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Designing Authentic Digital Experiences

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Abstract

The concept of authenticity has gained growing importance in the design of digital, hybrid, and XR experiences within the Cultural Heritage (CH) sector. In earlier research [PCS24], we examined authenticity through a multidisciplinary lens, combining a state-of-the-art review with empirical data collected via a Cultural Probe Kit (CPK) to explore user perceptions of authenticity in interactive experiences. From this, we developed a multidimensional authenticity framework, structured around three core dimensions: Self, Others, and World. This paper focuses on translating that framework into actionable design strategies through the PERCEIVE Co-design tool—a free resource composed of a card deck, board worksheets, and activity guidelines. Available as both a physical board game and a web app (in development), the tool supports designers and cultural experts through a step-by-step process to ensure authenticity is embedded in the experience design. By encouraging collaboration and creativity, it promotes the development of engaging, emotionally resonant digital experiences. Additionally, we created a custom GPT assistant to support iterative brainstorming and UX ideation around authenticity. The co-design outcomes were then used to shape the exhibition design strategy of Reconstruct & Relive, the final showcase of the PERCEIVE project (Ch.3).

CCS Concepts

• ***Authenticity*** → *Extended reality; Hybrid experiences, Digital experiences;* • ***Design*** → *codesign;* • ***Cultural Heritage*** → *Digital Cultural Heritage;*

1. Introduction

Although people search for authentic, memorable, and meaningful experiences in cultural tourism (and in everyday life), these requirements are often considered additional rather than fundamental in the design and development process. Our research addresses this gap by integrating authenticity as a key design requirement. In our previous work [PCS24], we laid the foundation for this research, which initially involved: a) drafting a theoretical framework for the concept of authenticity in experiences, and b) developing a framework to structure the concept of authenticity more effectively. Building upon this foundation, we are now focusing on making authenticity a practical and actionable design principle through:

1. the PERCEIVE Co-design tool,
2. a customized GPT model - "Designing Authentic Digital Experiences" - built with OpenAI.

The key question driving our research is: how can we develop a design tool that helps designers and developers integrate the concept of "authentic digital experiences"? Our work answers this question through the development of a specific "co-design tool" within the European Horizon project PERCEIVE (ID 101061157) and of a customisation of GPT. In addition, we have tested these tools in the design of an hybrid experience for the PERCEIVE exhibition dedicated to the lost polychromy of Roman sculptures and paintings.

2. Making authenticity actionable: from a framework to a co-design tool

The authenticity framework is grounded in three key dimensions (Self, Others, and World), each comprising distinct elements and components. To translate this theoretical model into actionable design guidance, we aimed to develop a practical, collaborative tool that could support interdisciplinary teams in crafting authentic digital cultural experiences. This effort led to the creation of the PERCEIVE CoDesign Tool [PMT*25], a framework in the form of a card-based game. As the demand for more engaging visitor experiences—whether digital, physical, or hybrid—continues to rise, cultural institutions need tools that support collaboration across diverse expertise. The PERCEIVE CoDesign Tool responds to this need through a card-based game that mirrors the typical stages of a design process—from defining the brief to creating a storyboard. Its playful, yet structured format fosters shared understanding, encourages reflection, and facilitates collaborative ideation and reflection, offering both a tangible working space and a shared language for interdisciplinary teams. The PERCEIVE CoDesign Tool builds on the earlier "VisitorBox" [GIF25b], developed at the University of Nottingham during the European GIFT project (ID 727040) [GIF25a] and released under a Creative Commons Attribution 4.0 International License. Nevertheless, after a first design iteration and many testing sessions, the Co-Design tool was developed differently, following a different approach (games mechan-

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ics have been included) and different parts have been added, substituting the previous work-sheets approach. Specifically, the tool was enhanced and adapted to better address the challenges identified within the PERCEIVE project—particularly the alignment of cognitive-emotional goals with user-centered design in the cultural heritage sector.

