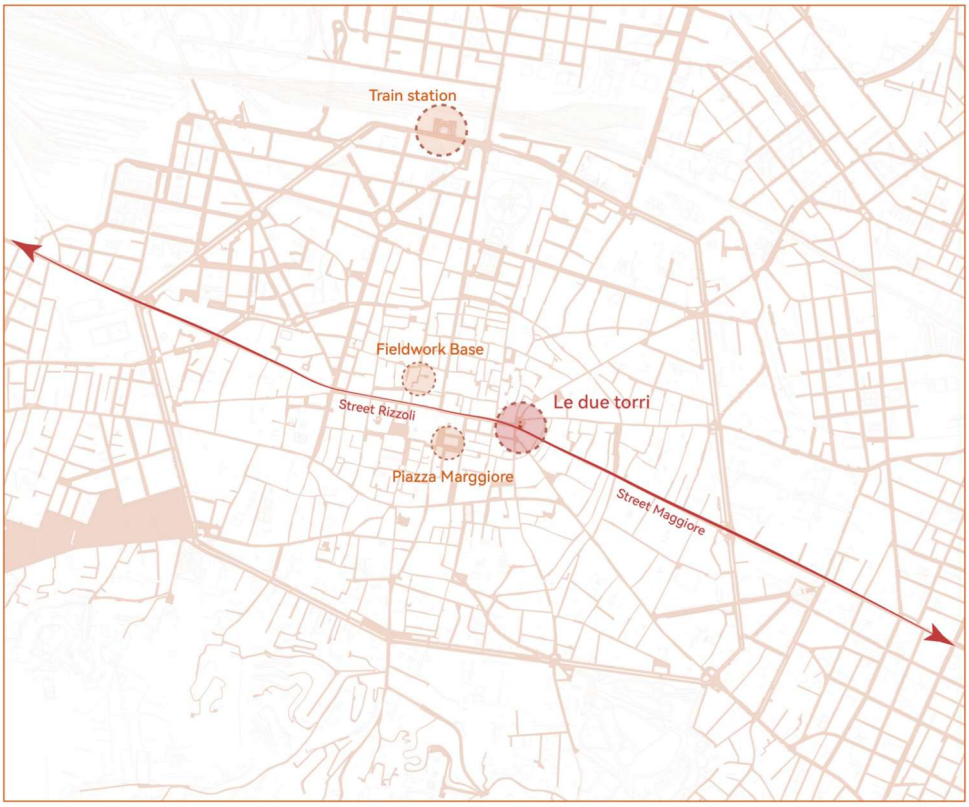


Figure 1.5 Fieldwork Map and the Towers' Urban Context

Source: Drawn by the author

The focus is therefore on analyzing architectural heritage from a spatial and relational perspective, and identifying which spatial experiences, memory elements, and relational materials can support later prototype design and narrative translation.

At the digital level, considering the goals and feasibility of the study, the focus is not on creating a precise digital model of Bologna or the towers. Instead, the study uses the towers as an entry point to explore how virtual heritage narratives can go beyond simple visual fidelity to organize multiple relationships.

In this study, the towers are both concrete heritage objects—with clear spatial, historical, and material attributes—and narrative carriers that go beyond their physical form, representing urban memory, everyday experience, public perception, and current challenges.

1.5 Chapter Structure

This thesis is organized into seven chapters.

Chapter 1 introduces the research background, research questions, and methodological framework.

Chapter 2 provides a theoretical review, covering architectural heritage conservation, critical heritage studies and memory theory, virtual heritage practices, and immersive narrative.

Chapter 3 explains the theoretical framework of Virtual Heritage Ethnography, the author's previous related case study, and the research methods used in this study.

Chapter 4 focuses on the Due Torri in Bologna, presenting fieldwork and narrative analysis. It uses spatial relationships as a starting point to identify key narrative elements for prototype design.

Chapter 5 presents the prototype design, including a conceptual approach, technical process, scene translation, and overall experience design.

Chapter 6 tests the narrative prototype with users and provides an initial evaluation of its effectiveness, discussing VHE as a method for narrative design research.

Chapter 7 concludes the thesis by summarizing its contributions, discussing its limitations, and suggesting directions for future research.

Chapter 2 Literature Review and Theoretical Framework

2.1 The Evolution of Cultural Heritage Conservation Theory and Contemporary Shifts

Cultural heritage conservation, as an important field within modern architecture and urban studies, has undergone significant development since the twentieth century. From an initial focus on the preservation of individual monuments, it has gradually expanded to include historic environments, cultural landscapes, and social practices (see fig.2.1). The objects, methods, and values of heritage conservation have all changed accordingly. This evolution is reflected not only in the improvement of conservation techniques and institutional frameworks, but also in a broader shift in how society understands the relationship between history, culture, and memory.



Figure 2.1 Shifts in Heritage Research Focus

Source: Drawn by the author

Modern heritage conservation theory is generally considered to have originated in nineteenth-century Europe, in discussions surrounding the protection of monuments. Alois Riegl, in *The Modern Cult of Monuments*, argued that the value of monuments is not inherent, but is constructed by the value systems of different historical periods. These values include historical value, artistic value, and commemorative value, among others[4]. This idea laid the foundation for modern theories of heritage value. Subsequently, the international community

[4] RIEGL A. *The modern cult of monuments: its character and its origin*: originally published as Der moderne Denkmalkultus: sein Wesen und seine Entstehung in 1903[J]. Translated by FORSTER K W, GHIRARDO D. Oppositions, 1982(25): 21-51.

gradually established basic principles of heritage conservation through institutional documents. *The Venice Charter* of 1964 systematically set out principles for the conservation and restoration of monuments and sites, emphasizing historical authenticity, the preservation of materials, and scientific methods of restoration, and providing an important international standard for modern conservation practice[5]. *The Convention Concerning the Protection of the World Cultural and Natural Heritage*, adopted in 1972, further incorporated cultural heritage conservation into a global governance framework, extending it from a professional field to an issue of international cooperation across nations and cultures[6].

With the continued development of conservation concepts, the scope of heritage protection has expanded from individual monuments to broader historic environments and urban spaces. *The Washington Charter* of 1987 explicitly highlighted the importance of conserving historic towns and urban areas, emphasizing that heritage value should be understood within the context of the whole environment, rather than limited to individual buildings[7]. In the twenty-first century, UNESCO further promoted this shift through the concept of *the Historic Urban Landscape (HUL)*. This approach emphasizes that urban heritage conservation should be integrated into the broader framework of social, economic, and cultural development, and achieved through comprehensive management, public participation, and interdisciplinary collaboration[8]. As a result, heritage conservation has gradually moved from a technical practice centered on material preservation to a more comprehensive process involving social, cultural, and governance dimensions.

In recent years, this shift has increasingly focused on the discussion of the living value of heritage and its social relationships. Heritage conservation is no longer limited to the protection of historical buildings themselves, but also includes the social lifestyles and

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[5] ICOMOS. International Charter for the Conservation and Restoration of Monuments and Sites (The Venice Charter 1964)[Z]. Venice: IInd International Congress of Architects and Technicians of Historic Monuments, 1964.

[6] UNESCO. Convention Concerning the Protection of the World Cultural and Natural Heritage[Z]. Paris: UNESCO, 1972.

[7] ICOMOS. Charter for the Conservation of Historic Towns and Urban Areas (Washington Charter 1987)[Z]. Washington, DC: ICOMOS General Assembly, 1987.

[8] UNESCO. Recommendation on the Historic Urban Landscape[Z]. Paris: UNESCO, 2011.

cultural practices associated with them. For example, the conservation of historic cities and traditional settlements has begun to emphasize the participation of local communities and the continuity of social structures, making heritage conservation a social process oriented toward the future.

However, despite this expansion—from individual monuments to historic environments, and from relic preservation to broader cultural heritage—the mainstream of heritage research still largely focuses on the scope of protection, technical methods, and institutional frameworks. Questions such as how heritage meaning is defined, who defines it, and what role the public plays in constructing heritage meaning have received relatively limited attention. It is in this context that scholars have increasingly begun to reconsider heritage from the perspective of social practice and cultural politics. Heritage is no longer understood only as a historical object to be preserved, but as a cultural practice that is continuously produced and negotiated in contemporary society. This theoretical shift has formed the basis for the emergence of *Critical Heritage Studies (CHS)* in recent years, and provides a new perspective for understanding the complex relationships between heritage and society.

2.2 Heritage as Practice: Authorized Heritage Discourse, Memory, and Everyday Life

Since the early twenty-first century, scholars have systematically re-examined traditional heritage conservation paradigms within the framework of Critical Heritage Studies. This perspective fundamentally changes how heritage is understood: heritage is no longer seen merely as a material remnant of the past, but as a cultural process that is continuously enacted through everyday practices, institutional frameworks, and emotional relationships. In other words, heritage is not a passive object, but a structure of meaning that is constantly produced, interpreted, and negotiated in social practice. As David Lowenthal points out, heritage is essentially a selective reconstruction of the past by contemporary society; it is a processed and interpreted version of history rather than a direct representation of past facts[9]. Therefore, decisions about preserving, neglecting, or transforming heritage are

[9] LOWENTHAL D. *The Past Is a Foreign Country*[M]. Cambridge: Cambridge University Press, 1985.

inherently political. These decisions not only shape how we interpret the past, but also influence how society imagines possible futures.

Within this theoretical framework, Rodney Harrison further argues that heritage practice is not only about preserving material remains, but also about actively participating in the production of the future through the selective continuation, transformation, or abandonment of the past[10]. Heritage can thus be understood as a "future-making practice." Through heritage practices, societies determine which aspects of the past are worth remembering, and shape cultural resources for future generations through institutionalized forms of conservation and presentation. This perspective shifts heritage studies from a focus on technical and managerial issues to a reflection on power structures and social practices.

In this context, the concept of *Authorized Heritage Discourse (AHD)* proposed by Laurajane Smith becomes one of the central theories in Critical Heritage Studies. AHD refers to a dominant mode of heritage narrative shaped by professional institutions, expert knowledge systems, and national cultural policies. Within this discourse, heritage is typically understood as a material object with commemorative and aesthetic value, whose significance is established primarily through expert evaluation and institutional recognition[11]. This narrative framework tends to prioritize grand history, monuments, and national identity, while everyday practices, local experience, gendered memory, and minority narratives are often marginalized.

As research has developed further, scholars have increasingly recognized the importance of *affect* in heritage practice. Affect is not a secondary factor, but an important mechanism through which heritage meaning is stabilized, contested, and negotiated[12]. Heritage is not only understood through knowledge and information, but also through emotional experience and embodied perception. Related studies have further explored how emotional engagement is connected with power structures[13], as well as how processes such

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[10] HARRISON R. *Heritage: Critical Approaches*[M]. London: Routledge, 2013.

[11] SMITH L. *Uses of Heritage*[M]. London: Routledge, 2006. DOI:10.4324/9780203602263.

[12] WATERTON E. *Politics, Policy and the Discourses of Heritage in Britain*[M]. Basingstoke: Palgrave Macmillan, 2010.

[13] SMITH L. *Emotional Heritage: Visitor Engagement at Museums and Heritage Sites*[M]. London: Routledge, 2021.

as enchantment, discussed in philosophy, can transform encounters between people and heritage into ethical action and a sense of responsibility[14]. In this sense, heritage experience is not only a process of knowledge transmission, but also an affective practice that can stimulate cultural identity and social responsibility.

Memory studies also provide an important theoretical basis for understanding the relationship between heritage and society. Paul Ricoeur's idea that "to forget is a second death" emphasizes the moral urgency of maintaining historical memory through commemorative practices when memory is under threat[15]. However, as Halbwachs points out, collective memory is not simply preserved in objects or individual minds, but is reconstructed through social frameworks[16]. When people's living environments are disrupted or destroyed, memory often needs to rely on specific places and media to be sustained. Pierre Nora conceptualized this phenomenon as "lieux de mémoire" (sites of memory)—spaces and symbols that carry a symbolic function within the structure of social memory[17]. From this perspective, heritage is no longer only a historical remnant, but a medium that carries social memory and cultural identity. Extending this logic to the digital age raises a new question: can digital environments become a new medium of memory, allowing heritage to continue participating in the construction of relationships and the production of meaning in contemporary society?

In understanding how heritage is practiced in everyday life, Michel de Certeau's distinction between "strategies" and "tactics" provides an important perspective[18]. Institutional heritage frameworks—including conservation systems, museum narratives, and digital heritage platforms—are typically forms of "strategies." They organize space by classifying objects, stabilizing meaning, and presenting narratives from specific perspectives,

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[14] PERRY S. The enchantment of the archaeological record[J]. European Journal of Archaeology, 2019, 22(3): 354-371.

[15] RICOEUR P. *Memory, History, Forgetting*[M]. BLAMEY K, PELLAUER D, trans. Chicago: University of Chicago Press, 2004.

[16] HALBWACHS M. On Collective Memory[M]. COSER L A, ed. Chicago: University of Chicago Press, 1992: 39-40.

[17] NORA P. Between memory and history: Les lieux de mémoire[J]. Representations, 1989(26): 7-24.

[18] CERTEAU M de. The Practice of Everyday Life[M]. RENDALL S, trans. Berkeley: University of California Press, 1984.

making space understandable and manageable. In contrast, "tactics" refer to the ways in which ordinary users re-appropriate and recreate space in everyday life, such as walking, dwelling, storytelling, and informal rituals. It is through these everyday practices that individuals generate new meanings within or beyond existing strategic structures. For example, in studies of urban heritage tourism, researchers have found that local residents and tourists do not simply accept official narratives, but continuously reinterpret and negotiate heritage meanings within specific social contexts[19]. In other words, the vitality of heritage as a living social practice is often sustained through these everyday "tactical" actions.

2.3 Virtual Heritage Practice: Reconstruction, Authenticity, and Transparency

Virtual Heritage was initially defined as a way of using interactive technologies to record, preserve, or reproduce cultural heritage for the purpose of public education[20]. In the fields of Virtual Heritage and Virtual Archaeology, the current research paradigm has gradually established virtual reconstruction as an academic practice constrained by methodological standards. It is understood as a scholarly process that must assume evidential accountability, maintain interpretative transparency, and clearly indicate uncertainty. These principles have been systematically formalized in international guidelines such as *the London Charter*[21] and *the Principles of Seville*[22].

These principles have subsequently been translated into validation workflows in many applied studies. At the architectural scale, Ferdani et al., in their virtual reconstruction of the Forum of Augustus in Rome, proposed an evidence-based production pipeline, exploring

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[19] ZHU Y. Uses of the past: negotiating heritage in Xi'an[J]. International Journal of Heritage Studies, 2018, 24(1): 1-17. DOI:10.1080/13527258.2017.1347886.

[20] STONE R J, OJIKA T. Virtual heritage: What next?[J]. IEEE MultiMedia, 2000, 7(2): 73-74.

[21] London Charter Initiative. The London Charter for the Computer-Based Visualisation of Cultural Heritage[EB/OL]. (2009-02)[2026-03-30]. https://londoncharter.org/.

[22] Principles of Seville. The Seville Principles: International Principles of Virtual Archaeology[Z]. 2011.

how archaeological evidence and historical interpretation can be systematically integrated into workflows of 3D reconstruction and VR development[23]. At the same time, Pietroni and Ferdani distinguished between virtual restoration and virtual reconstruction, and critically pointed out the epistemological risks of models that appear visually complete but lack conceptual transparency[24]. They argue that when visual realism conceals interpretative decisions made during the modeling process, virtual reconstruction may produce a false sense of reality. From this perspective, historical understanding does not primarily depend on geometric accuracy itself, but rather on cognitive models, interaction mechanisms, and the transparent expression of uncertainty.

At the urban scale, virtual reconstruction has developed into a tool for knowledge integration and analytical reasoning. Ferwati and El Menshawy's reconstruction of the historic city of Al-Zubarah shows that, under conditions where material remains are highly fragmented, it is possible to integrate archaeological evidence, historical documents, and spatial analysis into a coherent urban model, thereby supporting the interpretation of urban structure, building typologies, and patterns of everyday life[25]. Similar approaches are also found in cases where physical heritage can no longer be preserved. For example, Alkhatib et al.[26], in their digital reconstruction of the destroyed site of Palmyra, treat virtual reconstruction as an alternative form of preservation, allowing architectural knowledge to continue after irreversible loss, and demonstrating the technical feasibility of reconstructing lost heritage at a high level of geometric precision.

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[23] FERDANI D, FANINI B, PICCIOLI M C, et al. 3D reconstruction and validation of historical background for immersive VR applications and games: The case study of the Forum of Augustus in Rome[J]. Journal of Cultural Heritage, 2020, 43: 129-143.

[24] PIETRONI E, FERDANI D. Virtual restoration and virtual reconstruction in cultural heritage: Terminology, methodology, visual representation techniques and cognitive models[J]. Information, 2021, 12(4): 167.

[25] FERWATI M S, EL MENSHAWY S M. Virtual reconstruction of the historic city of Al-Zubarah in Qatar[J]. Ain Shams Engineering Journal, 2021, 12(3): 3069-3086.

[26] ALKHATIB Y J, FORTE A, BITELLI G, PIERDICCA R, MALINVERNI E. Bringing back lost heritage into life by 3D reconstruction in metaverse and virtual environments: The case study of Palmyra, Syria[C]. Cham: Springer, 2023. DOI:10.1007/978-3-031-43404-4_7.

In discussions of authenticity, research in virtual heritage has gradually shifted from a focus on "object authenticity" to a more multidimensional understanding. Traditional heritage conservation theory emphasizes the authenticity of materials, structures, and historical information of the original object. In digital environments, however, virtual objects do not possess the physical existence of original artifacts. Their authenticity is therefore more closely related to the reliability of information sources and the transparency of representation. At the same time, some studies have begun to reconsider authenticity from the perspective of experience and perception. Wang Ning[27], in tourism studies, proposed the concept of existential authenticity, arguing that authenticity does not entirely derive from the object itself, but can arise from emotional and embodied participation during experience. In the context of virtual heritage, this shift suggests that the meaning of virtual experience does not depend solely on the accuracy of reconstruction, but also on participants' cognitive and emotional engagement during interaction.

Taken together, these studies show that the field of virtual heritage has reached a relatively high level of methodological maturity in terms of reconstruction methods, validation mechanisms, and workflow design, while also beginning to address experiential dimensions. However, mainstream research still mainly focuses on the reconstruction of architectural entities, morphological structures, and spatial configurations, while paying less attention to the narrative dimensions of heritage. The narrative structures within virtual environments largely continue the expert-led logic of Authorized Heritage Discourse (AHD). As a result, discussions of relational dimensions such as social practice and everyday memory remain relatively limited. In other words, although digital technologies are now capable of achieving highly developed visual reconstruction of heritage, the question of how to reorganize heritage narratives through digital media, stimulate public participation, and build emotional connections remains an important issue that requires further exploration in virtual heritage research.

[27] WANG N. Rethinking authenticity in tourism experience[J]. Annals of Tourism Research, 1999, 26(2): 349-370.

2.4 Immersive Narrative and Heritage Experience: From "Seeing Heritage" to "Experiencing Heritage"

To respond to the limitations of object-centered virtual reconstruction models, recent scholarship has shown an immersive and interactive turn, in which emotional experience, narrative structure, and interaction mechanisms are regarded as important pathways for the generation of heritage meaning. This shift is represented by studies on the gamification of heritage by scholars such as Champion. The core argument is that meaningful virtual heritage practice does not depend solely on visual realism, but on how users critically engage within space and construct meaning through active narrative understanding[28] [29]. In other words, the value of virtual heritage no longer lies only in the visual reconstruction of historical objects, but in whether spatial experience and narrative structure can enable participants to develop an understanding and perception of historical contexts through interaction. However, Champion also points out that if genuine agency is lacking, immersive environments may become a superficial form of "visual spectacle," in which case the structure of interpretative authority remains unchanged.

The success of heritage narrative largely depends on the activation of the emotional dimension. Perry et al.[30] argue that heritage presentation should move from static display to experience-based design mediated by narrative, in which emotional dimensions are emphasized. Through storytelling, situational contexts, and interactive mechanisms, audiences are able to form emotional connections during participation. However, they also note that if the interpretative framework is still predetermined by experts, such emotional engagement remains exclusive.

In this situation, immersive heritage practice may simply transform traditional visual

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[28] CHAMPION E. Playing with the Past: Heritage, Interactivity and Experience Design in Virtual Worlds[M]. London: Springer, 2011. DOI:10.1007/978-1-84996-501-9.

[29] CHAMPION E. Critical Gaming: Interactive History and Virtual Heritage[M]. Farnham: Ashgate, 2015.

[30] PERRY S, ROUSSOU M, ECONOMOU M, et al. Moving Beyond the Virtual Museum: Engaging Visitors Emotionally[C]//Proceedings of the 23rd International Conference on Virtual Systems & Multimedia (VSMM). Dublin: IEEE, 2018: 1-8. DOI:10.1109/VSMM.2017.8346276.

authority into a new form of experiential authority[31]. Many current virtual heritage practices and studies implicitly confirm this concern. For example, Xing et al. [32], in their VR reconstruction of the Redtory industrial site, enhanced spatial experience through immersive navigation, but the narrative remained based on official historical accounts, leaving little room for contextualized or relational interpretation. As a result, Authorized Heritage Discourse (AHD) is reproduced within an immersive format.

Within the context of this immersive and interactive turn, the role of embodiment in understanding heritage has also received increasing attention. Many scholars draw on Merleau-Ponty's phenomenology of perception and theories of embodiment to analyze heritage experience. For instance, in virtual reality research, Kilteni, Groten, and Slater use the concept of the sense of embodiment to explain that self-location, agency, and body ownership together shape the sense of presence in immersive environments, allowing participants to enter spatial situations as actors rather than observers[33]. This shift from "seeing heritage" to "experiencing heritage" further expands how virtual heritage research understands participation, identity, and meaning-making.

However, although the immersive turn has expanded the expressive possibilities of virtual heritage—enabling richer forms of participation through narrative, interaction, and emotional experience—new limitations may arise when immersion and interaction themselves are treated as ends rather than as a relational field open to practice and negotiation. In other words, while immersive media provide new modes of expression, without an appropriate methodological framework to organize narrative materials and social memory, these technologies may continue to reproduce traditional structures of authoritative interpretation in new forms.

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[31] PERRY S, SIMANDIRAKI-GRIMSHAW A, MORGAN C, et al. Towards New Futures for Archaeological Data Production: Challenging Archaeonormativity through Storytelling[J]. Journal of Field Archaeology, 2025, 50(8): 796-815. DOI:10.1080/00934690.2025.2504235.

[32] XING Y, XIAO Y, LUO Y. Integrating restoration and interactive exploration to enhance cultural heritage through VR storytelling[J]. Scientific Reports, 2024, 14: 21194. DOI:10.1038/s41598-024-72182-9.

[33] KILTENI K, GROTEN R, SLATER M. The sense of embodiment in virtual reality[J]. Presence: Teleoperators and Virtual Environments, 2012, 21(4): 373-387.

Therefore, one of the key challenges facing contemporary virtual heritage practice is not whether more realistic immersive experiences can be created at the technical level, but how to regulate the interpretative process through effective methodological frameworks, so that heritage narratives can accommodate multiple voices and re-establish meaningful connections between the public and heritage.

2.5 Chapter Summary: Research Positioning and Core Proposition

Based on the literature reviewed above, several key shifts can be identified in contemporary research and practice related to virtual heritage narrative. These shifts are especially reflected in how to move beyond the dominant logic of object display and knowledge transmission, and to reorganize the relationships, emotional connections, and meanings between heritage and the public. They can be summarized as follows:

1）From Object to Memory：

Traditional virtual reconstruction and heritage presentation processes tend to prioritize archaeological data and material remains, which leads to a phenomenon of memory displacement, where important memory resources such as oral history and informal narratives are largely overlooked.

2）From Monumental to Everyday：

Many digital heritage projects continue to follow the institutional bias of Authorized Heritage Discourse (AHD), emphasizing monumental heritage and official narratives. In doing so, they unintentionally marginalize bottom-up everyday experiences and social memory, thereby increasing the distance between heritage and the public.

3）From Aesthetic to Affective Politics：

Immersive practices often enhance participation through sensory stimulation, but pay less attention to the underlying structure of affect within the experience. As a result, they overlook the political nature of emotion itself and its role in shaping power relations and identity within virtual environments.

4）From Past to Future：

Mainstream research still tends to treat heritage as something belonging to the past that

needs to be preserved. However, as Harrison points out, heritage practice should not remain at the level of passive protection and conservation, but should become a future-oriented action, sustaining cultural continuity through negotiation, dialogue, and social interaction.

Core Proposition：

Overall, a key direction for contemporary virtual heritage narrative practice lies in responding to these shifts and repositioning the public at the center of heritage meaning-making. Based on this research gap, Virtual Heritage Ethnography (VHE) is proposed in this study as a methodological framework for heritage narrative. By combining design and spatial thinking from architecture, ethnographic methods, and perspectives from critical heritage studies, VHE aims to provide a pathway for virtual heritage practice that moves from object reconstruction to relational reconstruction.

Chapter 3 Research Design and Methodology

3.1 Core Framework of Virtual Heritage Ethnography: General Principles

The core aim of Virtual Heritage Ethnography (VHE) is to introduce perspectives from Critical Heritage Studies and ethnographic methods into virtual heritage practice (see fig.3.1). It seeks to transform virtual heritage from a simple display tool into a research framework for organizing social memory, spatial narrative, and public engagement. Within this framework, ethnography allows informal memories and emotional elements to move from the margins of heritage interpretation to become a central part of narrative construction. In other words, VHE is not only concerned with how to see the past more accurately, but with how to narrate and rebuild the cultural and emotional connections between heritage and contemporary society through digital media.

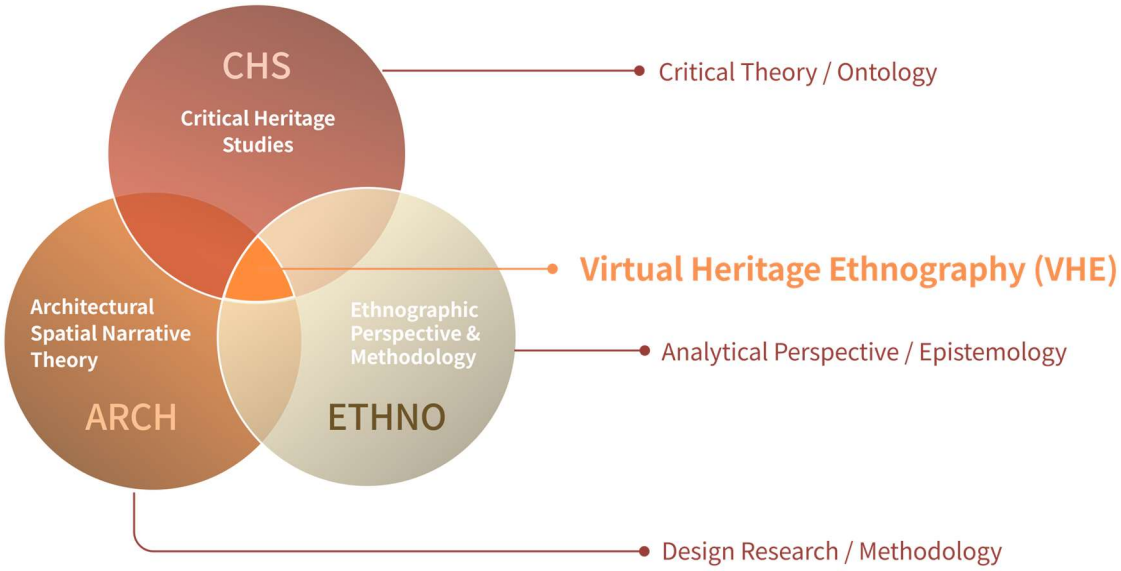


Figure 3.1 VHE Theoretical Background

Source: Drawn by the author

In recent years, ethnographic methods have been increasingly used in digital research and design. Sarah Pink, in her discussion of Digital Ethnography, points out that contemporary social practices take place across interconnected online and offline

environments. Digital media are not external tools, but part of social life itself. Therefore, digital space should be understood as a hybrid fieldsite—a dynamic field shaped by perception, action, technology, and social relationships[34]. This idea provides an important foundation for applying ethnography to virtual heritage.

In this context, virtual environments are no longer just interfaces for presenting historical information. They become social spaces that can be entered, experienced, and participated in. Thus, the research focus shifts from heritage as a static historical object to the relational processes behind it, especially how people today form new emotional connections through immersive experience, co-presence, and narrative participation.

From the perspective of architectural anthropology, the concept of *Spatial Ethnography*, proposed by Huaqing Huang, also provides key inspiration for this study. Spatial ethnography emphasizes understanding place through spatial practices, everyday narratives, and local experience, while recognizing the agency of space itself[35]. Unlike traditional approaches that focus on form, function, or style, this perspective examines how space is continuously interpreted, negotiated, and reproduced through social interaction. For this study, its significance lies in shifting space from a representational object to a process of meaning-making. It also suggests that ethnographic approaches can engage more deeply with cultural practices and memory systems, and reveal the agency of heritage.

Based on these ideas, the ethnographic method used in VHE is not just a simple extension of traditional ethnography. Instead, it is a form of mixed ethnography that operates across physical and digital spaces and runs through the entire research process. In the first stage of the research, the researcher conducts field observation, collects public narratives, uses small-scale surveys, and reviews literature to identify living memories and everyday practices that are often excluded from dominant historical narratives. These materials form the social foundation of virtual heritage storytelling. In the later stage, the focus shifts to the digital environment itself, examining how interface design, spatial paths, narrative nodes,

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[34] PINK S, HORST H, POSTILL J, et al. Digital Ethnography: Principles and Practice[M]. London: SAGE Publications, 2016.

[35] 黄华青. 空间作为能动者：基于“空间志”的当代乡村变迁观察[J]. 建筑学报, 2020(7): 14-19. DOI:10.19819/j.cnki.ISSN0529-1399.202007003.

and immersive experience shape new heritage understanding, emotional structures, and perceptions of the future. However, as noted above, the ethnographic method adopted in this study still has certain limitations in terms of the depth and breadth of fieldwork. Therefore, its main function is to provide exploratory support for the feasibility of the VHE, rather than to produce definitive conclusions.

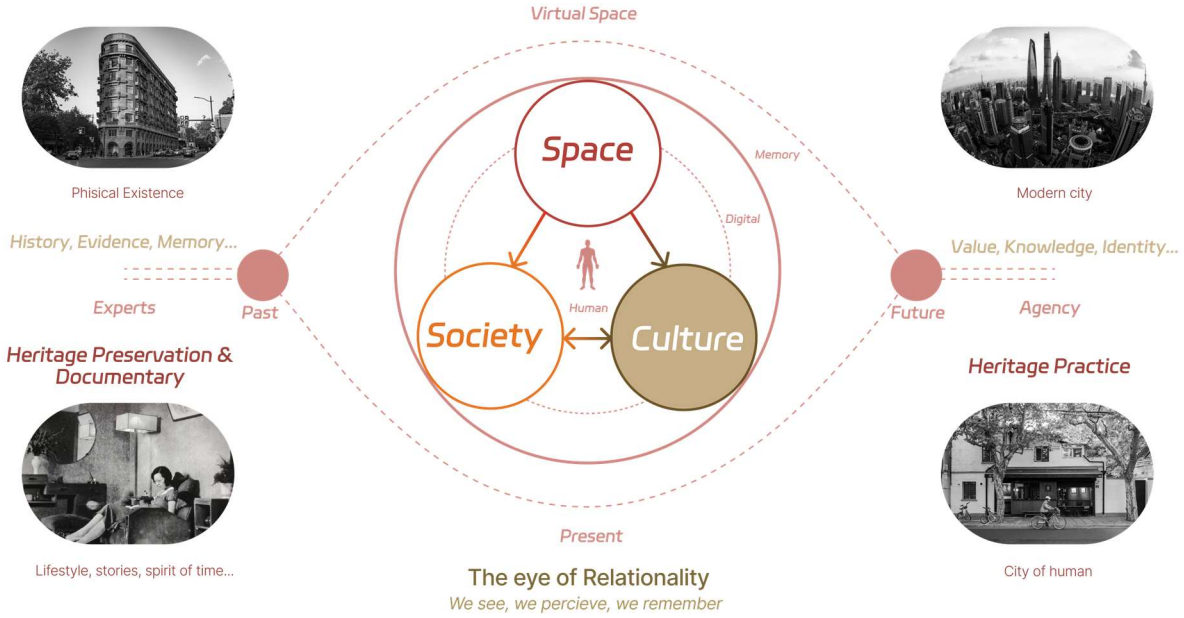


Figure 3.2 The VHE *Eye of Relationality* Framework

Source: Drawn by the author

A key feature of VHE is that it redefines the role of digital space in heritage research. In this study, the core logic, aims, and characteristics of VHE are summarized in a diagram created by the author and titled the Eye of Relationality (see fig.3.2). The diagram visualizes VHE as a human-centered knowledge framework, mediated by digital space and organized across spatial, social, and cultural dimensions. Through this relational structure, heritage is reinterpreted by excavating and translating the past, reconstructing experience in the present, and transforming that experience into future-oriented understanding and action.

Once constructed, the digital environment becomes a *memory laboratory* that can be repeatedly accessed, tested, and experienced. Within this experimental space, researchers can observe how participants understand heritage and engage with it sensorially.

This allows for a deeper understanding of how virtual environments and heritage narratives function, and supports continuous adjustment and iteration of the VHE framework, forming a closed research loop.

3.2 Preliminary Practice: Testing the Method through *Shanghai 1924*

3.2.1 Project Overview: From Highly Visible Heritage to Narrative Reorganization

Before developing the prototype for the Due Torri in Bologna, it is important to revisit a previous virtual heritage project in which the author participated as a core team member and art director: *Shanghai 1924 - Wukang Mansion Centenary VR Exhibition*.

This project is used as a preliminary case because it directly inspired the development of the VHE framework and addressed one of the key questions of this study: when a widely recognized urban heritage site becomes a fixed visual symbol, how can virtual media reorganize its narrative so that hidden experiences can re-enter public perception?



Figure 3.3 Shanghai 1924 - Wukang Mansion Centenary VR Exhibition

Source: Screenshot of the project by the author

The project was created to mark the 100th anniversary of *Wukang Mansion* (see fig.3.3). It was an immersive heritage project led by academic research and developed in collaboration with industry partners. Unlike many heritage exhibitions that focus mainly on

visual spectacle or sensory experience, this project did not treat the building simply as an object to be visually presented. Instead, it combined architectural history, urban history, everyday life, and social-cultural studies to ask deeper questions: why is this building important, how is it connected to Shanghai's modern urban identity, and how can this connection be re-experienced by the public? In this way, heritage was no longer just something to be seen or explained. It became something that needed to be reintroduced into perception through narrative design.

Importantly, the project did not deal with an unfamiliar heritage site, but with one that is already over-exposed. *Wukang Mansion* is highly visible in Shanghai today. As an important landmark of the city, it appears frequently in tourism promotion, social media, and urban imagery. However, high visibility does not necessarily lead to deeper understanding. On the contrary, repeated photography and circulation often reduce the building to a fixed visual icon. Its layered history, social relationships, and everyday life are pushed out of view. The most common narratives around the building focus on the architect *Hudec*, the Art Deco style, and its value as a city landmark. These correspond closely to the logic of *Authorized Heritage Discourse*: emphasizing architects, style, time period, and symbolic meaning, while paying less attention to everyday life, gender experience, and living practices.

What makes Shanghai 1924 important for this study is not simply that it revives a building through immersive experience, but that it shifts the focus of the narrative. The project still includes established historical frameworks such as the architect, the development of the former French Concession, and the rise of modern apartment living. However, it also deliberately moves toward less visible aspects. It draws from informal archives, fragmented records, and everyday life details to explore connections between apartment living, urban consumption, and modern female identity. Through this approach, women's lifestyles, living experiences, career imagination, and emotional structures become part of heritage interpretation. This not only responds to contemporary discussions on feminism in China, but also rebalances traditional heritage narratives. It weakens the dominance of architect-centered and style-based narratives, allowing Wukang Mansion to be understood not only as a masterpiece of design, but also as a space where modern lifestyles and everyday experiences were shaped.

For VHE, the key insight is that heritage is not only made of physical objects and

official knowledge. It is also constructed by everyday practice, local emotions, and marginalized experiences. The virtual environment can therefore serve as a space where these hidden narratives re-enter interpretation.

3.2.2 The Organization of Spatial Narrative: From Spatial Script to Heritage Relations

The narrative of *Shanghai 1924* was built on a spatial script centered on spatial organization. The spatial script is different from simply placing a traditional story script into a three-dimensional environment. Rather, it is a narrative mechanism that brings together characters, events, dialogue, movement paths, viewpoints, scene transitions, and bodily motion within one design structure (see below fig.3.4). In this structure, virtual space is no longer just a container for content. It directly participates in the production of meaning. How users enter a space, where they move, where they stop, and from what scale or angle they view a scene all affect how they understand history and the relationships between people.

This is one of the key differences between immersive heritage exhibitions and conventional exhibitions. In traditional exhibitions, information is usually organized through panels, images, objects, and timelines, while space mainly serves the function of display and separation. In *Shanghai 1924*, space itself became an important narrative language.

The project divided Wukang Mansion and its related life world into a series of scene units with different temporalities and atmospheres, and the narrative developed through the transitions between them. In this way, the experience of heritage was no longer about seeing a static past, but about entering a way of living. Within this structure, spaces such as the entrance, lobby, corridor, corner, and overlook were not only physical locations, but also devices for narrative and emotional transition. Entering the lobby meant moving from the present into history. Entering the domestic interior meant shifting from the city and the public realm to privacy and everyday life. Views such as miniature, section, and bird's-eye perspective gave audiences positions that are impossible in real life, allowing them to perceive the relationships between building, city, and historical period from different levels. What digital media provides here is actually a reorganization of different historical layers.

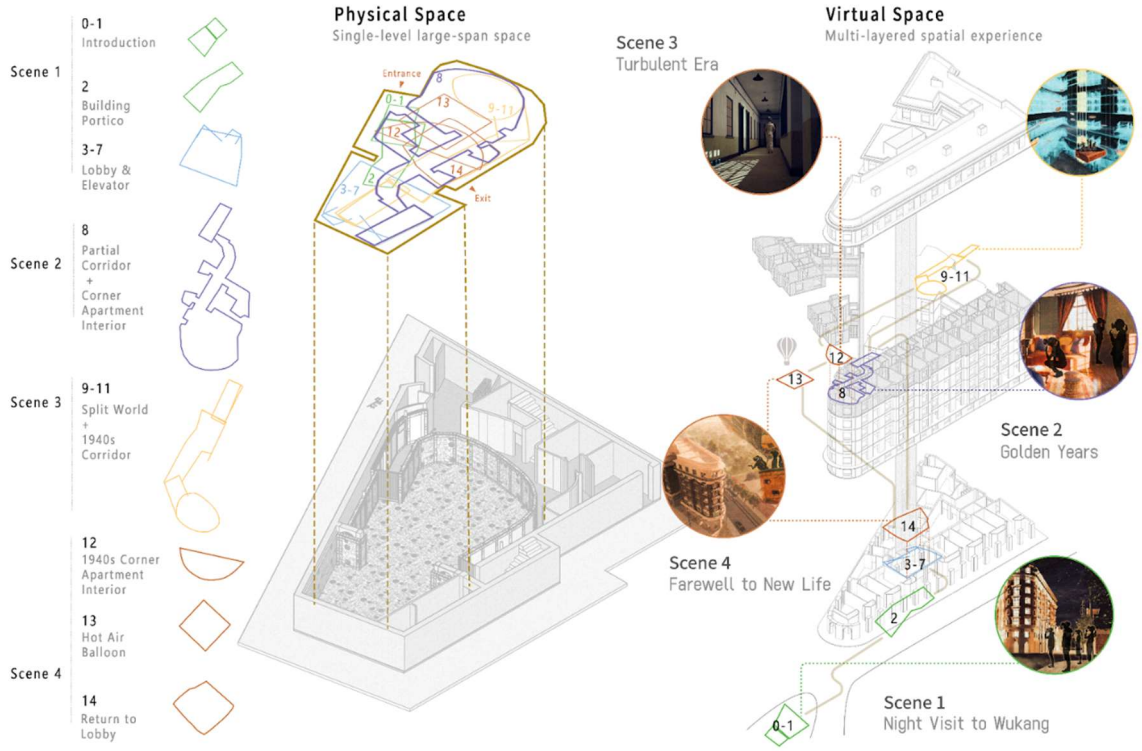


Figure 3.4 Spatial script planning in Shanghai 1924

Source: Drawn by the author

At the same time, the characters in the project also play a key role in heritage understanding. They were important media within the spatial narrative structure itself (see fig.3.5). In addition to *Hudec* as the architect, several female characters represented different aspects of apartment life, and through them, Wukang Mansion was transformed into a social space and network that could be felt and understood. *Miss Wang*, a film star, was linked to consumer culture, media imagination, and female self-presentation in the modern city. *Aunt Zhong*, the domestic worker, represented the often-overlooked domestic labor, service relationships, and class order inside the apartment. *Nana*, a contemporary citywalk guide, brought into the narrative today's experience of wandering in Shanghai, freelance lifestyles, and new ways of rediscovering heritage.



Figure 3.5 Characters Design in Shanghai 1924

Source: Drawn by the author

Because of this, when viewers entered the apartment, walked through the corridor, and listened to details of daily life, what they encountered was both the physical properties of space and the way that space is continuously produced through different everyday practices. In other words, the spatial script connected the more complex relationships among architecture, people, lifestyles, and social structure.

This is especially important for this study, because VHE is concerned with whether virtual environments can make visible the social relationships that are often hidden by grand narratives. The key role of virtual media here is to organize relationships behind materiality—to reconnect historical space, human experience, and social logic at the level of heritage perception.

This case shows that the basic unit of heritage narrative can be an experiential structure formed by scenes, viewing relations, narrative clues, and emotional progression. For this study, this provides an important direction for thinking about how relational heritage materials can be organized into narrative units that can be entered, read, and compared.

3.2.3 Evidence, Reconstruction, and Interpretation: How Authenticity Is Organized

Compared with many immersive heritage projects, another important feature of *Shanghai 1924* is that immersion is not based on free imagination detached from research. Instead, it maintained an operable balance among historical evidence, spatial reconstruction, and narrative interpretation. During the reconstruction of historical scenes, the project was clearly aware of the differences among different types of materials, as well as the limitations of the research process itself. As a result, it adopted a multimodal group of historical sources .

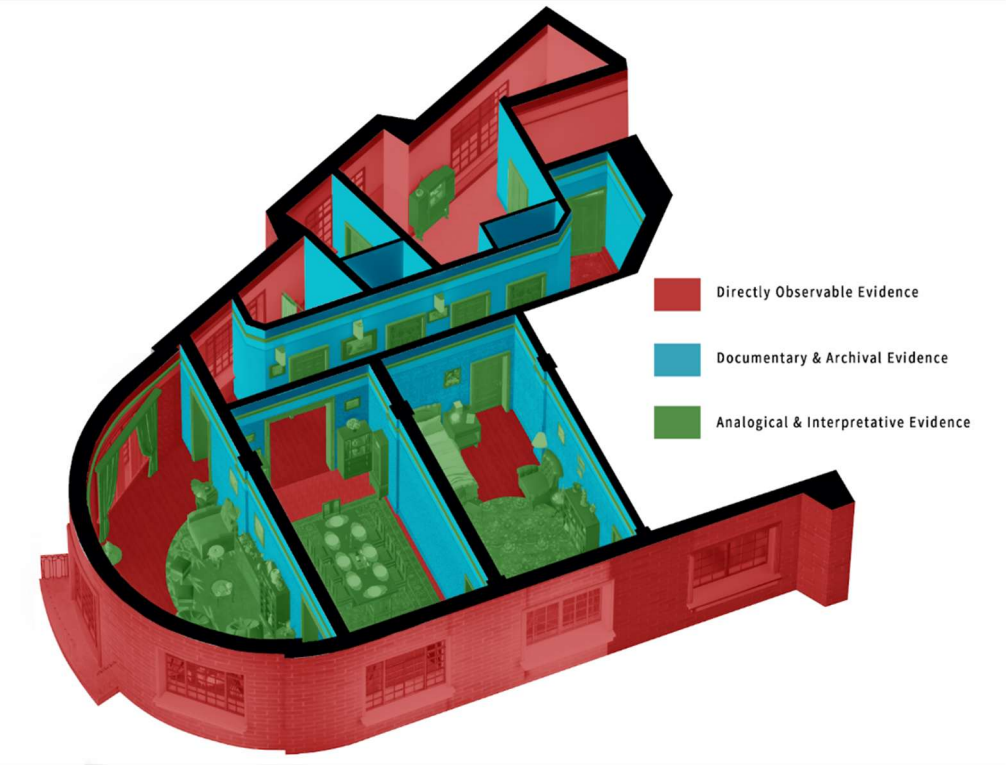


Figure 3.6 Layers of Evidence for Interior Reconstruction in Shanghai 1924

Source: Drawn by the author

The sources used for reconstruction can be divided into three categories (see fig.3.6).

The first category includes relatively unquestionable present-day materials, mainly from on-site surveys and existing photographs. These include the building façade, details of the lobby, the surrounding street texture, and basic spatial relationships. They formed the basic framework of scene reconstruction.

The second category includes materials that no longer exist in the present but still have relatively high historical reliability. These require professional selection and comparison, such as the original design drawings of Wukang Mansion, measured drawings from different periods, and historical photographs and written descriptions related to everyday life. This layer made it possible to reconstruct some lost interior layouts, architectural details, and spatial conditions of specific periods with a relatively high level of credibility.

The third category includes analogical materials from the same historical period, such as nonfiction writing, oral history, similar works by designers from the same era, historical images of comparable life scenes, newspapers, and magazines. These materials were mainly

used for details that lacked direct historical evidence, including interior decoration, domestic furnishings, character styling, and the overall atmosphere.

Among these three categories, the third layer best shows the project's methodological character. It has the greatest potential to express urban character and everyday life, but it also most directly faces the tension between authenticity and completeness in heritage narrative. These materials are used together here to try to reconstruct a historical sensibility closer to the lifeworld through marginal, informal, and everyday materials.

