Authenticity in Interactive Experiences

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Abstract: Building on our previous work presented at the Eurographics GCH conference, this paper further explores the characteristics of an "authentic experience", developing a framework that can be applied to the development of XR and hybrid applications in the field of cultural heritage. While recognising the broader concept of authenticity, we have not focused on an in-depth analysis of it. Instead, we focus specifically on "authentic experiences". Here, we have extended the definition of authenticity beyond realism or sense of presence, proposing instead a multi-dimensional approach to engaging users cognitively, emotionally, and sensorially (the "Self" dimension) and, at the same time, including two other fundamental dimensions (the "Others" and the "World") intrinsically connected to the "Self". We have then further detailed these three dimensions, which are the pillars of the perception of authenticity, identifying their "components" and "elements". Finally, we transformed the elements into "actionable" design indications, setting the ground to further develop specific design (UI and UX) strategies for digital heritage and serious game applications.

Keywords: authenticity; virtual reality; design; cultural heritage; extended reality; cultural probe kit; hybrid experiences

1. Introduction

Following our recent investigation presented at the Eurographics GCH conference [1], this work is meant to advance our research by examining how authenticity can enhance user experiences in XR and hybrid environments, focusing on the digital heritage domain. The cultural heritage domain refers to the field concerned with the preservation, interpretation, and management of cultural heritage, which includes tangible and intangible elements of human history and culture. This domain was chosen for its specific characteristics, as it requires a higher level of reliability when it comes to content and UX design. Building on our previous findings, we aim to develop a theoretical framework, a conceptual structure used in a research or study to guide and support the analysis of a problem, that could support designers, museum and gallery specialists, researchers, artists, and curators in the creation of authentic, memorable, and meaningful experiences [2]. This work aims to demonstrate how the design of XR experiences could benefit if specific strategies are adopted, following our framework, to increase the perception of authenticity. Therefore, this study proposes a detailed analysis of the concept of authenticity that extends well beyond simple realism to encompass deeper and multidimensional aspects. Such an analysis is particularly challenging because the essence of authenticity is characterised by an inherent subjectivity and complexity. There is in fact a general lack of consensus regarding the conceptualisation of authenticity due to the wide scope to which this concept has been applied to, resulting in a scholarly debate, such as in [3]. Therefore, we adopted a pragmatic approach, focusing on the identification of the characteristics of an authentic

experience, as it emerges not only from available studies in various fields (philosophy, social science, cognitive psychology, linguistics and computer science) but also from the perception people have in their daily lives of what makes an experience authentic. For this purpose, we adopted a specific approach and tool, a Cultural Probe Kit, to gather qualitative insights. We then organised the findings, identifying domains, components and elements, and finally, applied them to interactive media design. To further test the reliability of the framework, we used it to classify and describe two very different types of interactive applications: a single-user serious game for mobile devices and a multi-user hybrid experience.

According to our previous research [1], authenticity encompasses three dimensions: the "Self", the "Other", and the "World" [Figure 1]. The role of the perceiver (the self) in fact is crucial, together with his/her connection with people around (the others representing his/her social dimension) and also with the environment. Such a prominent position of the perceiver led us to initially represent the concept of authenticity as a triangle, with the self placed on the upper vertex. Each dimension is characterised by multiple components.

Figure 1. The triangle of authenticity with its three dimensions. This image was created by us with Canva.

Our hypothesis is that it is possible to classify and design an authentic interactive experience using these domains and also their components. At last, we have revisited our previous definition of an "authentic XR experience": *"Authenticity is a multi-dimensional concept, made of three main domains (self, others, world) and of components (reflection-emotion-sensation, exchange and embodiment), working by touching the deeper self of the user, through performative actions that transform the unfamiliar (distant) into familiar (close)"* [1].

2. The Concept of Authenticity

In philosophy and psychology, individuals have always been treated in accordance with their relations with other people and with the physical world.