With this aim in mind, new decks were introduced in the Audience Goals phase, dedicated to the concepts of Authenticity (Figure1) and Sense of Care. This extension not only highlighted the adaptability of the tool, but also served to embed the authenticity framework directly into the design process, allowing for its practical application and testing. Regarding the Authenticity cards to apply and validate the tool, a series of testing sessions have been conducted since October 2023, in collaboration with key partners of the PERCEIVE project, as CNR, MANN, MUNCH, Victoria & Albert Museum, NTNU, HSLU, Fraunhofer, FORTH, Anamnesia-Imki, and the University of Bologna [PF23]. Each workshop gathered 3–5 participants from different institutions and expertise, enabling a rich, interdisciplinary design environment. The sessions served as grounds for subsequent iterations of the tool, allowing for continuous refinement based on real-time feedback. Updated versions of the paper-based tool are regularly published on Zenodo, currently available in version 0.9.2 [PMT*25]. Each iteration brought improvements in both usability and visual design. These changes were particularly useful for online and hybrid workshop environments, making the tool more accessible and self-guided. During some of these sessions, specific focus was placed around authenticity, as participants collaboratively explored initial concepts for the final PERCEIVE exhibition. This included the development of ideas for XR and hybrid applications, later referred to as "Authenticity prototypes" (see next chapter). In this context, the tool proved especially effective in facilitating creative dialogue, helping align cognitive-emotional goals with institutional narratives, and positioning authenticity as a guiding principle in the design process. Outputs such as contextual insights, design briefs, and detailed storyboards provided the conceptual groundwork for prototype development, demonstrating the practical value of the PERCEIVE co-design methodology in crafting meaningful and participatory digital heritage experiences.

To further extend the application of the authenticity framework beyond the card-based tool, a custom GPT-based assistant was also developed [Ope23a]. This AI tool is designed to support the ideation and refinement of authentic digital experiences—especially XR and hybrid formats—by offering continuous, interactive guidance. It can act as both a stand-alone support system and a complementary extension of the CoDesign Tool, enabling designers, curators, and researchers to iteratively explore conceptual ideas, translate abstract authenticity dimensions into concrete design features, and receive tailored UX suggestions. Trained on the full structure of the Authenticity Framework—including its three core dimensions (Self, Others, World) and their respective components and elements—the GPT integrates methods from cultural probes, co-design practices, and qualitative research [PCS24] to propose strategies that foster cognitive, emotional, sensory, social, and environmental engagement. Technically, the assistant was implemented using OpenAI's Custom GPT infrastructure, with domain-specific behavioral instructions and embedded knowledge derived from the full framework documentation and design resources. At the core of this assistant lies a Generative Pre-trained Transformer (GPT)—a type of large language model (LLM) developed by OpenAI and based on a transformer architecture [Ope23b]. Technically, GPTs are neural networks trained on vast amounts of textual data to develop a statistical understanding of language. Prompt engineering techniques were applied to optimize the model's performance in contextual reasoning, design suggestion relevance, and alignment with co-design methodologies. Accessible via the OpenAI platform, the customized GPT offers a novel, operational way to support authenticity-driven design thinking across diverse cultural contexts.

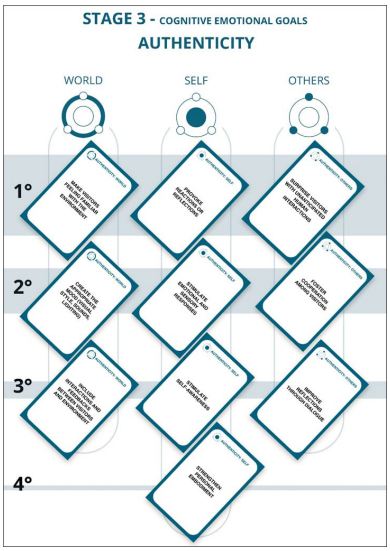

Figure 1: *Authenticity Board in the CoDesign Tool*

Beyond its technical implementation, this customized GPT proves to be a highly practical and versatile tool that supports both analytical and creative dimensions of design research. It facilitates the recognition of which specific dimensions and components of authenticity—such as relational depth, embodied presence, or contextual grounding—are most prominent within a proposed or existing digital strategy. This interpretative capacity is paired with a generative one: the GPT can suggest design directions, adaptations, or enhancements that resonate with the identified authenticity features. These suggestions are not generic, but tailored to the goals of the user, making the tool particularly effective in bridging theoretical understanding with actionable outcomes. As such, the assistant serves as both a reflective companion and a creative catalyst in the process of crafting meaningful and impactful digital experiences.