In this sense, the project shows an ethnographic tendency. It is not only concerned with what the building was, but also with how it was inhabited, used, worked in, consumed, and embedded in social relationships. The exploration of women's modern lifestyles relied especially on this kind of evidence. The connection between Wukang Mansion and modern female experience can not be found in a complete and obvious body of official documents. It had to be identified from fragmentary life materials, cultural texts, and the wider social landscape of the period, and then translated into a narrative structure through the organization of space, characters, and scenes. In other words, this layer of reconstruction was no longer a simple reproduction of existing information, but an interpretive construction based on research judgment.

Therefore, from the perspective of responding to the issue of authenticity in heritage research, the real issue is not whether the project completely removed the risks related to authenticity, but how it responded to them. The approach of *Shanghai 1924* managed to maintain the transparency of reconstruction. While acknowledging that materials are incomplete and that the past cannot be fully recovered, it built a convincing reconstruction mechanism through the interaction of layered evidence and typological reference.

Here, authenticity should not be understood only as whether a scene corresponds exactly to historical reality. It should also be understood as whether a narrative spatial expression remains internally consistent in terms of evidence, historical context, and social logic. In other words, the project did not pursue a single form of material authenticity, but a more complex authenticity involving spatial relations, lived situations, and narrative experience.

At the same time, this approach also had some limitations. First, although the layering of evidence played an important role in the internal process of research and design, the final

experience still lacked a sufficiently clear external mechanism to communicate it. Audiences could sense the academic basis of the work, but they could not easily tell which scenes were supported by direct historical sources, which were based on analogical reconstruction, and involved more active narrative interpretation.

Even so, the project offers an important insight: virtual heritage narrative design does not need to choose between absolute historical verification and free fiction. What matters more is to recognize differences among layers of evidence, and to organize them through the cooperation of research and design into a structure that is both evidence-based and narratively powerful. In this way, authenticity becomes part of its internal generative logic.

3.3 Research Methods and Sources of Materials

Based on the methodological insights above, this study takes Bologna's Due Torri as the main case and further develops VHE into a three-stage research path. In practice, VHE is carried out through three connected stages—Excavation, Interpretation, and Integration (see below fig.3.7). The following sections will explain these stages in relation to the Due Torri di Bologna case.

3.3.1 Excavation: Knowledge Collection and Narrative Foundations

This stage aims to build an ethnographic material base related to Bologna's Due Torri. In addition to preserving historical documents, archaeological records, and architectural survey data, the main focus is to identify the diverse narratives, emotions, and experiences that have formed around the heritage in society. From these materials, the study extracts the relational elements behind the heritage and incorporates them into narrative development.

The materials used in this study come from three main sources.

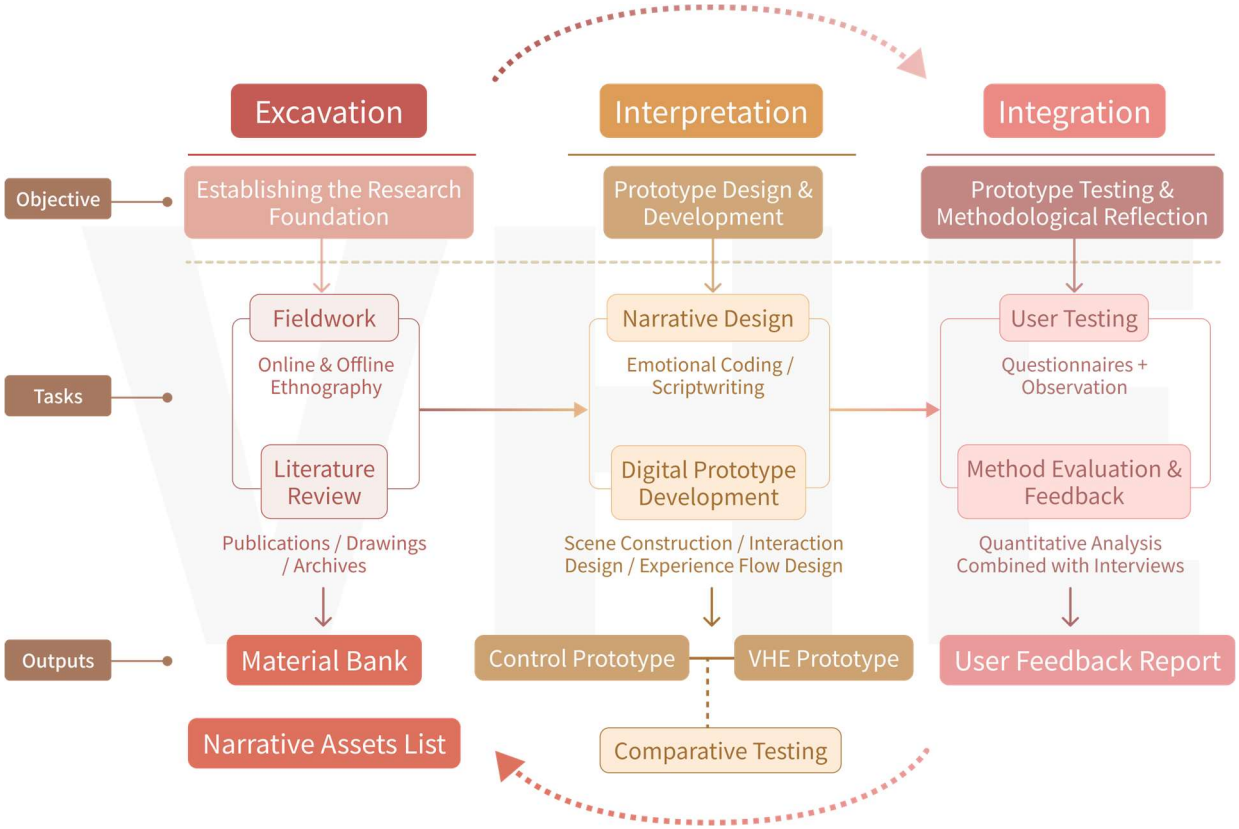


Figure 3.7 VHE workflow diagram

Source: Drawn by the author

The first is field observation. The researcher conducted on-site visits to the towers and their surrounding urban spaces, documenting tourist activities, patterns of public space use, visual relationships within the urban landscape, and the everyday atmosphere around the towers. These observations were recorded through photography, field notes, and route tracking. In addition, a small-scale questionnaire survey was conducted with local residents in Bologna to understand the role of the towers in everyday life, local memory, and urban identity. The researcher also visited local institutions such as museums, libraries, and the State Archives of Bologna, as well as informal places including souvenir shops and markets, to collect and record different forms of knowledge and narratives related to the towers. The key purpose of this material is to move beyond formal historical accounts and engage with lived local experience and everyday emotional dimensions.

The second category of material comes from public narratives. Following a digital ethnographic approach, the researcher examined platforms such as Facebook, Reddit,

TripAdvisor, and Unibo (University of Bologna), as well as official websites of the Bologna government and tourism organizations. Materials collected include social media comments, travel reviews, news reports, official tourism narratives, and museum texts. Particular attention was given to discussions after the closure of the towers, especially those related to safety concerns, accessibility, conservation measures, and their symbolic role in the city. Although these materials are not traditional historical documents, they reveal how contemporary audiences understand the towers as an urban symbol. They also show how heritage value is negotiated, contested, and reinterpreted among different stakeholders.

The third category consists of historical and academic sources, including measured drawings, urban archives, scholarly publications on the towers and the development of Bologna, as well as studies of their cultural symbolism. These materials provide historical context and a knowledge framework for interpreting the first two categories, and help establish connections across different time layers in narrative design.

Through sorting, classification, and initial coding of these materials, this stage produces two main outputs. The first is a structured Material Bank, which compiles all collected data. The second is a Narrative Assets List, developed from cross-analyzing the material bank. This list identifies relationships within the data and summarizes key relational characteristics of the heritage from spatial and social perspectives, providing a foundation for later prototype design.

3.3.2 Interpretation: From Ethnographic Materials to Spatial Narrative Prototypes

The focus of the second stage, Interpretation, is to transform the content in the Narrative Assets List developed in the previous stage into narrative prototypes that can be experienced in a digital environment.

Regarding the translation mechanism from data to narrative, and from narrative to heritage representation, the core questions are: which materials can enter the narrative, in what way they should enter, and what roles materials from different sources should play within the narrative.

To address this issue, this study adopts a three-layer framework composed of *Evidence – Interpretation – Speculation*, and applies it to label different narrative assets. *Evidence*

refers mainly to direct information from historical documents, measured drawings, field observation, and verifiable texts. *Interpretation* refers to the researcher's synthesis of meaning, thematic abstraction, and relational judgment based on these materials. *Speculation* is used when there are gaps in historical or experiential materials or limitations in available samples; under the condition that the overall logic is not violated, it allows for reasoned relational judgments through interpretation. This framework is used both to organize differences in the reliability of materials and to control the boundaries of interpretation in narrative expression, while also enabling a more critical reflection on heritage values.

After this, in order to further strengthen the emotional dimension in narrative organization, the researcher, based on cross-reading field materials, open-ended questionnaire responses, and narrative testing objectives, assigned an emotional code to each narrative asset. Each asset was associated with one of six emotions: curiosity, awe, distance, familiarity, reconnection, and loss, and the relationships among these emotions were preliminarily organized to form a node structure for entering the narrative experience. At the same time, key spatial images and related visual materials of the towers and their surroundings were digitally organized to form a digital asset base serving narrative expression.

After completing the above work, the researcher designed, within feasible limits, a set of comparable online spatial narrative prototypes. These prototypes are presented in the form of interactive digital interfaces combined with immersive experience fragments, and can be experienced through screen-based devices (computer or mobile) or VR equipment.

The first type is the traditional heritage presentation (*Control Prototype*). This prototype follows the common logic of museum-style or digital archive-style display, guided by architectural information, historical timelines, and expert knowledge, and presents the historical background, construction process, structural characteristics, and cultural symbolism of the towers in a linear way.

The second type is the relational narrative based on the methodological framework of Virtual Heritage Ethnography (*VHE Prototype*). In this prototype, the organization of the narrative focuses on the heritage relationship types identified in the first stage, and the experience is driven by the task of *searching*. The narrative is not organized linearly, but

instead develops around interaction and the relationships behind the heritage, linking text, images, spatial scenes, and immersive fragments. At the same time, emotional factors are incorporated into the narrative design, and the participant's role in interpreting heritage narratives is taken into account.

The main outcome of this stage is a set of comparative narrative experience prototypes, which are used for subsequent user testing and evaluation.

3.3.3 Integration: Prototype Testing and Mechanism Analysis

The core task of the third stage is to test the two narrative prototypes developed in the previous stage, to observe and record immediate feedback from the users, to analyze how different narrative mechanisms influence ways of understanding heritage, and on this basis to further reflect on the VHE methodological framework. The focus is on identifying which narrative mechanisms affect participants' understanding of heritage, emotional engagement, and agency toward heritage care.

Participants with limited prior knowledge of heritage were invited to take part in the experience, and an exploratory narrative effect test was designed.

The study adopts a within-subjects comparative design with counterbalanced presentation order, a procedure commonly used to reduce potential order and carryover effects in repeated-measures research.[36] Participants are randomly assigned to two sequence groups: Group A completes the experience in the order of "Control → VHE," while Group B follows the order of "VHE → Control." After each round of experience, participants complete the corresponding questionnaire.

The questionnaire is designed around four dimensions. The first is Heritage Understanding, which examines whether participants' understanding of the towers remains at the level of object-based knowledge or extends to social, cultural, and historical dimensions. The second is Emotional Resonance, which evaluates whether the experience

[36] WEST S G, BIESANZ J C, KWOK O-M. Within-subject and longitudinal experiments: design and analysis issues[M]//SANSONE C, MORF C C, PANTER A T, eds. The SAGE Handbook of Methods in Social Psychology. Thousand Oaks, CA: Sage, 2004: 287-312.

triggers emotional responses, memory associations, and affective involvement. The third is Perception of Multiplicity of Meaning, which examines whether participants recognize that the towers do not have a single fixed interpretation, but carry multiple narratives and positions of different subjects. The fourth is Agency toward Heritage Protection and Participation, which explores whether the experience enhances participants' awareness of heritage protection, public participation, or reinterpretation. All items are measured using a 7-point Likert scale, supplemented by short open-ended questions to capture immediate feedback that cannot be fully reflected in quantitative results.

It should be noted that the evaluation conducted in this stage is exploratory and prototype-oriented, focusing mainly on differences between narrative organization models. All experiments are carried out on desktop devices in a controlled setting. In addition, this study does not attempt to draw generalized conclusions about complex heritage perception processes from a limited sample. Instead, through comparative prototypes and feedback collection, it aims to move VHE beyond a methodological proposal and establish it as a research process that can be experienced, compared, and discussed.

After completing the third stage, through analysis and reflection on the results, this study further refines the VHE framework and identifies directions for future research.

Chapter 4 Narrative Excavation under the Crisis of the Due Torri

4.1 The City of Towers and the Symbolic Status of the Due Torri

The two towers of Bologna (Le Due Torri di Bologna), namely the Torre degli Asinelli and the Torre Garisenda, as the most representative urban symbols of contemporary Bologna, reflect the city's magnificent medieval landscape. Medieval Bologna was truly a city of towers, and numerous surviving paintings and engravings vividly depict a spectacular scene in which towers rise like a forest. Estimates of the number of towers vary among scholars: early studies represented by Giovanni Gozzadini suggested around 180 towers, while later research revised this number to approximately 90 to 100 towers and tower-houses. Although the exact number remains open to discussion, this is sufficient to show that in the 12th and 13th centuries, towers were not isolated landmarks, but collectively formed the city's skyline and power structure. Today, only 22 towers remain in Bologna, distributed across the historic center and serving diverse urban functions (see fig.4.1). Among them, the Asinelli and Garisenda towers stand out due to their advantageous location, exceptional height, distinctive leaning form, and their contrasting spatial relationship.

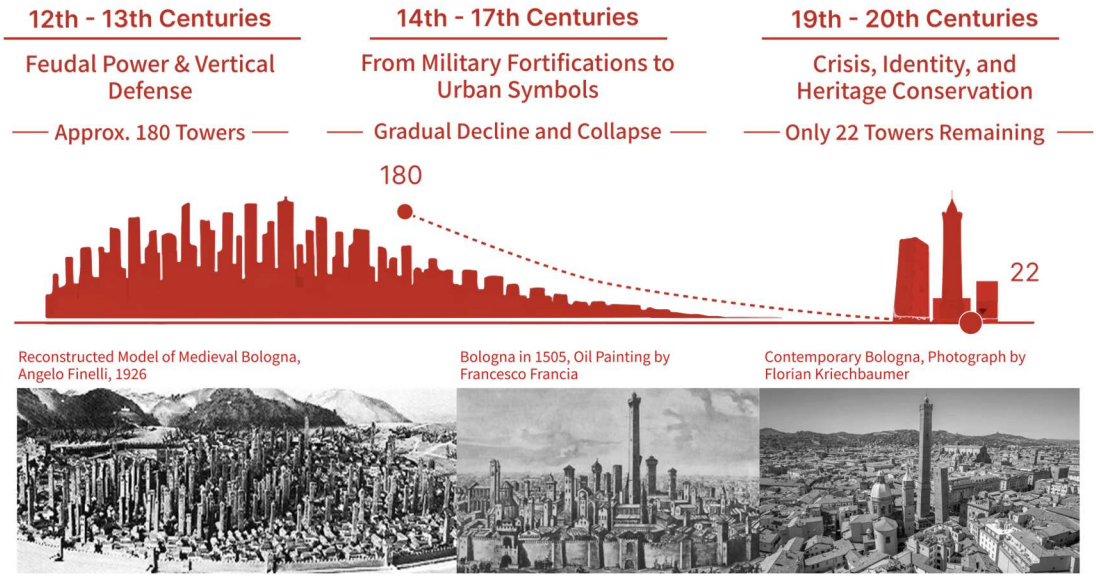


Figure 4.1 Changes in the Number and Meaning of Bologna's Towers

Source: Drawn by the author

According to the chronicles of Bologna, the construction of the Asinelli Tower is generally dated to 1109, while the Garisenda Tower began construction between approximately 1100 and 1110. The particular significance of the two towers is closely related to their spatial location. Francesca Bocchi[37], in *A Companion to Medieval and Renaissance Bologna*, points out that the square at Porta Ravegnana, where the towers are located, was situated in front of a Roman city gate of Bologna's ancient walls (see fig.4.2). At the time of their construction, this area had already developed into a lively market space. The location of the Asinelli Tower, in particular, lies at a strategic node where several main roads converge and radiate outward, including the important Via Aemilia. This advantageous position meant that from the moment of their construction, the towers were deeply embedded in the processes of urban development, civic culture, and economic exchange.



Figure 4.2 Seventeenth-Century City Plan of Bologna

Source: Adapted by the author based on Antiquarius, "Bologna," Matteo Florimi, ca. 1600, printed in Siena, 505 × 400 mm.

[37] BLANSHEI S R, ed. *A Companion to Medieval and Renaissance Bologna*[M]. Leiden; Boston: Brill, 2018.

This condition is also related to Bologna's broader urban identity. In the introduction to the same book, Sarah Rubin Blanshei describes Bologna as a "strategic and cultural crossroads" on the Italian peninsula, noting that its historical narratives have long revolved around themes such as freedom, autonomous governance, university tradition, urban conflict, and its relationship with the Papacy[38]. In this context, the Due Torri are not merely architectural objects within a local space; they are also among the most stable and visible symbols through which Bologna represents its own history and constructs its identity. Thus, the towers belong both to the physical urban environment and extend beyond ordinary architectural attributes, becoming a condensed expression of urban identity and memory.

From their origin, the emergence of towers was closely related to family competition, defensive needs, and political conflict in medieval Bologna. In *Le Torri di Bologna: Quando, come e perché*, edited by Giancarlo Roversi[39], towers are defined as private defensive structures, symbols of political power, and important material tools in periods of urban conflict. The study points out that noble families often formed architectural clusters (curia) centered on towers. These clusters shaped the urban fabric and formed a tightly connected defensive system together with the Roman road network and canal system. This indicates that early towers were essentially physical structures for territorial control and surveillance, representing a competitive occupation of vertical space.

The particularity of the Asinelli and Garisenda towers lies in the fact that they pushed this vertical competition to its extreme. R. Ambrosini[40], in *La Torre degli Asinelli*, describes the intention of the Asinelli family: as one of the most powerful Magnati in the city, they aimed to construct a tower surpassing all others as a material declaration of family status. According to *La Torre Garisenda*, edited by Francesco Giordano[41], this action stimulated the Garisenda family to build their own tower. As a result, the two towers together became both an engineering achievement and a visual peak of Bologna.

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[38] BLANSHEI S R. Introduction: History and Historiography of Bologna[M]//BLANSHEI S R, ed. *A Companion to Medieval and Renaissance Bologna*. Leiden; Boston: Brill, 2018: 1, 4-5.

[39] ROVERSI G, ed. *Le torri di Bologna: quando, come e perché*[M]. Bologna: Grafis, 1989.

[40] AMBROSINI R. *La torre degli Asinelli*[M]. Bologna: Romagnoli, 1904.

[41] GIORDANO F, ed. *La torre Garisenda*[M]. Bologna: Costa Editore, 2000: 207.

However, the subsequent trajectories of the two towers diverged. The Garisenda Tower originally reached nearly 60 meters in height, but due to uneven ground conditions—combined with the close proximity of the two towers and the resulting foundation stress—the tower began to lean severely during construction. Between 1351 and 1360, Giovanni d'Oleggio, then ruler of Bologna, ordered the upper part to be cut off, reducing its height to approximately 48 meters. Its inclination continued to increase over time, making it today the most tilted tower in Italy, even exceeding the Leaning Tower of Pisa.

As for the Asinelli Tower, there is no fully consistent conclusion regarding its original height. A common view suggests that it was initially around 70 meters and later extended to approximately 97.2 meters. What is certain, according to Ambrosini[42], is that the tower suffered a major fire in the 14th century and was subsequently rebuilt. Due to its height, it was also struck by lightning multiple times. While many medieval towers collapsed due to structural issues or natural disasters, the Asinelli Tower has survived intact and still stands at 97.2 meters. Giuseppe Rivani[43], in *Le Torri di Bologna*, compares it with other famous Italian towers and praises both its construction technique and its remarkable ratio.

The dramatic difference in the fate of the two towers creates a distinctive juxtaposition of a tall tower and a leaning tower, producing a strong visual identity and providing a powerful image base for literary representation and urban imagination. Through repeated reinforcement in literature and visual culture, this representation further consolidates the status of the Due Torri as a symbolic totem of Bologna. From Dante's poetry to Goethe's travel writings, the towers have consistently served as primary reference points for describing the city. In religious murals and altarpieces, they often occupy the central position in representations of the urban landscape.

[42] AMBROSINI R. La torre degli Asinelli[M]. Bologna: Romagnoli, 1904.

[43] RIVANI G. Le torri di Bologna[M]. Bologna: Tamari, 1966.

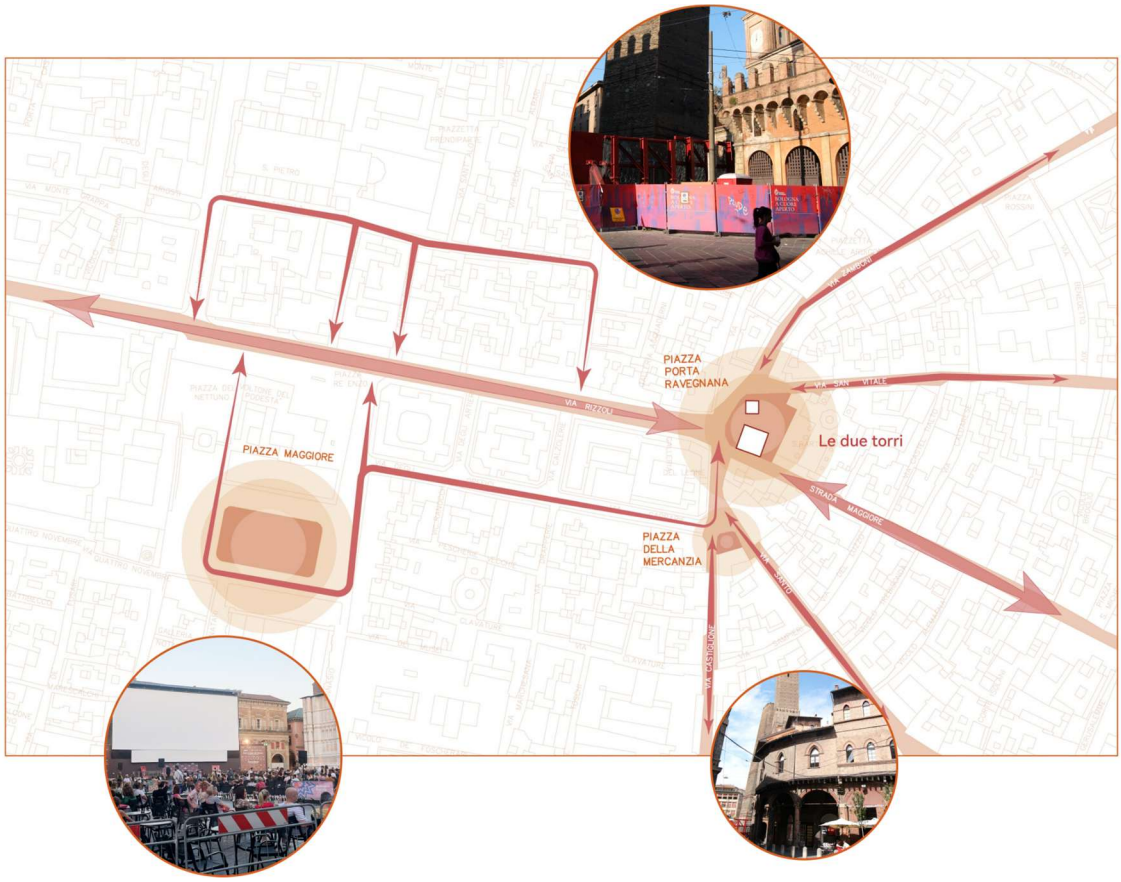


Figure 4.3 The Converging Role of the Two Towers as a Key Urban Node

Source: Drawn by the author

In the course of urban development, the towers have undergone multiple transformations, and their functions and ownership have changed several times. It was not until the late nineteenth century that they were transferred to the Municipality of Bologna and formally became public cultural heritage.

In the twentieth century, modern urban planning further reinforced their central position. The widening and reorganization of Via Rizzoli, together with a series of historicist restoration projects promoted by Alfonso Rubbiani, reorganized the original medieval spatial fabric of "towers—narrow alleys—markets"[44]. In this process, the location of the towers became part of a more prominent urban axis, making them both a spatial and symbolic center of modern Bologna (see fig.4.3 & fig.4.4).

[44] SHANKEN A M. Preservation and creation: Alfonso Rubbiani and Bologna[J]. Future Anterior, 2010, 7(1): 60-81.



Figure 4.4 Via Rizzoli Axis and the Asinelli Tower Before and After Transformation

Source: Left image from Trombetti Budriesi, *Bologna delle torri*; middle and right photographs by the author.

Looking back at their historical development, family competition shaped the origin of the towers; transport and market nodes established their key position; conflict and municipal planning continuously assigned them new institutional functions; and religious painting, literary writing, heritage management, and modern urban transformation have continuously reinforced their symbolic value. Through this long process, the Due Torri gradually shifted from private to public, from a vertical declaration of family power to the most condensed and stable visual and narrative carrier of Bologna's urban image, and ultimately became the most representative symbol of medieval Bologna.

4.2 Heritage Narrative under Closure, Governance, and the Crisis of Absence

As discussed earlier, the reason for selecting the Due Torri as a case for VHE practice lies in the current social absence crisis caused by structural risks. As a result, the public can only access the towers through heritage narratives. However, homogeneous interpretative approaches increase the risk of flattening architectural heritage, making it difficult to truly evoke empathy and agency. This crisis, however, is not without historical precedent. The Garisenda Tower has been associated with structural problems since its construction, and throughout Bologna's history, towers have repeatedly experienced tilting, collapse,

truncation, reuse, and demolition. Ambrosini[45] recounts the sudden collapse of the Torre degli Alberighi next to the Asinelli Tower in 1201, which caused more than thirty deaths, as one such example. Similarly, the demolition of towers such as Artenisi and Riccadonna in the early twentieth century—despite strong opposition from cultural figures—reflects the same condition. The danger of towers has never been a new issue, but rather a recurring theme throughout Bologna's urban history.

What makes the current crisis distinctive is that it occurs at the most central landmark of Bologna, and within a historic urban center that is already highly modernized, densely trafficked, and long governed under heritage management systems.

At present, the heritage narrative surrounding the Due Torri shows clear characteristics of *Authorized Heritage Discourse* and is mainly focused on medieval legends and crisis management. This is directly reflected in the digital sphere. A survey of information related to the towers shows that, in addition to official narratives of cultural symbolism, discussions of structural performance dominate online discourse.

Monitoring data indicate that since 2010, research on the material condition and geometric state of the Garisenda Tower's foundation has significantly increased. In November 2023, the technical scientific committee officially triggered an emergency closure after identifying abnormal settlement at the southwest corner of the tower. With the installation of double-layer container barriers and rockfall protection nets, along with the initiation of a long-term restoration plan, the crisis has shifted from a sudden event to a normalized governance process, deeply influencing future visions of the city (see Table 4.1).

The real consequences of the crisis directly affect spatial perception and social experience. As mentioned earlier, Porta Ravegnana is a central node of Bologna's urban life. The current closure and barriers go far beyond the simple loss of access to the towers. The towers now exist in a paradoxical condition of being "visible but inaccessible." They still dominate the skyline, yet at ground level they are isolated by heavy containers and protective structures, forming a construction island (see fig.4.5). At the same time, structural risks generate concerns at the community level.

For medieval towers, their social role is often realized through bodily proximity and

[45] AMBROSINI R. La torre degli Asinelli[M]. Bologna: Romagnoli, 1904.

spatial interaction. When this central space shifts from a "stage of public life" to a "potential risk," the way people experience the city center is fundamentally reshaped. This sense of spatial distance and concern marks the transformation of the towers from lived urban symbols into abstract monuments, which is a concrete manifestation of the "social absence" discussed earlier.

Table 4.1 Timeline of the Due Torri Structural Crisis

Date (Local Time)	Key Event	Crisis Logic
2023-10-21	The mayor ordered restricted/no-access zones around the towers, activated emergency coordination (COC), and announced closure "for at least several years"	Risk identification and rapid containment
2023-10-23	Asinelli Tower closed to the public for monitoring and intervention works on Garisenda (both towers enter a "non-accessible" state)	Public safety and visitor management
2023-11	Barriers and construction become normalized; monitoring and preliminary measures continue; narrative shifts to "long-term restoration"	From emergency to normalized governance
2023-11-24	Launch of Art Bonus fundraising mechanism to mobilize the city and "global supporters"	Financial mobilization and public participation
2024-01-18	Media reports new subsidence risks and propose a two-phase restoration timeline (approx. two years +)	Public risk communication and temporal framing
2024-05-08	"Operazione Garisenda" exhibition launched in the Medieval Museum	Cultural adaptation and reinterpretation
2024-10-12	" Bologna a cuore aperto" installation on construction façade reconstructs visibility through visual narrative and donation interface	Visual governance and expansion of AHD

Continued Table 4.1

Date (Local Time)	Key Event	Crisis Logic
2025-05-13	Project advancement: partial reduction of risk level after monitoring; proposal includes Pisa-style support structures and foundation grouting	Technical consolidation and future projection
2025-11	Withdrawal from part of PNRR funding (~€5 million), triggering debates on procedures and finance	Institutional and financial restructuring
2026-02-07	National-level intervention: Ministry issues formal warning (diffida) regarding monitoring data	Multi-level governance conflict
2026-02-19	€ 5.5 million approved for structural support and monitoring system upgrades	Entry into implementation phase



Figure 4.5 Reshaping of the Space around the Two Towers under the Structural Crisis

Source: Drawn by the author

If we further ask what would happen if the towers were to collapse, the answer goes beyond the loss of architectural heritage. Given the close connection between the towers and Bologna's image, memory, and identity, the risk associated with Garisenda has an amplifying effect. What is at stake is not only a structurally unstable medieval tower, but an entire narrative foundation related to historical continuity, local identity, and collective memory. Thus, while the crisis appears as an engineering and civil defense issue in practical terms, it also suggests instability in the city's self-image at a symbolic level.

An analysis of news reports and official communications since 2023 shows that governance efforts are active rather than passive (see Table 4.2 below). Monitoring, protection, planning, fundraising, and phased restoration have all been continuously advanced. At the same time, in response to the inaccessibility of the towers, attempts have been made to compensate at the interpretative level—for example, using construction barriers as exhibition surfaces, organizing museum projects, workshops, and cultural activities, and reframing the restoration site as a narrative space about the towers and medieval Bologna. This approach is logically consistent: when the towers themselves cannot be accessed, the barriers become temporary narrative surfaces, and museums take on the role of interpretation and education. However, the actual reach of these measures remains limited, and whether the public is truly engaged is still uncertain.

Table 4.2 Analysis of Official Discourse

Category	Frequency (n=26)	Percentage	
engineering/governance /restoration	17	65%	High
medievality/legend/historical legitimacy	10	38%	Medium
absence/closure / managed presence	9	35%	Medium
city identity/symbol	7	27%	Medium-low
interpretive/museum/educational framing)	6	23%	Low
participation/fundraising/future reopening	5	19%	Low

To supplement local experience, the researcher conducted a one-week field study in Bologna in August 2025, and a small exploratory survey with 20 participants who live, study, or work in the city (see fig.4.6). The survey covered four dimensions: everyday experience and spatial connection; generational memory and knowledge sources; emotional responses to absence; and perceptions of virtual reconstruction and narrative gaps.



Figure 4.6 Profile of Exploratory Survey Respondents

Source: Drawn by the author

The results suggest that official narratives are not strongly perceived in everyday experience. Only 1 out of 20 participants considered themselves "very familiar" with the towers, while 10 out of 20 reported that their understanding came from informal narratives closely tied to everyday practices such as passing by, meeting, navigation, student life, and local stories. In other words, connection precedes knowledge. For most participants, the meaning of the towers emerges through lived experience rather than systematic historical understanding (see fig.4.7).



Figure 4.7 Respondents' Sources of Knowledge about the Towers

Source: Drawn by the author

Accordingly, the impact of closure is primarily a shift in relationships rather than a lack of knowledge. Seventeen participants reported a sense of "losing connection with the city." This is reflected in the loss of access, blocked public space, disrupted daily routes, and the transformation of the city center into a long-term construction site. While many have gradually adapted to the situation, this adaptation does not eliminate concern or regret, but rather reflects a form of passive acceptance (see fig.4.8).

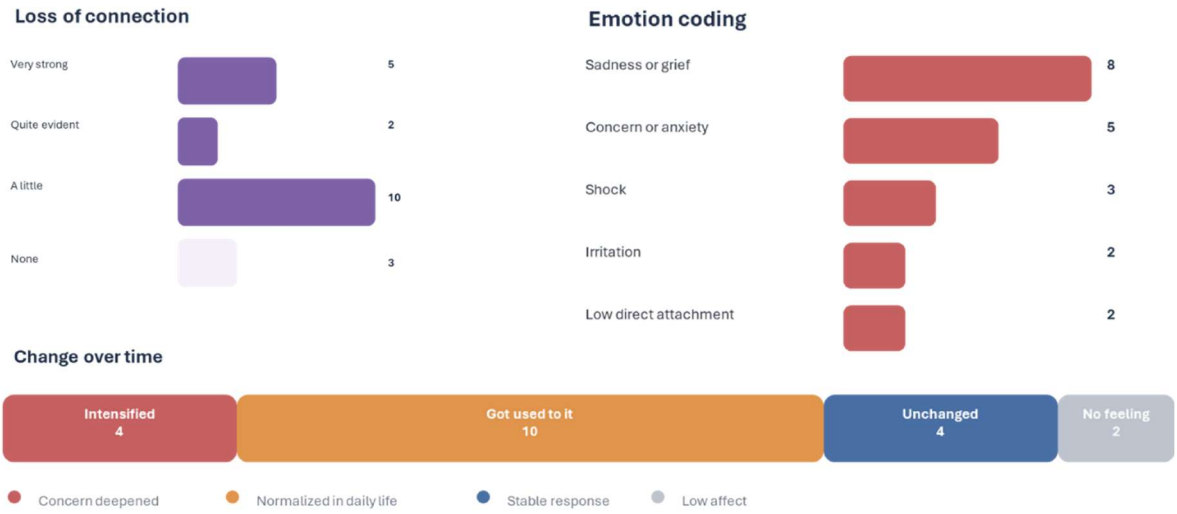


Figure 4.8 Emotional Data from the Field Survey

Source: Drawn by the author

From the current focus of heritage narratives surrounding the Due Torri, official institutions and museums are better at telling the towers' medieval history, urban symbolic meaning, restoration projects, and institutional actions. The survey results, however, reveal that although respondents are also interested in medieval history, what truly causes emotional fluctuation and sustained concern for them is more often the crisis itself, the effects of closure, structural risk, local legends, personal memory, and the specific role of the towers in the city today. At the same time, the contents that respondents felt were "not sufficiently told" were mainly concentrated in areas between history and lived experience, such as wartime memory and crisis, love life and legends, scientific experiments and university culture. This reflects the intertwining of individuals and heritage at the relational level. Although limited by the sample size and research period, this survey is insufficient to produce statistically generalizable conclusions. However, as an exploratory observation, it can still suggest the

potential contained in such relationships themselves. Under conditions of crisis and "absence," how can the recovery and narration of these relationships be used to transform attention into agency? This is a key question that the next step of heritage narrative needs to address.

In sum, the current predicament of the Due Torri can be described as a state of absence that is visible but inaccessible. The towers remain the most central urban symbol of Bologna; they continue to be viewed, reported on, governed, and interpreted. Yet the relationships once formed between people and the towers through lived experience are being reshaped by barriers, the construction site, and institutionalized management. The field observation and analysis in the fourth section of this chapter proceed on this basis: identifying the relational elements between the towers, the public, and Bolognese society from historical documents, spatial context, and everyday experience, and exploring the possibility of presenting heritage narratives in digital media through these relationships.

4.3 Existing Digital and Heritage Narrative Practices Related to the Due Torri

Before entering the analysis of field materials related to the Due Torri, it is necessary to first review the digital and heritage narrative practices that have developed in Bologna around the Twin Towers and the medieval urban space. These projects have responded, from different perspectives, to the question of how to record, reconstruct, and communicate the heritage of a medieval city. They have accumulated distinctive experiences and together form the methodological background with which this study must engage. This section attempts to trace their development, and to identify which dimensions have already been addressed and which remain insufficiently developed, in order to clarify the specific position from which VHE intervenes in this context.

From a chronological perspective, Bologna's virtual heritage practices began in the late 1990s with *Nu.M.E.* (Nuovo Museo Elettronico), initiated by the PhD programme in History and Informatics at the University of Bologna. Afterwards, *APA l'Etrusco alla scoperta di Bologna*, produced by Cineca VisitLab in 2011, and the immersive VR projects developed on this basis, including *La Macchina del Tempo* since 2017 and *Back to BO* in 2022,

extended virtual heritage practices into the field of public experience. In parallel, *Storia e Memoria di Bologna* has organized Bologna's urban memory and public history through a digital portal since 2014 (see Table 4.3).

Table 4.3 Digital Practices and Narrative Orientations Related to the Due Torri

Project	Leading Institution	Medium and Period	Narrative Focus
Nu.M.E. (Nuovo Museo Elettronico)	PhD programme in History and Informatics, University of Bologna (Bocchi, Lercari, etc.)	Academic virtual museum / Web and Second Life platforms; 1999–around 2012	An academic virtual museum centered on the reconstruction of medieval Porta Ravegnana and the tower cluster, emphasizing reflexivity, multivocality, and transparency of historical sources
APA l'Etrusco alla scoperta di Bologna	CINECA and Museo della Storia di Bologna	Stereoscopic animation / museum screening; 2011–present	A character-based narrative of urban history, connecting different historical periods through the Etruscan guide Apa
La Macchina del Tempo	La Macchina del Tempo team	VR headset / independent VR museum; 2017–present	Reconstruction of historical scenes through virtual reality, emphasizing the sense of "entering the past"
Back to BO	Genus Bononiae / La Macchina del Tempo	VR headset / museum exhibition space; 2022–2023	A curated VR experience structured through three thematic routes—Tower & Power, Bononia, and Al Canel—corresponding to three historical periods
Storia e Memoria di Bologna	Museo civico del Risorgimento di Bologna / Istituzione Bologna Musei	Digital portal / webpage + digital archive; initiated in 2002 and publicly launched in 2014	Organization of urban memory and public history by connecting people, places, events, monuments, and documents through thematic scenarios
Bologna 3D Open Repository	Comune di Bologna / CINECA	Open dataset, downloadable 3D models, API	Collection, sharing, and educational use of urban and historical models of Bologna, partly related to models produced for the APA project

Continued Table 4.3

Project	Leading Institution	Medium and Period	Narrative Focus
Bologna Digital Twin / Digital Twin della Torre Garisenda	Comune di Bologna, University of Bologna, Cineca, NVIDIA, FBK, etc.	Digital twin platform / sensors and AI simulation; 2023–present	Urban governance and structural monitoring, in which the tower is treated as a computable object of risk
Operazione Garisenda. Storie narrate, sognate e vissute	Settore Musei Civici Bologna / Museo Civico Medievale	Lectures, children's workshops, YouTube livestreams; 2024–present	Public historical interpretation and education during the period of crisis and restoration
Bologna a cuore aperto	Comune di Bologna	Construction-site hoarding installation / graphic and textual panels; 2024–present	Transformation of construction hoardings and containers into narrative surfaces for tourists and citizens

After the structural crisis of the Garisenda Tower in 2023, projects such as *Bologna Digital Twin*, *Operazione Garisenda*, and *Bologna a cuore aperto* pushed digital intervention and public interpretation around the Due Torri into a new stage .

This section roughly classifies these practices into four interrelated but differently oriented directions: academic virtual museums and historical spatial reconstruction; immersive reconstruction for public experience; urban memory narratives centered on the integration of archives and documents; and public interpretation and governance narratives generated by the structural crisis.

4.3.1 Academic Origins: Early Exploration of Bologna's Virtual Museum

Nu.M.E. was one of the earliest academic virtual reconstruction practices in Bologna centered on medieval urban space. It was led by the PhD programme in History and Informatics at the University of Bologna, with Francesca Bocchi as the main coordinator.

Bocchi et al.[46] first introduced the overall concept of *Nu.M.E.* at the SIGGRAPH conference in 1999 as a "four-dimensional virtual museum": a unified digital platform presenting the spatial evolution of Bologna from 1000 AD to the present, allowing historians, urban administrators, and citizens to discuss the formation and transformation of the city within the same virtual environment. Over the following decade, the project gradually produced research outcomes and prototypes at different stages, and in 2010, Bocchi and Smurra edited the collected volume *La Storia della Città per il Museo Virtuale di Bologna*.

The 2010 version is of direct relevance to this study. Lercari et al. [47]report that this version took Piazza di Porta Ravegnana, where the Due Torri are located, as the core object of reconstruction. On the Second Life platform, it reconstructed the thirteenth-century towers, square, cloth market, and surrounding urban fabric, allowing multiple users to enter the scene as avatars and collectively reenact medieval everyday life (see Figure 4.9). It is worth noting that this reconstruction was not limited to the Due Torri themselves, but also included towers such as Artenisi and Guidozagni, which had been demolished in the late nineteenth and early twentieth centuries. In this way, the virtual space partially restored the image of the "lost city of towers."



Figure 4.9 The area of Bologna reconstructed in Nu.M.E.

Source: Compiled by the author; left image from Bonfigli, Calori, and Guidazzoli, 2000, Fig. 1; right image from Lercari, 2011, Fig. 2.

[46] Bocchi F., Bonfigli M., Ghizzoni M., Smurra R., Lugli F. The 4D Virtual Museum of the City of Bologna, Italy. In Proceedings of the 26th Annual Conference on Computer Graphics and Interactive Techniques (SIGGRAPH 1999), Abstracts and Applications. New York: ACM, 1999, pp. 8–11.

[47] Lercari N. An Open Source Approach to Cultural Heritage: Nu.M.E. Project and the Virtual Reconstruction of Bologna. In Forte M. (Ed.) Cyber-Archaeology, BAR International Series. Oxford: Archaeopress, 2010, pp. 125–133.

At the methodological level, several papers written by Lercari on Nu.M.E. are more directly relevant to this research. In *An Open Source Approach to Cultural Heritage*, Lercari discusses how an open-source structure can support visitors in tracing the historical evidence behind each reconstructed element, and introduces an emphasis on reflexivity and multivocality on this basis[48]. In *Nuove Forme di Comunicazione per Nu.M.E.*, he further discusses how a virtual museum can undertake the dual task of public communication and scholarly exchange[49]. The orientation established by these works—that virtual heritage can be understood as an open environment that is verifiable, discussable, and able to accommodate multiple perspectives—is consistent in spirit with the E/I/S three-layer framework and the principle of narrative transparency proposed in this study.

From today's perspective, the narrative focus established by *Nu.M.E.* lies mainly in the credible reconstruction of Bologna's urban scenes across different historical periods. However, even though its multi-user mechanism attempted to involve audiences in the reenactment of historical everyday life, what was reenacted was still a certain linear and pre-designed narrative, rather than the full process through which the Due Torri were repeatedly used, transformed, and retold across different periods. Therefore, on the basis of the academic and reflexive trajectory opened by *Nu.M.E.*, this study seeks to further expand the narrative focus from credible reconstruction and historical scene display to the nonlinear relational meanings continuously generated around the Due Torri over a long historical duration.

4.3.2 The Extension of Immersive Reconstruction

After the second decade of the twenty-first century, Bologna's virtual heritage practices

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[48] Lercari N. Nuove Forme di Comunicazione per Nu.M.E. In Bocchi F., Smurra R. (Eds.) La Storia della Città per il Museo Virtuale di Bologna. Un decennio di ricerche nel Dottorato di Storia e Informatica. Bologna: Bononia University Press, 2010, pp. 217–225.

[49] Lercari N., Toffalori E., Spigarolo M., Onsurez L. Virtual Heritage in the Cloud: New Perspectives for the Virtual Museum of Bologna. In Proceedings of VAST 2011: The 12th International Symposium on Virtual Reality, Archaeology and Intelligent Cultural Heritage. Geneva: Eurographics Association, 2011, pp. 153–160.

gradually expanded from academic research spaces to public experience spaces with stronger narrative and entertainment qualities. *APA l'Etrusco alla scoperta di Bologna*, a stereoscopic animation produced by Cineca VisitLab for the Museo della Storia di Bologna in 2011, was an early representative of this shift. The film uses the anthropomorphic Etruscan guide Apa—voiced by the Bolognese musician Lucio Dalla—as a narrative thread, leading the audience through the Etruscan, Roman, medieval, and more recent historical periods. At the narrative level, the project explored the possibility of transforming complex historical information into an approachable experience through a character. At the production level, part of its archaeological reconstruction was carried out by the VHLab team of CNR ITABC, continuing the tradition of maintaining a connection with academic research. The Bologna 3D Open Repository later organized and published these models as open data, providing a foundation for later reuse in teaching and research.



Figure 4.10 Representative scenes from immersive reconstruction projects: APA (left), Back to BO (centre), Tower & Power (right)

Source: Compiled by the author; images from Comune di Bologna, Bologna Today, and La Macchina del Tempo.

Since 2017, the VR practices led by the *La Macchina del Tempo* team have represented a further development of immersive reconstruction at the experiential level. The team first launched a "VR tour of medieval Bologna" at Palazzo Pepoli, and in the following year established a dedicated VR museum on Via Zamboni, allowing visitors to enter the thirteenth-century streetscape of Bologna with its numerous towers through headsets. In 2022, under the curatorial framework of Genus Bononiae, the team further launched *Back to BO*, which presented three thematic routes—Tower & Power, Bononia, and Al Canel—in the mezzanine exhibition space of Palazzo Pepoli, corresponding respectively to medieval, ancient Roman, and early modern Bologna. Among them, Tower & Power placed the Due Torri within the context of medieval family competition, defensive logic, and the display of

power, allowing visitors to walk from a first-person perspective among tower clusters that no longer exist.