The concept has been studied in various fields. Its origins can be traced back to the Greek philosophers. It is derived from the word authentikós (**autós: self**) and has been the subject of philosophical currents [4]. In Western philosophy, there has always been a focus on the individual, with a distinction between a "private" self and a "public" self, dictating its connection with society. The guiding question (who am I, what is the authentic myself) highlighted the importance of self-judgement [5]. Until Hegel [6], the concepts of sincerity, honesty, and moral values were used more than authenticity, linked to the potential of knowing oneself and acting accordingly, with the specific goal of being considered honest and truthful by society [7]. Moreover, authenticity was used to define the potential of being true to oneself for personal benefits, with no relation to society, leading

to a modern ethic of authenticity and independence (autonomy), in a continuous inner search for a balance between identity and authenticity. This explains the importance of recent psychological and social science studies of extroverted/introverted traits. Introverts are individuals with a tendency to keep internal thoughts and withdraw from social contacts, while extroverts are characterised by more observable social behaviours and a higher interest/capacity towards social contacts [8]. Extroverts have been found to perceive authenticity more easily [9–12]. Nevertheless, it has also been shown that if introverts are asked to act extroverted, following flexible behaviours on purpose, they have the same capability of perceiving an authentic experience as extroverts [13]. In line with this, ref. [14] defines "Subjective Authenticity" as the judgement that one is acting following one's true self-concept. The possibility of letting individuals express themselves, finding their meaning and reflecting (meaningfulness), is therefore key in the development of the perception of authenticity. Meaningfulness is the result of a meaning-making active process, through which people revise an event; it is drawn from multiple sources and is motivated by four basic goals: purpose, value, sense of efficacy and self-worth [15,16]. Meaning-making is situation-specific and congruent with one's orientation. Scholars are studying meaningfulness through well-known and experimental methods, such as open interviews, analysis of written texts, behaviour observation, analysis of verbal exchange among users and also through psychogeography methods [17]. What they measure are a number of different potential indicators, including repeated words, ordered lists, position and dimension of recalled details, connection among words and concepts [16], time spent on a detail, purposes and motivations [15], conceptual sources such as family and love [16] (p. 611). Although many studies exist on meaningfulness and on how to capture meaning-making, there are still a limited number of works on how to design for meaningfulness [18]. Furthermore, the moral characteristics and **values**, as already analysed by existential philosophy [19], also seem to give importance to the meaningfulness of experiences. Within the types of personal disposition traits, there are also other components that have been studied as potentially impacting authenticity, such as distraction and sense of direction. Reference [20], for instance, states that authenticity only emerges when other distractions are controlled. This hypothesis was experimentally proved to be relevant also in connection with engagement and knowledge acquisition in serious game contexts [18]. Authenticity has been treated extensively in tourism studies, from many different perspectives, including the impact of spatial orientation and specifically disorientation on it [21]. Exploring and navigating would not be possible without a spatial representation of the space—real or virtual. Scholars working on **spatial memory** have identified two types of spatial representations: *allocentric* and *egocentric*. Egocentric orientation is easier for most people; in this case, locations are represented with respect to the perceiver's perspective, while allocentric is more complex, with locations represented as external and independent from the user position [22]. In UI design, therefore, it is important to take into consideration egocentric orientation and to provide assistance and support for allocentric (i.e., making available maps or other types of indications), thus avoiding disorientation and a diminished capacity towards authenticity perception. Beyond the elements connected to people's personal disposition, there are a number of other potential aspects that could impact authenticity, caused by the users' context with their **expectations**, **cognition**, **emotions** and **perceptions**. The **choices** a person might make, in accordance with a specific context, could be directed toward an implicit desire to feel authentic and to live an authentic experience [23]. Even personal **challenges**, such as when one experiences difficulty or poor performance, can be interpreted as an opportunity to grow, if in line with a specific context: perceived authenticity, in fact, may elicit an affective response to personal shortcomings that can impress efforts to improve [24]. The memorability of an experience has been already mentioned as crucial [2], but, from the perspective of the "Self", it is connected to the capacity to **remember**, to **compare** it with previous experiences, to **understand** it, and to develop new **knowledge**. Moreover, the importance of the self-monitoring of a person to be able to better judge a situation has been emphasised.