3. Reconstruct & Relive: a Perceive case study proposal

The PERCEIVE "Authenticity prototype", has been designed iteratively using the Co-design tool. Throughout the project's lifecycle, a series of design sessions have been carried out with different stakeholders. These sessions were specifically dedicated to exploring the concept of authenticity and were conducted for the development of digital solutions to better simulate and communicate the

lost polychromy of classical sculptures and for the guiding design narrative [PF23]. The concept behind the prototype was developed by a multidisciplinary team including designers, museum experts and archaeologists, drawing on the ideas that emerged in the aforementioned workshops. It will be finally applied to the PERCEIVE final exhibition, carried out by CNR ISPC and by the National Archaeological Museum of Naples (MANN), project partners, and dedicated to Isis.

One of the most promising concepts to emerge from the early co-design sessions held between MANN and CNR focused on a role-based immersive exploration of the Temple of Isis. This preliminary concept aimed to provide visitors with a visual and sensory journey into the religious and artistic life of the temple, allowing them to embody historical figures such as priests, artisans, or offering bearers, and thus better understand ancient practices and the material culture of Isis worship. These early insights served as the foundation for further iterations of the prototype [PF23]. As the project progressed, the development of the final version of the prototype was enabled by substantial advances in both content research and experience design. The growing body of archaeological and historical data concerning the cult of Isis in Pompeii—encompassing ritual practices, sacred spaces, associated deities, and material culture—allowed for greater historical accuracy and interpretive depth. Simultaneously, refinements to the experience architecture enabled more effective narrative immersion and interaction design. Through continued co-design sessions, a clearer structure was defined, culminating in a two-part experience that links the archaeological act of reconstruction with the ritual life that once animated the temple.

The exhibition unfolds as an interactive journey across two rooms, deepening visitor engagement with the theme of lost polychromy in ancient statuary. The first room opens with a short video introducing the project's aims and evolution, followed by an exploration of scientific processes behind reconstructing ancient colours. Visitors interact with digital "totems" to reveal step by step the original polychromy of classical sculptures. This culminates in a mapped projection onto the marble of the statue, illustrating various reconstruction possibilities. The statue selected as the case study for this room and as the focal point for the entire exhibition is the *Anadyomene Venus* (inv. 6298), which is exhibited in the permanent collection of MANN. The Venus was once situated in the Temple of Isis in Pompeii and depicts the goddess emerging from water and wringing out her hair [NN54], first excavated in the late eighteenth century and active in Pompeii since the 2nd century BC, later renovated following the earthquake of 62 AD, and ultimately buried by the eruption of Mount Vesuvius in 79 AD [Car06]. The cult of Isis, popular throughout the Roman world and particularly significant in Pompeii, provided alternative religious frameworks outside the traditional pantheon [Moo13], yet, the precise ritual practices and formulas remain partially veiled in mystery, a characteristic that could serve as a powerful draw for visitors, stimulating their curiosity and deepening engagement with the exhibition narrative [CBB*25].

The second room, house of the *Authenticity Prototype* and later referred to as *Authenticity Room*, builds upon the knowledge and emotional acquisitions obtained in the first. In this space, visitors transition from the position of conservators scientists to that of participants of life in Pompeii in the 1st century AD, engaging in a co-narrated journey that recontextualises the statue within its original ritual and spatial environment. The Authenticity Room was designed through the iterative application of the authenticity co-design tool, and is explicitly structured around the three core dimensions of the authenticity framework.

Structured in two distinct phases, the prototype begins in the setting of the destructed temple after the earthquake of the I century B.C., where the visitors are asked to wear the shoes of artists and artisan called to restore it to give it back its ancient glory. The participants are given different tasks grounded in historical data, inviting them to engage with archaeological evidence, such as the architectural layout of the complex, the statuary, and its frescoes decoration. This phase foregrounds the material and technical dimensions of heritage-making, asking users not merely to observe the past but to participate in its reassembly, thereby highlighting the processes through which authenticity is constructed. The second phase shifts from reconstruction to living life in the temple, immersing participants in a symbolic reenactment of the isiac rituals in the same spaces they have helped restore in the first phase. Through role-based, sensory-driven tasks, users engage with historically accurate contents involving textiles, scents, and sounds once central to temple life.