The greatest contribution of this type of immersive project lies in its use of visual impact and embodied perception to make historical scenes that previously existed only in images and texts accessible. However, its narrative focus is therefore also concentrated on the high-fidelity reconstruction of a specific historical period. The core question remains mainly "what did Bologna in the past look like?" By contrast, the role played by the Due Torri in contemporary everyday life, and the experiential and emotional connections formed between the public and the towers, have rarely been incorporated into the core agenda. This constitutes the space in which VHE can be further developed.

4.3.3 Archives and Relational Networks

Storia e Memoria di Bologna represents another path in the digitization of Bologna's heritage, parallel to immersive reconstruction. Led by the Museo civico del Risorgimento di Bologna and operated within the system of Istituzione Bologna Musei, this portal establishes a hypertextual "book of Bologna's memory" around people, events, places, monuments, and artworks from the Napoleonic period to the liberation of 1945. Its narrative logic is based on multimodal archives. Through "thematic scenarios" (scenari tematici), it links materials scattered across archives, images, and documents, forming a knowledge base of Bologna's memory and allowing local history and personal history to be juxtaposed within the same interface.

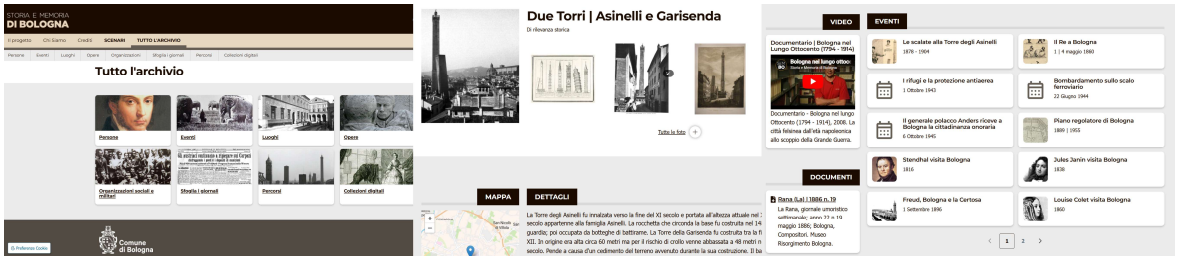


Figure 4.11 Storia e Memoria di Bologna website homepage and related pages about the Twin Towers

Source: Screenshot by the author.

This project has a double significance for this study. First, at the methodological level, it demonstrates that Bologna's urban heritage can be narrated through nonlinear relational organization. In other words, the interconnection between people, places, and events can itself become the structural carrier of heritage meaning. Second, during the fieldwork stage of this research, a large number of archival materials on this platform—related to the Due Torri, Cimitero della Certosa, nineteenth-century records of climbing the towers, images of citizens gathering during the Second World War, urban inscriptions, and satirical images—actually became one of the important sources for the digital ethnographic material bank.

It should be added that the project's strength lies in material integration, retrieval, and knowledge association. However, its experiential form still mainly consists of museum-style webpage reading, archival browsing, and entry-to-entry navigation. Users can enter urban memory through themes and links, but they have fewer opportunities to form an active understanding of heritage relations through spatial atmosphere, role selection, situational judgment, or immersive experience. Therefore, it is closer to a public history and digital archive platform than to a complete heritage narrative experience. This reflection provides conditions for the intervention of architectural and scene-based thinking, and also forms one of the foundations for later narrative excavation and design: how to translate this relational urban memory from the level of archives and webpages into a spatialized, immersive, and publicly explorable virtual heritage experience.

4.3.4 Public Interpretation Driven by Crisis

The structural crisis of the Garisenda Tower in 2023 directly generated a series of digital and public narrative projects centered on the crisis of the Due Torri. *Operazione Garisenda. Storie narrate, sognate e vissute,* jointly promoted by the Museo Civico Medievale and Settore Musei Civici Bologna, has organized lectures, children's workshops, and YouTube livestreams during the restoration period of the Garisenda Tower, transforming the restoration site into an opportunity for public historical interpretation and education. *Bologna a cuore aperto* adopts a more spatially interventionist approach, transforming the containers and hoardings around the Garisenda Tower construction site into narrative surfaces. Through a combination of medieval artistic imagery, graphic and textual panels,

and donation access points, it communicates information about the history and restoration process of the Due Torri to tourists and citizens. In addition, cultural tourism platforms such as Bologna Welcome continue to provide basic historical background and updates on the current condition of the Due Torri through webpages and audio guides.



Figure 4.12 Digital Twin della Torre Garisenda left and Bologna a cuore aperto right.

Source: Comune di Bologna.

In parallel with the narrative-oriented projects discussed above, the crisis of the Due Torri has also initiated engineering-governance-oriented practices such as *Bologna Digital Twin* and *Digital Twin della Torre Garisenda*. These projects are jointly carried out by the Comune di Bologna, the University of Bologna, Cineca, NVIDIA, and other institutions. Through sensor networks, AI simulation, and the Omniverse platform, they construct a digital twin model of the tower's structural behavior in order to support risk prediction and restoration decision-making. This project does not belong to the category of heritage narrative in the usual sense, but its existence itself is referentially significant, and it is also a future-oriented practice of heritage management. It shows that, in the context of the crisis of the Due Torri, digital technology can serve both as a tool for narrative reorganization and as a core instrument of engineering and governance.

Overall, this group of crisis-driven projects transforms heritage from a "historical object to be viewed" into a "risk object to be continuously monitored, calculated, and intervened upon," and shows a strong future-oriented direction. This shift undoubtedly has important conservation value, and it also reflects the trend toward datafication, prediction, and cross-institutional collaboration in contemporary heritage governance. However, these projects currently mainly use information explanation, expert lectures, engineering reports, and

graphic-textual panels as media, while the public mostly participates as listeners and readers. Therefore, how ordinary members of the public can intervene in the contemporary crisis of the Due Torri in a way that allows more space for emotion and judgment, and how the multiple meanings formed between the Due Torri and different subjects' experiences across different periods can be further organized into an experiential structure, remain questions worthy of further exploration. They can also complement the heritage narrative and management practices discussed above.

4.3.5 Narrative Boundaries of Existing Practices and the Entry Point of VHE

Taken together, over the past two decades, a relatively complete spectrum of digital and heritage narrative practices has formed around the Due Torri and the urban space in which they are located. The academic path represented by *Nu.M.E.* established a reflexive tradition in Bologna's virtual museum research, and relatively early on incorporated the Due Torri and the lost tower clusters into a virtual environment open to discussion. Immersive products such as *APA*, *La Macchina del Tempo*, and *Back to BO* further extended this tradition to the level of public experience, allowing the visual landscape of medieval Bologna to enter a broader public view. *Storia e Memoria di Bologna* provided another path for public historical narrative through archival relational organization, making the interconnections among people, places, and events themselves the carrier structure of urban memory. Crisis-driven projects such as *Operazione Garisenda* and *Bologna a cuore aperto* turned the contemporary condition of the Due Torri into an object of public interpretation and education. Each path responds to a specific type of question and has its own narrative significance.

However, beyond the scope collectively covered by these existing paths, there remains a set of questions that have not yet been sufficiently addressed. For example, how have the Due Torri been repeatedly passed by, paused at, talked about, and re-signified in more contemporary history and everyday life? How can legends, protests, scientific experiments, memories of refuge, love stories, and individual experiences related to the Due Torri across different periods coexist with historical knowledge within a unified narrative structure, instead of being dispersed across isolated archival entries or temporal slices? At a moment when the relationship between the public and the Due Torri is being reshaped by hoardings

and closures, can digital media take on a mediating role in reconnecting this relationship and mobilizing the public's emotional response? These are precisely the tasks that VHE seeks to undertake in this case.

After analyzing existing projects, this study identifies the entry point of digital narrative design. It does not attempt to repeat previous work by again reconstructing the historical appearance of the Due Torri or the overall urban form of Bologna with high precision, nor does it attempt to construct a more complete memory archive. Instead, it seeks to explore a mode of narrative experience that approaches the existence of the Due Torri in contemporary life and social experience through a spatial perspective and an ethnographic attitude. It organizes field observation, questionnaire materials, social media discussions, and images and documents from museums and archives into a relational narrative structure oriented toward public participation. Based on this positioning, the next section discusses the field observation and material organization carried out around the Due Torri, and extracts the relational elements on which the later narrative prototype design is based.

4.4 Field Observation: The Tension between Vertical Monumentality and Horizontal Everyday Life

4.4.1 Construction of the Ethnographic Material Bank

As discussed in the previous sections, the current predicament of the Due Torri lies not only in the officially narrated issues of structural risk, closure, and governance, but also in the way this closure has reshaped the relationships once formed between the towers and the public through proximity, passing by, staying, and repeated use. The relationship between people and heritage is shifting from a direct, experiential, accessible, and participatory urban connection toward an indirect one that is mediated by barriers, distance, and secondary narration.

At the same time, current official heritage narratives and digital projects have not effectively reached this relational dimension. Against this background, research on the heritage narrative of the Due Torri should not remain at the level of "historical overview" or "crisis events," but should return to the question of how the towers actually exist within

urban space, public life, and social experience. This is also where VHE, as a research method, finds its appropriate point of entry.

Based on the fieldwork mentioned earlier, the researcher further systematically organized multiple types of materials related to the Due Torri. The first consists of field observation and active investigation, including photographic documentation of Porta Ravegnana, Via Rizzoli, the tower base and surrounding spaces, barrier interfaces, lines of sight, patterns of staying, and path organization, as well as the previously mentioned exploratory questionnaire, which supplements first impressions, knowledge sources, spatial experiences, and perceptions of closure among long-term users of the city. The second consists of public narratives from digital platforms, including descriptions and emphases found on social media and official websites (government portals, museum websites, and tourism platforms), as well as discussions within local communities. The third consists of historical and academic materials, mainly from the Biblioteca Salaborsa and the Bologna State Archives, as well as models, paintings, historical photographs, exhibition panels, and archival images from the City Museum, the Medieval Museum, and related institutions. Together, these materials form a composite structure that spans past and present, formal knowledge and lived experience, and physical and digital space.

Based on this material structure, the researcher organized the core materials into an ethnographic material bank related to the Due Torri (see fig.4.13), and conducted a relational cross-analysis from a spatial perspective. It should be noted that the material bank adopts a bilingual working format. Since the final prototype design and the subsequent recruitment of participants were conducted in a Chinese-language context, the information reflected by the collected materials was mainly recorded in Chinese during the organization process, while key terms, proper names, and conceptual categories were kept in both Chinese and English.

Here, the understanding of the towers' significance is no longer centered on the "object" itself, but is re-examined through the relationships between architectural heritage and people, the city, and society. As proposed in the VHE methodology, the focus is placed on the ongoing processes through which the towers are seen, used, narrated, debated, and reinterpreted.

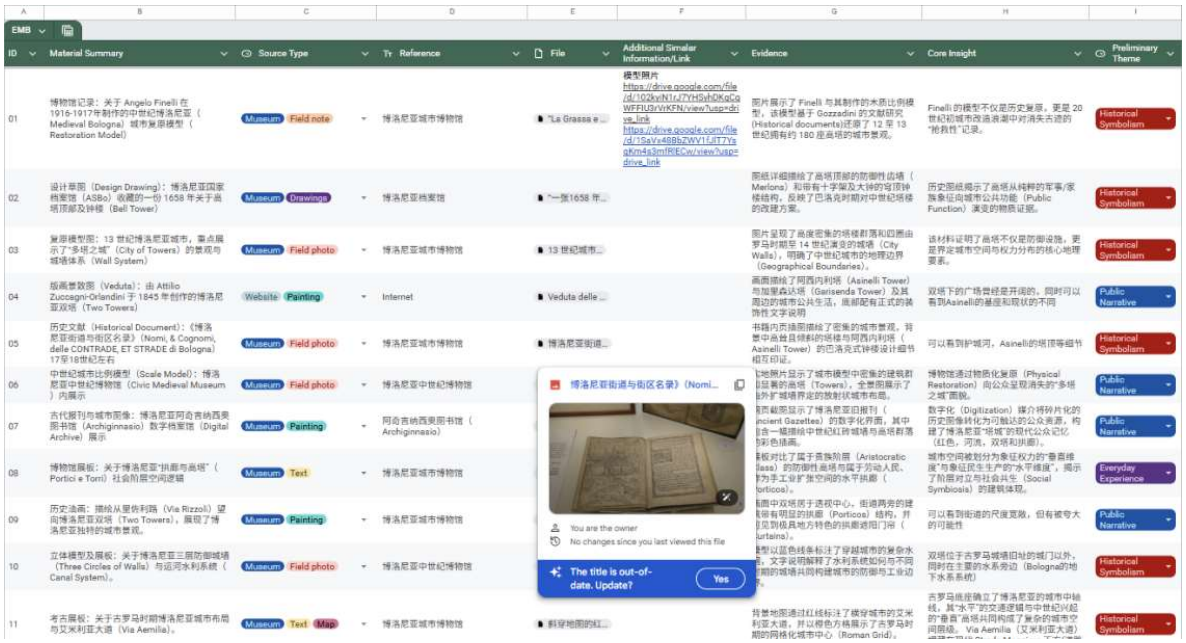


Figure 4.13 Ethnographic Material Bank Built through Preliminary Fieldwork and Research

Source: Screenshot by the author.

From these materials, it can be preliminarily observed that the meaning of the Due Torri as heritage is always expressed through two intertwined dimensions. One is the vertical dimension, related to the towers' façades and skyline, involving grand narratives, monumentality, height, upward viewing, display, visibility, and visual dominance. The other is the horizontal dimension, related to the towers' internal functions and the auxiliary structures at their base, involving markets, encounters, paths, staying, institutional occupation, and everyday relationships. Although both dimensions are present in museum and official narratives, the celebration of grand narratives within the vertical dimension still dominates over the exploration of relational aspects at the horizontal level. At the same time, vertical narratives are largely occupied by skyline imagery, medieval legends, and symbolic meaning, without fully engaging with deeper processes of meaning production.

Therefore, this study redefines both the vertical and horizontal dimensions. The vertical dimension is not limited to geometric height, but refers to a mode of organizing vision and projecting meaning through elevation. The horizontal dimension is not simply about ground-level activity, but represents a perspective that incorporates the towers into the lifeworld through repeated contact, spatial use, and relational connections. Within this framework, and

based on the cross-analysis of materials, the researcher identifies six relational characteristics embodied by the Due Torri and preliminarily outlines corresponding narrative entry points for heritage storytelling, which will be discussed in the following sections.

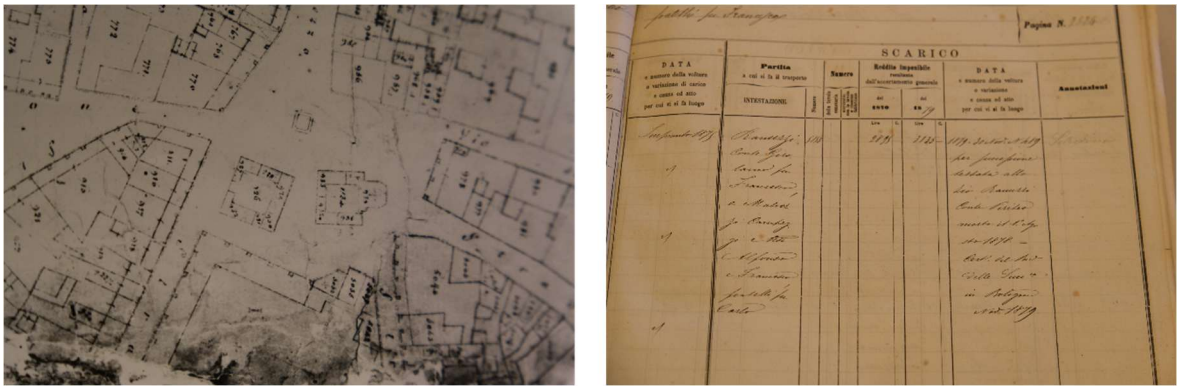


Figure 4.14 Nineteenth-Century Cadastral Map and Property Ownership Records of the Due Torri

Source: Compiled by the author; photographs taken by the author at the Archivio di Stato di Bologna.

4.4.2 Billboard—The Surface for Projecting Meaning

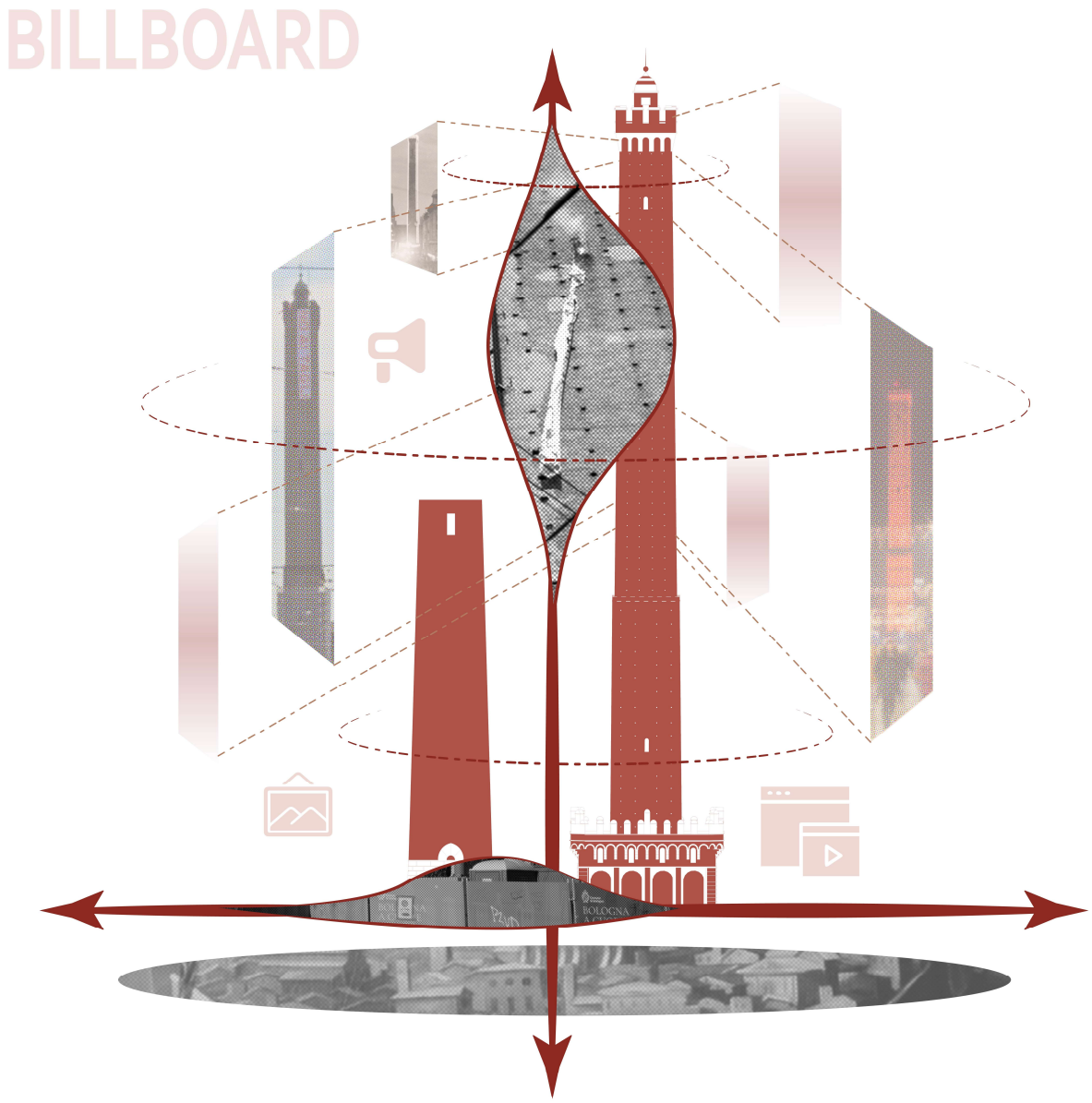


Figure 4.15 Billboard Analysis

Source: Drawn by the author.

The first characteristic observed in the vertical dimension is summarized by the researcher as *Billboard* (see fig. 4.15). It refers to the role of the Due Torri as a medium of urban visual identity, festival installations, protest backdrops, surfaces for public information projection, and carriers of the city's image. The focus here is not on the structural function of the towers themselves, but on how they operate as a surface that is seen, displayed, and used to project meaning, becoming a symbol of urban identity.

4.4.2.1 The Towers as an Urban and Symbolic Interface

The Due Torri function as a continuously usable, writable, and mobilized public interface in Bologna, serving as a vertical screen where public life, political memory, and collective emotion are expressed (see fig.4.16).

This is first reflected in historical and commemorative inscriptions. For example, on April 21, 1945, the day Bologna was liberated during World War II, Allied soldiers left the inscription "W Roosevelt, W Churchill, W Stalin" on a column of the portico along Strada Maggiore at the base of the Asinelli Tower. This trace was later incorporated into commemorative activities of the city's liberation. At that moment, the towers became a surface that recorded and preserved the marks of historical events. A similar interface can be observed in the repeated emphasis on the towers within commemorative routes and urban rituals. Historically, medieval processions such as the escort of prisoners and public punishments took place along the roads in front of the towers. In contemporary times, these routes have been transformed into paths for parades, celebrations, and torch relays.

In addition, the towers have been directly appropriated in political actions as devices of expression. Many demonstrations have used the towers as focal points, most typically by hanging banners from the façade of the Asinelli Tower or its surrounding structures, turning the towers themselves into carriers of protest messages. Such actions take advantage of their verticality, centrality, and high visibility, elevating political demands from the ground level to a position that cannot be ignored across the city. In this context, the towers function as temporarily activated communication interfaces.

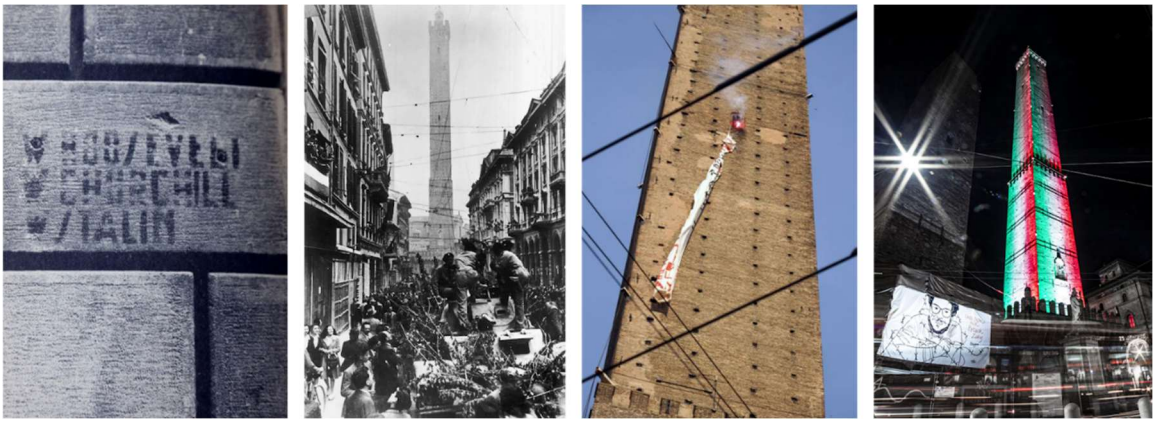


Figure 4.16 The Towers as a Display Surface

Source: Storia e Memoria di Bologna.

Beyond political and commemorative uses, the towers also repeatedly appear in the context of festivals and artistic installations, forming another mechanism of collective memory. In exhibitions such as "Towers of Light," as well as in Christmas light projections and urban festival settings, the towers are used as central objects for illumination, projection, and visual composition. They act as screens on which the contemporary image of the city is temporarily displayed. People do not simply "look at the towers," but experience their belonging to the city through the towers being illuminated, decorated, and reinterpreted during shared festive moments.

Therefore, the significance of the towers as an urban and symbolic interface lies in their long-term role in making certain things collectively visible to the city. Politics, commemoration, emotion, celebration, and identity are continuously amplified here and, through the towers, enter collective experience.

4.4.2.2 The Constructed Center of Meaning

Today, the Due Torri are often naturally regarded as the "icon" of Bologna. To some extent, however, this is the result of historical construction. In many religious paintings, the city is depicted being held by Saint Petronius, and within these visual representations, the towers consistently occupy the central position of the urban model. Similarly, in the famous Sala di Bologna in the Vatican, the mural depicting the city of Bologna places the towering Due Torri at its center (see fig. 4.17).

This suggests that from an early stage, the towers were not merely architectural objects, but were incorporated into a sacralized and totalizing mode of urban representation. This visual expression, closely tied to religion, further reinforced their role as a center of meaning.



Figure 4.17 The Image of Bologna in Religious Paintings

Source: Compiled by the author from field photographs and published materials.

The prominence of the towers today is also closely related to the disappearance of the broader tower cluster and the reorganization of the surrounding space. Historically, the area around Porta Ravegnana included several other towers, such as Alberighi, Artenisi, and Riccadonna. The first collapsed in the twelfth century due to structural problems, while the latter two were demolished in the early twentieth century in the name of traffic improvement and safety. With the disappearance of these towers, the once "five-tower" landscape gradually condensed into the image of a "two-tower confrontation." At the same time, the widening of surrounding streets, the clearing of façades, and the strengthening of main urban axes further amplified the visual dominance of the Due Torri within the urban fabric.

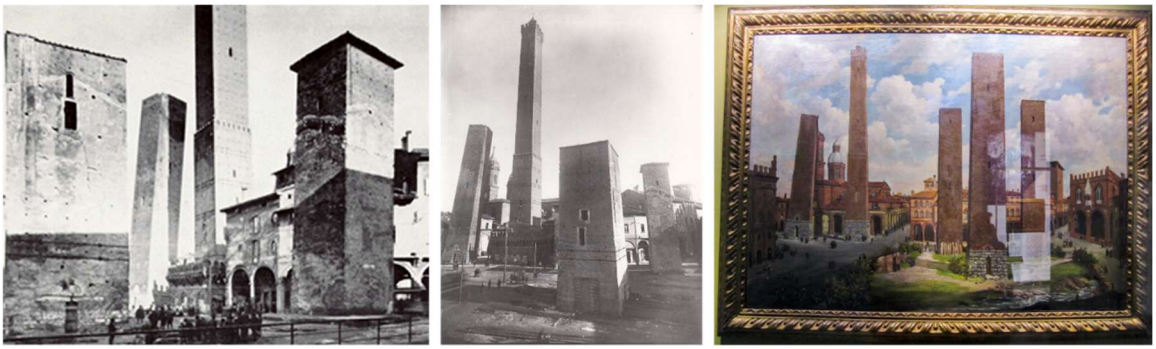


Figure 4.18 The Square of the Towers in the Late Nineteenth Century and the Twentieth-Century Painting *Le cinque torri*

Source: Compiled by the author; left and middle images from the fieldwork archive; right photograph by the author at the Museo della Storia di Bologna.

This constructed centrality can also be observed in artistic reinterpretations from the early twentieth century. In *Le cinque torri* (see fig. 4.18), Giuseppe Bertuffi did not follow the already stabilized "two-tower image," but instead recalled the previously denser tower landscape.

The work offers an imaginative reconstruction of the past, while also suggesting that the seemingly natural centrality of the Due Torri today is in fact the result of a continuous process of selection and reduction.

4.4.2.3 Crisis, Construction, and Display

After the closure in 2023, the "Billboard" characteristic of the towers has been reinforced in a new way: they have become a medium for displaying and validating governance mechanisms. This form of display operates on both physical and digital levels.

Physically, construction barriers and container-based protective structures quickly occupied the core area of Porta Ravegnana, enclosing the towers and transforming what was once an open urban node into a large and continuous construction site. This has created a new visual interface at the city center. The government has subsequently used the external surfaces of these barriers to present the history of the towers, provide updates on restoration progress, and communicate fundraising initiatives. When the towers themselves are inaccessible, the barriers become a substitute narrative surface. However, after the enclosure, the remaining space around the square is mainly composed of narrow passage-like corridors, making it difficult to support meaningful stopping, browsing, or immersive reading. The spatial experience remains one of closure, compression, detouring, and inconvenience.



Figure 4.19 Planned Enclosure Interface and Actual Site Condition

Source: Left photograph by the author; centre and right images from Comune di Bologna.

On digital platforms, another layer of display is formed through the frequent publication of structural reports and governance updates on official websites. Cultural and educational projects have also developed along this logic. For example, in 2024, the Medieval Civic Museum organized workshops and public programs centered on the restoration of the Garisenda Tower, explicitly framing the project as an opportunity to narrate the past, present, and future, while attempting to strengthen public belonging, responsibility, and understanding of medieval Bologna. In official narratives, the crisis is actively incorporated into a domain that can be displayed, narrated, and used for education.

However, online discussions surrounding the crisis also reveal expressions of regret, anxiety, and distrust regarding governance processes and information transparency. Some comments explicitly state that "even after reading news and official announcements, it is still unclear what is actually happening," while others attribute responsibility to media systems, administrative decisions, or broader cultural governance frameworks. As restoration funding was withdrawn in 2025 and plans were repeatedly delayed, this informational display has itself become a site of contestation among different stakeholders over narrative authority.



Keywords	Frequency
garisenda	14
tower	14
closed	14
worksite	10
regret	7
asinelli	5
cordoned	5
restoration	4
problema	3
hope	3

Figure 4.20 Online Community Discussions of the Towers' Crisis

Source: Screenshot by the author.

4.4.2.4 Image or Identity?

Within the Billboard mechanism, the towers face a fundamental dilemma: they have become highly successful as an image, but not necessarily as a deeply understood heritage object. This process of image-making is not recent. As early as 1836, in Giovanni Zecchi's Raccolta di cento vedute principali d'Italia, a romanticized representation of the towers had already stabilized. Today, the image of the Due Torri has become a central symbol in tourism promotion. The issue is that as this image becomes increasingly standardized, the complex temporal layers and social relationships of the towers are easily compressed.



Figure 4.21 Tourism Posters, Street Performers, and WWII Postcards Related to the Towers

Source: Left from the fieldwork archive; centre photograph by the author; right from Storia e Memoria di Bologna.

Survey results show that people primarily recognize the "symbol of the two towers," rather than the complex history behind it. Terms such as "symbol," "icon," and "monument" frequently appear in first impressions, while the processes behind their formation are often overlooked. The iconography of the towers within the city is highly uniform and lacks the richness needed to reflect historical transformation. This reveals a communication structure characterized by high visual visibility but low depth of meaning. In other words, although the towers have indeed become a symbol of Bologna's identity, what is most commonly consumed in everyday contexts is their skyline form, tourism imagery, and the idea of "having been here," rather than the more complex processes of urban change, social relationships, and local emotional connections. This structure—where image precedes understanding—is precisely one of the key issues that the subsequent narrative translation must address.

4.4.3 Lighthouse—A Coordinate that Defines Direction

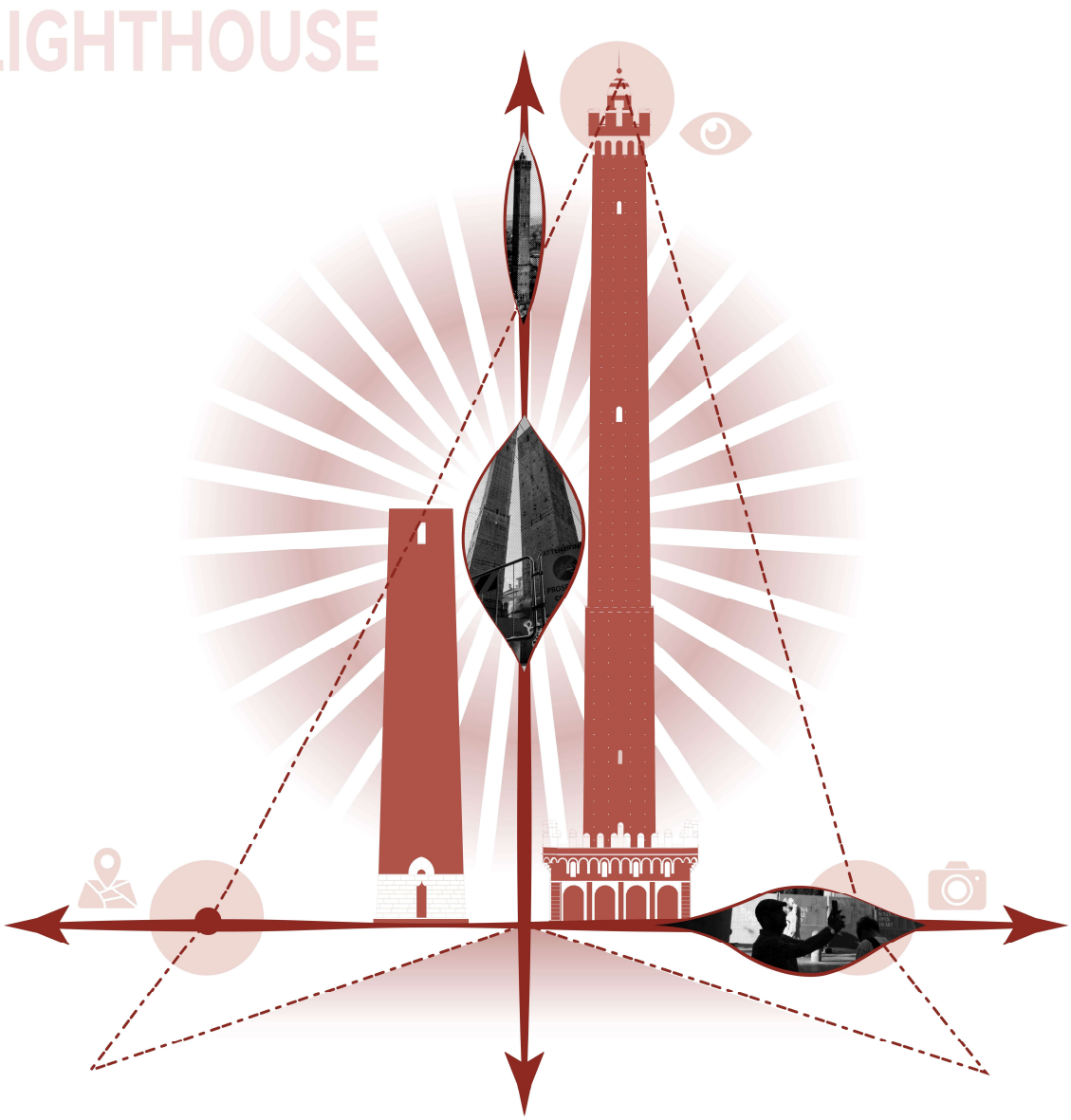


Figure 4.22 Lighthouse Analysis

Source: Drawn by the author.

The second characteristic within the vertical dimension can be defined as the *Lighthouse*. It refers to the role of the towers as organizers of orientation, urban axes, surveillance, defense, overlooking, and the relationships of "seeing/being seen." The focus here is on how the towers help people locate themselves, observe the city, and function as key devices within visual power relations, organizing modes of perception between people and between people and space across different historical periods.

4.4.3.1 Anchor of a "Forest of Power"

In medieval Bologna, towers were not primarily urban scenery to be appreciated, but vertical devices that organized defense, surveillance, and family power. Towers were typically constructed with thick brick walls, hollow interiors, wooden ladders, and elevated entrances positioned several meters above the ground. This spatial configuration indicates that their primary logic was to resist ground-level attacks, delay intrusion, and ensure family security. This "elevated" organization effectively concentrated safety, mobility, and surveillance in the upper levels.

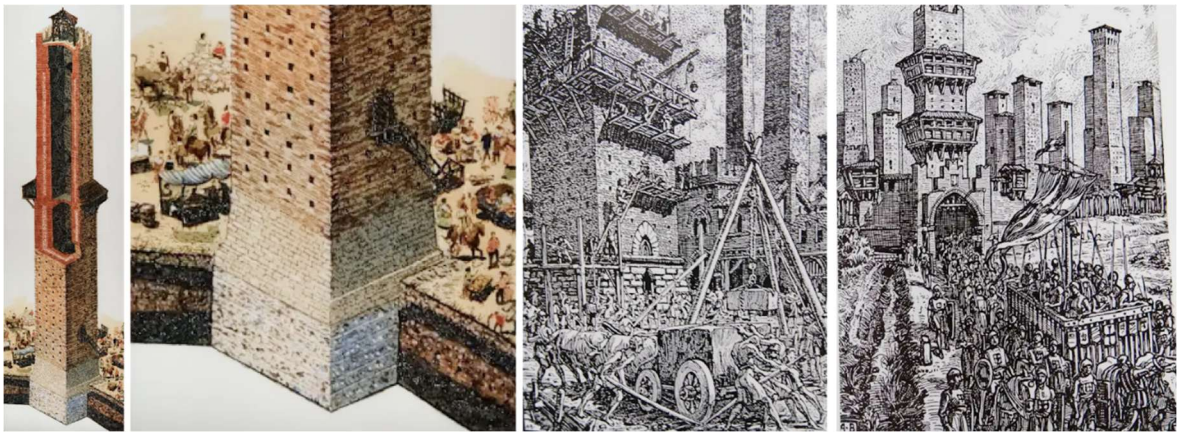


Figure 4.23 Medieval Tower Construction and an Engraving by Alfredo Baruffi

Source: Photographs from the fieldwork archive.

The reconstructed medieval tower clusters and street scenes illustrated by Alfredo Baruffi reveal this condition. Competition among towers in Bologna was not merely symbolic height comparison, but a continuous system of "seeing / being seen" embedded within real urban streets, gates, and squares. Whoever occupied a higher position gained

greater ability to observe approaching threats, monitor rival families, track street activities, and gain advantage in potential conflicts. Within this system, the Due Torri functioned as the most prominent anchors in this "forest of power," reflecting the political reality of organizing dominance through vertical positioning in medieval Bologna.

4.4.3.2 Translation of the Right to See

The meaning of the tower-top viewpoint has not remained constant over time. In the medieval period, height primarily served defense, surveillance, and control. From the sectional structure of the towers, it is clear that interior spaces were relatively simple, and ascending the tower was a strictly organized vertical process. The top level corresponded to lookout, defense, and the ability to occupy a dominant viewpoint, where the right to see largely overlapped with the right to control.

In the modern period, particularly during the two World Wars, towers continued to function as observation points, but their role shifted from internal conflict between families to the protection of the city and its citizens. In the contemporary period, however, this power relationship has been transformed into a form of entertainment and consumption. Climbing the Asinelli Tower and taking photographs has become a popular tourist activity, and heritage itself has become a consumable site. After the closure of the Due Torri, other towers have taken on a substitute role, as visitors remain willing to pay for the experience of viewing Bologna from above. It can therefore be seen that, under consumption-driven behavior, the object of climbing does not necessarily have to be the Asinelli Tower.



Figure 4.24 Nineteenth-Century Section of the Garisenda and Tourists Climbing the Tower

Source: Left photographs from the fieldwork archive; middle from the internet; right photographs by the author.

Thus, overlooking no longer primarily signifies control over others, but has been transformed into a temporary possession of the urban landscape, proof of "having been there," and a commodified experience within the tourism economy. The tower-top perspective has therefore undergone an important translation—from a viewpoint of authority to a consumable and commemorative visual product in the modern city.

4.4.3.3 Formation of Urban Orientation

The Due Torri function as landmarks because they are continuously embedded in people's sense of orientation during movement. The area around Porta Ravegnana lies at a key point where streets radiate and converge, making it naturally suited as an urban reference point. In the modern city, this directional role has been further reinforced by new urban axes.

People do not typically first recall the towers abstractly and then locate themselves. More commonly, they encounter the towers unexpectedly—at the end of a street, through a gap at a corner, or along the extension of a road—while walking, turning, approaching the center, or returning along a route. At that moment, they confirm their position. Field observations support this: when following Google Maps from the train station into the historic center, one inevitably encounters the silhouette of the Asinelli Tower when first reaching Via Rizzoli, producing both a strong visual impact and a sense of "entering Bologna."



Figure 4.25 Intersecting Tower Views from Different Locations

Source: Photographs by the author.

This is also reflected in the survey results. Respondents often associated the towers with movement-related activities such as walking, public transport, or passing through. Some also mentioned using the towers to orient themselves when lost. Therefore, in public perception, the Due Torri carry both symbolic and directional functions. They can be understood as a locational system activated through bodily movement, continuously shaping the city's sense of orientation through street axes, pedestrian paths, and everyday experience.

4.4.3.4 Embodied Experience and Post-Crisis Visual Convergence

Even after the closure, the Due Torri continue to strongly organize visual relations within the city. However, this relationship has shifted from an accessible panoramic viewpoint to a more embodied street-level experience. Survey responses and field observations show that closure has not removed the towers from view. Instead, it has created a condition of "visible but inaccessible" absence: people continue to see the towers, but can no longer enter, climb, or occupy their viewpoints as before. As a result, viewing is drawn back to the ground level.

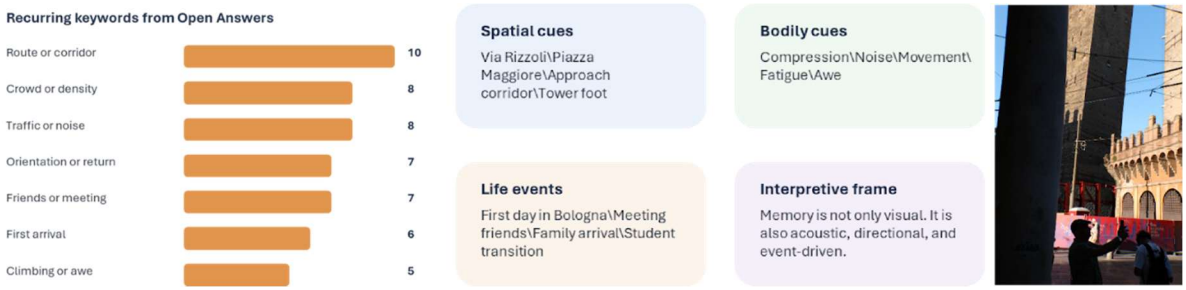


Figure 4.26 Analysis of Embodied Experience in the Field Survey

Source: Drawn by the author.

After the installation of barriers, the most intense visual experiences occur at the base of the towers and at street corners. Passages become narrower, forcing pedestrians to slow down or stop. At the corner where Via Rizzoli meets Piazza della Mercanzia, people naturally gather to look upward at the intersecting towers from close range. At this moment, the towers' landmark form in the skyline recedes into the background, giving way to a more embodied sensory experience: the body is forced to look up, surrounded by noise and crowding, and subject to a sense of compression and awe within a confined space.

This observation aligns with survey responses. Citizens' memories of the towers are strongly embodied, often linked to events such as passing through, meeting, getting lost, re-encountering, and crowding. After the crisis, this embodied dimension has been further intensified. What continues to attract people to stop is not the text displayed on the barriers, but the towers' persistent vertical visual dominance. Thus, although the towers have lost their accessible viewing rights in the post-crisis condition, they more clearly reveal their essential role as concentrators of gaze.

4.4.4 Playground—A Structure of Challenge and Heroic Narratives

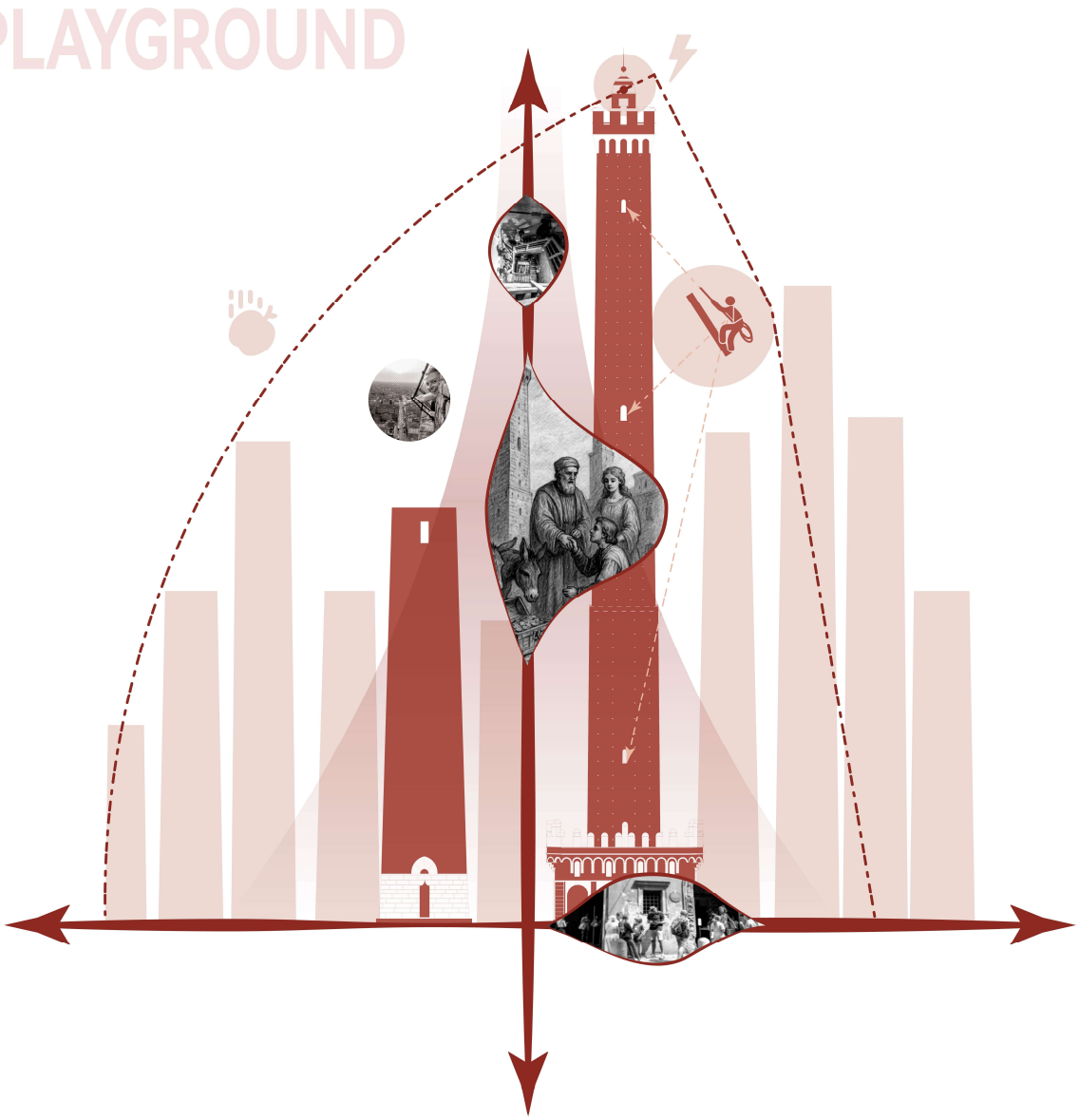


Figure 4.27 Playground Analysis

Source: Drawn by the author.