Pillow et al. [25], had, in fact, identified a relation among self-monitoring, authenticity, and well-being. Moreover, there are other aspects that could highly improve the authenticity perception, such as the **embodiment** of a specific experience and the possibility to **act** but also a sense of familiarity. Regarding this last aspect, scholars have identified two opposite tendencies that both seem to potentially strengthen the perception of authenticity. On the one hand, the disconnection from the usual "**security**" and "**comfort zone**" has been studied as fundamental to increase tourists' perceptions of the authenticity of the places they visit [21]. On the other hand, in many studies about virtual environments, users reported a preference for a more comfortable experience, i.e., closer to a similar/original situation, thus avoiding stress or other negative emotions [26]. This apparent conflict is probably due to the fact that in very different environments, such as in VR or XR, there is a high need for intelligibility and **usability** of systems, as the first threshold for an experience to be lived. This concept can be extended to ordinary life. This direction was followed by Jasper, a psychologist, and philosopher, who, in his "Psychology of the WordViews", wrote that authenticity is what touches a person's deeper self and endures, evolves, and changes together with the individual [27], thus introducing the concepts of **depth or intensity** (in contrast with superficiality), **time** and **evolution**.

We can, therefore, derive that *an authentic experience is perceived by an individual in a personal way; it is meaningful and close to the inner part of the self; it may be different for everybody and change over time; and it can be nurtured, by soliciting the self in the complexity of its components and relations.*

Although the self has been always considered a reference in the definition of authenticity, the importance of its **social** dimension and its relations with "**the others**" have recently been considered and studied in socio-linguistics. In this field, the concept has been analysed by referring to "**language**". Beyond inner dialogue and self-reflection, the language in fact is considered a "tool" used to exchange information and build and maintain interpersonal relations with others. The essence of an authentic life, in fact, involves acting and expressing emotions in ways that are congruent with physiological sensations, beliefs, and cognition [4]. Language is also recognized to contribute to shaping concepts and stabilising and organising knowledge acquisition [28]. According to Coupland [29] and Austin and Urmson [30], authenticity has a performative aspect ("authentication"), intended as an active process that involves not only **action**, but also verbal exposition and **dialogue**, a tactic that allows individuals to establish authentic or inauthentic participation in social groups. The importance of dialogue remains even when others are not physically present, but they are potentially the reference of an exchange, either through inner dialogue with ourselves or as a declared desire to exchange experiences and thoughts after the experience. The value of verbal **exchange** also emerges in what is defined as "**mediated dialogue**" by [31] (pp. 179–195). Bormann and Campt, from the International Coalition of Sites of Conscience, have drafted a model for facilitating dialogue based on four steps: 1) community building, 2) development of personal connections, 3) exploration of alternative **perspectives** and 4) closing of the experience (https://www.sitesofconscience.org/ (accessed on 27 August 2024)) [32]. This approach was also used to design interactive XR experiences, as in the case of the Emotive EU project [31,33], where **social gestures** have been developed to strengthen the embodiment and the social dimension but also solicit dialogue among users, triggered by provocative questions and by an "emotive" **tone of voice**. Authenticity has, in fact, been defined as a social psychological phenomenon, structured around **social practices** [34], such as activities shared with others (**challenges**, **competition**, **cooperation** including **co-creation**), and **social norms** (rewards, penalties, roles, etc.). In the social dimension, the importance of the discovery of **common aspects** that make people feel a part of a community (familiarity, sense of belonging) has emerged. On the other hand, it has been noted that authenticity also involves an opposite concept, such as a social behavioural **unpredictability**.