The design of the interactive game experience, as summarized in Table1 aims to create a cooperative learning environment, where visitors are engaged in an experience that goes beyond the simple exhibition of historical objects. The primary goal is to stimulate a deep reflection on the historical and cultural reconstruction of the temple, with a focus on the importance of the practices, architectural techniques, and methods used in ancient times. Each section of the exhibition is designed to spark curiosity and encourage a deeper understanding of cultural heritage, highlighting not only the visual beauty but also the meaning and historical evolution of the elements on display. In this context, the game experience adopts the structure of a role-playing game (RPG), allowing participants to fully immerse themselves in a unique learning journey. Each visitor, through the chosen path, has the opportunity to assume the role of two characters with distinctive traits.

Immersion in this environment helps strengthen engagement and active participation, while the game structure, which involves challenges and tasks to complete, requires the exchange of information and collaboration among participants. In this way, the game promotes the development of social and communication skills, which are essential for teamwork and problem-solving in a collective context. The approach is not merely playful, but fits within the framework of a "serious game," a game primarily designed for learning. In this case, the game not only offers a mode of historical exploration but also stimulates reflection on ancient culture, making participants more aware of the reconstruction techniques and methods used to preserve heritage. The design of the experience aims to create synergy between play and learning, ensuring that visitors not only acquire information but experience it firsthand, developing a more intimate and concrete understanding of history and the challenges involved in the temple's reconstruction.

Table 1: *Domains, Components, and Implementation of Experience Design of Reconstruct & Relive: a Perceive case study proposal*

Domain	Component	Experience	Implementation
Self	Personal Disposition	Curiosity and engagement	Quizzes, ritual actions, personalized dynamics
	Emotions	Emotional involvement	Choice of a symbolic path
	Cognition	Reflection and learning	Meaningful questions, historically grounded gameplay
	Personal Context	Value-based engagement	Thematic path selection, differentiated experiences
	Perception	Sensory activation	3D objects, pigments, sounds, scents, tactile materials
	Embodiment	Presence enhancement	Interactive web-app, multisensory spatial feedback
Others	Language	Exchange and dialogue	Character-based dialogues, narrative perspectives
	Social Practices	Collaboration	Shared ritual actions among participants
	Social Norms	Structured interaction	Roles, rules, rewards, progression systems
	Unpredictability (social)	Variability	Group decisions, peer influence
	Embodiment (personal)	Immersion	Direct interaction with others and environment
World	Verification	Archaeological grounding	Frescoes, texts, museum objects
	Physical Context	Spatial recreation	Models, props, spatial layout
	Atmosphere	Ambiance building	Lighting, soundscapes, stylistic coherence
	Embodiment (environmental)	Spatial interaction	Sensory input, responsive environments
	Time	Temporal flow	Diachronic narrative, ritual day simulation

4. Conclusion and further developments

Among the three core dimensions of the authenticity framework, the “Others” domain played a central role in the design of "Authenticity Room" in the final exhibition. The multiplayer structure, based on collaboration and dialogue among participants, was conceived as a way to foster shared meaning-making and social embodiment, elements that have emerged as crucial in both our theoretical work and Cultural Probe Kit’s investigations [PCS24]. At the same time, the implementation process revealed a series of challenges that are often underestimated in the design phase. The “Others” dimension, particularly when integrated into hybrid or fully digital formats, entails a high level of complexity in terms of technical infrastructure, UX flow, and curatorial mediation. In a museum context, especially within a permanent installation, these requirements translate into the need for ongoing facilitation, robust visitor management strategies, and potentially higher resource allocation, both in terms of budget and staff. This observation opens up a key research question that we intend to explore in the next phases of the project: what happens to the perception of authenticity when the social and multiplayer aspects are removed? If we reconfigure the experience into a single-user mode, will the affective and cognitive engagement decrease, or will alternative design strategies (e.g., narrative personalization, evocative atmosphere, responsive embodiment) compensate for the lack of direct social interaction? In parallel, we aim to further develop a qualitative evaluation method to capture how authenticity is perceived across different configurations. Building on our previous use of Cultural Probe Kits, we will explore new instruments capable of tracing subjective impressions, emotional responses, and the sense of presence or connection that users associate with the experience.

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