The third characteristic within the vertical dimension can be defined as *Playground*. It refers to the towers (especially the Asinelli Tower) as vertical structures that are challenged, competed over, tested, and used for risky or experimental activities. This reflects a pursuit of pushing limits—seen in family competition for height, scientific experiments, manual climbing challenges, and the gamification of risk. The focus here is on how the towers go beyond the image of stable monuments and become objects to be tested and challenged, while also reflecting Bologna's historically strong left-leaning civic spirit.

4.4.4.1 Competition of Height

In medieval Bologna, towers were essentially devices for continuous vertical competition. As discussed earlier, the Due Torri—especially the Asinelli Tower—represent the most extreme outcome of this logic. At its peak, Bologna's hundreds of towers formed a "forest of power," where height distinguished family status and control.

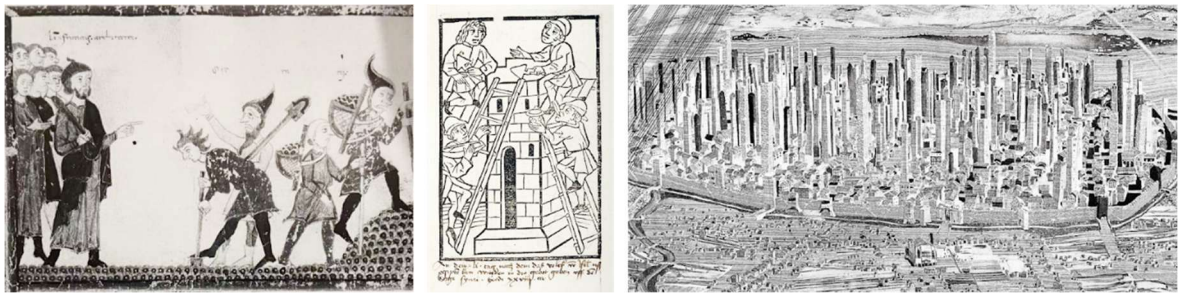


Figure 4.28 Tower Construction in Medieval Prints and Imagined Reconstruction of Bologna

Source: Photographs from the fieldwork archive.

In this context, tower construction became a public political and technical contest. As noted by Giancarlo, towers were closely linked to expressions of family power, control of squares, and street conflicts. Their meaning lay in "who dared to build, and who could build higher." From the construction process itself, it is clear that building a tower required immense financial and material resources and involved significant risk. The final outcome depended heavily on construction skills and technical capacity. This made the competition very concrete: tall towers relied on large labor forces, long construction periods, and complex organization. Height thus became a visible result of victory—it demonstrated not only wealth, but also a family's superiority in technology, resources, and determination.

4.4.4.2 Difficult Engineering and Legends Beyond Reality

When the height, construction duration, and difficulty of towers exceed everyday experience, they are often retold as nearly impossible human achievements. As noted earlier, building medieval towers was already an extreme engineering effort. The height of the Asinelli Tower therefore appeared almost unimaginable, and its construction was frequently transformed into legend.



Figure 4.29 Legends of Tower Construction

Source: Created by the author with AI assistance.

The story of "the devil building the tower in one night" uses supernatural power to explain a structure that seems beyond human capability. Another legend—"two donkeys, a chest of gold, and building a tower for marriage"—reframes construction as a dramatic story of sudden wealth, social mobility, and romantic ambition. Whether involving demons, unexpected fortune, or extraordinary opportunities, these narratives show that when architecture exceeds normal expectations, people tend to associate it with something beyond reality, creating admiration and myth.

In other words, the extremity of the tower produces not only awe, but also mythology. Real technical achievements are translated into heroic or even miraculous stories within collective memory.

4.4.4.3 Imagination of Science and Progress

The Due Torri were not only defensive structures in the medieval period. In later periods, they were continuously reactivated as vertical sites for research, testing, reinforcement, and verification. Studies by Maurizio Molinari[50]and others show that both towers have long faced challenges such as fire, lightning, structural tilt, and instability. Their maintenance and monitoring thus became ongoing tasks for authorities and professionals.

As noted in Le Torri di Bologna, the Asinelli Tower once served as a site for Professor Francesco Orioli's lightning protection experiments, demonstrating that protecting the towers was itself part of the struggle between humans and natural forces.

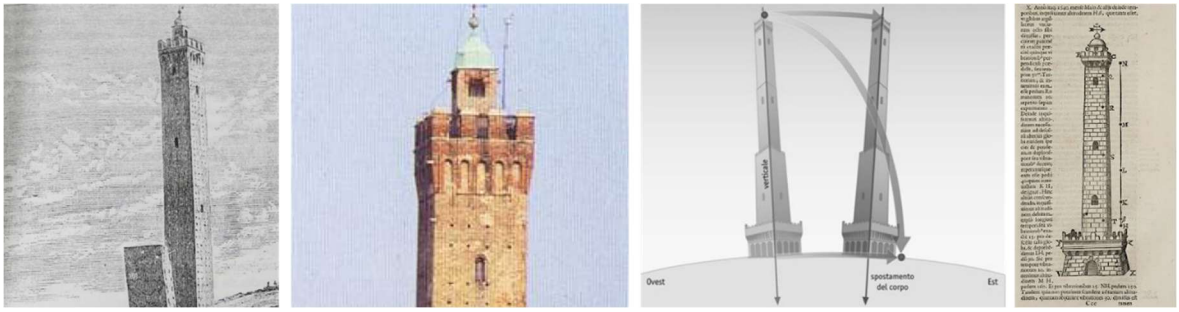


Figure 4.30 The Bell Tower atop the Asinelli and Scientific Experiments
Source: Photographs from the fieldwork archive.

At the same time, their height made them ideal platforms for scientific exploration. Historically, the tower tops were used for astronomical observation. In 1791, physicist Giovanni Battista Guglielmini conducted a famous experiment from the Asinelli Tower: dropping lead balls to measure their slight eastward deviation, providing evidence of the Earth's rotation. The Bologna tourism website even describes this as a direct experimental proof of Earth's rotation predating the Foucault pendulum by more than fifty years.

At this stage, the towers were no longer only defensive structures. They embodied Bologna's identity as a university city and a center of knowledge, redefining "height" as a resource for scientific experimentation and reflecting a broader imagination of progress.

[50] COSTA T. Due torri, una città: storia, leggenda e cronaca di un simbolo[M]. Roma: La Repubblica, 2024.

4.4.4.4 Performance Space and Heroism

Extreme height not only creates awe, but also continuously produces the impulse to "conquer" it. According to records from Storia e Memoria di Bologna, beginning in 1878, a dangerous and sensational activity emerged in the city. Instead of climbing the internal stairs, individuals would exit from the upper battlements of the Asinelli Tower, grasp iron wires connected to the lightning rod at the tower's corners, and climb or descend externally using arm strength alone.

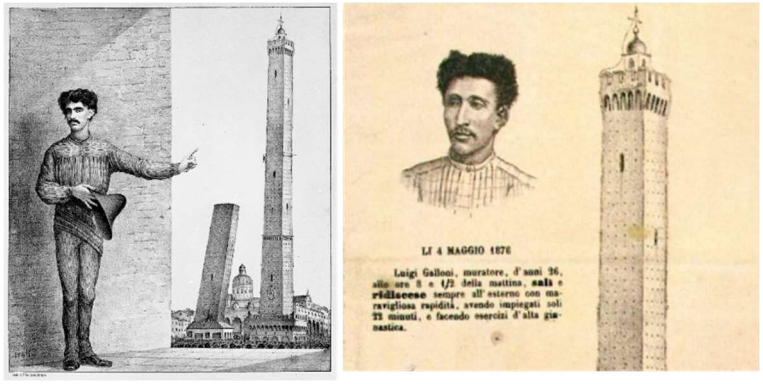


Figure 4.31 Archival Records of Successful Tower Climbs

Source: Storia e Memoria di Bologna.

Those who succeeded were celebrated as "heroes." Names such as Luciano Monari and Luigi Galloni are recorded in local archives. This practice transformed the tower into an object that could be conquered, displayed, and publicly performed through extreme physical acts. The tower thus became a stage for producing danger, fame, and urban spectacle.

In a sense, this continues the medieval spirit of "who can go higher," but shifts the competition from family construction to individual physical performance. The attraction of height lies not only in being admired from below, but also in its continuous ability to invite bodily challenges and to turn danger into honor and occupation into heroic narrative.

4.4.5 Hall—A Field of Gathering, Encounter, and Interaction

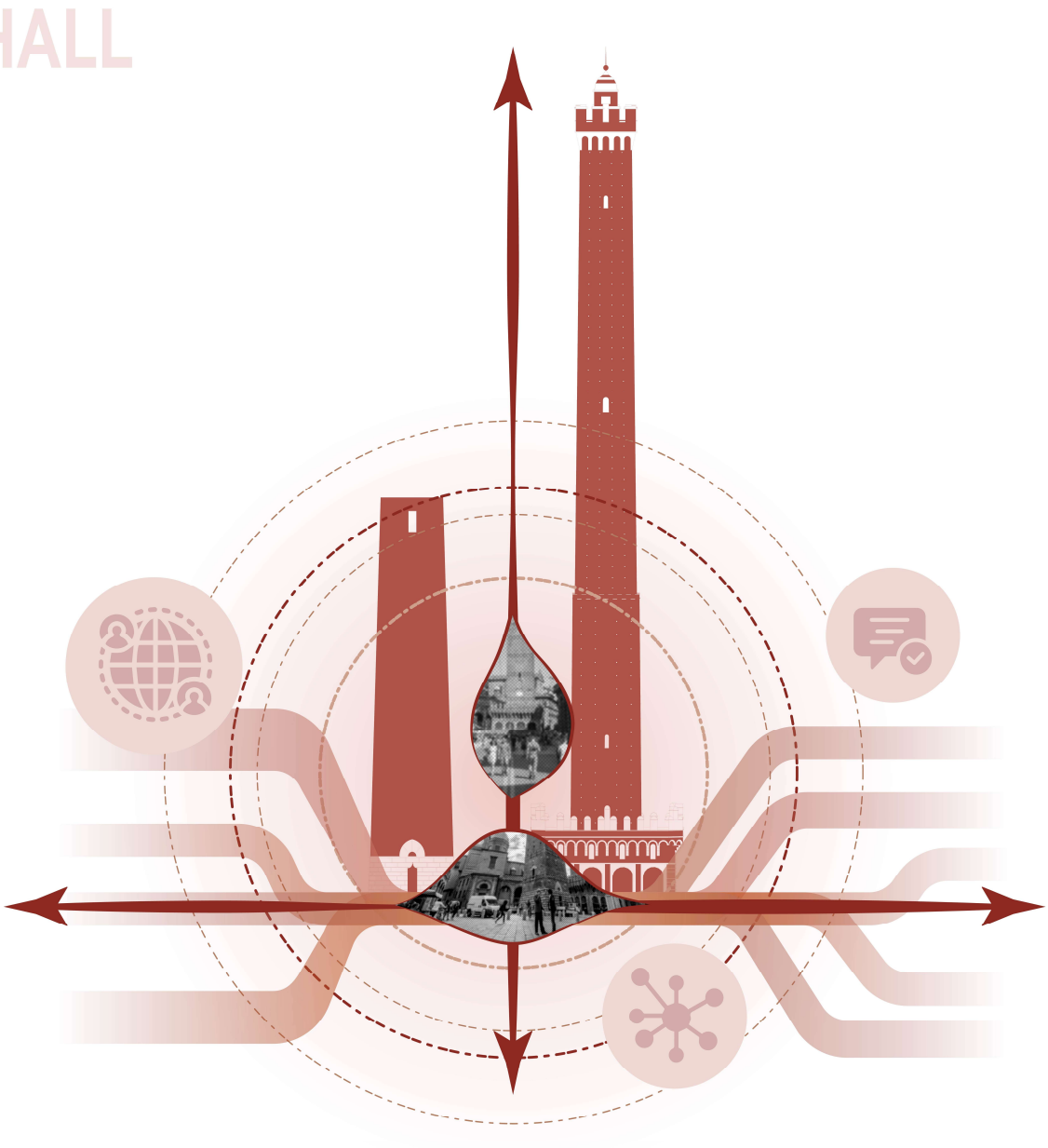


Figure 4.32 Hall Analysis

Source: Drawn by the author.

Beyond the vertical dimension, the towers also display a strong horizontal character, rooted in their functions and the transformation of their bases. Within this horizontal dimension, the first characteristic of the Due Torri can be defined as *Hall*. This refers to the towers and their surrounding square as a public space—an urban living room and marketplace—where public life unfolds. It is also a site where different groups meet, where discussions converge, and where shared meanings emerge, embedding the towers within social interaction, commerce, and everyday urban life.

4.4.5.1 A Point of Geographic Convergence

The importance of the Due Torri does not only come from their vertical height, but also from their role as a key point of urban convergence. Historical records of the Roman street network show that beneath the modern Strada Maggiore lies the path of the Via Aemilia, one of the most important ancient roads. This indicates that the area around Porta Ravegnana has long functioned as a critical urban crossing point. The construction of the Due Torri undoubtedly reinforced this structural relationship.

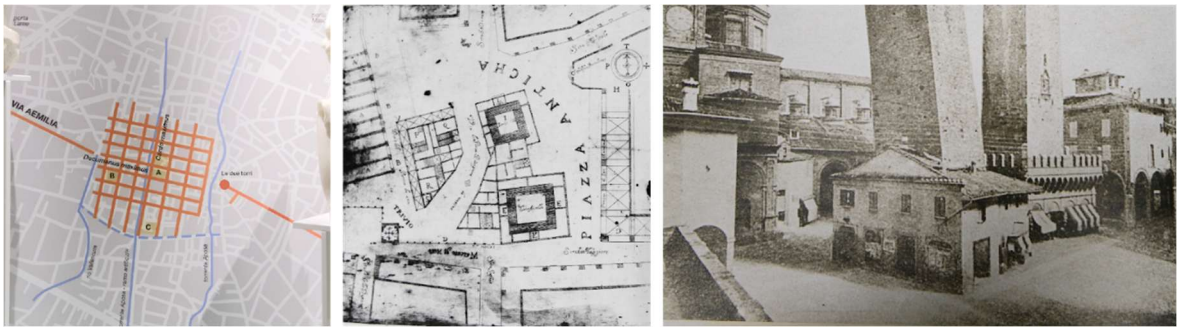


Figure 4.33 Roman Road Network, Seventeenth-Century Tower Shops, and Nineteenth-Century Square

Source: Compiled by the author; left image photographed by the author at the Museo della Storia di Bologna; middle and right images from the fieldwork archive.

In the medieval and early modern periods, engravings and survey drawings further show that the square around the towers had already become a complex node composed of a three-way intersection, shops, annex buildings, churches, and flows of people. It connected Strada Maggiore, the main route toward the city center, and surrounding commercial and religious spaces—a typical point of convergence.

From the late 19th century into the 20th century, this converging role was further reinforced by modern urban planning. Today, both pedestrian flows and transportation routes continue to position the towers at the strongest point of accessibility and orientation.

Thus, the Due Torri have consistently occupied a geographic node that has served as a site of urban convergence for centuries. Here, branching streets, extended arcades, shifting facades, adjacent buildings, and public life overlap, forming one of the most characteristic gathering interfaces in Bologna.

4.4.5.2 Everyday Coexistence Across Social Classes

Beyond geographical location, social classes also formed distinct patterns of concentration around the Due Torri. Located next to the Mercato di Mezzo, which has existed since the 12th century, the towers were long surrounded by dense housing, workshops, narrow alleys, and fish markets, embedded within a crowded and mixed social environment. This dense spatial fabric creates a natural stage for encounters. It was not until the late 13th century that the commune carried out large-scale demolitions to expand the square.

Paintings such as Fabio Fabbi's 19th-century depiction of Porta Ravegnana show that the space beneath the towers remained a busy node filled with carts, vendors, shops, and traffic. The square was lined with dense commercial activity, including documented rentals to trades such as knife sharpeners and bakers. This area was deeply embedded in everyday commerce and guild structures, populated by diverse social groups, and only gradually cleared with modern planning interventions.



Figure 4.34 Fabio Fabbi's Painting and Historical Views of the Tower Square

Source: Photographs from the fieldwork archive.

At the same time, a clear contrast existed between the towers and the arcades below. The towers were defined as “aristocratic” (aristocratica)—symbols of power and defense—while the arcades were considered “of those who work” (di chi lavora)—horizontal, accessible, and associated with artisans and merchants. The Due Torri compressed these two dimensions into a single site, where family power overlapped continuously with market activity, craftsmanship, and everyday movement.

Before becoming public property, the towers were also transferable assets circulating among different owners. Ambrosini notes that in December 1268, Ugolino sold one-eighth ownership of a tower to Alberto for 80 Bolognese lire, indicating that ownership was fragmented within family networks. This further expanded the web of social relations connected to the towers.

In this sense, the Due Torri functioned as an urban interface where different social classes could see one another and pass by one another.

4.4.5.3 Relations and Personal Memory

Beyond social interaction and encounters with others, in many people’s experiences, the Due Torri are also a place closely tied to personal life experiences. In open-ended survey responses, when asked about personal experiences related to the towers, many respondents mentioned that the towers marked important “firsts” in their lives: their first arrival in Bologna, their first day at university, or their first time drinking beer in the city.

Most respondents also referred to friends and family, including moments such as reconnecting with someone after a long time and visiting the towers together. Although many lacked systematic historical knowledge, they still formed connections with the towers through everyday experience and built up an emotional attachment with it. The emotional meaning of the towers gradually emerged through repeated encounters, spatial orientation, relationships, and informal storytelling, and the image of the Due Torri is no longer distant or cold, but becomes concrete and emotionally warm.

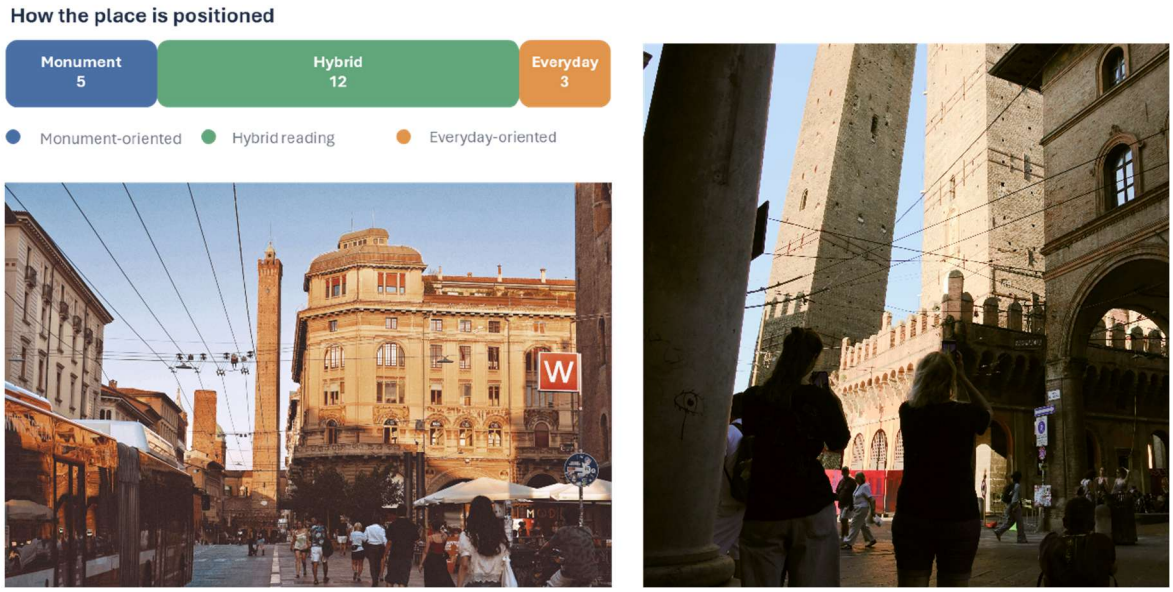


Figure 4.35 Everyday life around the Two Towers among Tourists and Local Residents

Source: Photographs by the author.

This intimacy is also closely related to the present spatial scale around the Due Torri. Beyond their role as monuments, the towers maintain a more intimate relationship with the surrounding urban fabric at the scale of streets and alleys, especially with the surrounding shops, set against the broad roads and sidewalks along the main street. This intimacy is both physical and emotional, involving not only physical proximity but also the psychological and emotional associations of tourists and residents. The radial and winding street network, the narrow porticoes, and the shadows cast onto the pavement together weave a spatial experience in which the visible and the invisible overlap. The towers are not simply landmarks to be passively viewed, but function more like a relational ground within everyday life in Bologna—witnessing repeated movements as well as life moments such as people's encounters and departures.

4.4.5.4 The Towers as a Public Issue

Even beyond the material dimension, the term "Due Torri" itself has already become a powerful symbol. The Due Torri are not only connected to the physical world as spaces for passing through, meeting, and staying; they are also continuous sites where different groups discuss and judge Bologna. Historically, this public issue dimension has long existed. For

example, in 1871, the statue of Saint Petronius was secretly moved at night to avoid public protest, showing that spatial changes around the towers were not merely technical decisions but quickly involved public emotion, public identity, and administrative legitimacy.



Figure 4.36 The Relocated Statue of St. Petronius and People Gathering Beneath the Towers

Source: Left photographs from the fieldwork archive; right photograph by the author.

At the same time, during key moments in Bologna's history—such as the proclamation of the Liber Paradisus in 1257, under the gaze of the Due Torri, the founding of Europe's first university, and later waves of leftist movements—the towers were present as part of these processes, participating as a public issue in broader social transformations.

Today, this issue-based role has been amplified by the current crisis. Even though few people stop to read official texts on the construction barriers, crowds and attention continue to gather around the towers, and conversations among tourists at the base of the towers often involve concerns about their future as well as regret over the inability to climb them. The crisis itself has become part of everyday conversation, connecting visitors who come to see the towers from different places. Online discussions reflect the same pattern: students, residents, business owners, workers, and tourists—despite differences in knowledge and lifestyle—all form their own interpretations of the towers and express their views under the condition of crisis. This collective expression constructs a kind of vernacular imagination about Bologna's future, and creates a site where public opinion and emotional identity intersect.

4.4.6 Host—Translation of Function and Emotion

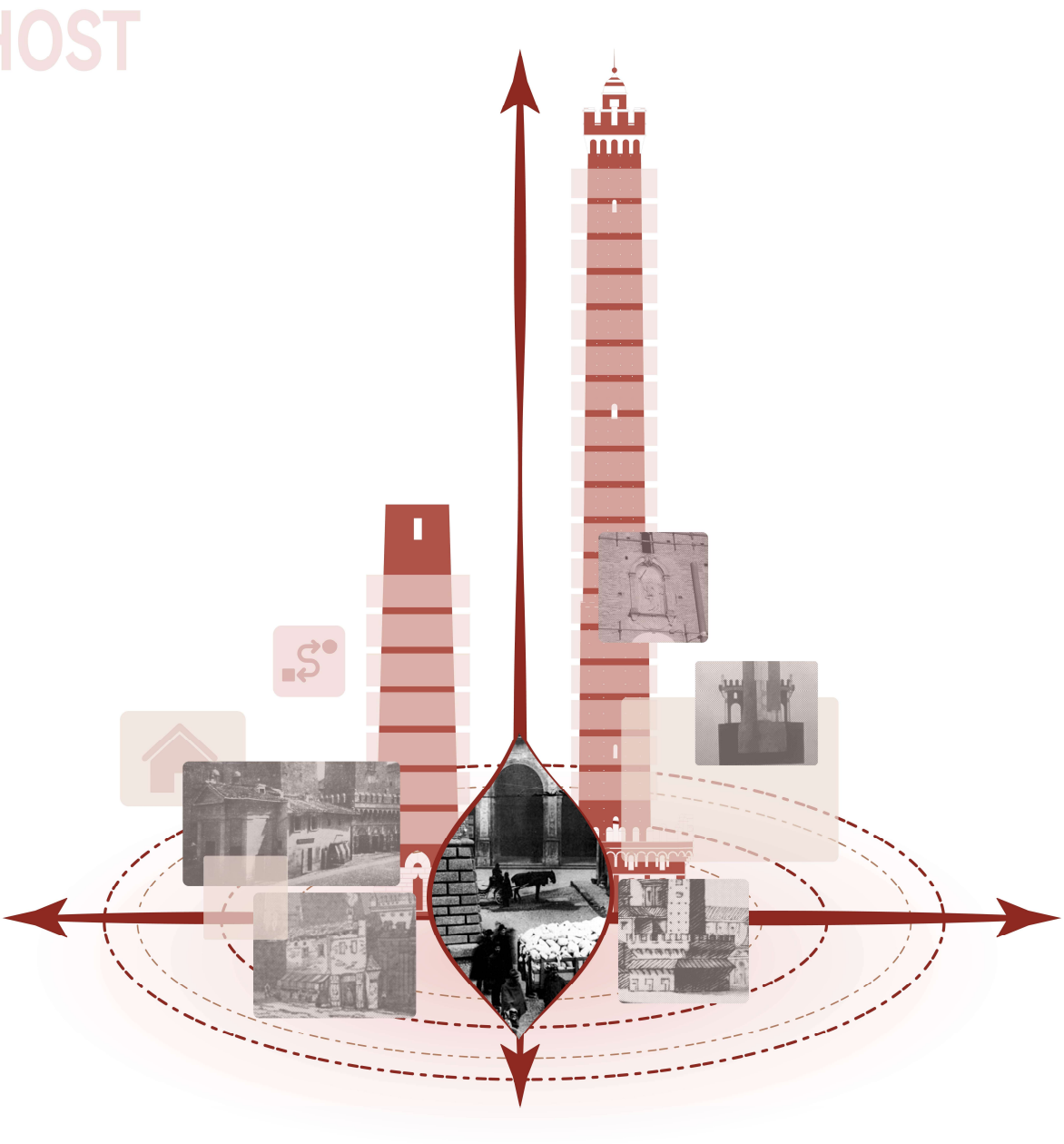


Figure 4.37 Host Analysis

Source: Drawn by the author.

The second characteristic within the horizontal dimension can be defined as *Host*. The towers and their bases, together with attached structures, have continuously accommodated different functions and institutional uses throughout history—such as prisons, granaries, fortresses, market shops, chapels, souvenir stores, and tourist facilities. In this sense, the Due Torri act as spatial hosts that receive and contain multiple spatial roles, while reshaping how people emotionally perceive the site.

4.4.6.1 A Continuously Changing Vertical Framework

Although their interior spaces are relatively simple, the towers are not "bare" or isolated brick structures. Rather, they resemble a trunk from which various spatial forms have continuously grown. Historical images and documents show that the towers were once equipped with external wooden balconies, houses, and attached buildings, with base spaces that were repeatedly expanded and transformed. They also served as locations for sculptures and civic emblems.

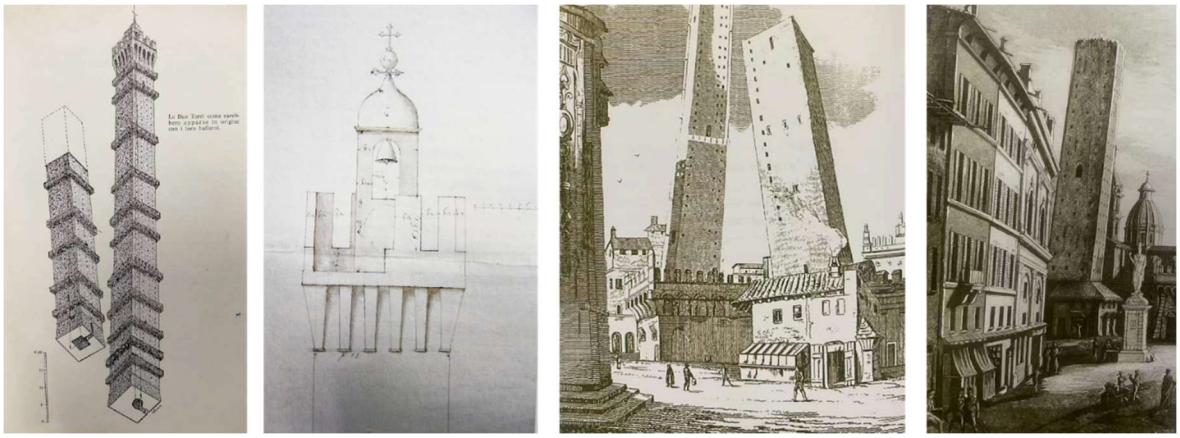


Figure 4.38 Attachments to the Towers Across Historical Periods

Source: Photographs from the fieldwork archive.

Their privileged location meant that even simple spaces could always take on important functions. At the base of the Asinelli Tower, the fortress (Rocchetta) was expanded in the late 15th century by Giovanni II Bentivoglio, for military purposes. In the 17th-century Baroque period, a bell tower topped with a cross was added to the summit, giving it a clear public signaling function. Meanwhile, the base of the Garisenda Tower successively hosted

simple dwellings, shops, and later the Church of Santa Maria di Porta Ravegnana, which served as a place of worship. Both towers also became sites for monuments, such as the stone statue of Saint Petronius and the civic coat of arms on the Asinelli façade.

At the same time, this capacity to host different functions also reveals a state of continuous adjustment according to urban needs. For example, the height of the towers themselves was repeatedly altered: the Garisenda was truncated due to structural risks, while the Asinelli was raised to achieve better surveillance. In this sense, the towers are not self-contained objects, but a vertical framework onto which changing social needs have been attached—upward, outward, and downward. Functions such as family defense, public signaling, urban governance, and religious symbolism have all been hosted within this evolving structure.

4.4.6.2 Imprisonment, Punishment, and Hidden Secrets

Beyond serving as a "container" for urban life and historical change, the Due Torri also reveal a darker layer embedded in the etymology of the term Host: the act of receiving and accommodating can turn into confinement, segregation, and control. From their earliest stages, the towers were vertically organized spaces under family control, closely tied to wealth, secrecy, and institutional use. A reconstructed sectional drawing by F. Gnudi shows that the internal structure followed a layered logic of storage, defense, isolation, and control from bottom to top.

Since the medieval period, the towers have stood next to major commercial structures such as the Loggia della Mercanzia, within a dense economic network. In a context of active minting, trade, and concentrated wealth, the towers functioned as containers for family power, property, and hidden transactions. Many private dealings took place within these enclosed vertical spaces.



Figure 4.39 Interior Structures of Medieval Towers and Contemporary Protests

Source: Left photograph from the fieldwork archive; right from internet.

After being taken over by municipal authorities, the Asinelli Tower was incorporated into a strictly controlled system of prisons and fortifications. During this period, the tower's identity shifted from an aristocratic symbol of family power to a state-controlled structure of confinement, isolation, and punishment. This functional transformation introduced an implicit logic of surveillance, giving the towers a colder and more severe urban presence.

In 2019, protests against inhumane detention took place beneath the towers, creating an ironic echo of this darker history. The towers were once again drawn into public discourse around confinement and freedom, becoming a visual field where power structures and civil rights demands intersect.

4.4.6.3 Shelter, Wartime Memory, and a Sense of Belonging

Beyond their associations with control and punishment, the towers also reveal a more human dimension during times of war and social instability—as places of shelter. During both World Wars, the towers functioned as observation points, shelters for civilians, and sites for distributing essential supplies.

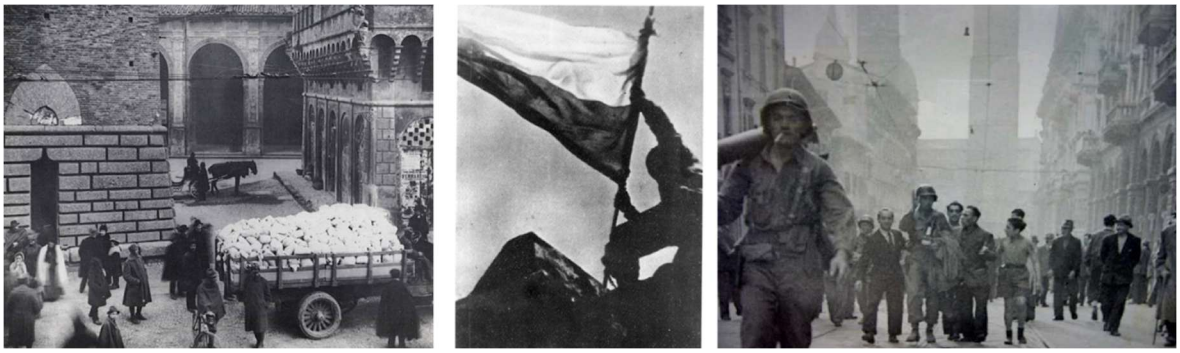


Figure 4.40 Citizens Gathering Beneath the Towers During WWII

Source: Storia e Memoria di Bologna.

Through their roles in wartime monitoring, warning, and resource distribution, the towers provided not only physical protection but also psychological reassurance, helping maintain a sense of continuity in urban life.

This function turned the towers into a point of collective identity, fostering emotional expectations of safety, survival, and belonging among local residents. It is also notable that in the current structural crisis, official narratives have framed the monitoring and restoration process as a story about urban resilience and the city's future. In essence, this narrative once again reinforces the towers' role as emotional anchors and symbols of identity for Bologna.

4.4.6.4 Artistic Interventions and the Hosting of Historical Imagination

The "Host" characteristic is also reflected in the towers' ongoing role as a site for artistic expression and cultural imagination. As highly open symbolic spaces, they continuously absorb emotional projections and layers of meaning from different periods and media.

Religious imagery uses the towers to express divine protection and urban glory. Landscape and pastoral paintings evoke local emotion and poetic visions of life. Urban reconstruction models and museum displays situate them within interpretations of historical form, spatial relationships, and idealized visions of the city.



Figure 4.41 Satirical Cartoons and Home Movies Related to the Towers

Source: Left from Storia e Memoria di Bologna; right screenshot by the author from internet.

At the same time, the towers repeatedly appear in literature, poetry, music, film, and visual culture. From Dante Alighieri's use of Garisenda's leaning form in The Divine Comedy to evoke giants and greatness, to Giosuè Carducci's personification of the towers as witnesses to urban history, and to their continued presence in contemporary media, the towers have consistently functioned as symbolic images of Bologna. In all these forms, the towers act as cultural hosts that gather emotion, memory, identity, and historical imagination.

In other words, the towers exist as a cultural field where meaning can settle, accumulate, and grow. Even when artistic representations differ from physical reality, what matters is not strict accuracy, but the ability of religious symbolism, local memory, urban imagery, and historical imagination to reside within them—and to gain new life through continuous reinterpretation and circulation.

4.4.7 Bridge—A Connector of Space and Meaning

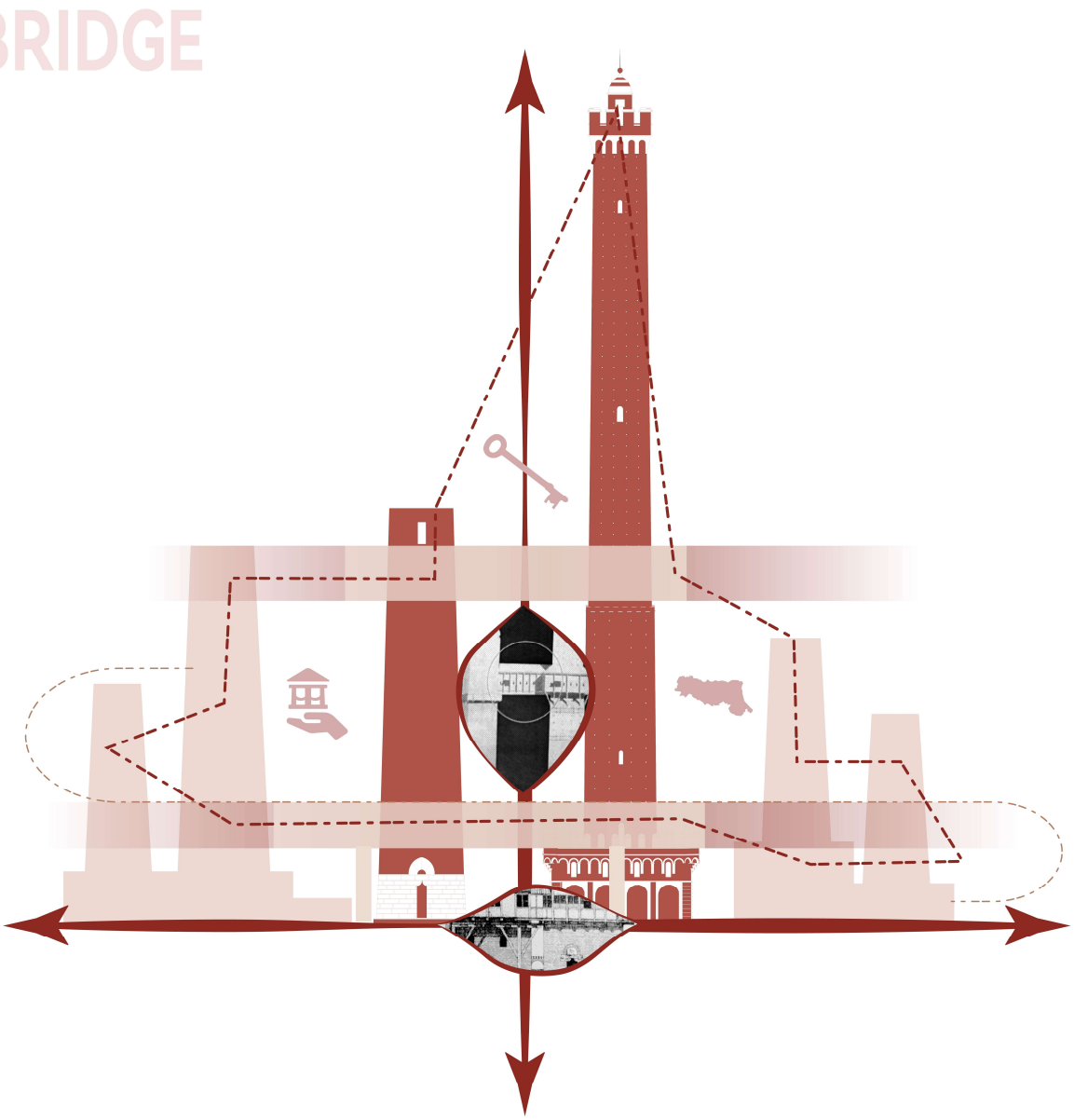


Figure 4.42 Bridge Analysis

Source: Drawn by the author.

The final characteristic within the horizontal dimension is defined as *Bridge*. It focuses on how the Due Torri establish connections across space, time, and different subjects, forming bridges between spatial systems and layers of meaning. This first refers to material connections—such as the historical bridges between the two towers and the aerial circulation system formed by attached wooden structures in medieval Bologna. Secondly, it refers to symbolic connections: the towers link the city's past and present, local memory and tourist experience, and, in the current structural crisis, they have become key elements in shaping a shared sense of destiny and the future of the city.

4.4.7.1 The Medieval Aerial Circulation System

In the medieval period, the Due Torri were more closely connected to each other than they are today. The two towers were linked through elevated doorways, wooden extensions, and aerial bridges, forming part of a horizontal circulation system embedded within surrounding residential structures.

This composite system of tower–house–bridge transformed the towers from isolated defensive "points" into continuous "lines" that could cross ground-level conflicts and connect different family spaces and elevated living units.

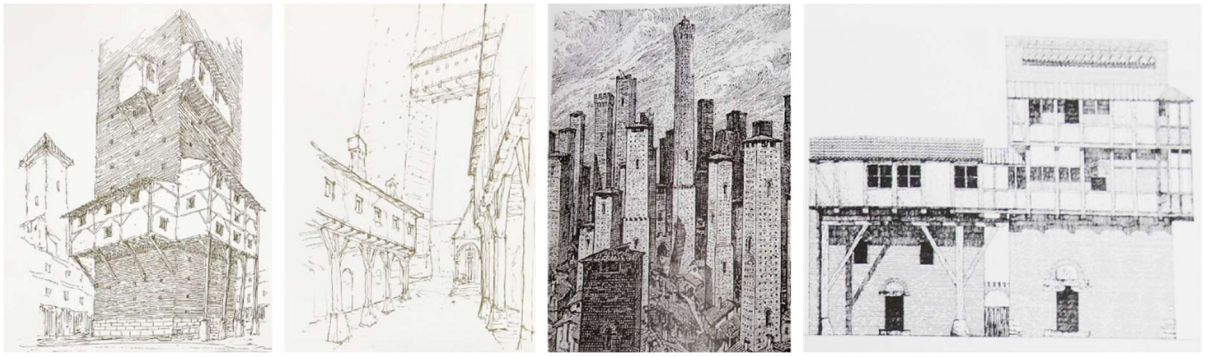


Figure 4.43 Connections Between the Towers and Aerial Corridor Systems in the 12th Century

Source: Photographs from the fieldwork archive

This was not an isolated case but part of the everyday spatial organization of the "city of towers." Networks formed between towers and between towers and houses allowed people to move, observe, and organize family life above ground level, avoiding conflicts below. In this sense, towers functioned as connectors enabling elevated mobility and

interaction. It is also in this context that scholars often compare medieval Bologna to Manhattan—a city logic based on vertical density and horizontal interconnection.

4.4.7.2 Witness of Regional Flows

The connective role of the Due Torri extends beyond individual buildings and is embedded within larger regional networks of movement. In addition to the Roman axis of the Via Aemilia, the area around the towers is intertwined with a complex system of underground waterways and infrastructure.

Between the 12th and 18th centuries, Bologna developed a canal network stretching over 60 kilometers, becoming a leading center of hydraulic industry and transportation in Europe, often referred to as "Little Venice." Although many open canals were later covered during 20th-century modernization, the water system itself never disappeared. Historical maps from 1754 clearly show how branches of the Aposa River flowed directly beneath the towers, outlining a once-thriving system of water-based movement.



Figure 4.44 Underground Canals of Bologna and Water Systems Beneath the Towers

Source: Photographs from the fieldwork archive

Seen from this perspective, the Due Torri occupy a central position within both road networks and water networks. Interregional roads brought external flows into the city, while underground water systems supported internal economic circulation. Surrounding streets and market activities translated these large-scale flows into everyday rhythms of urban life. The towers thus stand as witnesses to historical movement, continuously positioned at the intersection of transportation, urban hydrology, and public exchange, connecting the dynamic evolution of the city.

4.4.7.3 Urban Destiny and the Future

Following the structural crisis of the Garisenda Tower, the connective meaning of the Due Torri has taken on a more political dimension. They are no longer only symbols linking past and present, but are increasingly framed in official discourse as key nodes connecting individuals, the city, and its future.

Official narratives have continuously linked closure, monitoring, construction, community crisis, and future reopening into a single chain, frequently communicated to the public. This has transformed the crisis from an internal technical issue into a shared public concern for the entire city. Continuous communication has made the crisis visible, reinforcing the idea that the towers are not only historical artifacts but active elements shaping Bologna's present.

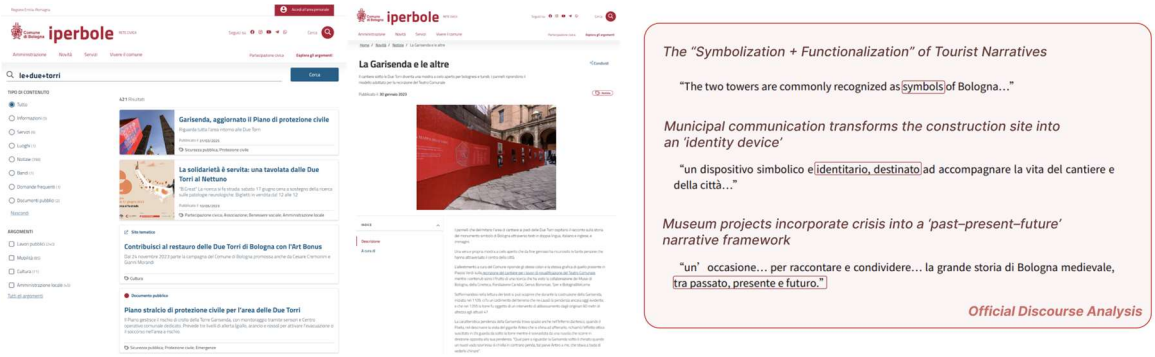


Figure 4.45 The Government's Construction of a Shared Destiny

Source: Drawn and screenshot by the author.

At the same time, fundraising campaigns, heritage education, and public activities increasingly frame the towers as a "shared heritage" and "something that cannot be lost." In this way, the towers connect heritage protection with the city's future, and governance with public emotion. During the crisis, they become an interface of shared destiny, prompting different groups to reconsider whether Bologna can continue to live with the towers—and what costs the city is willing to bear for its future.

4.4.7.4 A Bridge to the Lost City of Towers

Finally, as representatives of the 22 surviving medieval towers, in the present, the Due Torri act as a crucial medium connecting isolated remains to a lost urban whole. Although

artistic depictions of the "city of a hundred towers" often carry a romanticized exaggeration, the existence of the Due Torri undeniably represents the peak of medieval architectural ambition and urban spirit. Today, their meaning has already gone beyond their physical form.

However, as discussed earlier, the preservation of the towers faces significant challenges due to Bologna's complex geological conditions and the structural limitations of the towers themselves. Even though the Garisenda Tower's conservation draws on the successful experience of the Leaning Tower of Pisa, no absolute timeline can be guaranteed given its fragile condition and specific context.

This raises a deeper question: as vital urban heritage, how should society respond if their disappearance eventually becomes inevitable? For the public, the towers are not only landmarks but also keys to understanding—a way to recognize that Bologna once had a much denser and more complex medieval "vertical world."

In this sense, the Due Torri have become a bridge across time. They continuously reconnect absent towers, broken skylines, and lost landscapes to contemporary understanding. Through this ability of the part to point to the whole, the few surviving structures continue to speak for the many that are gone, preserving the integrity of the city's historical identity.