Although authenticity is seen today as a pervasive ideal, impacting social and political thinking, this concept also extends beyond the self and others, reaching the external **world**

with its relation with the self and others. The authenticity of this external dimension, the physical environment and the objects contained, have been used since the beginning to refer to something **faithful** to an original or "of unquestioned origin or authorship", encompassing a process of **verification** [5]. For example, Benjamin's [35] reflection on the dichotomy between original and reproduction, on the subtraction of uniqueness that a reproduction operates on an original, and if and how, in this case, the attribute of authenticity can migrate from original works to copies (be they digital, photographic, etc.) is located in this conceptual space. In this regard, authors such as Latour and Lowe [36] have enriched, both directly and indirectly, the debate on authenticity by theorising the concept of 'aura migration', stating that reproductions can acquire new meanings and values and that authenticity is no longer static but dynamic and culturally mediated. These issues are also of central importance in the specific context of VR experiences, as highlighted by Di Franco et al. [37]. This process has been recognized as having three aspects: it was considered as the action of separating "the true thing" or "original" from counterfeits and duplicates, as in the definition of "Indexical Authenticity" by [38]; as that of identifying verisimilitudes (whether or not an object conforms to an observer's expectations about how the object should appear), as for "Iconic Authenticity" [39]; and as a way to correctly identify "the origin, authorship or provenance of an object", as for "Nominal Authenticity", defined by [40]. In addition to tourists' expectations [2], the relation between authenticity and **realism**, **accuracy** and **objectivity** [41] has emerged from tourism studies. Specifically, **objectivity** cannot be separated from the ability of the visitors to discern the integrity of the sights or experiences they encounter. Realism is, therefore, strictly connected to the **physical context**, **characteristics** and **properties**. Moreover, tourists are found to give importance to authentic material objects when they are produced by skilled artisans, or to rituals and events when they are associated with traditional out-growths of cultures [42]. Some contend that a sense of place can be created [21]. In any case, as Cohen notices when defining "Constructive Authenticity" [43], the authenticity of an experience is variable, negotiable, and context-dependent [44]. In computer science and specifically in works related to VR experiences, the main dimension considered relevant is that of the "world". It is frequently solely associated, in general, with the **sense of presence**, **interaction** and **immersivity** that lead to the **embodiment** in a digital space [45–47] and with the **graphical realism** of virtual environments [45]. A different aspect emerges in studies about serious games, where **randomness** and **unexpected** elements are considered fundamental in the perception of authenticity [48], including the **time flow**. As for the other dimensions, even in this case, an opposite component is reported: the perceived **familiarity** of a space. Being able to interact with the environment is part of the basic requirements of any experience, and **ergonomics** can influence it [45]. Scholars have recently also explored the relation between authenticity and the concept of "**atmosphere**". This is a general term used to specify a dynamic subjective phenomenon, i.e., perceptual, sensory, and emotive [49]; it is a quality of a place that "moves" people, making them feel emotions or trigger sensations or also memories. It can be defined using an adjective related to the type of provoked emotion or sensation (tense, cool, ecstatic, nostalgic etc.) [50] (177–182). Atmospheres are felt or experienced [51]. According to [52], atmosphere is a key to quality architectural space. Böhme [53,54] has extensively treated the phenomenon "atmosphere" in his "Aisthetik", which is instantly perceived in a multi-sensory way. He also distinguishes an "ingression" atmosphere (a mood one finds in a space) from a "discrepancy" atmosphere (a personal state of modified mood provoked by the one found in the environment). In this case, the concept of authenticity is clear with Jasper's characteristic of increasing familiarity. Following Böhme's studies, therefore, there are characteristics that are more objective and connected to the external environment and characteristics that the designers could enhance. He also identifies five categories of "the atmospheric elements" that contribute to creating a mood: (1) **synesthetic** elements, perceived with more than one sense (cool, soft, rough, heavy, etc., caused by light and colour, intensity, brightness, and density but also sounds, music, smell); (2) ambience elements, perceived directly and immediately (nostalgic or

melancholic caused by the appearance of something or someone); (3) non-verbal elements; (4) impressions of movement, perceived directly and provoked by shapes and volumes associated with movements; (5) social or conventional elements, perceived indirectly and provoked by signs and symbols. Since the atmosphere cannot be measured or objectified, what can be analysed are mainly the subjective reactions to it, through qualitative methods. More recently, research on atmosphere and its impact on the perception of authenticity has been conducted in game and tourism studies, where it has emerged how developing an atmosphere of the past can satisfy users' needs for authenticity [55], while it can also produce "place attachment" in cultural tourism [56]. In the cultural heritage domain, mostly in virtual restoration, authenticity is frequently related to the "World" dimension, which refers to a work of art's **reliability** and **truthfulness**. Nowadays, environment design and 3D spaces made with graphics engines and tools like Unreal Engine 5, Quixel, Capturing Reality, and Twinmotion can achieve a very high degree of realism in their representations of space, shapes, and colours, simulating and emphasising the visual experience realistically. However, according to Vico [57], this faithful representation may not be authentic or a true reproduction of the artwork. Authenticity becomes linked to truthfulness: a digital object represents the original not only in terms of appearance but also in terms of context, meaning and use. Meticulous documentation of the digitisation and interpretation process is crucial to maintaining a sense of authenticity in digital replicas. Reliability and authenticity are therefore related to each other in cultural heritage and tourism, affecting people's involvement with objects [42] (p. 352). This approach has followed the assumption that tourism contributes to commodification, which many scholars believe reduces the authenticity of heritage [43]. In fact, a surrogate of "staged authenticity" or a "pseudo-event" [43] is sold to tourists as an authentic cultural product that can satisfy their real search for authentic experiences [37].

3. Methodology

In order to reach our goal, exploring how authenticity may enrich XR and hybrid experiences, we have defined an approach in five stages:

1. State-of-the-art analysis of the concept of authenticity in previous studies and in various fields;
2. User behaviours exploration in the context of cultural heritage;
3. Extension of the conceptual framework, organising the findings in "components" and "elements" assigned to the three already identified dimensions (self, others, world);
4. Transformation of the elements into actionable design indications/approaches;
5. Testing of the obtained framework on two different examples of interactive applications (a webXR hybrid experience and a serious mobile game).

3.1. State-of-the-Art Analysis

First, we analysed previous literature in very different and distant fields, starting from the first approaches used in philosophy and sociology (see Section 2). In this specific analysis, we have also considered works dating back in time, because of the systematisation work needed, although, when possible we have referred to more updated studies, quoting previous authors. Our research focus is on "authentic experience", not on the concept of authenticity; we considered specifically how an authentic experience was defined and specified in recent studies. Moreover, we have also added relevant studies about elements that could have an impact on the perception of authenticity. Section 2 is dedicated to this analysis.

3.2. User Behaviours Exploration

A key aspect of this investigation was to identify and understand how perceptions of authenticity could vary across different contexts, focusing specifically on the cultural heritage one. We have, therefore, adopted a specific qualitative method that required the design and development of a Cultural Probe Kit (CPK). As described by Gaver et.al. [58], CPKs

are tools for self-reporting that allow participants to observe, think about, and describe their experiences in situations where it is not possible to undertake direct observations, where the authors are trying to prevent the interference of researchers, or in situations where there are privacy issues and time limits [59]. The kit would usually contain diaries, activity workbooks with provocative assignments, together with various artefacts, such as maps, postcards, cameras, or notepads. Kits are distributed to participants, facilitating the documentation of particular sensations, emotions, or experiences [60]. The CPK invites creative responses as opposed to the inquiries that are typically posed in user experience research.