Figure 4.46 Archaeologist Angelo Finelli's Reconstruction Model of Medieval Bologna, made in 1916–1917

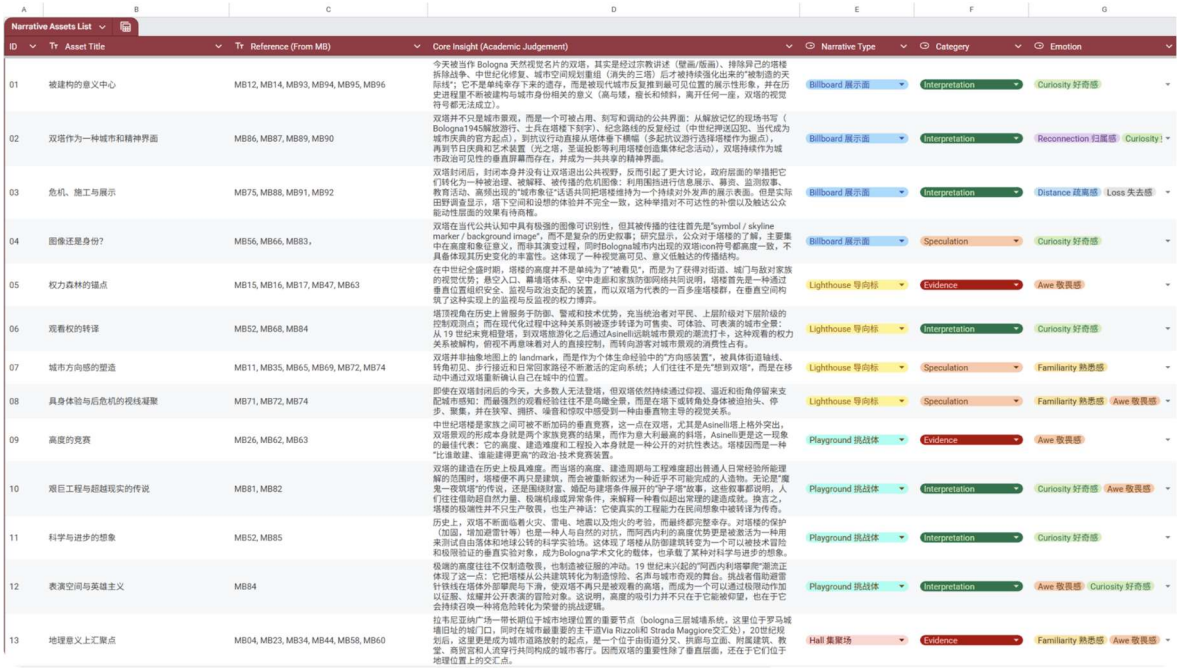
Source: Internet

4.5 Chapter Summary: Key Findings and Design Implications

Through a comprehensive synthesis of the Due Torri's historical trajectory, current crisis conditions, and ethnographic materials, it becomes evident that the heritage significance of the towers is structured along two intertwined spatial axes. One is a vertical monumental dimension, composed of height, symbolism, visibility, challenge, and the urban skyline. The other is a horizontal everyday dimension, shaped by markets, streets, encounters, institutional uses, public discourse, and affective memory. It is through the continuous intersection of these two axes that the towers have acquired their unique status as a central heritage entity in Bologna, forming the fundamental basis for understanding their relational structure in this research.

This chapter also demonstrates that the current crisis of the towers operates on multiple levels. Structural risks, enclosure measures, and long-term governance have altered how people approach, pass through, linger around, and observe the towers. As a result, the towers have shifted from being deeply embedded nodes in everyday urban life to a state of "visible yet inaccessible" absence. This transformation affects not only the physical safety and accessibility of the towers themselves, but also their capacity to organize public experience, local identity, and collective memory within the city center.

Building on this, field observations and cross-analysis of materials further identify six relational characteristics of the Due Torri: within the vertical dimension, Billboard, Lighthouse, and Playground; within the horizontal dimension, Hall, Host, and Bridge. Together, these characteristics reveal that the value of the towers lies not only in their historical identity and material form, but also in their continuous participation in processes such as visual production, spatial orientation, public gathering, functional transformation, emotional attachment, and temporal connection. Compared to singular historical descriptions or restoration narratives, these relational features offer a more effective explanation for why the towers retain strong narrative potential in the present.



Narrative Assets List

ID	Asset Title	Reference (From MB)	Core Insight (Academic Judgement)	Narrative Type	Category	Emotion
01	被建构的意义中心	MB12, MB14, MB93, MB94, MB95, MB96	今天被当作 Bologna 天然视觉名片的双塔，其实是经过宗教讲述（壁画/版画）、排除异己的塔楼拆除战争、中世纪化修复、城市空间规划重组（消失的三塔）后才被持续强化出来的"被制造的天际线"；它不是单纯幸存下来的遗存，而是被现代城市反复推到最可见位置的展示性形象。并在历史进程里不断被建构与城市身份相关的意义（高与矮，瘦长和倾斜，离开任何一座，双塔的视觉符号都无法成立）。	Billboard 展示面	Interpretation	Curiosity 好奇感
02	双塔作为一种城市和精神界面	MB86, MB87, MB89, MB90	双塔并不只是城市景观，而是一个可被占用、刻写和调动的公共界面：从解放记忆的现场书写（Bologna1945解放游行，士兵在塔楼下刻字），纪念路线的反复经过（中世纪押送囚犯，当代成为城市庆典的官方起点），到抗议行动直接从塔体垂下横幅（多起抗议游行选择塔楼作为据点），再到节日庆典和艺术装置（光之塔，圣诞投影等利用塔楼创造集体纪念活动），双塔持续作为城市政治可见性的垂直屏幕而存在，并成为一共共享的精神界面。	Billboard 展示面	Interpretation	Reconnection 归属感 Curiosity 好奇感
03	危机、施工与展示	MB75, MB88, MB91, MB92	双塔封闭后，封闭本身并没有让双塔退出公共视野，反而引起了更大讨论，政府层面的举措把它们转化为一种被治理、被解释、被传播的危机图像：利用围挡进行信息展示、募资、监测叙事、教育活动、高频出现的"城市象征"话语共同把塔楼维持为一个持续对外发声的展示表面。但是实际田野调查显示，塔下空间和设想的体验并不完全一致，这种举措对不可达性的补偿以及触达公众能动性层面的效果有待商榷。	Billboard 展示面	Interpretation	Distance 疏离感 Loss 失去感
04	图像还是身份?	MB56, MB66, MB83，	双塔在当代公共认知中具有极强的图像可识别性，但其被传播的往往首先是"symbol / skyline marker / background image"，而不是复杂的历史叙事；研究显示，公众对于塔楼的了解，主要集中在高度和象征意义，而非其演变过程，同时Bologna城市内出现的双塔icon符号都高度一致，不具备体现其历史变化的丰富性。这体现了一种视觉高可见、意义低触达的传播结构。	Billboard 展示面	Speculation	Curiosity 好奇感
05	权力森林的锚点	MB15, MB16, MB17, MB47, MB63	在中世纪全盛时期，塔楼的高度并不是单纯为了"被看见"，而是为了获得对街道、城门与敌对家族的视觉优势；最空入口，最难塔体系，空中走廊和家族防御网络共同说明，塔楼首先是一种通过垂直位置组织安全、监视与政治支配的装置，而以双塔为代表的一百多座塔楼群，在垂直空间构筑了这种实现上的监视与反监视的权力博弈。	Lighthouse 导向标	Evidence	Awe 敬畏感
06	观看权的转译	MB52, MB68, MB84	塔顶视角在历史上首服务于防御、警戒和技术优势，充当统治者对平民、上层阶级对下层阶级的控制视觉点；而在现代化过程中这种关系则被逐步转译为可售卖、可体验、可表演的城市全景；从 19 世纪末竞相登塔，到双塔旅游化之后通过Asinelli远眺城市景观的潮流打卡，这种观看的权力关系被解构，俯视不再意味着对人的直接控制，而转向游客对城市景观的消费性占有。	Lighthouse 导向标	Interpretation	Curiosity 好奇感
07	城市方向感的塑造	MB11, MB35, MB65, MB69, MB72, MB74	双塔并非抽象地图上的 landmark，而是作为个体生命经验中的"方向感装置"，被具体街道轴线、转角初见、步行接近和日常回家路径不断激活的定向系统；人们往往不是先"想到双塔"，而是在移动中通过双塔重新确认自己在城中的位置。	Lighthouse 导向标	Speculation	Familiarity 熟悉感
08	具身体验与后危机的视线凝聚	MB71, MB72, MB74	即便在双塔封闭后的今天，大多数人无法登塔，但双塔依然持续通过仰视、逼近和街角停留来支配城市感知；而最强烈的观看经验往往不是鸟瞰全景，而是在塔下或转角处身体被迫抬头、停步、聚集，并在狭窄、拥挤、噪音和惊叹中感受到一种由垂直物主导的视觉关系。	Lighthouse 导向标	Speculation	Familiarity 熟悉感 Awe 敬畏感
09	高度的竞赛	MB26, MB62, MB63	中世纪塔楼是家族之间可被不断加码的垂直竞赛，这一点在双塔，尤其是Asinelli塔上格外突出，双塔景观的形成本身就是两个家族竞赛的结果，而作为意大利最高的斜塔，Asinelli更是这一现象的最佳代表：它的高度、建造难度和工程投入本身就是一种公开的对抗性表达。塔楼因而是一种"比谁敢建、谁能建得更高"的政治-技术竞赛装置。	Playground 挑战体	Evidence	Awe 敬畏感
10	艰巨工程与超越现实的传说	MB81, MB82	双塔的建造在历史上极具难度。而当塔的高度、建造周期与工程难度超出普通人日常经验所能理解的范围时，塔楼便不再只是建筑，而会被重新叙述为一种近乎不可能完成的人造物，无论是"魔鬼一夜筑塔"的传说，还是围绕财富、婚配与建塔条件展开的"铲子塔"故事，这些叙事都说明，人们往往借助超自然力量、极端机缘或异常条件，来解释一种看似超出常理的建造成就。换言之，塔楼的极端性并不只生产敬畏，也生产神话：它使真实的工程能力在民间想象中被转译为传奇。	Playground 挑战体	Interpretation	Curiosity 好奇感 Awe 敬畏感
11	科学与进步的想象	MB52, MB85	历史上，双塔不断面临着火灾、雷电、地震以及泄火的考验，而最终都完整幸存。对塔楼的保护（加固，增加避雷针等）也是一种人与自然的对抗，而阿西内利的高度优势更是被激活为一种用来测试自由落体和地球公转的科学实验场。这体现了塔楼从防御建筑转变为一个可以被技术冒险和极限验证的垂直实验对象，成为Bologna学术文化的载体，也承载了某种对科学与进步的想象。	Playground 挑战体	Interpretation	Curiosity 好奇感
12	表演空间与英雄主义	MB84	极端的高度往往不仅制造敬畏，也制造被征服的冲动。19 世纪末兴起的"阿西内利塔攀爬"潮流正体现了这一点：它把塔楼从公共建筑转化为制造惊险、名声与城市奇观的舞台，挑战者借助避雷针铁线在塔体外部攀爬与下滑，使双塔不再只是被观看的高塔，而成为一个可以通过极限动作加以征服、炫耀并公开表演的冒险对象。这说明，高度的吸引力并不只在于它能被仰望，也在于它会持续召唤一种将危险转化为荣誉的挑战逻辑。	Playground 挑战体	Interpretation	Awe 敬畏感 Curiosity 好奇感
13	地理意义上汇聚点	MB04, MB23, MB34, MB44, MB58, MB60	拉韦尼亚纳广场一带长期位于城市地理位置的重要节点（bologna三层城墙系统，这里位于罗马城墙旧址的城门口），同时在城市最重要的主干道Via Rizzoli和 Strada Maggiore交汇处），20世纪规划后，这里更是成为城市道路放射的起点，是一个位于由街道分叉、拱廊与立面、附属建筑、教堂、商贸宫和人流穿行共同构成的城市客厅。因而双塔的重要性除了垂直居面，还在于它们位于地理位置上的交汇点。	Hall 集聚场	Evidence	Familiarity 熟悉感 Awe 敬畏感

Figure 4.47 Narrative Asset List After Organizing Narrative Points and Coding Them by Affect

Source: Screenshot by the author.

In this sense, the "knowledge excavation" conducted in this chapter can be understood as a process of extracting narrative resources for design. The six identified relational categories—along with associated elements such as legends, protests, scientific experiments, wartime memories, movement paths, everyday encounters, institutional uses, and crisis scenarios—collectively form the content foundation and structural framework for the next stage of prototype development. The task of the following chapter is to carry out this translation: to organize these relational features into perceivable narrative layers, accessible spatial scenarios, and participatory interaction pathways. Through this process, the relationship between the towers and the public can be reactivated within an immersive experience, thereby addressing the challenge of reconnecting heritage under conditions of absence.

Chapter 5 Narrative Interpretation: Prototype Design

5.1 Prototype Positioning and Overall Design Strategy

Building upon the knowledge excavation phase presented in the previous chapter, this section enters the second stage of the VHE methodological framework—Interpretation. The core task is to translate the previously constructed Material Bank, Narrative Assets List, and the six relational characteristics into narrative prototypes that can be experienced, compared, and critically discussed. As defined in Chapter 3, VHE is not primarily concerned with the mere representation of heritage objects, but rather with how digital media can reorganize the relationship between heritage and the public, allowing local memory, affective threads, and marginalized social experiences to enter the narrative structure. Therefore, the focus of the prototype design in this chapter is not on simply reconstructing the historical appearance of the towers or accumulating related knowledge, but on constructing a spatial narrative mechanism capable of carrying relationships, organizing modes of entry, and guiding the emergence of affect.

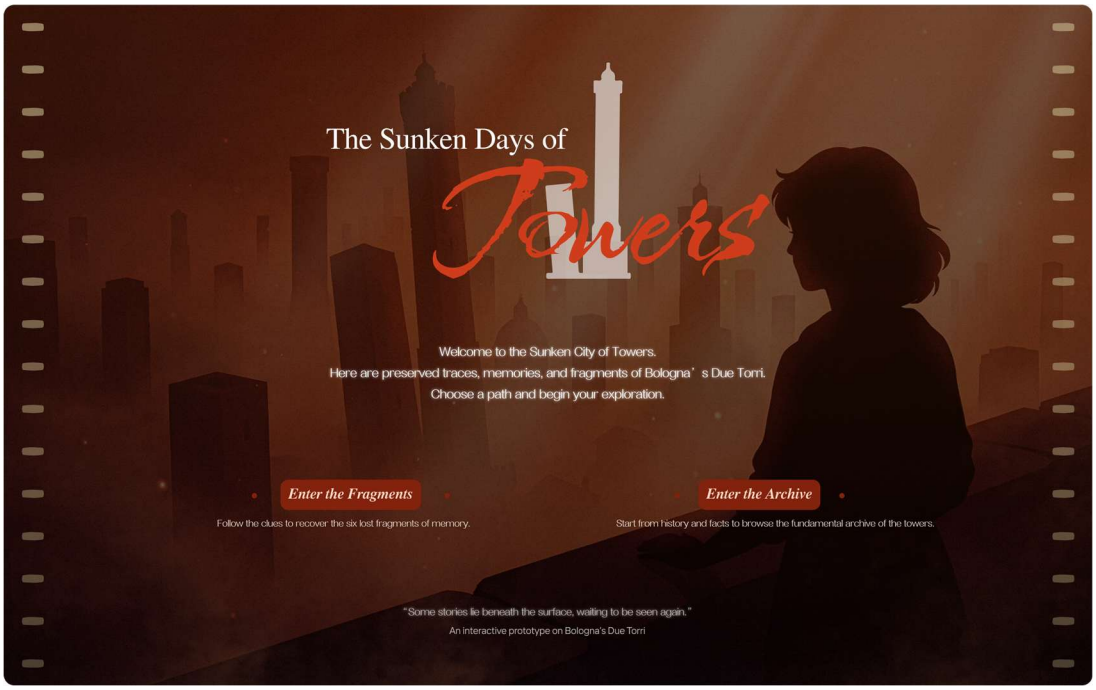


Figure 5.1 Prototype Entry Page

Source: Screenshot of the prototype by the author.

At the same time, the experiential prototype developed in this research is not a fixed interface product tied to a single platform. Instead, it constitutes a virtual narrative structure centered on the relational reconstruction of the Due Torri. Its core is composed of four interrelated layers: narrative organization, spatial scenarios, interaction logic, and emotional progression. Depending on the stage of research and exhibition conditions, this structure can be deployed either through screen-based interactive interfaces or through more immersive virtual environments. In other words, the essence of the prototype lies in how the multiple relationships embodied by the towers—such as visibility, orientation, challenge, gathering, hosting, and connection—are translated into enterable spatial situations, recognizable narrative nodes, and progressively unfolding interactive pathways, and grant participants the agency to engage with and interpret the value of heritage. At the current stage, the experimental implementation is primarily based on screen-based interaction, supplemented by immersive experience fragments, in order to clearly present the overall narrative logic and its potential extension toward more immersive media.

In terms of overall design, this study adopts a comparative prototype strategy. Based on the same dataset, research object, and core research question, two distinctly different narrative structures are developed. The first is the Control prototype, which organizes content in the form of the *Le Due Torri Archive*, simulating a conventional museum exhibition model and digital archival interface. The second is the VHE prototype, *The Sunken Days of Towers*, which structures the material through a task-driven relational exploration. In this version, users gradually enter, read, interpret, choose, and feel their way through the experience, forming a more emotionally layered connection with the towers while participating in the reorganization of heritage meaning.

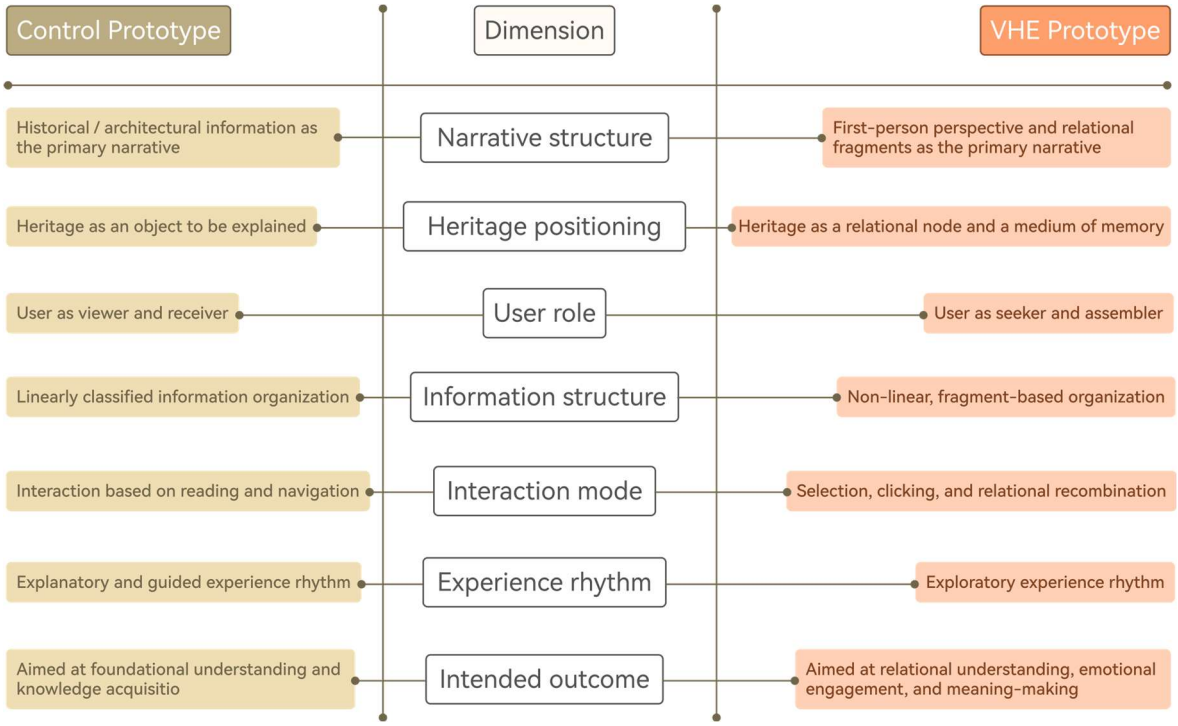


Figure 5.2 Design of the comparative prototypes

Source: Drawn by the author.

Both prototypes share the same foundational materials, yet they differ significantly in terms of interpretive authority, user positioning, modes of spatial entry, and mechanisms of affective generation. This design directly addresses the core question raised in Chapter 1: whether virtual heritage narratives can move beyond one-directional, static display models and re-establish a more relational and action-oriented connection between the public and heritage.

Among them, the Control Prototype is organized as an archive-style hub interface (See Fig.5.3). After entering the prototype, participants can switch between six knowledge sections through the top navigation bar, including Overview, City of Towers, Urban Symbol, Crisis and Closure, Archival Summary, and Conclusion.

Each page develops around a clear theme, organizing content through image-text layout, information zoning, and local pop-up windows. In this way, participants can understand information related to the Due Torri from the perspectives of historical background, urban image, contemporary crisis, and supplementary archives.

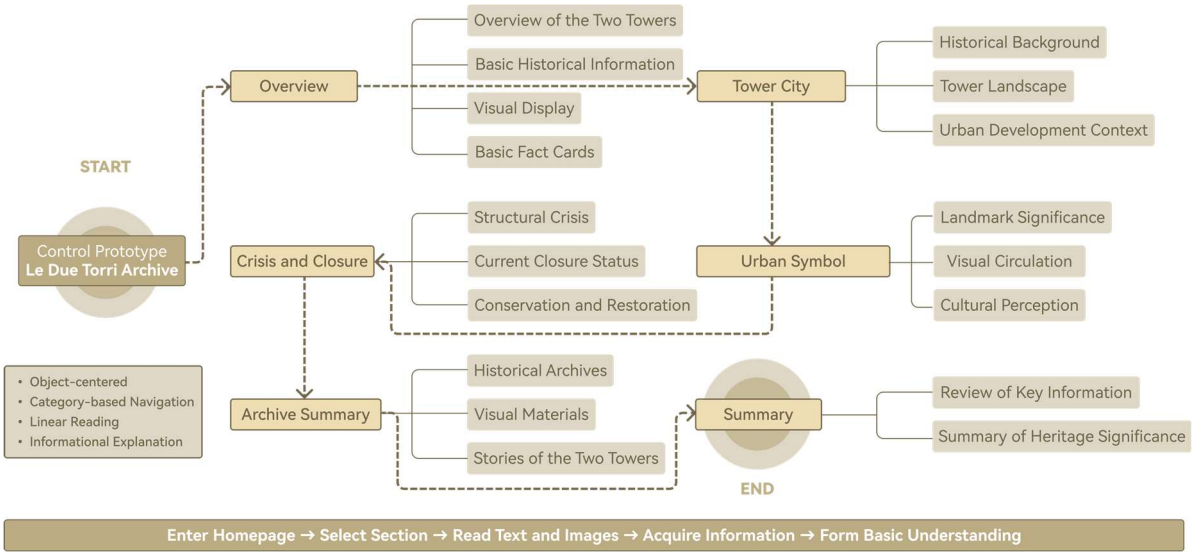


Figure 5.3 Narrative structure of the Control prototype

Source: Drawn by the author.



Figure 5.4 Interactive interface of the Control prototype

Source: Screenshot of the prototype by the author.

In this version, the Due Torri mainly appear as historical objects waiting to be explained, archived, and interpreted. Information is pre-classified by the system, and participants mainly complete their understanding through browsing, reading, and switching between sections. Its logic is close to that of a traditional museum website or digital archive platform: the authority of interpretation is concentrated within the system's preset categories and narrative structure. Although users can browse freely, they do not participate in the reorganization of heritage meaning.

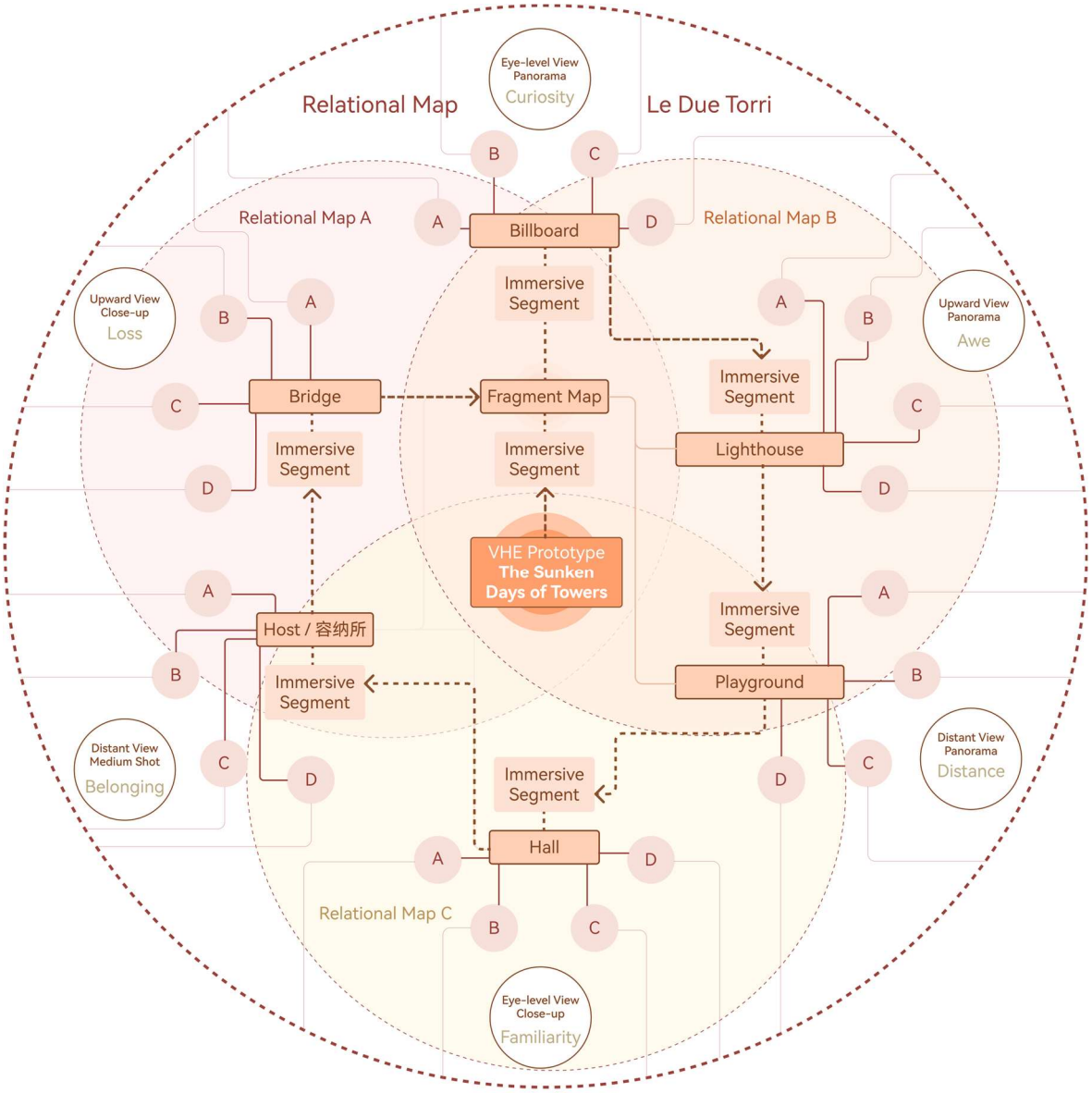


Figure 5.5 Narrative structure of the VHE prototype

Source: Drawn by the author.

The starting point of the VHE Prototype is entirely different. Here, the way of establishing a relationship with heritage is no longer preset as "learning knowledge first, and then understanding meaning." Instead, the prototype understands the Due Torri as a relational field that has gradually sunk beneath the surface of the city due to closure, barriers, and the rupture of public experience. The six relational characteristics extracted in the previous chapter become the basic structure of the experience here. After entering *The*

Sunken Days of Towers, participants first encounter a narrative world with a sense of mystery and calling: in the city where the Due Torri are located, its experiences, emotions, and memories are sinking beneath the surface of everyday life. What participants need to do is to follow the clues scattered across different scenes and gradually make these relationships visible again. In other words, what the Control Prototype organizes is knowledge, while what the VHE Prototype organizes is the process of entry, experience, and emotional formation.

The title and narrative setting of *The Sunken Days of Towers* borrow from the mystery and attraction of cultural motifs such as "lost civilizations" and "sunken cities," allowing participants to willingly enter this world even before they fully understand the history of the Due Torri.

The purpose of this narrative setting is, first, to suggest the condition of absence faced by the towers on a longer historical scale, and second, to attract users who may not yet know much about the heritage through a semi-mythical and semi-memorial mode of entry, so that interest, intimacy, concern, and resonance can gradually emerge. The word "sunken" refers, on the one hand, to the overall structure of the experience: fragments of relationships that need to be gradually recovered and restored. On the other hand, it also suggests that certain urban experiences, local memories, and emotional connections related to the Due Torri have not truly disappeared, but have been pressed beneath everyday life and are no longer immediately visible.



Figure 5.6 Interactive interface of the VHE prototype

Source: Screenshot of the prototype by the author.

From an architectural perspective, the design focus of the VHE Prototype lies in how these relationships can be restored through scene atmosphere, interface organization, visual

control, and the mode of narrative entry. Through this process, participants gradually become aware that the Due Torri are not only "architectural heritage" in an objective sense, but also a relational existence formed by urban symbolism, directional perception, emotional projection, public encounter, everyday hosting, and the connection of meanings. This point will be further discussed in the following sections.

5.2 Narrative Organization and Affective Mechanism of VHE: From the Narrative Asset Inventory to Six Acts of Searching

In the analysis and discussion in Chapter 4, this study summarizes six relational characteristics of the Due Torri: Billboard, Lighthouse, and Playground on the vertical dimension, and Hall, Host, and Bridge on the horizontal dimension. Together, they show that the significance of the Due Torri does not come only from the buildings themselves, but from their continuous participation in the processes of urban viewing, spatial orientation, public gathering, functional translation, emotional projection, and temporal connection. After entering the prototype design stage, these characteristics were further scenarized and translated into six accessible narrative tasks, forming the overall experiential framework of *The Sunken Days of Towers*.

The researcher first conducted affective coding for the 24 narrative points corresponding to the six relationship types, classifying them according to six affective categories: curiosity, awe, distance, familiarity, reconnection, and loss. On this basis, the affective potential of each relationship type was identified, and these affective tones were further connected to the atmospheric choices in scene design.

Based on this, the six relationship types were arranged as six sequential fragment-collection levels in the experience, and participants' concrete perception of the Due Torri is gradually formed through the combined effect of these narrative points and affective clues. The naming of each level corresponds to the relationship it reveals. After completing the collection and selection of fragments, the corresponding relationship name is unlocked. In this way, the relationship itself becomes an object that participants gradually perceive and reinterpret during the narrative process.

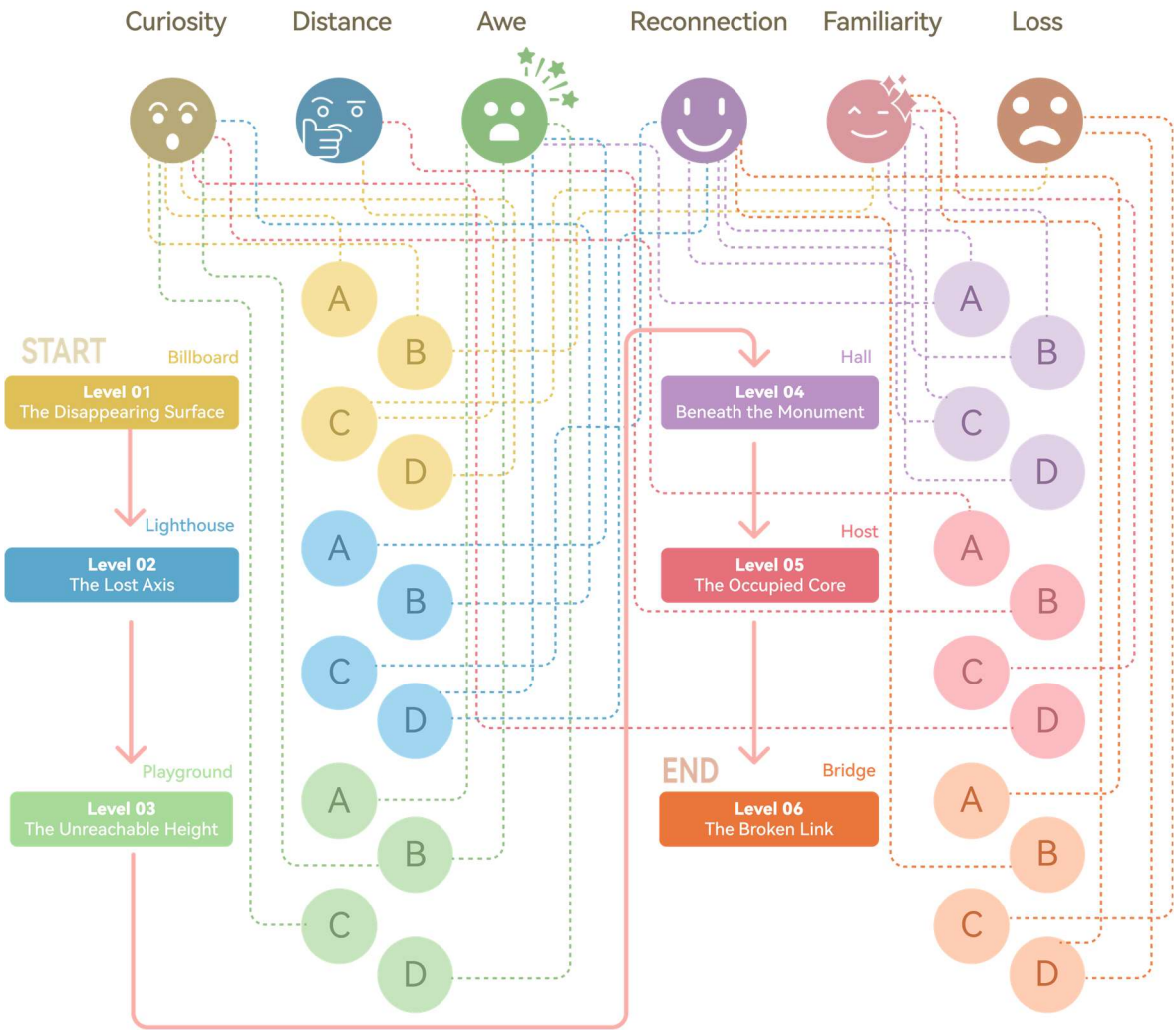


Figure 5.7 Affective coding of narrative points in the VHE prototype

Source: Drawn by the author.

In the VHE Prototype, participants first enter the worldview of the experience through an immersive segment (see fig.5.8), namely the task of "searching for lost fragments." They then enter a Recovery Map (see fig.5.9): a fragment-collection and settlement interface extracted from the silhouette of the Due Torri, the image of the tower city, and the relationships among spatial nodes.

The entrances to the six levels are arranged around it. Each level corresponds to one relational characteristic, as well as an entry scene formed through the combination of tower imagery, urban atmosphere, and conceptual translation.



Figure 5.8 Immersive segments in the VHE prototype

Source: Screenshot of the experience window.

Here, the Recovery Map interface functions both as navigation and as narrative guidance. It reminds participants that what they are about to enter is not a timeline narrative based on a fixed logic, but a group of searching paths organized around different relational dimensions.



Figure 5.9 Recovery map of the VHE prototype in two states

Source: Screenshot of the experience window.

The structure of each level is relatively stable. Participants first enter the situation through an immersive segment related to the current relationship and scene, and then arrive at the main page of the level, where they find four clickable fragments. Each fragment corresponds to a specific narrative point in the narrative inventory, that is, a historical, memorial, crisis-related, or everyday clue connected to that relationship. After clicking on a fragment, participants enter the corresponding fragment page and read the images, texts, and brief explanations related to it (see fig.5.10). They can also open a secondary pop-up window to view the Evidence / Interpretation / Speculation category to which the content belongs, as well as its image source. After reading, participants need to choose one fragment from the

four. This fragment then enters the unlocking page of the level, where the corresponding keyword and a spatial relationship diagram are displayed. Afterwards, the corresponding relationship on the Recovery Map is restored, and a new geometric symbol appears at the relevant position of the Due Torri silhouette, symbolizing the relighting of this relational dimension. Through this repeated cycle, participants gradually understand the relational clues about the Due Torri assembled by all 24 narrative points through six rounds of entering, reading, judging, and recovering.

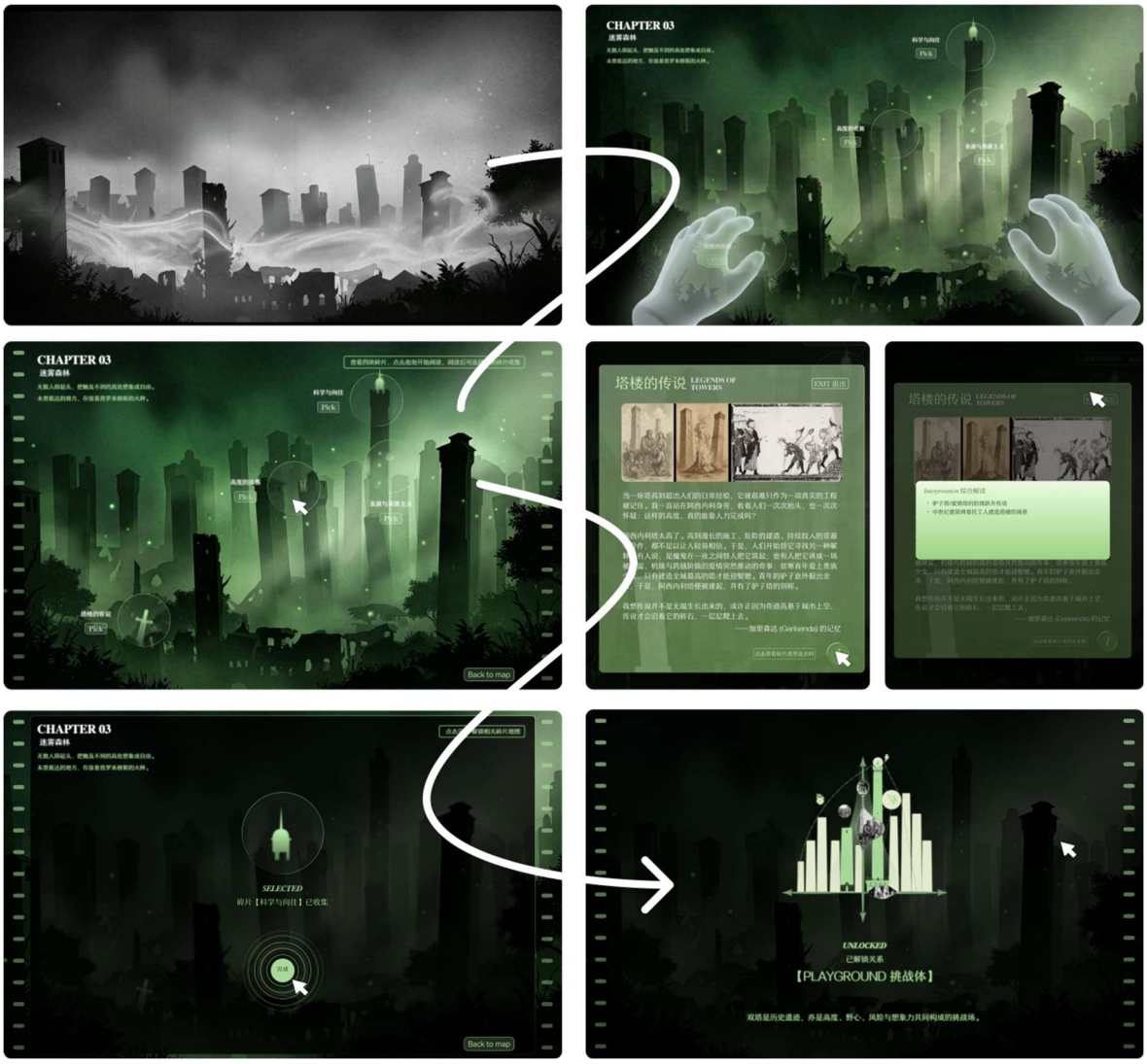


Figure 5.10 Interaction flow for collecting fragments in the VHE prototype

Source: Screenshot of the experience window.

The key of this mechanism lies in how it reorganizes the way heritage meaning is accessed. Different from traditional archive-style display, *The Sunken Days of Towers* reorganizes heritage materials into relational fragments that need to be searched for, compared, and recovered. Among these actions, "selection" has particular importance. Each level provides four fragments, but participants can eventually take away only one of them. This design allows meaning to be generated through the process of "comparison—judgment—retention." In other words, participants do not simply read four pieces of information and passively accept a systematic conclusion. Instead, they are forced to think within a limited choice: what is the most important element in this context? Which clue best represents their own understanding of this relationship? It is through such local judgments that participants gain interpretive agency at the micro level, and acquire the power to select, judge, and retain within a structured narrative system. The meaning of the Due Torri is therefore no longer only a standard answer preset by experts, but begins to be re-perceived and renamed through participants' paths and judgments.

Another key design lies in the expressive perspective of the fragment content. In the VHE Prototype, the narrative points in the fragments are transformed into first-person self-narrations by the Asinelli Tower or the Garisenda Tower (see fig.5.11). Therefore, what participants read is not a neutral exhibition label, but the memories of the Due Torri: they narrate themselves and also narrate each other.

Through confessional language, the relational characteristics extracted earlier are shifted from observation to empathy. This allows the Due Torri to become not only heritage objects being interpreted, but also narrative subjects that gain a position of voice. At the same time, this approach turns the affective coding conducted for each narrative point into a systematic form of expression, allowing participants to enter a relational state of "communicating with heritage." In this way, the distance between knowledge understanding and emotional resonance is shortened, and the affective mechanism becomes an important force that drives participants' thinking and judgment in *The Sunken Days of Towers*.

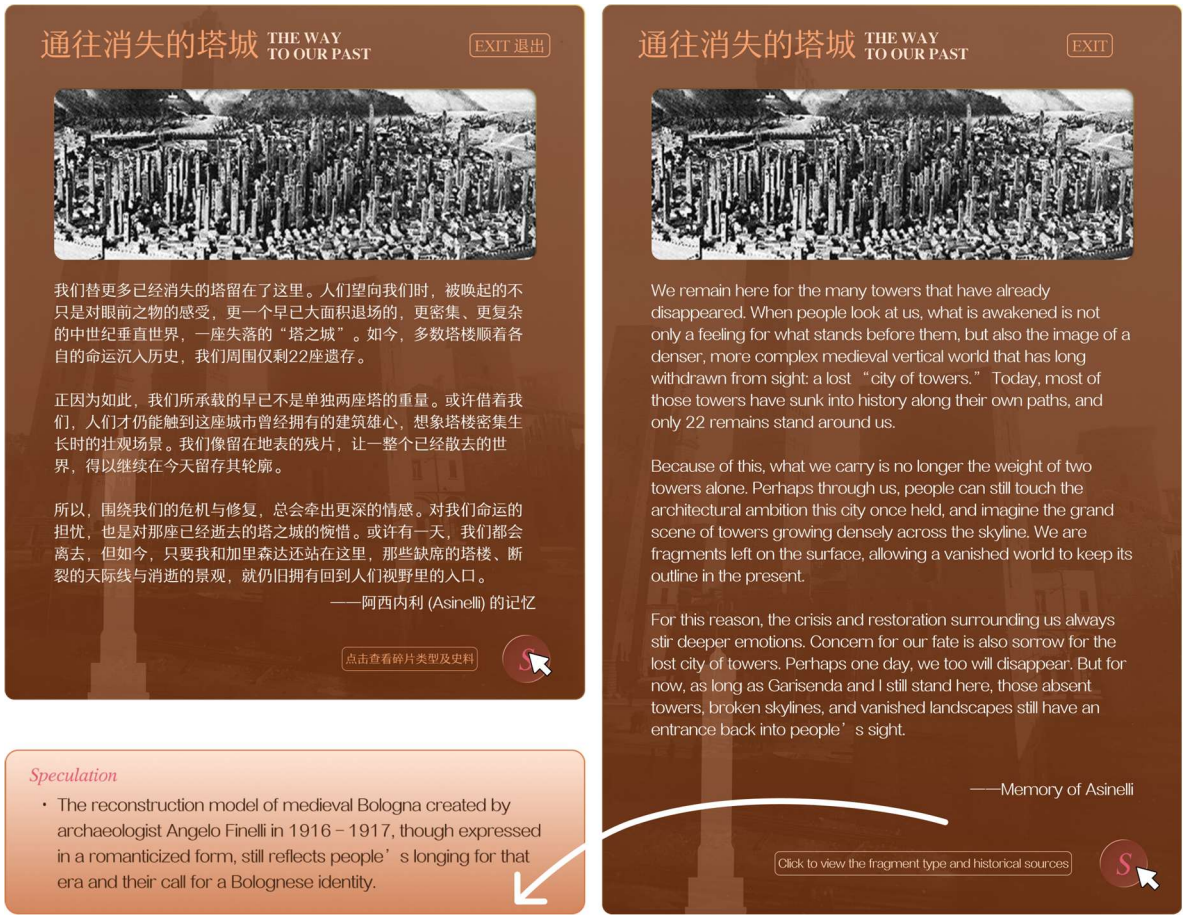


Figure 5.11 VHE Prototype: First-Person Self-Narration of the Two Towers (Left CN; right EN)

Source: Screenshot of the experience window.

In the specific design, the overall emotional progression of the six searching tasks (see fig. 5.12) follows a structure from curiosity, to awe, to distance, to familiarity, to loss, and finally to reconnection. At the same time, each level also has its own local emotional fluctuation.

The first level, “The Disappearing Surface”, corresponds to the Billboard display surface. It consists of four fragments: “the constructed center of meaning,” “the Due Torri as an urban and spiritual interface,” “crisis, construction, and display,” and “image or identity?” This level mainly activates emotions such as curiosity, belonging, distance, and loss. Participants first become aware of why the Due Torri are so visually powerful, and then gradually realize that this high visibility does not automatically equal deep understanding. It creates identity, but it may also create distance.