We have specifically designed a CPK to better understand what our users thought and felt about authentic experiences. Although acquired inputs are only qualitative, they proved to be extremely useful in the integration and refinement of the concept of authenticity, detailing attributes and triggers. We have chosen to focus on a uniform group consisting of potential users of digital heritage's interactive applications, such as virtual museums, exhibitions or serious games [61].

In the CPK, we included a diary and an activity workbook. The activities were meant to explore multiple aspects and the following research questions:

(a) How do people perceive an authentic experience in a museum setting?

(b) How do people perceive authenticity in their daily life?

(c) Are there repeated/common behaviours and thoughts connected to authenticity?

(d) How do people perceive an authentic experience in a digital setting?

Our goals have been to investigate the potential connection between the perception of authenticity and emotions (Question 1: Q1); to determine which emotion best encapsulates an authentic experience among the main six emotions (fear, happiness, sadness, disgust, anger, and surprise) (Q2); to identify the predominantly involved senses and corresponding stimuli (among sight/visuals, hearing/sounds, touch, sense of smell, and taste) (Q3); to examine whether authenticity correlates with trustworthiness and reliability (Q4); to better understand individuals' perceptions of what constitutes a truly authentic digital experience (Q5), investigating at the same time the correlation between the realism of digital scenarios and perceptions of authenticity (Q6); and finally, to compare stimuli and triggers experienced in everyday life with those encountered in digital experiences (Q7).

Within the first research question (a), we planned our sample to perform several tasks during a museum visit, such as taking one picture of what they perceived as authentic and another of what they considered inauthentic as well as commenting on them.

With (b), we designed a writing task: participants would have reported a personal story about a significant and authentic episode that happened in their lives, with the request of also uploading a picture of it. The storytelling approach was meant to let us better explore thoughts and feelings regarding the perception of authenticity.

Within (c), we wanted participants to write (daily) a diary, tracking how frequently they had specific experiences. Finally, we prepared a set of questions online designed to explore (d). The table below (Table 1) summarises the tasks, the questions we wanted to investigate and the specific methods used. The experiment and the results are described in Section 4.

Table 1. Summary of tasks, questions, and methodology we used in our Cultural Probe Kit.

Tasks Description	Questions	Methodology
(A) Photo during museum visit	Q4, Q5	Analysis of the picture and comments
(B) Write a story about a significant and authentic episode	Q1, Q2	Exploring thoughts and feelings regarding the perception of authenticity
(C) Write authentic experiences of everyday life	Q1, Q4, Q7	Exploring the correlations between repeated actions in a week
(D) Exploring authenticity within digital experiences	Q3, Q4, Q5, Q6	Analysis of the answers with Google Forms

3.3. Organisation and Extension

Based on the obtained findings, we wanted to organise them around the three main dimensions (Self, Others, World), identifying the main "components". We have, therefore, listed all relevant terms and concepts obtained with the study of existing scientific works and with the observations resulting from the Cultural Probe Kit and assigned each of these components to one of the three specific dimensions.

To be able to better describe the characteristics of these general components, we have tried to extend them to include more specific concepts that we have named "elements". We have adopted a specific approach, based on the "family resemblance" method, as initially described by Ludwig Wittgenstein in his work "Philosophical Investigations" [62]. According to this philosopher, for instance, the concept of a "game" cannot be defined by one clear-cut definition, but it can be understood as a collection of traits ("elements") that many games share (i.e., being enjoyable and voluntary). Through this approach, we have, therefore, discarded the idea of a single characteristic, and instead, we have chosen to define each component as a set of overlapping aspects. This approach appeared particularly suited to our case, also emerging from the comments left by the users of the Cultural Probe Kits, who reported across different stories "common elements", much like "family members" who shared certain traits but were never the same. This approach has helped us to introduce a layered and multifaceted definition of authenticity, with its complex interplay of components and elements. Following this method, we have not provided a complete list of all possible elements but only a limited number in line with our specific goal, which is to define a practical guide for designers and evaluators, and in line with our application context (digital heritage). Moreover, we also want our "elements" to be used to evaluate the components qualitatively or/and quantitatively (i.e., through psychophysics and psychometrics tests) and therefore suggest a possible assessment methodology of perceived authenticity in hybrid and XR experiences.

3.4. Actionable Design Indications

Finally, we moved from a more theoretical level to a practical one, transforming the "elements" into action-oriented design hints, by assigning them the status of "verbs". In this case, we have adopted the "Frame Semantics Theory" used in computer science and linguistics [63–65], and already adopted it in the store game domain [66] (pp. 246–256). Within this perspective, verbs transcend mere linguistic components, extending into cognitive realms. They serve as cognitive elements that engage and stimulate higher-order processes like reasoning, action planning, and decision-making [67] (pp. 3–39). Pinker [68] aptly describes them as a gateway to understanding the human mind. Verbs can be seen as representations of events and states—dynamic expressions that depict a process where something changes state or location over time. Essentially, verbs outline actions and processes as a series of interconnected components, observed in their temporal evolution [4]. Viewed through this lens, a verb becomes more than just a linguistic tool; its cognitive nature invokes conceptualisations of real experiences and aids in the ongoing construction of knowledge. Every element, following this approach, can include one or more verbs, and each verb provides the concept it expresses in the form of a real action scenario [66].

4. User Behaviours Exploration: The "Authenticity" Cultural Probe Kit

This study has also gathered insights beyond the literature to observe behaviours and opinions of potential users in their everyday lives and daily experiences to better understand cultures, viewpoints, and beliefs and inspire designers, museum and gallery specialists, researchers, artists, and curators [1,59]. As anticipated, we have designed a specific Cultural Probe Kit (CPK) aimed at gathering insights within the cultural heritage context. In the future, we plan to expand the Cultural Probe Kit to include responses from the other key stakeholders. By incorporating the perspectives of curators, artists, museum professionals and researchers, we intend to enrich the data and provide a more comprehensive understanding of how XR experiences can authentically represent cultural heritage. Engaging the

contributions of these experts will add scientific weight and provide a nuanced understanding that will complement the students' insights gathered at this early stage.

We involved a group of students enrolled in the Master of Digital Humanities and Digital Knowledge at the University of Bologna, consisting of 25 individuals, aged between 22 and 46, representing diverse nationalities and, in most cases, having a degree in humanities-related fields.

A total of 25 anonymized CPK were collected. The most important finding has been the identification of various characteristics of authenticity, partially overlapping with the studies, while other aspects did not emerge in the considered literature.

Descriptions of the findings are summarised in the following paragraphs.

(a) Authenticity perception in a museum setting (Palazzo Poggi Museum).

Using the activity workbook, participants were requested to follow a guided visit to Palazzo Poggi Museum, in Bologna (Italy). During this visit, participants were instructed to undertake various activities aimed at fostering reflection on the (visual) perception of authenticity within the museum experience. The activities were divided into two parts (a), reported in Table 2 and (b), in Table 3.

Table 2. Tasks and questions of the CPK (a).

Nr	Question
A1	"You are going to visit the Museum today. This activity is meant to make you reflect on authenticity perception in your experience. During the visit: Take a photo of something you experienced as AUTHENTIC (photo or video) and upload it and reply"
A2	"What are the elements in the uploaded photo that you perceive as AUTHENTIC?"
A3	"Take a photo of something you experienced as NON-AUTHENTIC (photo or video) and upload it and reply"
A4	"What are the elements in the photo that you perceive as NON AUTHENTIC?"
A5	"Without these elements, would the experience change?"
A6	"Why was this experience AUTHENTIC?"
A7	"Watch a video and reply: could you define the experience as AUTHENTIC?"
A8	"Could the video be considered untruthful?"
A9	"Why?"
A10	"Do you think that AUTHENTICITY depends on: Expectations, Stereotypes, Traditions, Knowledge/know-how, or others components?"