The second level, “The Lost Axis”, corresponds to the Lighthouse orientation marker. It consists of four fragments: “the anchor point in a forest of power,” “the translation of the right to view,” “the shaping of urban orientation,” and “embodied experience and the concentration of sight after the crisis.” This level mainly evokes awe, curiosity, and familiarity, allowing participants to recognize that the Due Torri are not only a background for photography, but also urban coordinates that organize direction, routes, and viewing relationships.

The third level, “The Unreachable Height”, corresponds to the Playground challenge body. It consists of four fragments: “the competition of height,” “difficult construction and legends beyond reality,” “imaginations of science and progress,” and “performance space and heroism.” This level undertakes the transition from awe to complication, allowing participants to move beyond the idea that “high towers are impressive” and further realize that the Due Torri are also a stage for competition, myth, adventure, and technological experimentation.

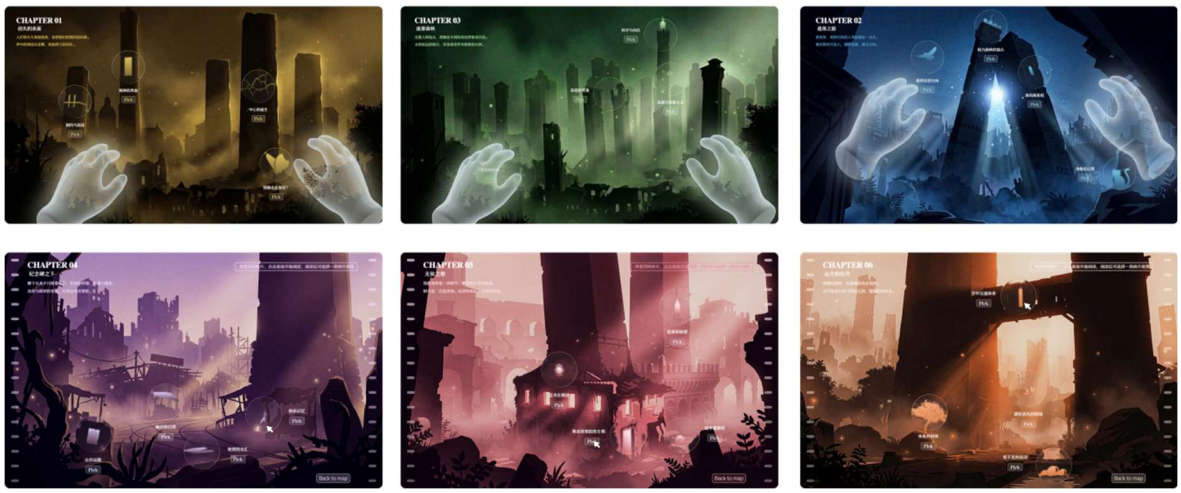


Figure 5.12 Scene construction for the six levels of the VHE prototype

Source: Screenshot of the experience window.

The fourth level, “Beneath the Monument”, corresponds to the Hall gathering field. It consists of four fragments: “a convergence point in geographical terms,” “everyday coexistence across social classes,” “relationships and individual memory,” and “the towers as a public issue.” The emotional focus here is familiarity, belonging, and intimacy. Participants no longer only look up at the towers, but begin to enter the everyday world

beneath them, sensing how the Due Torri enter individual lives through passing by, meeting, waiting, and memories of first arriving in Bologna.

The fifth level, “The Occupied Core”, corresponds to the Host accommodating place. It consists of four fragments: “a constantly changing vertical framework,” “imprisonment, punishment, and invisible secrets,” “shelter, wartime memory, and belonging,” and “artistic intervention and the inhabitation of historical imagination.” This level carries a stronger interpretive and reflective function, allowing participants to understand that the Due Torri are not natural, stable, and pure monuments, but spatial hosts continuously occupied by use, institutions, war, art, and governance.

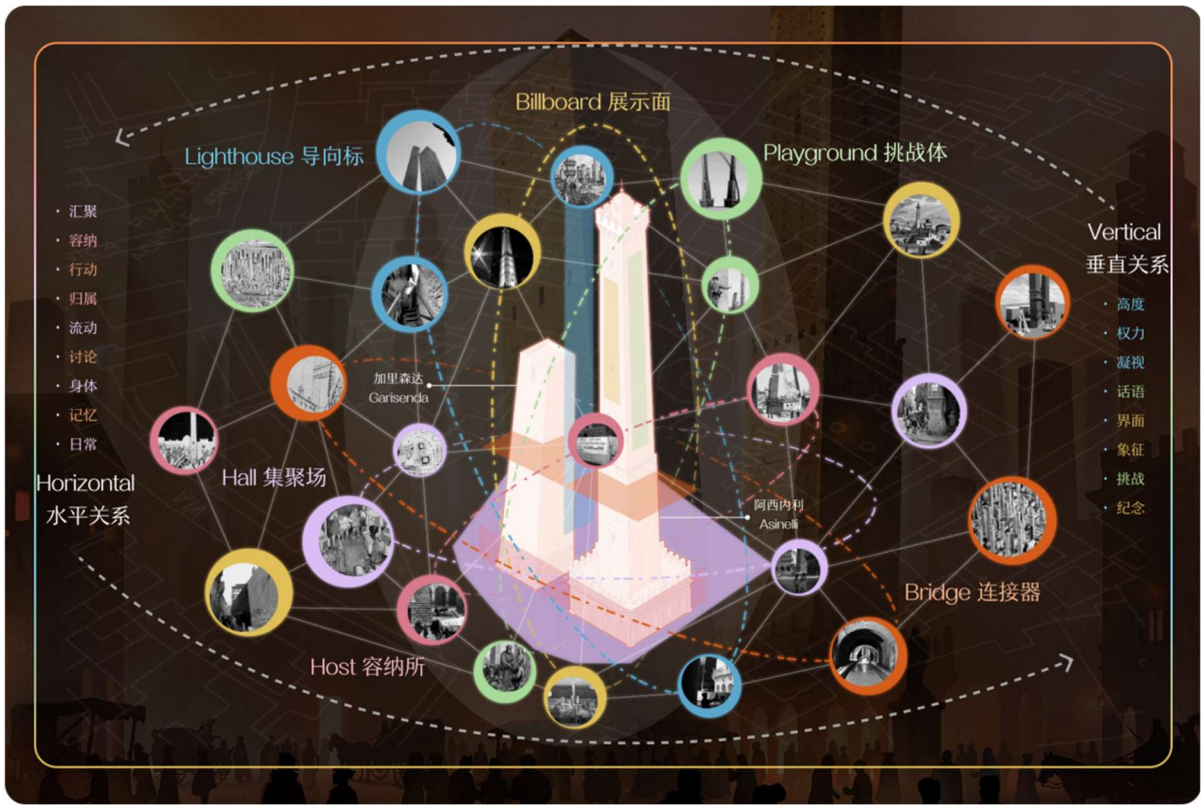


Figure 5.13 The relational map of the towers formed after fragment collection

Source: Screenshot of the experience window.

The sixth level, “The Broken Link”, corresponds to the Bridge connector. It consists of four fragments: “the medieval aerial traffic system,” “witnesses of regional mobility,” “the fate and future of the city,” and “the surviving Due Torri as a bridge to the lost city of towers.” The emotions here are the most complex, including curiosity, awe, loss, and renewed

belonging. This level connects past and future, survival and disappearance, the individual and the fate of the city. It is also the level in the whole experience that most strongly triggers empathy and the desire for action.

Finally, after six rounds of searching and selection, participants enter the complete Relationship Map (see fig.5.13) of the Due Torri and assemble their own relational network of the towers, a re-emerging "relational core." The map places the Due Torri within the overall structure formed by six relational dimensions and 24 narrative clues, reintegrating the previous fragments, levels, and participants' choices within the same interface. At this point, participants acquire a heritage understanding framework centered on relationships: the meaning of the Due Torri is reorganized and revealed through their multiple connections with urban space, collective memory, everyday life, historical crisis, and future imagination. Here, the prototype translates the methodological proposition of "from object reconstruction to relationship reconstruction" into a visible narrative result, allowing heritage to no longer be compressed into a single image, but to be understood as a continuously generated network of relationships.

5.3 Technical Path, Scene Translation, Immersion Mechanism, and Interpretive Boundaries

The heritage narrative experience of the VHE Prototype is jointly constructed through two parts: digital interaction and immersive segment experience. In terms of the technical path of the screen version, the interface and interaction components are mainly designed and built in Figma (see fig.5.14), which is used to organize the page tree, interaction flow, pop-up pages, map states, and level switching, while AI is used to assist scene design. The immersive segments are completed through a combination of 3D modeling, AI-based image processing, and video editing.

The Due Torri and several key spatial images are modeled by the researcher, and then combined with post-production image compositing and audiovisual editing to form immersive segments for the opening, level entry, and ending. This path ensures the operability of the prototype at the research stage, while also allowing the key mechanisms in narrative design to be presented in a concentrated way.

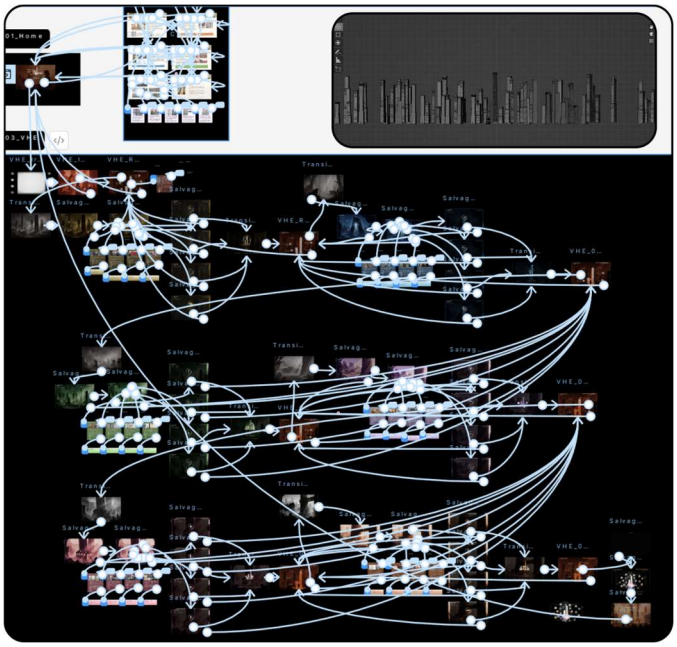


Figure 5.14 Interaction flow and page tree of the prototype in Figma

Source: Workspace screenshot.

Immersion is one of the key elements addressed in this narrative design. For this study, immersion is first of all a narrative mechanism. It operates at the starting point of the experience and determines the psychological position from which participants enter the relational world of the Due Torri, while the effect of this mechanism is directly connected to visual and scene design.

Related studies in architecture and environmental psychology reveal that spatial experience is not only the perceptual result of physical form. It also continuously shapes an individual's emotional tone, level of alertness, and behavioral expectations through elements such as scale, direction, obstruction, openness, light and shadow, materiality, and boundary.

It is in this sense that the space and visuals in *The Sunken Days of Towers* take on the function of "psychological presetting." Looking upward evokes awe; viewing from a distance creates distance; a low viewpoint strengthens the tension between oppression and proximity; while gaps, obstructions, and voyeuristic angles trigger hesitation, peeking, and unease.

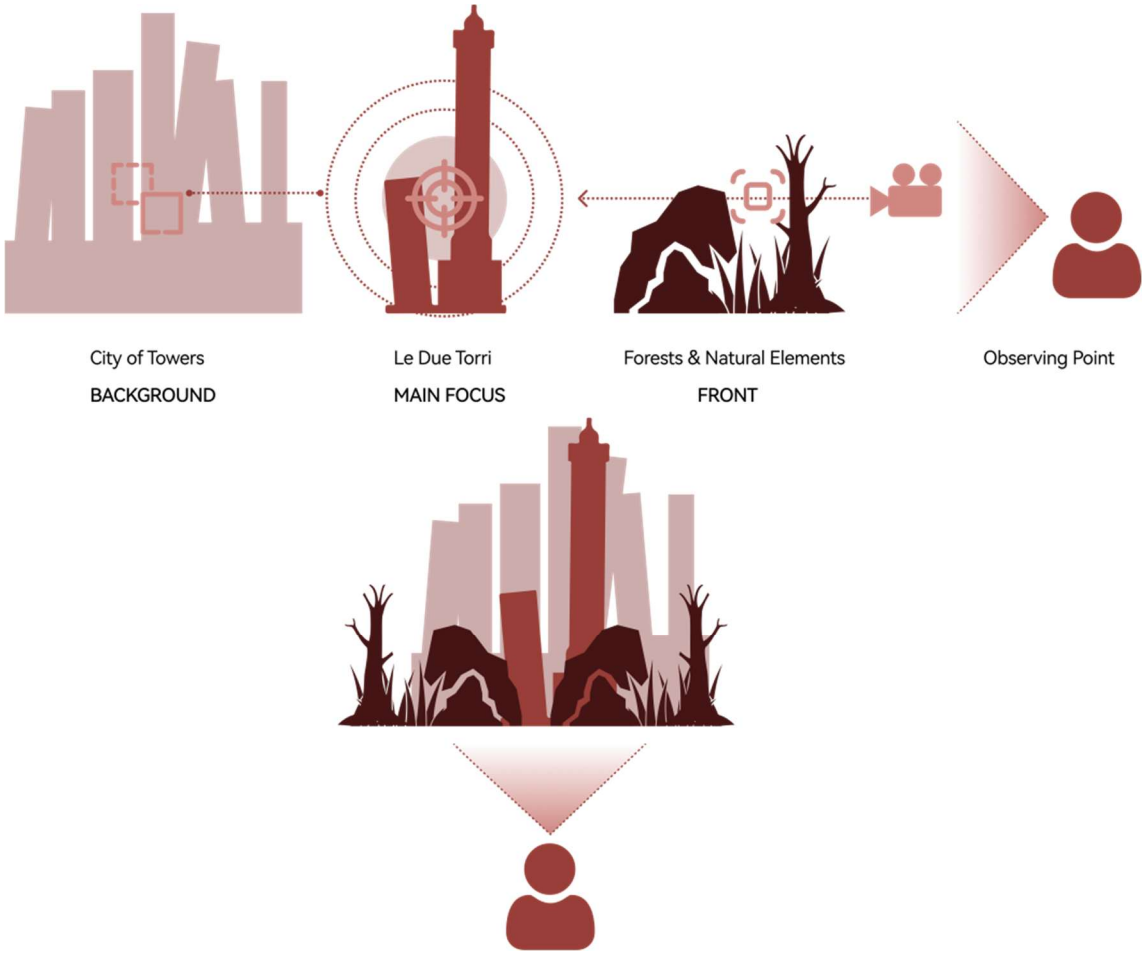


Figure 5.15 VHE scene design: visual control and atmosphere building

Source: Drawn by the author.

The scene design of each act of the experience takes the Due Torri as the main subject and is divided into three layers (see fig.5.15): foreground, middle ground, and background. These layers respectively function as a viewfinder, creating the effect of peeking; as the focused object, presenting the image of the Due Torri under the corresponding relationship; and as the atmospheric background, evoking the city of towers. Space and scene are not merely visual elements in the experience, but function more like perceptual commands that arrive before language, setting an emotional entrance for the later reading of fragments.



Figure 5.16 Scene construction, viewpoints, and emotional progression across the six levels of the VHE prototype

Source: Drawn by the author with AI assistance.

In addition, the main scenes in the prototype do not serve the complete replication of real space, but the perceptualization of relational dimensions. Each level's scene remains connected to the spatial elements of the Due Torri themselves and to their surrounding spaces (see fig.5.16). At the same time, through abstraction, symbolism, and surrealization, real places are elevated into narrative spaces with stronger emotional intensity. The ruins, plants, mist, high-contrast images, large areas of shadow, highly saturated pure colors, and soft light

that participants see are not arbitrary stylistic collages, but organized psychological environments. Together, they shape an immersive space with a sense of privacy, distance, and silence, allowing participants to detach from the state of everyday browsing and enter a perceptual rhythm in which they are more willing to stay, speculate, and judge. This visual language, commonly found in healing and puzzle-solving games, maintains a sense of mystery while also providing a sense of safety; it opens up the unknown while allowing contemplation. This spatial quality provides architectural heritage narrative with a psychological temperature suitable for "approaching memory."

If space and visuals are responsible for establishing the perceptual position, then the prior setting of "crisis—disappearance—memory" is responsible for establishing the ethical relationship between participants and heritage. The form of the Due Torri's self-narration transforms materials originally organized externally by the researcher into a call from within heritage itself. The Due Torri become narrative subjects that are telling their own fate. They have witnessed the density and glory of the city of towers, and have also witnessed the collapse and disappearance of many towers of the same period. Now, they themselves are situated within a structural crisis.

Under this setting, "searching for fragments" gains a psychological meaning beyond the game task itself. What participants receive is not simply an invitation to explore, but a call with a sense of restoration. At the psychological level, keywords such as crisis, loss, memory, and survival naturally activate an individual's tendency to preserve, recover, repair, and rescue. Participants are therefore transformed from receivers of knowledge into figures with a stronger sense of responsibility and desire to participate (see fig. 5.17). The prototype thus establishes a key emotional logic: participants continue searching not only because of curiosity, but also because they begin to feel that certain disappearing relationships need to be seen again, named again, and brought back again.



Figure 5.17 Immersive segments and the representation of destroyed heritage

Source: Made by the author with AI assistance.

This "rescue mentality" is gradually generated through setting and atmosphere. The crisis of the Due Torri provides emotional tension; the disappearance of the city of towers provides historical depth; the fragmented structure provides an action path; and the first-person self-narration gives emotional direction to all of these elements. Therefore, after entering *The Sunken Days of Towers*, participants encounter a set of relational fragments with a sense of fate. These fragments guide participants to form a continuously changing psychological state: from curiosity to approach, from approach to concern, and from concern to a willingness to undertake local judgment. This state is highly consistent with the goal of VHE discussed earlier, because it shifts the public's way of entering heritage from "knowing" to "caring."

Rhythm also plays a core role in this expressive mechanism. The experiential structure of six acts of searching is not a simple sequence of pages, but a breathing cycle: the Recovery Map provides overall expectation; the immersive segment completes emotional preparation; the main scene page creates a moment of staying; the fragment pop-up unfolds close reading; the secondary explanation leads to evidence tracing; the act of selection brings a local decision; and returning to the map forms closure and restart. Color and sound take on the functions of segmentation and progression in this cycle. The changes in color atmosphere, image brightness, and sound tone across different levels allow participants to sense different psychological focuses and emotional tendencies in each round. Some levels lean more toward calling and disorientation; some lean more toward awe and oppression; and some lean more toward intimacy and staying. The background sound and music maintain the

continuity of the experience, while also giving each round of searching an independent and clear sense of section. What rhythm organizes is a temporal structure from perception to judgment.

The current prototype experience uses the screen as its medium. At this level, immersion is mainly established through visual composition, color organization, sound atmosphere, page state transitions, and users' clicking behavior. In a medium with a stronger sense of enclosure and orientation, such as a VR headset environment, directionality, distance perception, spatial positioning, and bodily participation would be further strengthened, allowing the narrative mechanisms discussed above to gain a more intense sensory carrier.



Figure 5.18 Representation of the evidence classification page in the VHE prototype

Source: Screenshot by the author.

Beyond immersion, objectivity also remains important. The previous discussion has explained the evidence classification logic of E/I/S, namely Evidence / Interpretation / Speculation, and the importance of transparency (see fig.5.18). This logic determines whether heritage narrative is placed within the context of authenticity. In the VHE Prototype,

after reading the self-narration of the Due Torri, participants can choose to further view the evidence type and image source corresponding to that content. Emotional entry, content understanding, and material tracing are organized within the same path. Participants first establish an emotional connection through the memories of the Due Torri, and then return, through secondary explanation, to the nature of the materials and the scope of interpretation at the research level. In this way, a balance is established between narrative attraction and research responsibility.

Overall, the technical path and expressive strategies adopted in this prototype always serve the same goal: to make relational clues, emotional mechanisms, and interpretive boundaries clearly perceivable within the same experiential structure. The digital interface provides structure and logic; immersive segments establish the state of entry; space and visuals shape psychological expectations; the setting of crisis and disappearance activates the impulse to repair; color and sound organize rhythm; and E/I/S balances the issue of authenticity. It is through the combined effect of these elements that *The Sunken Days of Towers* transforms a group of materials and concepts, under the VHE framework, into a heritage prototype with narrative intensity, emotional tension, and methodological awareness.

5.4 Chapter Summary: How Differences in Narrative Authority Structures Are Made Visible

The prototypes constructed in this chapter are both a visual translation of the materials discussed earlier and a structural reorganization of heritage narrative methods. The Control Prototype organizes knowledge about the Due Torri through an archive-style structure, emphasizing knowledge modules, historical review, and information browsing. It presents a relatively stable structure of interpretive authority commonly seen in traditional heritage display. By contrast, the VHE Prototype, *The Sunken Days of Towers*, organizes the six relational characteristics extracted earlier into six searching tasks. Through the Recovery Map, immersive segments, first-person self-narration by the Due Torri, local selection, and the final Relationship Map, participants gradually form their understanding of the Due Torri through the process of entering, reading, judging, and integrating. They also gradually build

emotional connections with the towers and participate in the reproduction of heritage meaning in this process. The difference between the two prototypes is reflected not only in the way content is organized, but also in the position occupied by participants: the former faces a heritage object that has been systematically organized and interpreted, while the latter faces a heritage world waiting to be re-entered, re-perceived, and reconnected.

More importantly, this mode of translation responds to the basic judgment of this thesis regarding virtual heritage practice. The value of heritage exists in the architectural object itself, and also in the relational processes through which it continues to be viewed, passed by, narrated, used, debated, and reimagined.

The current crisis faced by the Due Torri involves not only the practical condition of structural safety, but also the relational dimensions of public access, emotional identification, and connection with urban memory. Based on this understanding, the core task of the VHE Prototype is to guide participants to gradually approach, care about, and re-perceive this heritage object through an attractive immersive mechanism. The narrative path formed by mystery, task orientation, fragment collection, emotional progression, and multisensory experience also lays the foundation for the exploratory validation in the next chapter. It allows the researcher to further examine how different modes of narrative organization influence the public's depth of understanding, emotional engagement, perception of multiplicity, and protective agency toward "heritage in crisis."

On this basis, this thesis also proposes a further application scenario (see below fig.5.19). If this virtual prototype is extended from its digital experiential form at the research stage toward the heritage site itself, it may become an alternative narrative medium embedded in the public spaces around the Due Torri. Especially under the current condition in which the towers are enclosed by long-term barriers and the public has difficulty approaching them, the prototype would no longer serve only as a screen-based experience for comparison. It could also be imagined as a digital narrative installation deployed at nodes around the Due Torri, responding to the limitation that the current construction-site panels mainly perform the function of explanation and information delivery, while finding it difficult to establish a deeper public connection.

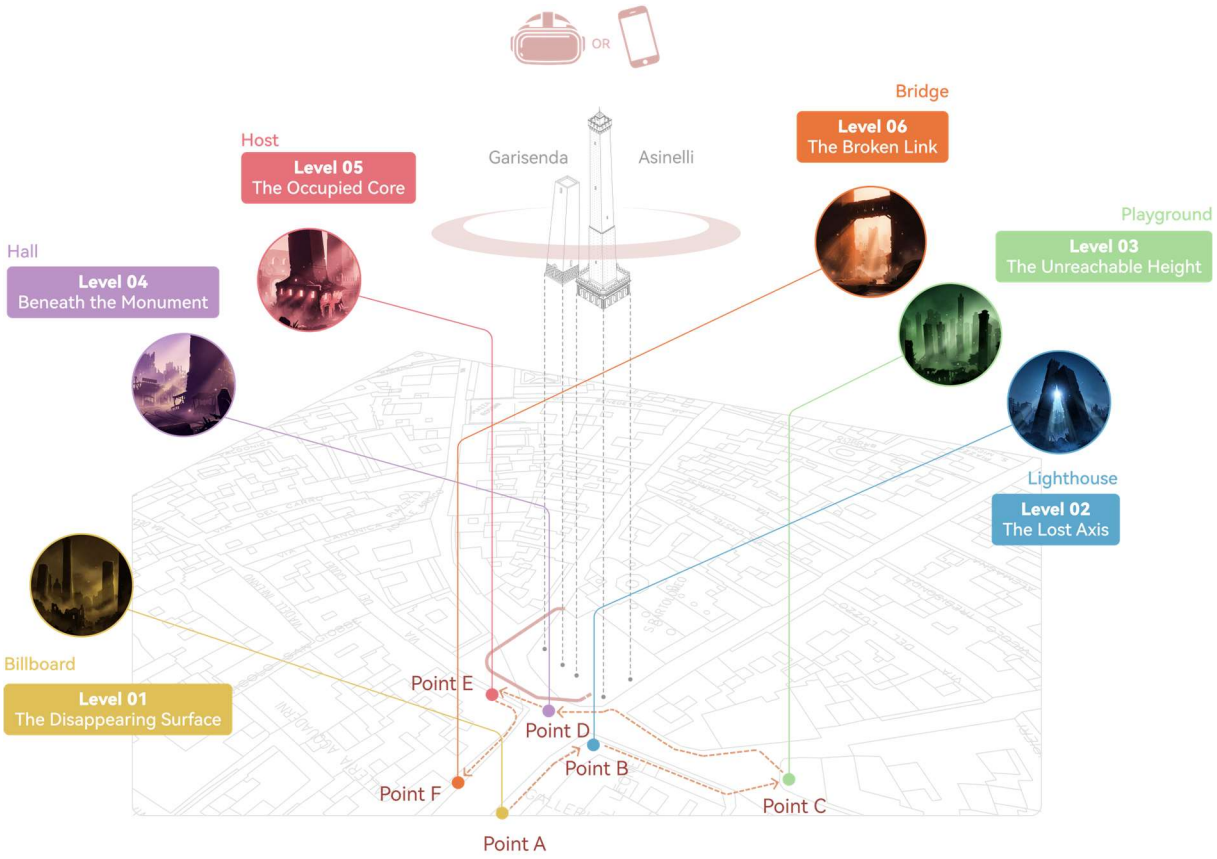


Figure 5.19 Offline extension concept for the VHE prototype

Source: Drawn by the author.

Compared with passive information display based on reading, this approach places greater emphasis on the process of entering, staying, judging, and returning. In this way, even when the public cannot truly approach the heritage object itself, they can still rebuild their relationship with the Due Torri on site.

Therefore, the VHE Prototype proposed in this chapter presents two layers of meaning. First, it constitutes an experimental structure for comparing different narrative methods. Second, it also points to a possible path for reorganizing heritage display and public perception under the condition of crisis. Through relationship-oriented narrative design, the prototype creates an entry point for the public to approach, understand, and feel the Due Torri again. It also provides a direction that can be further developed for the renewal of the public interface around the towers.

Chapter 6 Integration: Exploratory Validation and Preliminary Evaluation

6.1 Prototype Evaluation Method

This chapter enters the third stage of the VHE methodological framework: Integration, namely integrative evaluation. This stage observes, through exploratory evaluation, how different modes of narrative organization influence participants' understanding of heritage, emotional engagement, perception of meaning, and tendency toward further attention. The focus of this stage is to use the prototype as a research medium that can be entered, compared, and discussed, and to examine through user experience feedback whether its narrative mechanisms truly trigger the "relational understanding" that this thesis is concerned with.



Figure 6.1 Core dimensions of the evaluation and questionnaire

Source: Drawn by the author.

This evaluation is conducted around the two narrative prototypes constructed in the previous chapter: the Control Prototype, which is mainly based on linear information display, and the VHE Prototype, *The Sunken Days of Towers*, which is characterized by relational organization, fragment exploration, and first-person narration.

It should be clarified that the exploratory validation here uses the screen-based versions of the Control and VHE prototypes. Therefore, the results discussed below should be

understood as an evaluation of the VHE narrative structure and interaction logic, rather than a direct measurement of the full immersive experience.

Based on the research questions proposed in the Introduction, the evaluation in this chapter mainly focuses on four aspects. First, whether participants' understanding of the Due Torri remains at the level of object-based knowledge, such as architectural objects, chronological information, and visual recognition, or further expands to the relational level among society, culture, history, and urban life. Second, whether the experience stimulates more evident emotional connections, including curiosity, immersion, empathy, concern, and memory association. Third, whether participants are able to perceive the multiple meanings, multiple subjects, and diverse perspectives carried by the Due Torri, and thereby realize that they are not a single and fixed object of historical interpretation. Fourth, whether participants develop a tendency to continue learning about, discussing, or paying attention to the condition of the Due Torri and heritage issues after the experience.

In other words, what this chapter hopes to observe is not only the single result of "whether users learned more information," but whether the narrative mechanism can guide participants from object-based cognition toward relational understanding, and, in this process, form warmer emotional engagement and a clearer willingness for further attention. This evaluation goal is also consistent with the position of this thesis, which understands virtual heritage as a relational field rather than simply as a tool for visual reconstruction.

The formal experiment recruited 12 participants in total, who were divided into Groups A and B according to the principle of counterbalanced order, with 6 participants in each group. The participants were mainly ordinary users with relatively limited prior knowledge of the Due Torri. This sample setting helps reduce the strong interference of existing knowledge on judgment, and allows a more direct observation of how the prototype itself establishes paths of understanding, emotional resonance, and meaning perception. Before the experiment began, participants completed a short pre-test questionnaire to record whether they had visited the Due Torri site, their existing level of knowledge about the towers, and whether they had a background in architecture or heritage-related studies. This information was used only as a background reference for explaining individual differences, and not as a basis for grouping. The method in which the same participant experiences both prototypes in sequence makes it possible to compare the immediate differences triggered by

the two narrative paths within the same individual, thereby reducing the influence of perceptual differences among different participants on the results. To control order effects, Group A completed the experience in the order of "Control → VHE," while Group B completed it in the order of "VHE → Control." A short transition of 2–3 minutes was set between the two rounds to weaken the immediate interference of the first experience on the judgment of the second. The total testing time for each participant was controlled at around 20–25 minutes. The prototype experience formed the main part of the test, while the questionnaire and brief follow-up questions were used to capture immediate reactions and comparative judgments.



Figure 6.2 Test setting

Source: Photographed by the author.

This evaluation was divided into five steps. First, participants completed the pre-test questionnaire and entered the corresponding sequence group. Second, participants experienced the first prototype and immediately completed the first-round questionnaire after the experience, in order to record the immediate understanding, emotional response, and overall judgment brought by that version. Then, after a short transition, they entered the

second round of prototype experience and completed the second-round questionnaire afterwards.

After the two rounds of experience were completed, the researcher conducted brief follow-up questions around overall impressions, key moments, emotional changes, and differences between the two versions. Finally, the scale results from the two rounds, open-ended responses, and oral feedback were organized into experimental materials for comparison.

The quantitative dimensions involved in the questionnaire were divided into four items and evaluated through a seven-point Likert scale. Each item included 2–3 questions. The first item was depth of heritage understanding, which was used to judge whether participants' understanding of the Due Torri expanded from a single architectural object to more complex urban, historical, and social relationships. The second item was emotional resonance, which was used to evaluate whether the experience triggered emotional fluctuation, immersion, a sense of involvement, and concern for the condition of the Due Torri. The third item was perception of multiplicity of meaning, which was used to examine whether participants recognized that the Due Torri carry multiple stories, the positions of different subjects, and more than one possible interpretive path. The fourth item was protective and participatory agency, which was used to observe whether the experience strengthened participants' tendency to continue learning, discussing, sharing, or paying attention to heritage conservation issues. On this basis, this study additionally included two overall judgment questions, respectively examining "whether participants would be more willing to visit the Due Torri on site" and "whether they felt that the Due Torri are still closely related to contemporary urban life." These questions were used to supplement the overall narrative effect beyond the four core dimensions. The open-ended questions focused on "the most touching fragment or interface," "how to describe the Due Torri," "the strongest perceived content," and comparative judgments between the two rounds, in order to record subjective impressions and verbal expressions that are difficult to fully capture through scales. This setting preserves the basis for quantitative comparison while also providing sufficient textual materials for qualitative interpretation, allowing this chapter to understand the narrative role of the prototypes from both "score differences" and "experience descriptions."

Considering the small sample size of this study, and the fact that the current stage

focuses on prototype comparison and methodological validation rather than generalizable inference, this chapter adopts a mixed analysis method of descriptive statistics plus thematic coding. In the quantitative analysis, the mean values of the four core dimensions and the scores of the two overall judgment questions under the Control and VHE conditions were first calculated for each participant. These results were then further summarized into the overall mean values of the two prototypes, and individual-level trends were observed, such as how many participants showed stronger emotional engagement or a higher willingness to visit under the VHE condition. In the qualitative analysis, open-ended responses and post-experiment oral feedback were examined through thematic coding, in order to summarize the recurring content features in participants' descriptions. In relation to the research objectives of this thesis, the coding mainly focused on five themes: object-based understanding, relational perception, emotional triggering, multivocal awareness, and action intention. It should be emphasized that the purpose of the evaluation in this chapter is to provide preliminary empirical support for the VHE method, and to reflect on its organizational logic, effective boundaries, and future directions for improvement. It is not intended to draw statistically generalizable conclusions from a small sample.

6.2 Results Presentation and Analysis

This section compares and analyzes the experiential differences between the Control Prototype and the VHE Prototype from two levels: quantitative results and qualitative feedback. Overall, the test results show a relatively consistent trend: without clearly weakening basic understanding, VHE more effectively enhanced participants' emotional resonance, perception of multiplicity, willingness to visit, and understanding of the relationship between the Due Torri and contemporary urban life. The Control Prototype, by contrast, performed more steadily in terms of information clarity, structural directness, and the efficiency of basic knowledge acquisition. These results indicate that the two prototypes do not form a simple opposition of superiority and inferiority, but instead activate different paths of heritage interpretation.

From the quantitative results, in the dimension of depth of heritage understanding, the average score of VHE was 5.57, while that of Control was 5.50, showing only a small

difference. This result indicates that VHE did not significantly weaken participants' grasp of basic information because of its fragmented and narrative-based path. Further observation of individual items shows that the difference between the two prototypes in the item "helping participants understand the position of the Due Torri in Bologna's urban history" was only 0.25 points. This suggests that the basic understanding of the Due Torri as an urban landmark and historical remain was relatively effectively communicated in both prototypes. However, in the items related to more relational forms of understanding, the advantage of VHE became more evident. For example, in the item "becoming aware of the connection between the Due Torri and everyday urban life and public space," VHE scored 1.42 points higher than Control; in the item "understanding has expanded from a single architectural object to a more complex relational level," VHE scored 1.58 points higher. In other words, the value of VHE does not mainly lie in adding more factual information, but in helping participants understand the Due Torri from a "single object" into a "node within a relational network." This is highly consistent with the question raised in the Introduction of this thesis: what this research is truly concerned with is not how to make heritage more clearly "seen" in the digital environment, but how to make the relationships, memories, and social depth carried by heritage perceptible again.

In the dimension of emotional resonance, VHE also showed a relatively clear advantage. Its average score was 5.02, higher than Control's 4.57. Among the 12 participants, 10 gave VHE a higher score in this dimension. The results of individual items further show that VHE achieved the greatest improvement in "immersion/sense of involvement," scoring 2.00 points higher than Control, and scored 1.25 points higher in "concern and care." This indicates that VHE does not trigger emotional responses simply by being "more interesting" in an abstract sense, but more effectively establishes a connection between participants and the heritage object through its narrative mechanism. The first-person perspective, fragment exploration, task-driven structure, and more atmospheric visual and linguistic expression together created a stronger sense of entry. Participants were no longer only reading information about the Due Torri, but gradually sensed, during the experience, the emotional tension formed by the towers as "witnesses," "carriers," and even "beings currently facing crisis." For this reason, the emotional engagement triggered by VHE is not merely superficial enjoyment, but directly serves the reorganization of heritage meaning.

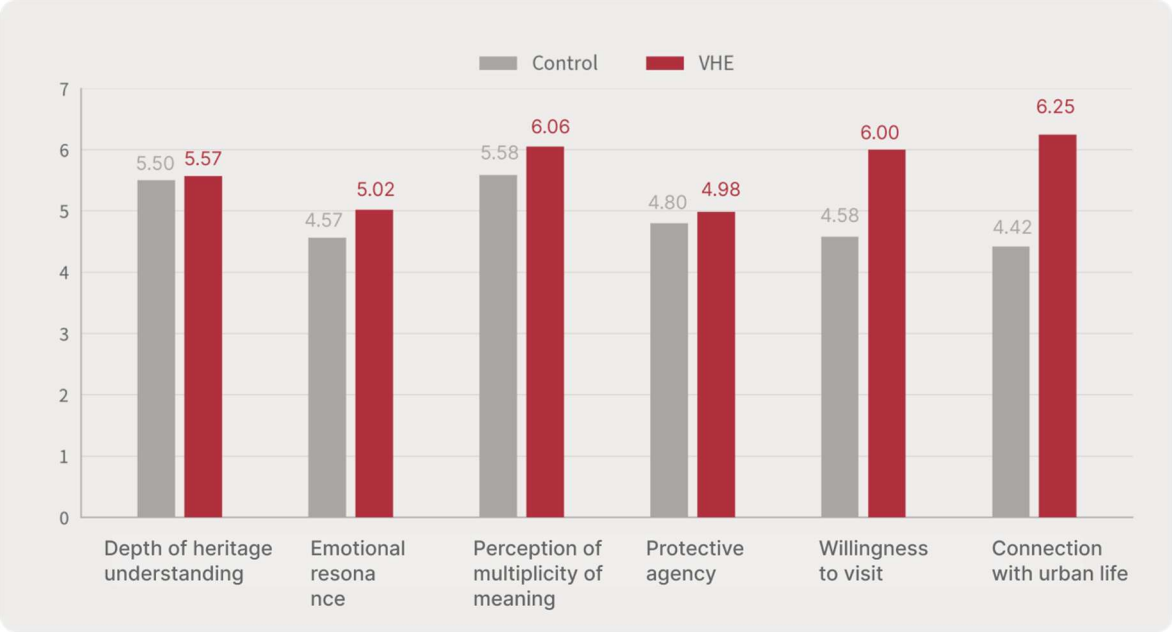


Figure 6.3 Mean scores of four core dimensions and two overall judgment items

Source: Drawn by the author.

In the dimension of perception of multiplicity of meaning, VHE also showed a stable advantage, with an average score of 6.06, compared with 5.58 for Control. Among the 12 participants, 8 gave VHE a higher score in this dimension, while 4 gave the same score to both prototypes. No participant considered Control stronger in this regard. At the level of specific items, VHE scored 1.50 points higher in "becoming aware that the Due Torri carry many different stories and perspectives," and 1.42 points higher in "understanding that the meaning of the Due Torri comes from the combined effect of history, memory, everyday life, and contemporary crisis." These results indicate that VHE more effectively breaks the single-line structure of heritage interpretation, allowing participants to realize that the Due Torri do not have only one fixed and closed historical narrative. By comparison, Control communicates a more stable, clear, and summarizable knowledge framework; VHE opens up a meaning space closer to the perspective of critical heritage studies, in which the Due Torri are simultaneously an urban symbol, an everyday background, a historical witness, a site of crisis, and a trigger of collective memory. Participants' perception of this multiplicity is one of the important pieces of evidence that VHE moves beyond the one-way interpretation of AHD.

The difference in the dimension of protective and participatory agency was relatively moderate, but the trend still pointed toward VHE. Its average score was 4.98, slightly higher than Control's 4.80. Among the 12 participants, 5 gave VHE a higher score in this dimension, 2 gave Control a higher score, and 5 gave the same score to both. In terms of individual items, VHE scored 0.92 points higher in "willingness to learn more," 1.00 point higher in "willingness to discuss / share," and 1.17 points higher in "willingness to pay attention to conservation issues." This result shows, on the one hand, that it is not easy for a single short experience to directly and significantly promote "action intention," and that there is still a distance between being touched and forming a clear intention to act.

On the other hand, it also shows that VHE has already demonstrated preliminary advantages in stimulating interest, concern, and a tendency toward discussion. In other words, it has not yet fully transformed emotional connection into strong action, but it has significantly increased the possibility of "taking one further step." This finding is consistent with the positioning of the Integration stage in this thesis: the goal is not to take strict behavioral change as the direct objective, but to examine whether the narrative structure can create conditions for further attention and participation.

If the two overall judgment items are included in the analysis, the advantage of VHE becomes even more prominent. In the item "I would be more willing to visit the Due Torri on site," the average score of VHE was 6.00, while that of Control was 4.58. In the item "I feel that the Due Torri are still closely related to today's urban life," VHE reached 6.25, notably higher than Control's 4.42.

These two results are especially important because they directly touch upon the core question of this thesis: whether virtual heritage narrative can rebuild the relationship between heritage and the contemporary public under conditions of "absence." The test results show that the greatest effect of VHE is not only to enhance immersion during the experience, but to make participants more clearly aware that the Due Torri are still part of today's urban life, and to generate a desire to be present and to continue paying attention. Heritage here is no longer only a remnant of the past, but is re-understood as an existence that still operates in the present. This is also the core effect of relationship-oriented narrative.



Figure 6.4 User choices in the comparative questionnaire

Source: Drawn by the author.

In the final comparative judgment, 8 out of the 12 participants clearly chose VHE (see fig.6.4), considering it easier for them to "enter the situation and meaning of the Due Torri"; 2 participants chose Control; and another 2 believed that both had their own strengths and that the more ideal approach would be to combine them. This result indicates that VHE was recognized by the majority of participants as the main experiential entry point. At the same time, the 2 participants who chose Control and the 2 who suggested a combination also reveal an important fact: for some participants, the completeness of information, clarity of structure, and efficiency of quick access remain key conditions for heritage understanding. Especially under the condition of limited background knowledge, some people are more inclined to first establish basic understanding through a linear, objective, archive-style organization, and then enter a more contextualized and narrative-based experiential layer. This result does not weaken the value of VHE. Instead, it further indicates its direction for future optimization: VHE and Control do not need to be understood as an either-or choice, but are more suitable to be seen as complementary relations between a "relational entry layer" and a "knowledge index layer."

The open-ended responses and oral feedback further deepened the above judgment. In the Control Prototype, the keywords most frequently mentioned by participants included "historical information," "clear," "objective," "rich in images and texts," "like a museum

website," and "like a history class." When asked to describe "what the Due Torri are," participants often summarized them as "an urban symbol of Bologna," "medieval heritage," "historical landmarks," or "towers under restoration." Overall, their descriptions were concentrated at the level of object-based cognition. For the question "what did you feel most strongly," most responses also clearly pointed to "historical information." This shows that the main strength of Control lies in establishing a clear and stable knowledge framework. It can quickly help participants grasp the basic chronology, symbolic meaning, and crisis condition of the Due Torri, but it less often pushes them into more complex relational levels.

By contrast, the expressions triggered by the VHE Prototype were more concentrated on "immersion," "storytelling," "desire to explore," "the relationship between people and the city," "spatial atmosphere," and "the Due Torri as witnesses." Several participants mentioned that fragment collection, chapter-based progression, first-person narration, and scenes with music, video, and image transitions made it easier for them to "be brought into" the experience, and also made it easier to sense the connections between the Due Torri and different clues such as war, everyday life, public space, scientific discovery, and urban memory. When describing "what the Due Torri are," participants' responses to VHE were clearly more relational. For example, they described the towers as "witnesses to historical and cultural change," "an intersection of urban life and people's memory," and "historical carriers that have accompanied people through different ways of life." This shows that VHE not only changed the intensity of participants' impressions of the Due Torri, but also changed the way they organized language and summarized heritage meaning. Here, the Due Torri are no longer only "a certain relic," but become a set of relationships that continuously move across history and the present.

Of course, the qualitative feedback also clearly revealed the limitations of the current version of VHE. The main problems were concentrated in four aspects. First, some participants felt that its information organization was relatively scattered, and that the classification logic and overall structure were not clear enough. Second, some textual expressions were considered obscure and relatively literary, increasing the threshold for reading and understanding. Third, for participants who wanted to quickly obtain a complete factual framework, VHE created the feeling that "only looking at these contents is not enough to understand the whole picture." Fourth, loading, clicking, and rhythm-related

issues were explicitly mentioned in a small number of responses, indicating that interaction fluency still directly affects the immersive effect.

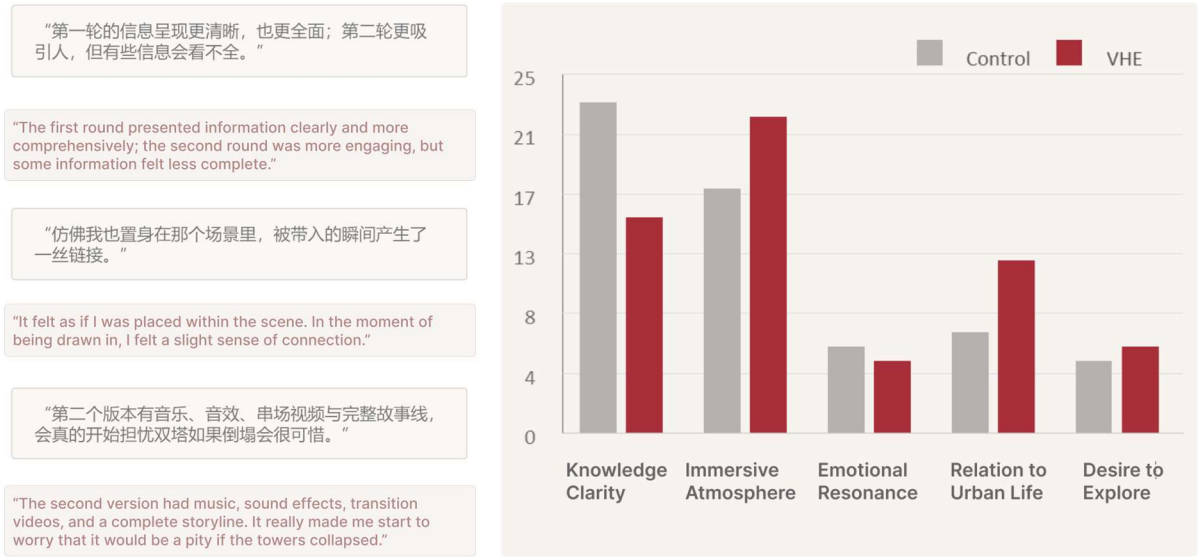


Figure 6.5 Thematic coding of open responses

Source: Drawn by the author.

These responses remind us that relationship-oriented narrative does not mean weakening structure. On the contrary, it requires a carefully designed guidance system to help participants maintain a sense of direction during open exploration. It is precisely in this sense that this study does not understand VHE as a simple replacement for Control, but as a narrative method that can work together with archival and knowledge layers.

Combining the quantitative and qualitative results, three preliminary conclusions can be drawn. First, while maintaining the ability to support basic understanding, VHE significantly strengthened emotional engagement, relational perception, and understanding of multiplicity, indicating that it is feasible as a relationship-oriented virtual heritage narrative path. Second, the key factor driving this effect does not lie in visual stimulation alone, but in the organization of relational clues, the task-driven exploratory path, the emotional amplification produced by immersive segments, and the capacity of the interface mechanism to carry multiple narrative entries. Third, spatial organization, narrative structure, and interface mechanism are not merely supplementary packaging in the digital environment;

together, they determine how participants understand heritage, whether they are willing to enter the situation, and whether they regard heritage as an existence still connected to the present. In other words, the exploratory validation in this chapter does not prove VHE to be a "more perfect form of display." Rather, it provides this thesis with a more important understanding: when virtual heritage narrative unfolds around relationships rather than objects, it can more effectively rebuild the connection between the public and heritage, and create conditions for subsequent attention, discussion, and care. This is also where the value of VHE as a research method lies.

6.3 Chapter Summary: Limitations and Reflections

Although the exploratory validation in this chapter preliminarily shows that VHE, compared with the Control Prototype, has a stronger capacity to stimulate emotional engagement, relational perception, and attention to the contemporary condition of the Due Torri, this result still needs to be understood within the research conditions and methodological boundaries of this study.

First, the sample size of this study is relatively small, with a total of 12 participants, most of whom were ordinary users with relatively limited prior knowledge of the Due Torri. This setting has its own rationale, as it helps to observe more directly how the prototype itself establishes paths of understanding and emotional engagement, without being strongly influenced by prior knowledge. At the same time, however, it also means that this study is not yet sufficient to make more general judgments about differences in responses among groups with different backgrounds. For example, participants with stronger backgrounds in architecture or heritage studies may place greater emphasis on the completeness of historical information, the clarity of evidence boundaries, and the transparency of narrative sources; ordinary members of the public, by contrast, may be more easily influenced by interface rhythm, emotional atmosphere, and the mode of entry. Since this sample was not systematically stratified according to these background differences, the current results are more suitable as preliminary evidence for methodological validation and prototype comparison, rather than as general conclusions applicable to a broader audience.

Second, what this study compares is not two fully mature immersive systems with

equivalent levels of completion, but two experimental digital prototypes built around the same heritage object. The Control Prototype is closer to the logic of museum-style knowledge presentation, with advantages in structural clarity, information concentration, and stable reading paths. The VHE Prototype, by contrast, undertakes more experimental tasks. It needs to simultaneously handle the organization of relational clues, the rhythm of fragment exploration, the atmospheric construction of first-person narration, and the interface coordination of a multi-entry structure. For this reason, while VHE presents a stronger capacity for immersion and relational evocation, it also exposes problems such as relatively scattered information organization, occasionally obscure textual expression, and a navigation logic that is not yet sufficiently stable. In other words, the current version of VHE demonstrates methodological potential while still retaining a considerable degree of "prototypicality." The advantages it presents do not mean that this method has already reached its optimal state at the design level; the problems it exposes should not simply be attributed to "relationship-oriented narrative itself," but should be understood as the inevitable friction of a methodological structure still under adjustment at an early prototype stage.

Third, from the perspective of media implementation, the testing in this study still mainly relies on digital screens rather than a more complete immersive virtual environment, and there remains considerable room for improvement. In the construction of the methodological framework, the theory of VHE emphasizes the importance of digital space, understanding it as a relational field capable of carrying memory, narrative, and emotion, and even as a "memory laboratory" that can be repeatedly entered, tested, and revised. Under this premise, the value of the prototype lies in the fact that it is sufficient to support the preliminary comparison of narrative mechanisms, information organization, and experiential paths, and to complete methodological testing under the constraints of research time and technical cost. Yet its limitations are also clear. The spatial enclosure, degree of embodied experience, and intensity of sensory immersion provided by a screen interface still differ from those of a real VR, LBVR, or more immersive interactive environment. Therefore, the "immersion" observed in this study is currently more a sense of narrative entry and psychological immersion guided by the interface, rather than embodied immersion in the full sense.

Finally, it is also necessary to reflect on the evaluation dimensions themselves. This thesis takes “heritage understanding,” “emotional resonance,” “perception of multiplicity of meaning,” and “protective and participatory agency” as its core dimensions, supplemented by two overall judgment items: “willingness to visit” and “sense of contemporary relevance.” This setting can respond relatively well to the research questions raised in the Introduction, but it still relies on participants’ subjective self-reports. In other words, what this study measures is how much participants “feel they have understood,” what they “feel they have experienced,” and whether they are “more willing to pay attention,” rather than their real-time behavioral trajectories, positions of staying, reading paths, frequency of revisiting, or subsequent actual behaviors such as searching, discussing, or revisiting. For a methodological framework that emphasizes relationship generation and an experiential loop, questionnaires and brief follow-up questions are sufficient to support preliminary judgment, but they still cannot fully capture the more detailed effects produced by the narrative mechanism at the levels of time and behavior. Therefore, while this study shows that VHE has visible directional effects, it also suggests that richer behavioral and process-based evidence will be needed in future research to understand how this method operates.

Overall, the limitations mentioned above do not negate the final conclusions of this study. On the contrary, they constitute an important part of the VHE framework: feedback, iteration, and further refinement. The role of Integration in the methodological framework is not only to test the effectiveness of the design outcome, but also to use public feedback to examine, revise, and advance the method itself. In this sense, the sample limitations, prototype limitations, media limitations, and evaluation limitations exposed in this chapter are part of the self-calibration process that VHE, as an emerging research path, must undergo. Through this step, VHE can gradually move from a theoretical proposition about “relationship-oriented narrative” toward a methodological framework that can be iterated, compared, and expanded.

Chapter 7 Conclusion: Imagining a Different Future for Cultural Heritage

7.1 Main Conclusions

This thesis investigates the narrative predicament faced by contemporary architectural heritage under conditions of "absence." It attempts to answer the following question: when architectural heritage is gradually compressed into an object to be viewed and explained through closure, distant viewing, check-in consumption, and knowledge-based narration, how can a mode of narrative organization different from *Authorized Heritage Discourse (AHD)* rebuild a more emotional, relational, and agentic connection between the public and heritage? Around this question, this thesis proposes *Virtual Heritage Ethnography (VHE)* as a methodological framework, and takes the Due Torri in Bologna as its case study. Through the three stages of Excavation, Interpretation, and Integration, the framework is preliminarily constructed and validated.

First, through the excavation of the historical context, crisis conditions, and field materials related to the Due Torri, this thesis points out that the heritage meaning of the towers is built upon two intertwined spatial axes. One is the vertical monumentality formed by height, symbolism, viewing, challenge, and the urban skyline; the other is the horizontal everydayness formed by markets, roads, encounters, institutional occupation, public issues, and emotional memory. It is precisely through the continuous intersection of these two axes that the Due Torri have formed their unique position as a core heritage object of Bologna. Further spatial interpretation summarizes six relational characteristics of the Due Torri: Billboard as display surface, Lighthouse as orientation marker, Playground as challenge body, Hall as gathering field, Host as accommodating place, and Bridge as connector.

Together, these characteristics show that the value of the Due Torri does not only come from the historical identity and material form of the towers themselves, but also from their continuous participation in processes of urban viewing, spatial orientation, public gathering, functional translation, emotional projection, and temporal connection.

This finding responds to the basic judgment of this thesis: the core issue of contemporary architectural heritage is not limited to object preservation. There is still considerable research potential in how heritage meaning is organized within social

relationships, and how these relationships are flattened by existing modes of narration.

Second, in the stage of narrative translation, this thesis organizes the above relational characteristics into two different prototype structures. The Control Prototype organizes knowledge about the Due Torri through an archive-style logic, emphasizing historical review, information modules, and browsing paths. It presents a relatively stable structure of interpretive authority commonly seen in traditional heritage display. The VHE Prototype, *The Sunken Days of Towers*, further translates the six relational characteristics into six searching tasks. Through the Recovery Map, immersive segments, first-person self-narration by the Due Torri, local selection and judgment, and the final Relationship Map, participants gradually form their understanding of the towers through the process of entering, reading, judging, and integrating. In this process, they also build emotional connections with the towers and participate in the reproduction of heritage meaning. It can therefore be seen that VHE, as proposed in this thesis, attempts to shift the focus of heritage narrative from object display to relationship organization, and to shift the public from receivers of knowledge to participants in meaning-making. This is also its response to narrative structures dominated by AHD.

Finally, in the stage of integrative evaluation, the exploratory test results provide preliminary support for this methodological path. The experiment shows that, without clearly weakening basic understanding, the VHE Prototype more effectively enhanced participants' emotional engagement, perception of multiplicity, willingness to visit, and understanding of the relationship between the Due Torri and contemporary urban life. The Control Prototype performed more steadily in terms of information clarity, structural directness, and the efficiency of basic knowledge acquisition. This result indicates that the two prototypes activate different paths of heritage interpretation: the former is more suitable for knowledge organization and basic explanation, while the latter has a stronger capacity to guide participants to gradually approach, care about, and re-perceive a heritage object in crisis. For this thesis, the significance of this validation lies in showing that differences in heritage narrative are not only differences in the amount of content, but also differences in how narrative authority is distributed, what position participants occupy, and whether the public can form more active relational understanding and meaning judgment during the experience.

Based on the above discussion, this thesis argues that VHE, as a relationship-oriented

methodological framework, can provide a new entry point for research on contemporary architectural heritage narrative. It connects critical heritage studies, ethnographic methods, and spatial narrative design, transforming architectural heritage from a static knowledge object into a relational field that can be re-entered, re-perceived, and reconnected. For architecture, the significance of this research lies in moving beyond the inertia of professional thinking and further advancing the focus toward how architectural heritage is interpreted, mediated, and transformed into public experience in the contemporary context. Through the real case of the Due Torri in Bologna, which are "visible yet difficult to access," this thesis preliminarily shows that the value of virtual heritage lies not only in representation and display, but also in whether it can reorganize the emotional connections, meaning structures, and action possibilities between the public and heritage.

Overall, the contribution of this thesis is mainly reflected at three levels. First, at the methodological level, the study proposes and preliminarily constructs VHE as an interdisciplinary framework, providing a path for architectural heritage narrative and virtual heritage research that connects critical heritage theory, ethnographic methods, and spatial narrative design. Second, at the design level, by constructing two comparable prototypes, Control and VHE, this thesis translates relatively abstract issues such as *Authorized Heritage Discourse*, emotion and agency, public participation, and relational understanding into narrative objects that can be experienced, compared, and discussed. Third, at the case-study level, this thesis takes the Due Torri in Bologna, a piece of urban heritage that is "visible yet inaccessible," as the research entry point, and demonstrates the operational mode and current boundaries of relationship-oriented virtual heritage narrative in a real crisis context. From this starting point, what this thesis hopes to promote is not simply a new form of display, but a shift in research perspective: to make digital media a way for the public to re-approach heritage, re-understand its meaning, and rethink its future.

Here, what the researcher ultimately hopes to raise is a question that goes beyond narrative design itself: when heritage continues to remain in the urban landscape but gradually loses accessibility and experientiality, and may even eventually disappear, how should we reimagine its future? Should we accept the status quo and allow it to become a mechanical information panel that feels irrelevant to people's lives, or should we actively explore the possibility of building a deeper relationship with it?

The "future of heritage" discussed here does not only refer to the renewal of preservation technologies or display media. It also refers to how the public will continue to encounter, understand, and care about heritage. The Due Torri as a case make this question concrete and clear: narrative can be not only an interpretation of the past, but also a construction of future relationships. Even when material heritage is damaged, endangered, or temporarily inaccessible, the relationships, memories, and emotions attached to it do not simply disappear; they require new forms of mediation in order to remain connected to the heritage object. The proposal of VHE is precisely an attempt to reopen, at the point where rupture appears, the possibility for the public to enter, understand, and care about heritage.

However, it should be note here that VHE does not place immaterial records above material objects. Rather, it emerges precisely from the crisis of materiality and initially comes from the attempt to rebalance the relationship between material existence and immaterial information and experience. Thus, the materiality functions as the anchor of heritage, while memories, emotions, and narratives are the relational fields through which this object continues to matter to the public and raise people's concern.

7.2 Research Prospects

Based on the research results and the preceding discussion, VHE, as a methodological framework still in its early stage, can continue to be developed in terms of design refinement, methodological expansion, and application.

First, at the design level, the maturity of "relationship-oriented narrative" needs to be further improved. The current test has shown that the main problems exposed by VHE are concentrated in the unclear hierarchy of information, the still loose navigation logic, and the relatively abstract expression of some texts. Therefore, the design focus of the next stage should be how to establish a more stable sense of direction and rhythm for participants while retaining exploration and multiplicity. One feasible direction is to further clarify the structure of "main line—branch line—index layer": the main line is responsible for constructing emotional entry and the overall experiential rhythm; the branch lines are responsible for unfolding multiple relationships and marginal clues; and the index layer undertakes the functions of historical organization, evidence explanation, and quick reference.

Second, at the methodological level, future research can further develop VHE from a "two-prototype comparison" into a more complete research and design tool. The closed-loop framework composed of the three stages of Excavation, Interpretation, and Integration can still be refined into more explicit operational units. For example, in the Excavation stage, clearer rules can be established for classifying ethnographic materials, selecting narrative assets, and identifying affective nodes. In the Interpretation stage, more stable models can be developed for relationship mapping, interface narrative templates, and E/I/S annotation strategies. In the Integration stage, richer experience evaluation tools can be introduced, such as behavioral path recording, dwell-time analysis, comparison of oral recall, and delayed follow-up questionnaires. As these methodological steps gradually become clearer, VHE can further develop from a framework proposed and tested in the Due Torri case into a methodological framework that can be referenced, modified, and expanded.

At the level of media implementation, future research can also extend the narrative mechanisms validated at the current stage fully into more complete immersive environments, such as VR games or LBVR exhibitions. This would allow the further effects of relational narrative on participation, empathy, and memory retention to be tested in a more enveloping and embodied space, and would more fully transform digital space into a "memory laboratory." For heritage objects that are already enclosed and cannot be fully approached in reality, media with higher levels of immersion may transform the reality of "inaccessibility" into stronger perceptual tension, allowing participants to more directly feel, at the bodily scale and through spatial rhythm, the relationships among approach, detour, closure, looking upward, and absence. Also, future research could compare screen-based, 3D desktop, and VR / LBVR versions of the same VHE narrative, in order to examine how different degrees of immersion influence relational understanding, emotional engagement, and the willingness to care for heritage.

Returning to the theoretical composition of VHE, since ethnography is a key component of this method, it also needs to be developed more fully in future research. Due to objective limitations, this study has not yet carried out deeper and longer-term ethnographic investigation, and this part deserves further strengthening in subsequent practice. At the same time, it will also be necessary to apply VHE to more types of heritage cases in the future, in order to test its applicable boundaries and possible variants. The Due Torri case combines

strong symbolism, real crisis, everyday urban visibility, and restricted public access, making it especially suitable for testing the narrative tension between absence and relationship reconstruction. However, when the same method is applied to religious buildings still in use, highly touristic historic districts, industrial heritage sites, postwar ruins, or heritage objects that have completely disappeared, the relational clues, narrative focus, and interface strategies that VHE needs to activate may all change.

Overall, VHE remains a methodological framework in the process of formation, and its proposal and validation are only a beginning. For virtual heritage research, the construction of method itself is a task that requires continuous development, because it needs to respond to theoretical reflection and shifts, while also being constantly deepened and calibrated across specific cases, narrative structures, technical media, and public experience. The research conducted in this thesis around the Due Torri in Bologna is not yet sufficient to provide a complete conclusion for this method. However, it has preliminarily shown that when virtual heritage narrative begins from relationships, digital space can become a field for reorganizing memory, experience, and public perception, and can open up a path for the public to re-approach heritage. Based on this, VHE, as an exploration oriented toward contemporary heritage conditions, has the necessity for further development.

Finally, perhaps the true fragility of cultural heritage has never only lain in whether it will collapse, be closed, or disappear. It also lies in whether people are still willing to regard it as something related to themselves. When heritage still stands, yet gradually withdraws from everyday experience, it also slowly loses its power as a public matter. For this reason, the narrative for architectural heritage becomes especially important. Whether we can excavate more inclusive and participatory narratives is related to whether we can still awaken, in the present, a renewed capacity to feel, judge, and take responsibility for heritage.

In looking toward the future of architectural heritage, what is ultimately imagined is not an object forever frozen into history books, but a relationship and memory that can continue to happen and be passed on across generations.

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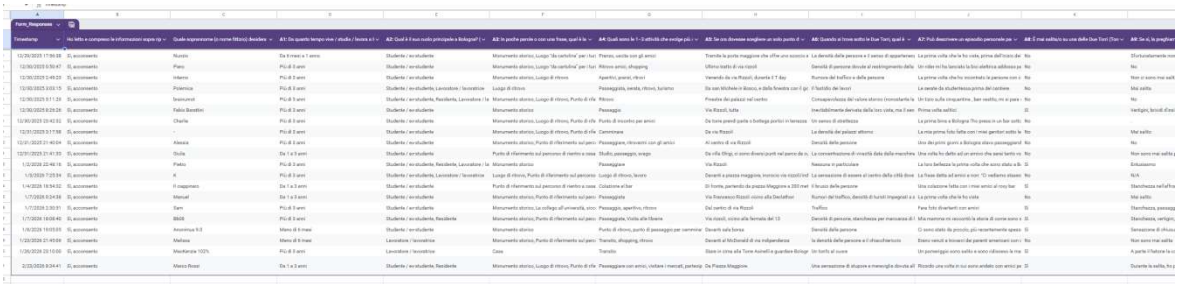
Appendix: A Fieldwork Questionnaire

A.1 Questionnaire Description

This appendix presents the fieldwork questionnaire used during the Excavation stage of this research. The questionnaire was distributed anonymously through Google Forms and was designed to collect public perceptions, everyday experiences, memory sources, emotional responses, and future narrative expectations related to Bologna's Due Torri. The questionnaire was written in Italian and targeted people who had lived, studied, or worked in Bologna for a relatively long period.

The questionnaire contained 30 items and was divided into four parts: everyday life and spatial relations; intergenerational memory and sources of information; physical closure, crisis, and emotion; and virtual reconstruction, missing narratives, and possible futures. The estimated completion time was approximately 15 minutes. All responses were processed anonymously and used only for academic research.

A total of 20 valid responses were collected. The main purpose of the questionnaire was to supplement field observation and spatial analysis, and to help identify relational clues, memory, and narrative gaps associated with the Due Torri in contemporary urban life.



A.2 Full Questionnaire

Questionnaire Title

Etnografia del patrimonio virtuale: le Due Torri di Bologna e la memoria collettiva

Virtual Heritage Ethnography: Bologna's Due Torri and Collective Memory

Part I – Vita quotidiana & rapporto con lo spazio / Everyday Life and Spatial Relations

A1.

Italian: Da quanto tempo vive / studia / lavora a Bologna?

English: How long have you lived, studied, or worked in Bologna?

Options:

- Meno di 6 mesi / Less than 6 months
- Da 6 mesi a 1 anno / 6 months to 1 year
- Da 1 a 3 anni / 1 to 3 years
- Più di 3 anni / More than 3 years

A2.

Italian: Qual è il suo ruolo principale a Bologna? (Selezioni tutte le opzioni pertinenti)

English: What is your main role in Bologna? (Select all that apply)

Options:

- Studente / ex-studente / Student / former student
- Residente / Resident
- Lavoratore / lavoratrice / Worker
- Commerciante / titolare di negozio / Shop owner / business owner
- Turista / soggiorno di breve durata / Tourist / short-term visitor
- Altro / Other

A3.

Italian: In poche parole o con una frase, qual è la sua prima associazione quando pensa alle “Due Torri”? (Selezioni tutte le opzioni pertinenti)

English: In a few words or one sentence, what is your first association when you think of the “Due Torri”? (Select all that apply)

Options:

- Monumento storico / Historical monument
- Luogo di ritrovo / Meeting place
- Punto di riferimento sul percorso di rientro a casa / Reference point on the way home
- Luogo “da cartolina” per i turisti / “Postcard-like” tourist spot
- Altro / Other

A4.

Italian: Quali sono le 1–3 attività che svolge più spesso nell’area delle Due Torri (Piazza di Porta Ravegnana, Quadrilatero)?

English: What are the one to three activities you most often do around the Due Torri area, including Piazza di Porta Ravegnana and the Quadrilatero?

A5.

Italian: Se ora dovesse scegliere un solo punto da cui guardare le Due Torri, quale luogo le viene in mente per primo?

English: If you had to choose only one place from which to view the Due Torri, which place comes to mind first?

Note in Italian: La preghiamo di descrivere questo punto nel modo più preciso possibile (ad esempio: l'angolo di una certa via, un lato specifico di una piazza, davanti all'ingresso di un negozio particolare, da una certa finestra/piano di un edificio, vicino a una fermata dell'autobus, ecc.).

Note in English: Please describe this point as precisely as possible, for example, the corner of a specific street, one side of a square, in front of a particular shop entrance, from a certain window or floor of a building, near a bus stop, and so on.

A6.

Italian: Quando si trova sotto le Due Torri, qual è la sensazione "non visiva" più forte che ricorda?

English: When you are standing beneath the Due Torri, what is the strongest "non-visual" sensation you remember?

Note in Italian: Ad esempio: la sensazione del suolo sotto i piedi, l'aria / gli odori, la vicinanza o densità delle persone, i rumori del traffico / delle campane, ecc.

Note in English: For example: the feeling of the ground under your feet, the air or smells, the closeness or density of people, the sounds of traffic or bells, and so on.

A7.

Italian: Può descrivere un episodio personale particolarmente memorabile legato alle Due Torri?

English: Can you describe a particularly memorable personal episode related to the Due Torri?

Note in Italian: Può trattarsi di un giorno specifico, di una conversazione, di un'emozione particolare, ecc.

Note in English: This may involve a specific day, a conversation, a particular emotion, and so on.

A8.

Italian: È mai salita/o su una delle Due Torri (Torre degli Asinelli o Torre Garisenda)?

English: Have you ever climbed one of the Due Torri, either Torre degli Asinelli or Torre Garisenda?

Options:

- Sì / Yes
- No / No

A9.

Italian: Se sì, la preghiamo di ricordare, per quanto possibile, le sensazioni durante la salita.

English: If yes, please recall, as much as possible, your sensations during the climb.

Note in Italian: Sensazioni fisiche (ad esempio: stanchezza, vertigini, entusiasmo, paura, disagio o piacere legati all'altezza); percezione dello spazio interno (ad esempio: scale strette o meno, spessore delle murature, cambiamenti di luce, cambiamenti della vista man mano che si sale, ecc.).

Note in English: You may describe physical sensations, such as fatigue, dizziness, excitement, fear, discomfort or pleasure related to height, as well as your perception of the interior space, such as whether the stairs felt narrow, the thickness of the walls, changes in light, and changes in view while climbing.

Part II – Memoria intergenerazionale & fonti di informazione / Intergenerational Memory and Sources of Information

B1.

Italian: Quanto ritiene di conoscere la storia delle torri di Bologna, in particolare delle Due Torri?

English: How much do you think you know about the history of Bologna's towers, especially the Due Torri?

Options:

- Quasi per nulla / Almost nothing
- Un po / A little
- Abbastanza / Quite a lot
- Molto / A lot

B2.

Italian: Da dove provengono principalmente le sue conoscenze sulla storia o sulle leggende delle Due Torri? (Selezioni tutte le opzioni pertinenti)

English: Where does your knowledge of the history or legends of the Due Torri mainly come from? (Select all that apply)

Options:

- Familiari / persone anziane in famiglia / Family members / older people in the family
- Corsi scolastici / università / School courses / university
- Musei, visite guidate o siti ufficiali / Museums, guided tours, or official websites
- Social media, articoli online, podcast, video / Social media, online articles, podcasts, videos
- Opere letterarie (ad esempio Dante, ecc.) / Literary works, for example Dante
- Racconti informali di amici, colleghi, compagni / Informal stories from friends, colleagues, or classmates
- Altro / Other

B3.

Italian: Quali usi storici delle Due Torri conosce o ricorda? (Selezioni tutte le opzioni pertinenti)

English: Which historical uses of the Due Torri do you know or remember? (Select all that apply)

Options:

- Difesa / Defense
- Abitazione / Dwelling
- Prigione / Prison
- Esperimenti scientifici / Scientific experiments
- Punto panoramico / Panoramic viewpoint
- Altre storie / Other stories

B4.

Italian: Può condividere una storia o leggenda sulle Due Torri che le è rimasta particolarmente impressa?

English: Can you share a story or legend about the Due Torri that has particularly impressed you?

Note in Italian: Può essere un fatto storico oppure una "leggenda urbana".

Note in English: It can be a historical fact or an "urban legend."

B5.

Italian: I suoi genitori o i suoi nonni sono bolognesi?

English: Are your parents or grandparents from Bologna?

Options:

- Sì / Yes
- No / No
- Altro / Other

B6.

Italian: I suoi genitori o nonni hanno mai parlato delle Due Torri? Se sì, in che modo ne parlavano?

English: Have your parents or grandparents ever talked about the Due Torri? If yes, how did they usually describe them?

Note in Italian: Ad esempio: quali usi o atmosfere ricordavano, episodi legati alla loro giovinezza, ecc.

Note in English: For example: what uses or atmospheres they remembered, episodes related to their youth, and so on.

B7.

Italian: Rispetto alla generazione precedente, come descriverebbe il suo legame emotivo con le Due Torri?

English: Compared with the previous generation, how would you describe your emotional connection with the Due Torri?

Options:

- Più forte / Stronger
- Più debole / Weaker
- Non è cambiato molto / Not much changed
- Non saprei / Not sure

Part III – Chiusura fisica, crisi & emozioni / Physical Closure, Crisis, and Emotion

C1.

Italian: Quando ha saputo per la prima volta che le Due Torri sarebbero state chiuse al pubblico per motivi di sicurezza strutturale e che l'area circostante sarebbe stata transennata, quale è stata la sua emozione/percezione più forte?

English: When you first learned that the Due Torri would be closed to the public for structural safety reasons and that the surrounding area would be fenced off, what was your strongest emotion or perception?

Note in Italian: Ad esempio: shock, indifferenza, tristezza, ansia, curiosità… Può descriverla nel dettaglio.

Note in English: For example: shock, indifference, sadness, anxiety, curiosity, and so on. You may describe it in detail.

C2.

Italian: Con il passare del tempo, come è cambiata la sua emozione/percezione rispetto alla chiusura delle Due Torri?

English: Over time, how has your emotion or perception regarding the closure of the Due Torri changed?

Options:

- La sensazione si è intensificata / The feeling has become stronger
- Mi sono abituato/a / I have gradually become used to it
- Non è cambiata sostanzialmente / It has not changed substantially
- Non ho mai provato una sensazione particolare a riguardo / I have never had any particular feeling about it

C3.

Italian: La chiusura delle Due Torri, cioè il fatto di non potersi più avvicinare o salire, le ha dato la sensazione di "avere perso" una certa forma di legame con la città di Bologna?

English: Has the closure of the Due Torri, namely no longer being able to approach or climb them, given you the feeling of having "lost" a certain form of connection with the city of Bologna?

Options:

- Per niente / Not at all
- Un po / A little

- In modo abbastanza evidente / Quite clearly
- In modo molto forte / Very strongly

C3 supplementary question.

Italian: Può descrivere brevemente questa sensazione?

English: Can you briefly describe this feeling?

C4.

Italian: Secondo lei, che ruolo svolgono le Due Torri nell'identità urbana di Bologna e nel senso di appartenenza dei suoi abitanti?

English: In your opinion, what role do the Due Torri play in Bologna's urban identity and in residents' sense of belonging?

C5.

Italian: Per lei, le Due Torri sono più vicine a quale delle seguenti percezioni?

English: For you, which of the following perceptions are the Due Torri closer to?

Options:

- Sono più simili a un "monumento / simbolo" visto da lontano (ad esempio: rappresentano il potere, la storia, l'immagine della città) / They are more like a "monument / symbol" seen from a distance, representing power, history, and the image of the city
- Sono più simili a un "luogo della vita quotidiana" (ad esempio: un posto dove si passa spesso, ci si dà appuntamento, si entra nel mercato, ecc.) / They are more like a "place of everyday life," for example a place one often passes by, meets friends, or enters the market
- Sono qualcosa a metà tra le due cose; è difficile distinguere / They are somewhere between the two; it is difficult to distinguish

C6.

Italian: Se un giorno, per motivi di sicurezza, una delle Due Torri non potesse più essere mantenuta (venisse demolita o chiusa definitivamente), pensa che questo influenzerebbe: a) l'immagine di Bologna ai suoi occhi? b) il suo senso personale di appartenenza alla città?

English: If one day, for safety reasons, one of the Due Torri could no longer be maintained, and had to be demolished or permanently closed, do you think this would affect: a) the image of Bologna in your eyes; b) your personal sense of belonging to the city?

Options:

- Avrebbe un impatto significativo su entrambe le cose / It would have a significant impact on both
- Influirebbe soprattutto sull'immagine della città, ma poco sul mio senso di appartenenza / It would mainly affect the image of the city, but have little impact on my sense of belonging
- Influirebbe soprattutto sul mio senso di appartenenza / It would mainly affect my sense of belonging
- Avrebbe un impatto limitato / è difficile dirlo / It would have a limited impact / it is difficult to say
- Altro / Other

Part IV – Ricostruzione, narrazioni mancanti & futuri possibili / Reconstruction, Missing Narratives, and Possible Futures

D1.

Italian: Per quanto ne sa, come valuta le attuali presentazioni delle Due Torri da parte di musei / istituzioni ufficiali?

English: As far as you know, how do you evaluate the current presentation of the Due Torri by museums or official institutions?

Options:

- Le considero abbastanza complete / I consider them quite complete
- Penso che alcuni aspetti importanti siano trascurati / I think some important aspects are neglected
- Non conosco bene le presentazioni ufficiali / I do not know the official presentations well

D2.

Italian: Nelle presentazioni che ha visto (siti ufficiali, visite guidate, promozione turistica, media, ecc.), quali dei seguenti temi le sembra siano "raccontati troppo poco" e dovrebbero essere valorizzati di più? (Selezioni tutte le opzioni pertinenti)

English: In the presentations you have seen, such as official websites, guided tours, tourism promotion, media, and so on, which of the following themes seem to be "told too little" and should be given more attention? (Select all that apply)

Options:

- Rischi strutturali delle torri e monitoraggio ingegneristico / Structural risks of the towers and engineering monitoring
- Esperienze di vita quotidiana degli abitanti (mercato, artigianato, caffè, la piazza di sera, ecc.) / Everyday life experiences of residents, such as the market, craftwork, cafés, and the square at night
- Esperienze della città in tempi di guerra e crisi (bombardamenti, quotidianità in stato d'emergenza, aiuti pubblici, ecc.) / Urban experiences in times of war and crisis, such as bombings, everyday life under emergency conditions, and public aid
- Esperimenti scientifici e storia dell'università (ad esempio esperimenti di caduta libera, ecc.) / Scientific experiments and university history, for example free-fall experiments
- Storie legate all'amore, alla vita studentesca, ai racconti e alle leggende / Stories related to love, student life, tales, and legends
- Altro / Other

D3.

Italian: Secondo lei, il livello di conoscenza delle Due Torri tra le generazioni più giovani (compresa la sua) è:

English: In your opinion, the level of knowledge of the Due Torri among younger generations, including your own, is:

Options:

- Sufficiente / Sufficient
- Non ancora sufficiente; sarebbe necessario trasmettere meglio questi ricordi / Not yet sufficient; these

memories need to be transmitted better

- Non saprei / Not sure

D4.

Italian: Come valuta le attuali misure di protezione e consolidamento adottate per le Due Torri?

English: How do you evaluate the current protection and consolidation measures adopted for the Due Torri?

Note in Italian: Può descrivere in tre o quattro frasi se è favorevole, quali sono le Sue eventuali preoccupazioni o le Sue aspettative, ecc.

Note in English: Please describe in three or four sentences whether you support these measures, and what your possible concerns or expectations are.

D5.

Italian: Secondo lei, un progetto di ricostruzione virtuale può aiutare soprattutto a trasmettere quali valori fondamentali delle Due Torri alle generazioni più giovani?

English: In your opinion, what core values of the Due Torri could a virtual reconstruction project most effectively help transmit to younger generations?

Note in Italian: Ad esempio: memoria della città, vita quotidiana, esperienze di guerra, esperimenti scientifici, immaginari letterari, ricordi condivisi con amici/familiari, ecc.

Note in English: For example: urban memory, everyday life, wartime experiences, scientific experiments, literary imagination, memories shared with friends or family members, and so on.

D6.

Italian: Se una futura esperienza VR sulle Due Torri dovesse concentrarsi soprattutto sui seguenti filoni narrativi, quali vorrebbe vedere maggiormente rappresentati? (Può selezionare una o più opzioni)

English: If a future VR experience about the Due Torri were to focus mainly on the following narrative lines, which would you most like to see represented? (You may select one or more options)

Options:

- Medioevo: rivalità tra famiglie, torri come strutture di potere e difesa / The Middle Ages: rivalry between families, towers as structures of power and defense
- Vita quotidiana in epoca moderna e contemporanea: mercato, artigianato, caffè, vita nella piazza / Everyday life in the modern and contemporary periods: markets, crafts, cafés, and life in the square
- Esperienze urbane in tempi di guerra e crisi: bombardamenti, nascondigli, vita quotidiana in situazione di emergenza / Urban experiences in times of war and crisis: bombings, shelters, and everyday life under emergency conditions
- Immaginari legati alla scienza e alla letteratura: esperimenti di caduta libera, riferimenti danteschi, ecc. / Scientific and literary imaginaries: free-fall experiments, Dante-related references, and so on
- Rappresentazioni artistiche e surreali / Artistic and surreal representations
- Altro / Other

D7.

Italian: Pensa che “esplorare le torri virtuali insieme ad altre persone, parlando e indicando cose in tempo reale” possa rafforzare di più i suoi ricordi di Bologna rispetto a un’esplorazione individuale?

English: Do you think that exploring the virtual towers together with other people, while talking and pointing things out in real time, could strengthen your memories of Bologna more than an individual exploration?

Options:

- Sì, preferirei un'esperienza condivisa con altre persone / Yes, I would prefer a shared experience with other people
- No, per me un'esperienza individuale è sufficiente / No, an individual experience is sufficient for me
- Non so / dipende dal tipo di progetto / I do not know / it depends on the type of project

D8.

Italian: Se dovesse scegliere un solo tipo di esperienza, quale formato preferirebbe?
English: If you had to choose only one type of experience, which format would you prefer?
Options:

- Tipo "museo": principalmente esplorazione libera (si esplora lo spazio con un proprio ritmo) / "Museum-like": mainly free exploration, where one explores the space at one's own pace
- Tipo "film / teatro": principalmente guidata da una trama e da una narrazione più strutturata / "Film / theatre-like": mainly guided by a plot and a more structured narrative
- Tipo "gioco": una via di mezzo, esplorazione libera ma con piccole storie che si attivano strada facendo / "Game-like": an intermediate form, with free exploration and small stories triggered along the way
- Altro / Other

A.3 Summary of Results

First, regarding the first association with the Due Torri, "historical monument" appeared most frequently, selected by 15 respondents. "Reference point on the way home" was selected by 11 respondents, while "postcard-like tourist spot" and "meeting place" were each selected by 7 respondents. This suggests that the Due Torri are understood simultaneously through monumentality, landmark identity, and everyday spatial use.

Second, regarding self-assessed knowledge of the towers' history, 3 respondents reported knowing "almost nothing," 10 reported knowing "a little," 6 reported knowing "quite a lot," and 1 reported knowing "a lot." The sample therefore mainly consisted of participants with limited or moderate knowledge.

Third, regarding the emotional impact of closure, 10 respondents indicated that they had gradually become used to it, 4 reported that their emotional response had become stronger, 4 reported no substantial change, and 2 reported no particular feeling. Regarding the sense of losing a connection with the city, 10 respondents reported that the closure

affected them "a little," 5 reported a very strong impact, 2 reported a relatively evident impact, and 3 reported no impact at all.

Fourth, when asked whether the Due Torri are closer to a monument or an everyday place, 12 respondents considered them to be somewhere between the two, 5 tended to understand them as a monument or urban symbol viewed from a distance, and 3 tended to understand them as a place of everyday life.

Fifth, regarding official narratives, 17 respondents stated that they did not know official presentations or institutional narratives well, while 3 believed that current presentations neglect some important aspects. This indicates that many respondents have limited contact with existing institutional narratives.

Sixth, regarding intergenerational transmission, 10 respondents believed that younger generations still do not know enough about the Due Torri and that related memories need to be better transmitted; 7 were unsure; and only 3 considered current knowledge transmission to be basically sufficient.

Seventh, regarding future experience formats, 7 respondents clearly preferred a shared experience with others, 2 considered an individual experience sufficient, and 11 answered that it depends on the type of project. In terms of format, 12 respondents preferred a "game-like" experience, 5 preferred a "film / theatre-like" guided narrative, 1 preferred a "museum-like" free exploration, and the remaining 2 provided open-ended answers.

A.4 Excerpts from Open-ended Responses

A.4.1 Responses to A6

Question in Italian: Quando si trova sotto le Due Torri, qual è la sensazione "non visiva" più forte che ricorda?

Question in English: When you are standing beneath the Due Torri, what is the strongest "non-visual" sensation you remember?

Table A.1 Selected Responses to A6

Respondent	Original response in Italian	English translation
Nunzio	La densità delle persone e il senso di appartenenza alla città	The density of people, and a sense of belonging to the city.
Interno	Rumore del traffico e delle persone	The sound of traffic and people.
Charlie	Un senso di strettezza	A sense of narrowness and constriction.
K	La sensazione di essere al centro della città dove tutto è raggiungibile a piedi	The feeling of being at the center of the city, where everything is reachable on foot.

Respondent	Original response in Italian	English translation
Bb08	Densità di persone, stanchezza per mancanza di luoghi in cui decomprimere / sedersi	Many people, and a sense of fatigue caused by the lack of places to rest, sit, or decompress.
MacKenzie 102%	Un tonfo al cuore	A sudden sinking feeling in the heart.

A.4.2 Responses to A7

Question in Italian: Può descrivere un episodio personale particolarmente memorabile legato alle Due Torri?

Question in English: Can you describe a particularly memorable personal episode related to the Due Torri?

Table A.2 Selected Responses to A7

Respondent	Original response in Italian	English translation
Interno	La prima volta che ho incontrato le persone con cui avrei passato tutta la mia carriera universitaria	The first time I met the people with whom I would spend my entire university life.
Charlie	La prima birra a Bologna l'ho presa in un bar sotto le due torri	I had my first beer in Bologna in a bar beneath the Due Torri.
Alessia	Uno dei primi giorni a Bologna stavo passeggiando per delle strade che non conoscevo, non ero sicura che quella fosse la strada giusta per tornare a casa, ma quando ho alzato lo sguardo ho visto le torri e mi sono subito ritrovata	During one of my first days in Bologna, I was walking through streets I did not know and was not sure whether I was on the right way home. When I looked up and saw the towers, I immediately found my bearings again.
K	La frase detta ad amici e non: "Ci vediamo stasera sotto le torri"	The phrase I often said to friends and others: "See you tonight under the towers."
Melissa	Erano venuti a trovarci dei parenti americani con cui avevamo perso i contatti e li abbiamo ritrovati su Facebook durante il covid. Stavamo facendo il giro di Bologna e il tour dei 7 segreti e parlavamo della storia di questa città.	Some American relatives came to visit us. We had lost contact with them and reconnected through Facebook during Covid. We were walking around Bologna, doing the tour of the seven secrets, and talking about the history of the city.
Marco Rossi	Ricordo una volta in cui sono andato con amici per assistere a un concerto all'aperto in Piazza Ravegnana; è stata un'esperienza indimenticabile.	I remember once going with friends to attend an outdoor concert in Piazza Ravegnana; it was an unforgettable experience.

A.4.3 Responses to C1

Table A.3 Selected Responses to C1

Respondent	Original response in Italian	English translation
Polemica	Tristezza	Sadness.
Charlie	Stupore e leggero timore che un luogo così iconico potesse cadere	Surprise, and a slight fear that such an iconic place could collapse.
Fabio Barattini	Sul momento potevo capire la necessità, in luce degli anni passati con le torri transennate sento che possa essere una grave mancanza per i giovani l'ammirarle nella loro completezza	At that moment I could understand the necessity, but considering the years during which the towers have been fenced off, I feel it may be a serious loss for young people not to be able to admire them in their entirety.
Il ciappinaro	Shock, non pensavo avrebbero chiuso anche l'altra torre	Shock. I did not think they would close the other tower as well.
Manuel	Preoccupazione per la sicurezza della zona e per il decoro urbano	Concern for the safety of the area and for the urban appearance.

Respondent	Original response in Italian	English translation
Marco Rossi	Quando ho saputo per la prima volta della chiusura delle Due Torri, ho provato un forte senso di tristezza e perdita. Sentivo che si stava portando via un pezzo della mia connessione con la città e con la sua storia.	When I first learned about the closure of the Due Torri, I felt a strong sense of sadness and loss. I felt that a piece of my connection with the city and its history was being taken away.

A.4.4 Responses to C3 Supplementary Question

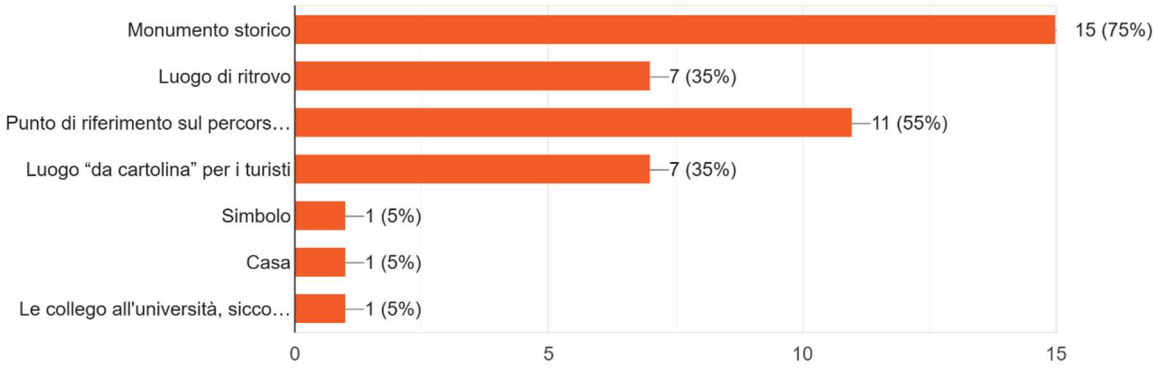
Table A.4 Selected Responses to C3 Supplementary Question

Respondent	Original response in Italian	English translation
Interno	Tristezza per la consapevolezza che forse non ci salirò mai	Sadness at the awareness that perhaps I will never climb them.
Polemica	Per ora il cuore del centro è chiuso, impedisce di incontrarcisi e passare le sere sotto le torri, oltre a essere scomodo per il passaggio	For now, the heart of the city center is closed. It prevents people from meeting there and spending evenings beneath the towers, and it is also inconvenient for passing through.
Alessia	Sono un simbolo della città e sono care a tutti i suoi abitanti e ora che sono chiuse è come se fossero più distanti da noi, un po' come quando un caro parente è in ospedale, speri che uscirà al più presto ma nel frattempo ne soffri la mancanza	They are a symbol of the city and dear to all its inhabitants. Now that they are closed, it feels as if they are more distant from us, a bit like when a close relative is in hospital: you hope they will come out soon, but in the meantime you feel their absence.
K	Prima della chiusura era una piazza percorribile a piedi e smistava traffico pedonale che adesso si affolla all'incrocio sulla strada. Se non ci fosse la chiusura mi sentirei più libero	Before the closure, it was a square that could be crossed on foot and that distributed pedestrian movement. Now people crowd at the street intersection. If there were no closure, I would feel freer.
Anonimus 9.0	Dal punto di vista panoramico e culturale è un peccato che non vi si può più accedere perché vedere la città dall'alto dà una bella sensazione ed è anche una prospettiva particolare rispetto al quotidiano	From a panoramic and cultural point of view, it is a pity that one can no longer access them, because seeing the city from above gives a beautiful feeling and offers a perspective different from everyday life.
Marco Rossi	Sì, ho sentito di aver perso una parte della mia identità legata a Bologna, non poter salire sulle torri significava non poter più vivere un'esperienza personale e unica che mi legava al patrimonio della città.	Yes, I felt that I had lost part of my identity connected to Bologna. Not being able to climb the towers meant no longer being able to live a personal and unique experience that connected me to the city's heritage.

A.5 Charts from the Results

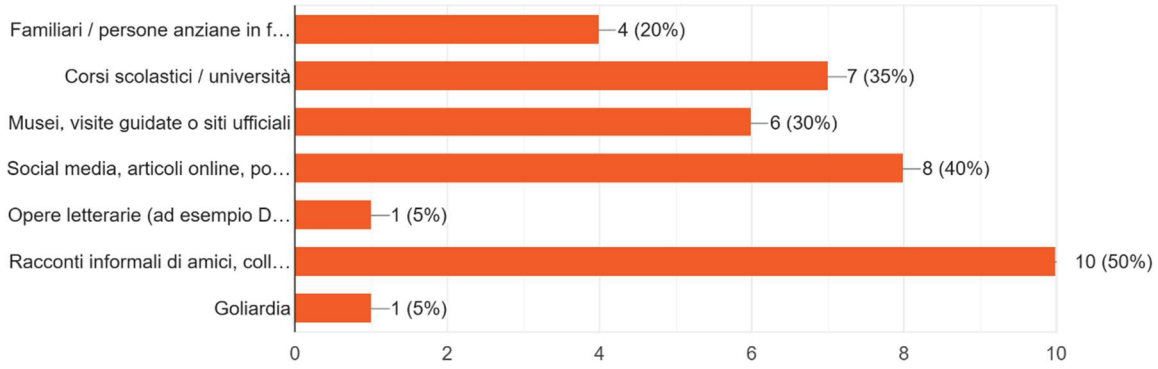
A3: In poche parole o con una frase, qual è la sua prima associazione quando pensa alle "Due Torri"? (Selezioni tutte le opzioni pertinenti)

20 responses



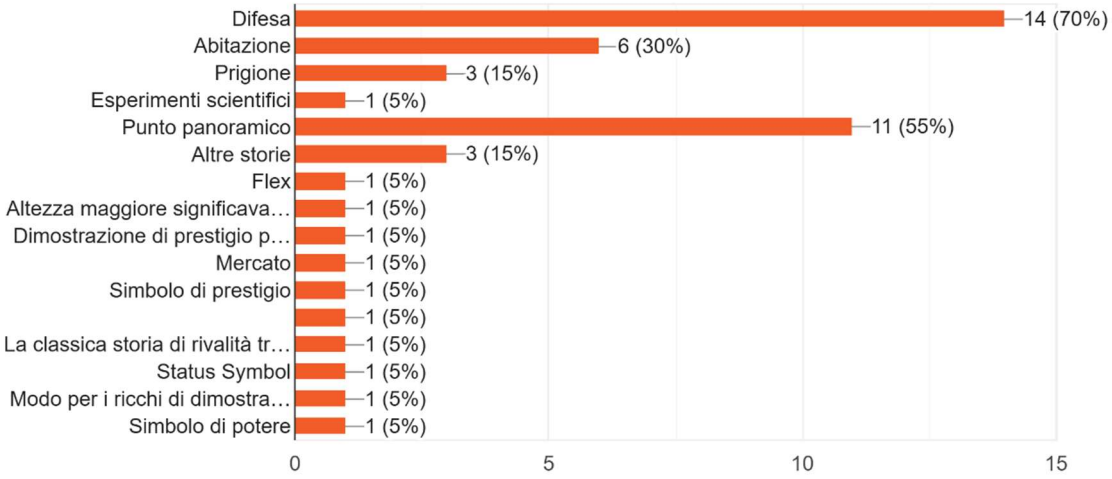
B2: Da dove provengono principalmente le sue conoscenze sulla storia o sulle leggende delle Due Torri? (Selezioni tutte le opzioni pertinenti)

20 responses



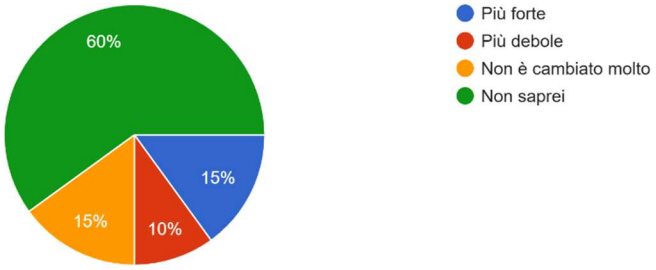
B3: Quali usi storici delle Due Torri conosce o ricorda? (Selezioni tutte le opzioni pertinenti)

20 responses



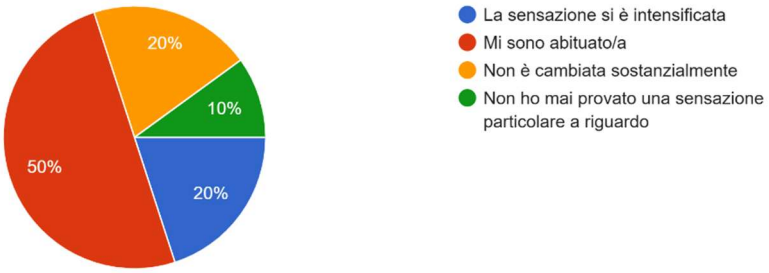
B7: Rispetto alla generazione precedente, come descriverebbe il suo legame emotivo con le Due Torri?

20 responses



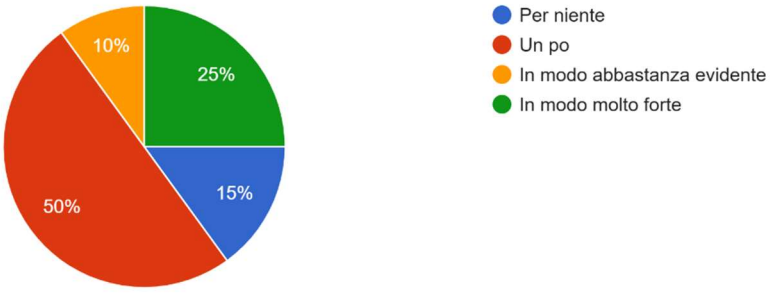
C2: Con il passare del tempo, come è cambiata la sua emozione/percezione rispetto alla chiusura delle Due Torri?

20 responses



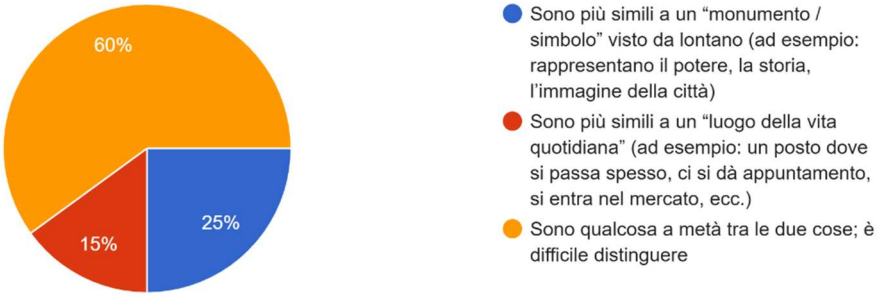
C3: La chiusura delle Due Torri (il fatto di non potersi più avvicinare o salire) le ha dato la sensazione di "avere perso" una certa forma di legame con la città di Bologna?

20 responses



C5: Per lei, le Due Torri sono più vicine a quale delle seguenti percezioni?

20 responses



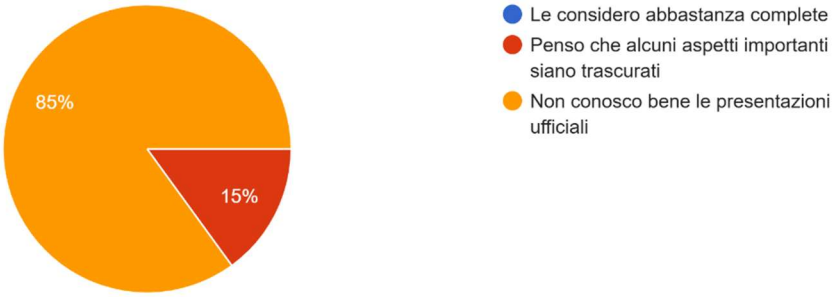
C6: Se un giorno, per motivi di sicurezza, una delle Due Torri non potesse più essere mantenuta (venisse demolita o chiusa definitivamente), pensa ...l suo senso personale di appartenenza alla città?

20 responses



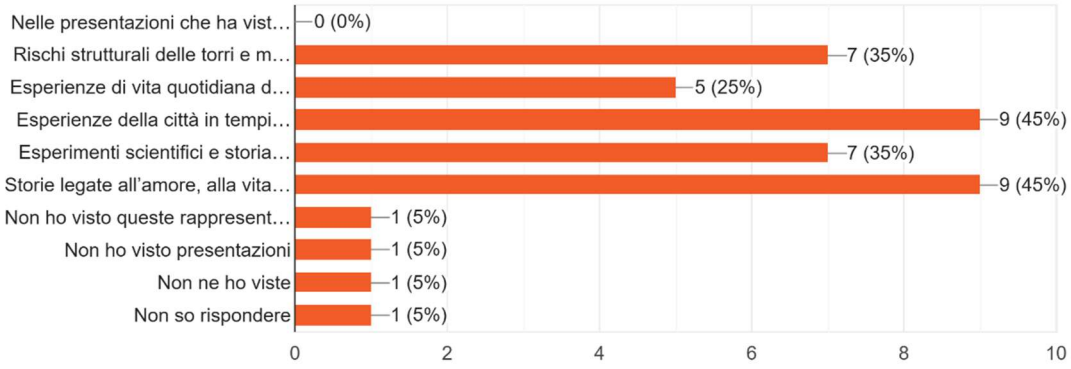
D1: Per quanto ne sa, come valuta le attuali presentazioni delle Due Torri da parte di musei / istituzioni ufficiali?

20 responses



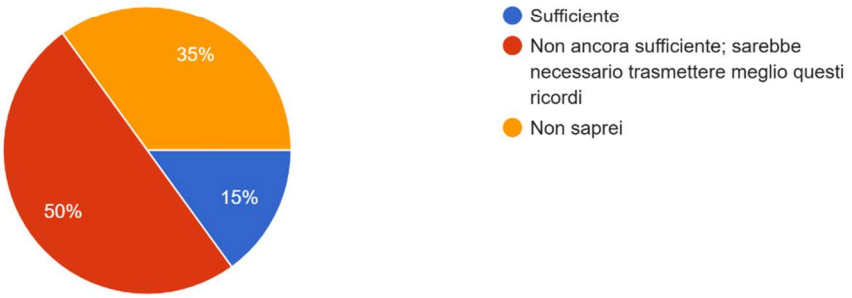
D2: Nelle presentazioni che ha visto (siti ufficiali, visite guidate, promozione turistica, media, ecc.), quali dei seguenti temi le sembra siano "raccontati tr...zati di più? (Selezioni tutte le opzioni pertinenti)

20 responses



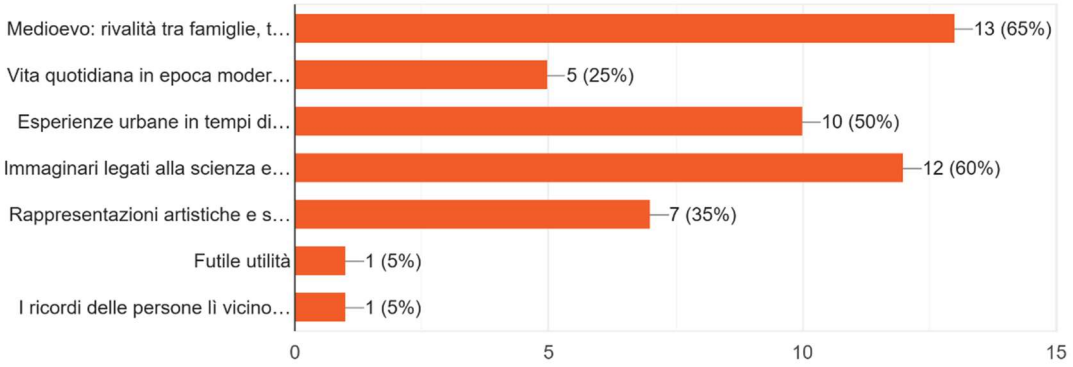
D3: Secondo lei, il livello di conoscenza delle Due Torri tra le generazioni più giovani (compresa la sua) è:

20 responses



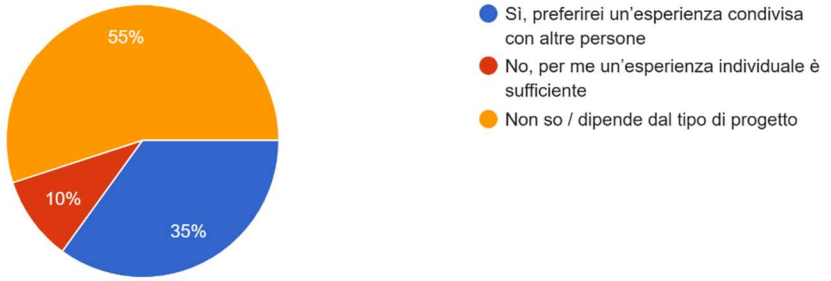
D6: Se una futura esperienza VR sulle Due Torri dovesse concentrarsi soprattutto sui seguenti filoni narrativi, quali vorrebbe vedere maggiormente rappresentati? (Può selezionare una o più opzioni)

20 responses



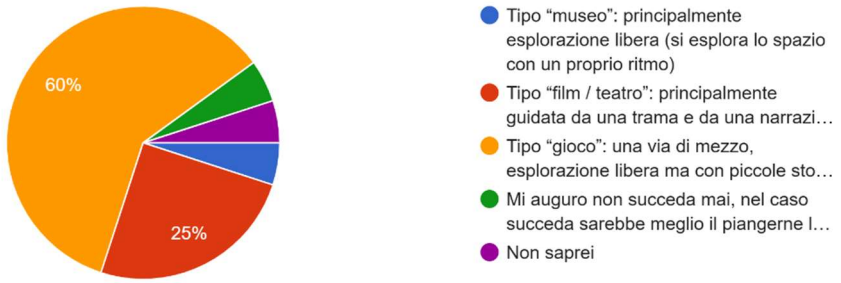
D7: Pensa che "esplorare le torri virtuali insieme ad altre persone, parlando e indicando cose in tempo reale" possa rafforzare di più i suoi ricordi di Bologna rispetto a un'esplorazione individuale?

20 responses



D8: Se dovesse scegliere un solo tipo di esperienza, quale formato preferirebbe?

20 responses



Appendix B Ethnographic Material Bank

This appendix presents selected excerpts from the ethnographic material bank and narrative asset list developed during the Excavation and Interpretation stages. It explains how this research extracted relational materials for later design from field observation, questionnaires, historical images, museum displays, and public narratives.

Due to the length limitations of the thesis, the full material bank is not included here. Instead, representative entries are selected. The material bank records original observations and memory clues, while the narrative asset list further explains how these materials were translated into spaces, plots, interfaces, or perceptual mechanisms in the later prototype.

B.1 Overview of the Material Bank Categories

Table B.1 Overview of Material Bank Categories

Theme category	Number of items	Main sources	Research focus	Representative item numbers
Historical Symbolism	35	Museums, archival drawings, historical models, historical images	Historical formation of the Due Torri and the city of towers; spatial power and symbolic meaning	MB01, MB02, MB03
Public Narrative	26	Prints, museum displays, digital archives, urban promotional materials	How the Due Torri are institutionally narrated and publicly circulated	MB04, MB06, MB07
Everyday Experience	18	Field observation, questionnaire, everyday spatial records, historical urban images	Routes, meetings, perceptions, and memories of the Due Torri in everyday life	MB08, MB19, MB21
Crisis / Governance	15	Historical notices, measured drawings, barrier information, governance materials	Transformation of the Due Torri through crisis, restoration, administrative management, and monumentalization	MB30, MB31, MB32
Emotional Response	2	Questionnaire conclusions, fieldwork interpretation	Emotional changes caused by closure and the sense of absence generated by being “visible but inaccessible”	MB75, MB76
Total	96	—	—	—

B.2 Representative Entries from the Material Bank

Table B.2 Representative Entries from the Material Bank

No.	Material summary	Source type	Core evidence / observation	Preliminary theme	Later use
MB01	Reconstruction model of medieval Bologna made by Angelo Finelli in 1916–1917	Museum record, field notes	The model reconstructs the "city of towers" landscape based on documents and archaeological findings, presenting the spatial imagination of the lost tower city	Historical Symbolism	Supports the overall historical image of the city of towers and the symbolic basis of "vertical Bologna"
MB02	1658 drawing of the upper part of a tower and its bell structure	Museum, historical drawing	The drawing shows defensive battlements, a domed bell tower, and other structures, indicating that the function of the tower changed over time	Historical Symbolism	Supports the interpretation of the Due Torri's transformation from family / military symbols to public functions
MB03	Image of a reconstruction model of thirteenth-century Bologna	Museum, field photograph	The image shows a dense tower landscape and city wall system, indicating that towers were important elements of urban boundaries and power distribution	Historical Symbolism	Supports the geographical and political position of the Due Torri within the city of towers
MB04	1845 print showing the urban view of the Due Torri	Online image, historical painting	The image presents the Due Torri together with surrounding public life, while also showing differences between their historical base environment and current condition	Public Narrative	Used to analyze how the Due Torri were visualized as the center of the urban landscape
MB06	Urban scale model in the Medieval Museum	Museum, field photograph	The museum uses the model to present the lost "city of towers" to the public	Public Narrative	Used to analyze how institutional exhibition shapes public memory
MB07	Historical newspapers and urban images in digital archives	Website, digital archive	Digital media allow fragmented historical images to re-enter public visibility	Public Narrative	Supports how the Due Torri are re-publicized in the present
MB08	Museum panel on the social logic of "arcades and towers"	Museum panel	The panel juxtaposes vertical towers and horizontal arcades, revealing the spatial distinction between power and everyday production	Everyday Experience	Supports the analysis of vertical / horizontal spatial relations
MB19	Seventeenth-century panoramic print of the square and commercial activities	Historical print	The image shows active commerce, traffic, and public life around the base of the Due Torri	Everyday Experience	Supports the analysis of the Due Torri area as a long-term node of everyday activities
MB21	Early nineteenth-century sketch of Piazza di Porta Ravegnana	Historical image	The square had a more everyday and continuous commercial atmosphere before modern transformation	Everyday Experience	Supports the interpretation of the coexistence between the Due Torri and surrounding everyday space
MB30	Historical photograph of Piazza di Porta Ravegnana in 1871	Historical photograph	Records the demolition of attached buildings and the process of monumentalization, revealing the tension between municipal planning and public emotion	Crisis / Governance	Used to analyze how the space around the Due Torri was reorganized by administrative power
MB31	Municipal notice before demolition and photograph of the church at the tower base	Historical notice, historical photograph	Reflects the logic of compulsory acquisition and spatial clearing by the administration	Crisis / Governance	Supports the historical analysis of spatial governance around the Due Torri
MB32	1902 measured elevation of Torre Garisenda	Engineering measured drawing	Shows that the Due Torri entered a stage of scientific monitoring and structural protection	Crisis / Governance	Supports the perspective of crisis governance and engineering-oriented conservation
MB75	Questionnaire finding: absence created by closure as "visible but inaccessible"	Questionnaire interpretation	Although the public can still see the Due Torri, their spatial and emotional relationships with them have significantly changed	Emotional Response	Supports the argument that "absence" refers not only to disappearance, but also to relational transformation

No.	Material summary	Source type	Core evidence / observation	Preliminary theme	Later use
MB76	Questionnaire finding: "accustomed risk" at the public level	Questionnaire interpretation	Negative emotions may become normalized over time, and the public gradually adapts to the state of closure	Emotional Response	Supports the need to actively reconstruct public relationships with heritage

B.3 Narrative Assets List

Table B.3 Narrative Assets List

Asset No.	Asset name	Source material No.	Narrative type	Relational category	Affective tendency	Condensed core interpretation
NA01	Constructed center of meaning	MB12, MB14, MB93, MB94, MB95, MB96	Interpretation	Billboard	Curiosity	The current status of the Due Torri as an "urban name card" is not natural, but has been continuously produced and reinforced through religious images, demolition disputes, urban restoration, and spatial reorganization.
NA02	The Due Torri as an urban and spiritual interface	MB86, MB87, MB89, MB90	Interpretation	Billboard	Reconnection, Curiosity	The Due Torri are not only landscape objects, but also public interfaces that can be inscribed, occupied, commemorated, and mobilized.
NA03	Crisis, construction, and display	MB75, MB88, MB91, MB92	Interpretation	Billboard	Distance, Loss	Closure has not removed the Due Torri from public visibility; instead, it has transformed them into crisis images to be governed, explained, and circulated.
NA04	Image or identity?	MB56, MB66, MB83	Speculation	Billboard	Curiosity	The Due Torri are highly recognizable in public communication, but they are often consumed first as visual symbols, while their historical complexity is compressed.
NA05	Anchor of the forest of power	MB15, MB16, MB17, MB47, MB63	Evidence	Lighthouse	Awe	The height of medieval towers first served surveillance, safety, and political domination, rather than simply being something to be seen from afar.
NA06	Translation of the right to view	MB52, MB68, MB84	Interpretation	Lighthouse	Curiosity	The tower-top perspective gradually shifted from a historically controlling gaze to a modern tourist consumption of the urban panorama.
NA07	Formation of urban orientation	MB11, MB35, MB65, MB69, MB72, MB74	Speculation	Lighthouse	Familiarity	In many people's experience, the Due Torri are not abstract landmarks, but urban devices that repeatedly activate orientation during movement.
NA08	Embodied experience and post-crisis visual concentration	MB71, MB72, MB74	Speculation	Lighthouse	Familiarity, Awe	Even after closure, the Due Torri continue to dominate urban perception through upward gazes, pauses, gatherings, and crowdedness.
NA09	Competition of height	MB26, MB62, MB63	Evidence	Playground	Awe	The tower landscape itself resulted from the continuous vertical

Asset No.	Asset name	Source material No.	Narrative type	Relational category	Affective tendency	Condensed core interpretation
						competition among families; height was a public confrontation of politics and technology.
NA10	Difficult engineering and legends beyond reality	MB81, MB82	Interpretation	Playground	Curiosity, Awe	When engineering difficulty exceeds everyday experience, towers are translated into legends and myths in popular imagination.
NA11	Imagination of science and progress	MB52, MB85	Interpretation	Playground	Curiosity	The Due Torri gradually shifted from defensive structures to vertical experimental objects capable of carrying scientific experiments and technological adventures.
NA12	Performance space and heroism	MB84	Interpretation	Playground	Awe, Curiosity	Extreme height not only creates awe, but also summons a logic of climbing, conquest, and public performance.
NA13	Geographical point of convergence	MB04, MB23, MB34, MB44, MB58, MB60	Evidence	Hall	Familiarity, Awe	The importance of the Due Torri lies not only in verticality, but also in their position at the intersection of streets, arcades, commerce, and pedestrian flows.
NA14	Everyday coexistence across social classes	MB18, MB19, MB21, MB70	Interpretation	Hall	Familiarity, Reconnection	The Due Torri were long embedded in a highly everyday and mixed market system where different social classes coexisted.
NA15	Relationships and individual memory	MB69, MB72, MB73, MB74	Interpretation	Hall	Reconnection, Familiarity	For many people, the Due Torri are first a relational place of “meeting here” and “finding the way here,” rather than heritage explained through a system.
NA16	The towers as a public issue	MB75, MB76, MB77	Speculation	Hall	Reconnection, Familiarity	The Due Torri continue to carry judgments, discussions, and public issues among different groups concerning Bologna.
NA17	A constantly changing vertical skeleton	MB05, MB17, MB39, MB40	Evidence	Host	Curiosity	The Due Torri were not always the bare brick structures seen today; they long carried timber attachments, base spaces, and multi-layered composite structures.
NA18	Imprisonment, punishment, and invisible secrets	MB48, MB49, MB50	Evidence	Host	Distance	The Due Torri once contained hidden transactions, punishment, and internal control, functioning as spaces not always open to the public.
NA19	Shelter, wartime memory, and belonging	MB53, MB54, MB55	Interpretation	Host	Reconnection	During crisis and war, the Due Torri were reinterpreted as supports for protection, orientation, and collective memory.
NA20	Artistic intervention and historical imagination as inhabitation	MB57, MB59, MB61	Speculation	Host	Curiosity	The Due Torri have long been “inhabited” by different media, becoming containers for artistic creation and historical imagination.
NA21	Medieval aerial traffic system	MB20, MB22, MB24	Evidence	Bridge	Curiosity	The Due Torri were once embedded in a

Asset No.	Asset name	Source material No.	Narrative type	Relational category	Affective tendency	Condensed core interpretation
						horizontally extended aerial traffic system through elevated wooden bridges, tower-house complexes, and attached structures.
NA22	Witnesses of regional flows	MB33, MB36, MB37	Evidence	Bridge	Awe, Curiosity	The connectivity of the Due Torri occurred not only between tower and tower, but also at the larger scale of the city, roads, and regional movement.
NA23	Urban destiny and the future	MB88, MB91, MB92	Interpretation	Bridge	Distance, Reconnection, Loss	After the structural crisis, the Due Torri began to connect individuals, the city, and future destiny, becoming a key node in official narratives.
NA24	The surviving Due Torri as a bridge to the lost city of towers	MB01, MB03, MB06	Speculation	Bridge	Loss, Reconnection	Today, the Due Torri continue to connect the surviving remains with the lost whole, allowing the public to imagine the former city of towers.

Appendix C Official and Digital Platform Discourse Analysis of Bologna's Due Torri

C.1 Appendix Description

This appendix presents selected excerpts from the official and digital platform discourse analysis conducted during the digital ethnography stage. It supplements the discussion in the main text concerning the crisis, closure, and narrative transformation of the Due Torri. The objects of analysis include official and semi-official texts, tourism and ticketing pages, administrative and project governance pages, and selected publicly visible online discussions related to Bologna's Due Torri between 2023 and 2026.

Due to the length limitations of the thesis, the full corpus is not included here. Instead, this appendix preserves the research scope, source overview, core findings, keyword results, and representative evidence excerpts, in order to show how this research identifies differences among crisis governance narratives, institutional interpretive mechanisms, and public emotional expression in digital space.

C.2 Research Scope and Method Summary

Table C.1 Research Scope and Method Summary

Item	Content
Research object	Digital discourse formed around the structural crisis, closure, consolidation, fundraising, and long-term governance of Bologna's Due Torri between 2023 and 2026
Research aim	From the perspective of VHE, to examine how two narrative systems — official discourse (government / tourism / museum) and public discourse (platform discussions / travel reviews / social media) — define the meaning and crisis of the Due Torri
Official corpus scope	Municipal press releases, bulletins, administrative / legal texts, cultural / museum activity pages, tourism / ticketing information pages, fundraising pages, and project progress pages
Official sample size	26 official text units
Official sample period	Visible publication dates from October 2023 to February 2026, with a small number of pages during the closure period without clearly marked dates
Online sample scope	Publicly visible Reddit discussions, TripAdvisor reviews, Facebook public snippets, and donor messages
Comment sample size	53 comments: Reddit 25 / TripAdvisor 20 / Facebook 5 / donor messages 3
Analytical methods	Corpus construction and quantitative analysis of official discourse; structured factual timeline; online multi-voice netnography / thematic analysis
Value framework	E (Evidence) – I (Interpretation) – S (Speculation)

Item	Content
Note	The results should be understood as a "visibility cross-section" of the digital field, rather than as statistically representative public opinion

C.3 Overview of Official Corpus Source Types

Table C.2 Overview of Official Corpus Source Types

Source type	Number	Main narrative function
Municipal press releases / bulletins	7	Governance visibility, risk explanation, phased progress
Cultural / museum activity pages	6	Interpretive mechanism, public education, re-narration of urban memory
Administrative / legal texts	4	Institutional chain, funding, and engineering phases
Tourism / ticketing information (semi-official services)	4	Controlled experience, closure notice, alternative routes
Specialized websites / fundraising and crisis information aggregation	2	Explanation of closure, donation mobilization, update portal
Project management / progress visualization	2	Project-based governance, construction schedule, and funding structure
Public information material for residents / workers	1	Risk communication, warning system, and civil protection communication
Total	26	—

C.4 Online Discourse Themes

Table C.3 Online Discourse Themes

Theme	Core meaning	Representative expression direction
Urban identity and emotional attachment	The Due Torri are understood as anchors of Bologna's self-narration	"civic symbol," "city of memory," "hope children can also smile under the towers"
Distrust toward governance and information transparency	The public finds governance language difficult to understand or questions responsibility	"I cannot understand the notice," "who is responsible," "why is it still closed"
Tourism regret and accessibility anxiety	Users first ask whether it is still possible to climb, when it will reopen, and where alternative viewpoints are	"still closed," "where can I see it," "trip disappointment"
Restoration hope and intergenerational transmission	In donor and supportive messages, the Due Torri are framed as a shared heritage to be passed on to the next generation	"hope children can also enjoy it," "cannot wait to see the towers without barriers again"

C.5 Digital Platform Comment and Sentiment Analysis

Table C.4 Digital Platform Comment and Sentiment Analysis

Platform	Sample size n	Average sentiment (-1 to +1)	Negative ratio	Positive ratio	Neutral ratio
Reddit r/bologna	25	-0.021	23.7%	28.9%	47.4%

Platform	Sample size n	Average sentiment (-1 to +1)	Negative ratio	Positive ratio	Neutral ratio
TripAdvisor	20	-0.258	41.7%	0.0%	58.3%
Facebook public snippets	5	-0.360	80.0%	0.0%	20.0%
Donor messages, Art Bonus site	3	0.333	0.0%	33.3%	66.7%

C.6 Core Findings

1. A dual value framework in official discourse: In official texts from 2023 to 2026, the value of the Due Torri is usually organized through a dual framework. On the one hand, the towers are narrated as an "urban symbol / historical heritage." On the other hand, they are framed through "public safety – engineering governance – institutionalized risk management." These two lines do not exclude each other. In some cultural project pages, they are actively bridged: the restoration site and crisis scene are re-narrated as opportunities for public education, urban memory, and renewed identification.

2. Crisis translated into a manageable governance process: The core strategy of official crisis narratives is to translate "instability / risk" into a process that can be monitored, warned against, prepared for, and advanced in phases. Related texts repeatedly use terms such as monitoring, enclosure, traffic diversion, control room, warning system, observation method, funding, and phased progress. This shows that the crisis is engineered, administratively managed, and projectized.

3. Three roles of the "public" in official texts: The public is not a single object in official narratives, but is organized into at least three roles. First, the public appears as a group that needs to be protected and informed. Second, the public is organized as "multiple publics" through cultural projects, museum activities, and educational mechanisms. Third, through Art Bonus and donation platforms, citizens and global supporters are called upon as co-guardians of the towers.

4. Online public discourse emphasizes "closure – barriers – regret": Compared with official texts, the high-frequency meaning centers in public digital platforms clearly shift toward "closed," "cordoned," "regret," and "problem." In other words, after the crisis, the Due Torri are first perceived in public discourse as inaccessible objects of absence, rather than simply as medieval buildings or urban symbols.

5. Tourists and local residents have different emotional structures: Based on the emotional distribution of comment samples, non-local tourists tend to express "regret / disrupted travel plans," while local or long-term residents present a mixed structure of "explanation – complaint – hope." Donor messages, by contrast, tend to express support, expectation, and intergenerational transmission.

Appendix D Prototype Evaluation Questionnaire

D.1 Appendix Description

This appendix presents the questionnaire used during the user testing stage, as well as the summarized results. The user test consisted of four parts: a pre-test questionnaire, the first post-experience questionnaire, the second post-experience questionnaire, and the final comparative questionnaire. The first and second post-experience questionnaires shared the same structure and were used to evaluate the two narrative prototypes in terms of understanding, emotion, multiplicity, agency, visit intent, and current life relevance. The final comparative questionnaire recorded participants' direct comparison and preference between the two versions.

All results were organized by participant number and used for analysis in Chapter 6.

D.2 Questionnaire Items

D.2.1 Pre-test Questionnaire

1. English: Before participating in this test, had you heard of Bologna's Due Torri?
   Chinese: 在参与本次测试之前，您是否听说过博洛尼亚双塔（Le Due Torri）？
2. English: Have you ever been near the Due Torri in Bologna or seen them on site?
   Chinese: 您是否去过博洛尼亚双塔附近或现场看过双塔？
3. English: How interested are you usually in historical buildings, cultural heritage, or urban memory?
   Chinese: 您平时对历史建筑、文化遗产或城市记忆类内容的兴趣程度如何？
4. English: Do you actively pay attention to cultural heritage conservation, restoration, or related public issues?
   Chinese: 您是否会主动关注文化遗产保护、修复或相关公共议题？

D.2.2 First and Second Post-experience Questionnaires

The first and second post-experience questionnaires had the same structure and consisted of scale questions and open-ended questions. These questions were not designed only around "preference," but around several evaluative dimensions. Their purpose was to compare the two narrative prototypes in terms of cognition, emotion, relational understanding, and willingness to act. Based on the aim of this research, the questions corresponded to six dimensions: Understanding, Emotion, Multiplicity, Agency, Visit intent, and Current life relevance.

The scale questions used a seven-point Likert scale, where 1 indicated strong disagreement and 7 indicated strong agreement.

Understanding

This dimension evaluates whether participants understood the historical position, urban relations, and complex meanings of the Due Torri more clearly.

1. English: This experience helped me understand more clearly the position of the Due Torri in Bologna's urban history.

   Chinese: 本次体验帮助我更清楚地理解双塔在博洛尼亚城市历史中的位置。

2. English: This experience made me realize that the Due Torri are closely connected with everyday urban life and public space.

   Chinese: 本次体验让我意识到双塔与城市日常生活和公共空间之间存在紧密联系。

3. English: After the experience, my understanding of the Due Torri expanded from a single architectural object to a more complex relational level.

   Chinese: 体验结束后，我对双塔的理解已经从单一建筑对象扩展到更复杂的关系层次。

Emotion

This dimension evaluates whether the experience generated emotional fluctuation, empathy, and a sense of connection.

4. English: This experience produced a clear emotional response or emotional fluctuation in me toward the Due Torri.

   Chinese: 本次体验让我对双塔产生了明显的情感反应或情绪波动。

5. English: During the experience, I felt that some kind of connection was formed between myself and this heritage object.

   Chinese: 我在体验过程中感受到自己与这一遗产对象之间形成了某种连接。

6. English: This experience stimulated my desire to continue exploring the stories and current condition of the Due Torri.

   Chinese: 本次体验激发了我继续探索双塔相关故事和处境的愿望。

Multiplicity

This dimension evaluates whether participants recognized the multiple stories, subjects, and layers of meaning carried by the Due Torri.

7. English: This experience made me realize that the Due Torri carry multiple stories and perspectives.

   Chinese: 本次体验让我意识到双塔承载着多种不同的故事与视角。

8. English: I could feel that the meaning of the Due Torri is shaped by history, memory, everyday life, and contemporary crisis together.

   Chinese: 我能够感受到双塔的意义来自历史、记忆、日常生活与当代危机的共同作用。

Agency

This dimension evaluates whether the experience encouraged participants to learn more, pay attention to, or reflect on heritage issues.

9. English: This experience strengthened my willingness to continue learning about the current condition and restoration progress of the Due Torri.

   Chinese: 本次体验增强了我继续了解双塔现状与修复进展的意愿。

10. English: This experience increased my attention to public issues related to cultural heritage.

    Chinese: 本次体验提升了我对文化遗产公共议题的关注。

11. English: After the experience, I am more willing to think about how people build relationships with heritage.

    Chinese: 体验结束后，我更愿意思考人们如何与遗产建立关系。

Visit intent

12. English: This experience made me more willing to visit the Due Torri on site.

    Chinese: 本次体验让我更想去现场看看双塔。

Current life relevance

13. English: This experience made me feel that the Due Torri are still closely related to contemporary urban life.

    Chinese: 本次体验让我觉得双塔与今天的城市生活仍然密切相关。

Open-ended questions

1. English: Which fragment, interface, or content in this version moved you the most? Please briefly explain why.

   Chinese: 这一版本中，哪个片段、界面或内容最打动您？请简要说明原因。

2. English: After the experience, how would you describe “what the Due Torri are” to someone else in a few sentences?

   Chinese: 体验结束后，您会如何用几句话向别人描述“双塔是什么”？

3. English: In this experience, did you most strongly perceive historical information, spatial atmosphere, the relationship between people and the city, or something else? Please briefly explain.

   Chinese: 这次体验中，您最强烈感受到的是历史信息、空间氛围、人与城市的关系，还是别的内容？请简要说明。

D.2.3 Final Comparative Questionnaire

1. English: Compared with the two versions, which one made it easier for you to truly enter the situation and meaning of the Due Torri?

   Chinese: 两个版本相比，哪一个更容易让您真正进入双塔的处境与意义？

2. English: Why did you make this choice?

   Chinese: 为什么您会这样选择？

3. English: What do you think is the biggest difference between the two versions?

   Chinese: 您觉得这两个版本最大的差别是什么？

D.3 Explanation of Core Dimensions

Table D.1 Explanation of Core Dimensions

Dimension	Meaning
Understanding	Understanding of the historical position, urban relations, and complexity of the Due Torri
Emotion	Emotional fluctuation, empathy, and sense of connection
Multiplicity	Perception of multiple stories, multiple subjects, and multiple meanings
Agency	Willingness to further learn about, pay attention to, and reflect on heritage issues
Visit intent	Willingness to visit the site after the experience
Current life relevance	Perception of the relevance between the Due Torri and contemporary urban life

D.4 Summary of Results

Table D.2 Summary of Results

Dimension	Control mean	VHE mean	Difference Δ (VHE - Control)	N
Understanding	5.5000	5.5667	0.0667	12
Emotion	4.5667	5.0167	0.4500	12
Multiplicity	5.5833	6.0556	0.4722	12
Agency	4.8000	4.9833	0.1833	12
Visit intent	4.5833	6.0000	1.4167	12
Current life relevance	4.4167	6.2500	1.8333	12

Overall, the VHE version scored higher than the Control version across all six core dimensions. The two most significant differences appeared in “willingness to visit the Due Torri on site after the experience” and “perception that the Due Torri are closely related to contemporary urban life.” This suggests that the VHE prototype performed more strongly in stimulating site-related imagination and contemporary relational understanding.

D.5 Variable Abbreviations

Table D.3 Variable Abbreviations

Variable	Meaning
U_C / U_V	Mean score of Understanding under the Control / VHE condition
E_C / E_V	Mean score of Emotion under the Control / VHE condition
M_C / M_V	Mean score of Multiplicity under the Control / VHE condition
A_C / A_V	Mean score of Agency under the Control / VHE condition
Visit_C / Visit_V	Willingness to visit the site after the experience
Current_C / Current_V	Perceived relevance between the Due Torri and contemporary urban life
Final_choice	Raw choice code in the final comparative questionnaire

Note: Final_choice is a raw sequence-based code: 1 = the first experienced version, 2 = the second experienced version, and 3 = both versions / complementary preference. In the comparative analysis, these raw codes were converted according to each participant’s sequence into Control, VHE, or Both.

D.6 Participant-level Results

Table D.4 Understanding, Emotion, and Multiplicity

Participant	Sequence	U_C	U_V	E_C	E_V	M_C	M_V
P01	Control → VHE	5.2	5.0	5.0	5.4	6.3	6.3
P02	VHE → Control	5.2	5.2	3.4	4.6	4.0	5.3
P03	Control → VHE	5.4	5.8	4.6	5.2	5.0	5.7
P04	VHE → Control	5.4	5.4	4.2	4.8	5.7	6.0
P05	Control → VHE	5.8	5.6	5.0	5.0	6.3	6.0
P06	VHE → Control	5.2	5.6	4.2	5.0	5.7	6.3
P07	Control → VHE	5.8	5.6	4.6	5.4	6.0	6.3
P08	VHE → Control	5.2	5.0	4.4	4.6	5.3	5.7
P09	Control → VHE	5.4	5.6	4.8	5.6	5.7	6.3
P10	VHE → Control	5.8	5.8	5.2	5.4	6.0	6.3
P11	Control → VHE	5.8	5.8	5.2	5.4	6.7	6.0
P12	VHE → Control	4.8	5.4	4.2	4.8	5.3	6.7

Table D.5 Agency, Visit Intent, Current Life Relevance, and Final Choice

Participant	A_C	A_V	Visit_C	Visit_V	Current_C	Current_V	Final_choice
P01	6.0	6.0	5	6	3	5	3
P02	3.4	3.8	2	7	3	7	1
P03	4.8	5.4	5	6	3	6	2
P04	4.0	4.4	4	6	5	6	1
P05	5.8	5.2	6	6	5	7	1
P06	4.2	4.4	4	7	4	7	1
P07	5.0	5.0	5	6	5	6	1
P08	4.8	4.8	4	5	4	6	3
P09	5.2	5.4	4	6	4	7	2
P10	5.0	5.2	5	6	5	7	1
P11	5.2	5.8	5	6	4	7	1
P12	4.2	5.2	6	5	4	6	1

D.7 Excerpts from Open-ended Responses

D.7.1 Comparative Questionnaire

Table D.6 Selected Responses from the Comparative Questionnaire

Participant	Source	Original response in Chinese	English translation
P01	Final_reason	从情感调动、共情的角度来说我赞同第二轮，但是第一轮的信息呈现更清晰，也更全面，所以我觉得两者各有优势。	In terms of emotional mobilization and empathy, I agree with the second round, but the first round presented information more clearly and comprehensively, so I think both have their advantages.
P02	Final_diff	一个是故事型的解构，塔楼的自述。另一个是客观视角的总述，有点冰冷。	One is a story-based deconstruction, with the towers speaking for themselves. The other is an overall account from an objective perspective, which feels a bit cold.
P03	Final_reason	故事更多，记忆碎片更丰富。	It contains more stories and richer fragments of memory.
P04	Final_diff	碎片版本借助文本设计、图形交互和视频图片材料，可以提供更多的趣味性、沉浸感和情感表达；另一版本则只完成了信息传达的功能。	The fragment-based version uses textual design, graphic interaction, videos, and images to provide more interest, immersion, and emotional expression; the other version only fulfills the function of information transmission.
P09	Final_diff	游戏化/视觉化/信息量，通过游戏+视觉化，其实传达了更多的信息，纯靠文本的话人的注意力很容易分散。	Gamification, visualization, and information density. Through game-like and visual forms, it actually conveys more information; relying only on text makes it easy for people's attention to drift.
P12	Final_reason	第一个的话就可以当作游戏来体验，而且两个塔拟人也会比较能带入，画面也做得更好看一点。	The first one can be experienced like a game, and the personification of the two towers makes it easier to get

Participant	Source	Original response in Chinese	English translation
			involved. The visuals are also better.

D.7.2 Classified Responses

Table D.7 Selected Classified Responses

Participant	Control version response in Chinese	English translation	VHE version response in Chinese	English translation
P01	历史信息，能感觉到双塔在历史沧桑中的坚挺与变迁，但是对当今时代和社会的联系并没有较多体会。	Historical information. I could feel the resilience and transformation of the Due Torri through history, but I did not feel much connection with the present era and society.	空间氛围，或者人与城市的关系都感受到了。	I felt the spatial atmosphere, as well as the relationship between people and the city.
P02	历史信息吧，很多历史建筑都面临危机。	Historical information, I think. Many historical buildings are facing crises.	也许是人和城市间的关联……突然对建筑产生一种莫名的敬意。	Perhaps the relationship between people and the city… I suddenly felt a kind of inexplicable respect for the architecture.
P03	历史信息、空间氛围。	Historical information and spatial atmosphere.	人与城市的关系。建筑是反映人与城市变迁的载体。	The relationship between people and the city. Architecture is a medium that reflects changes between people and the city.
P05	历史信息，因为缺乏基本的历史和地理信息了解，所以第一印象对基本信息的补足印象比较深刻。	Historical information. Because I lacked basic historical and geographical knowledge, my first impression was mainly about supplementing basic information.	空间氛围，气氛感和文学性描述丰富了感情色彩。	Spatial atmosphere. The sense of atmosphere and literary description enriched the emotional color.
P10	主要是历史信息，因为前面对于双塔的一些信息介绍还是比较清楚的。	Mainly historical information, because the earlier introduction to the Due Torri was relatively clear.	历史信息最多，同时也给到了一些人文方向的印象，比如它很贴近日常生活。	Historical information was still the strongest, but it also gave some humanistic impressions, such as the fact that the towers are close to everyday life.
P12	历史信息吧，这个好像还是以陈述为主。	Historical information, I think. This version seems mainly based on exposition.	我觉得都有吧，几个结合得还蛮好的，不过氛围确实做得最好。	I think it has all of them. Several aspects are combined quite well, but the atmosphere is indeed the strongest.

Acknowledgements

Somehow, I have arrived at the moment of writing these acknowledgements. Long ago, I imagined that when the thesis was finally finished, I would have many feelings to express about the past. Yet when I actually began to write, I found myself unexpectedly calm. The intense desire to speak, and the impulse to look back on a dramatic journey, did not arrive as I had once imagined.

Perhaps this calmness is something more precious. Over the past half year, I have been feeling like a bird trapped in endless academic terminology and uncertain future. Words and theories intertwined into a rainforest with no visible end. I knew that I did not necessarily have to fly deeper into it, yet something in my subconscious kept driving me toward its dense and obscure darkness. This process has certainly been painful, filled with self-doubt. Even now, these feelings still return from time to time, and they have not simply disappeared because I survived some deadlines. But at this moment, as I am about to ritually say goodbye to this thesis and to my master's study, I want to embrace the uncertainties within myself with a calm and ordinary mind. Perhaps the bird that struggled for months in the rainforest never found the mysterious fruit hidden within it. Yet flying itself should be more about experience and freedom than about reaching a predetermined destination.

I have always been an idealist, and I have been told countless times what kind of bad ending idealists are destined to face. Fortunately, up to this point, I have been lucky enough to keep playing my own game, without fully submitting to certain predetermined and rigid rules. For this luck, I owe gratitude to the important people in my life.

First, I would like to thank my parents. Although at many moments they have been rather typical and sometimes difficult East Asian parents, without the unconditional love and freedom they gave me in childhood, and without the greatest support they could offer for every decision I made, I would not have become the whole person I am today. I also want to thank my dearest grandfather, my aunt who first opened the door of art for me, and my uncle and grandmother, whom I will always miss.

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It is often hard to believe that one third of my life has already been accompanied by the word "architecture." Yet I still cannot say, without hesitation or insecurity, that I truly understand this discipline well enough. Perhaps that confidence and ease is the fruit I will spend a lifetime searching for, and for now, I am still on the way.

As the bird flies, it will always hear people talking. They say: leave the rainforest for the beach, where there will be flocks of seagulls and bright sunlight. They say: a stubborn bird will one day yield before the barrel of a gun. But the bird does not long for the beach, nor does it fear risk. It simply enjoys flying. It enjoys searching.

At the end of these acknowledgements, I want to thank the anxious bird that keeps flying in my heart. I want to tell it: keep a calm and ordinary mind. Sing in the wind, dance among the clouds, and enjoy every moment of spreading your wings. To reach a distant place one has chosen is certainly important, yet compared with the act of flight itself, everything else is perhaps not such a big deal.

Persistence may not always bring success, but it always brings change. And the ending of an idealist may not necessarily be so bleak after all.

02.07.2026