(b) Perceived authenticity in daily life.

Another task involved participants in a self-reflection of authenticity in their daily life and writing a story focused on a notable episode. They were asked to describe this episode and, if possible, to upload a corresponding picture. These types of inquiries were found to be highly suitable for our qualitative research (Table 3).

Table 3. Part (b) tasks and questions.

Nr	Question
B1	"Write a story about an experience you had in your life, that you felt authentic. It should not be "real" or "realistic", but "authentic"
B2	"Re-Read your story and reflect. In the story you just wrote, which are the elements that made the experience authentic?"
B3	"Which basic emotions characterised that experience, making it so authentic? Choose among Fear, Happiness, Sadness, Disgust, Anger, Surprise"
B4	"What senses were mostly involved in the perception of authenticity? Choose among: Sight/visual elements, Hearing/sounds, Touch, Sense of Smell, Taste"
B5	"What other aspects would you see as indicators of authenticity in that experience? Choose among: emotional impact, presence of other people, Exchange of thoughts with other people, Unicity, Unpredictability, Immediate Feedback, Action (the fact that you could do something), Other"

(c) Authenticity repeating/common behaviours and thoughts.

Regarding investigation (c), we asked participants to keep a diary for 8 days and focus on what they experience daily, keeping track of events and emotions. Figure 2 reports an example of the used template and of a completed page.

Figure 2. Layout of the daily diary tasks. Photo of the Cultural Probe Kit we made.

(d) Authenticity in digital experiences.

Finally, to fully explore (d), we included in the activity workbook a specific set of tasks, asking participants to complete and answer a number of questions, allowing us to compare our initial assumptions. Our goal was to identify any potential connections among variables such as emotional responses to videos, engagement levels, expectations, perceived credibility, and unpredictability (Table 4).

Table 4. Part (d) questions and tasks.

Nr	Question
D1	"Complete and Look back at your diary. Do you think that your perception of authenticity could be connected with emotions?"
D2	"Which emotion do you think was more connected to the concept of authenticity?"
D3	"Have a look at the walkthrough video of "Modigliani VR at Tate Gallery". Do you think this immersive 3d experience created by the Tate Gallery in London, during the exhibition on Modigliani, the painter, is authentic for you?"
D4	"Consider a virtual experience created by a trustworthy institution, such as the Tate Gallery. Do you think such "reliability" makes a digital experience authentic? Why?"
D5	"Describe a digital experience you have had in your life, one that you have found the most authentic. Which was it? Why was it authentic for you?"
D6	"Watch the video Unreal 5 about Matrix"
D7	"Could you define the experience of the video as "authentic"?"
D8	"Reconsider what you have written in the diary: did you find the same elements of authenticity also in this video? Is there something new?"
D9	"Can you compare this video with other authentic digital experiences?"
D10	"Which basic emotions do you think better characterise an authentic experience for you". Choose among: Fear, Happiness, Sadness, Disgust, Anger, Surprise.
D11	"What senses are mostly involved in the perception of authenticity for you", among: Sight/visual elements, Hearing/sounds, Touch, Sense of Smell, Taste.
D12	"What other aspects would you see as indicators of authenticity" among: emotional impact, presence of other people, exchange of thoughts, unicity, unpredictability, immediate feedback/real-time reply, action (the fact that I could do something).

Results

This section presents the findings, categorised according to the specific tasks and details of the obtained responses, without interpretive commentary.

(a) Authenticity in a museum setting.

Participants shot and uploaded very different pictures. Figure 3 displays three examples deemed to embody authenticity, with some of the original comments (A1).

Figure 3. Photos of the Cultural Probe Kit with comments: (**left**) drawing: *"it's the perception of something profound [. . .] and therefore authentic"*; (**middle**) *globe: "an experience that we actually lived [. . .] real people doing something not because I was taking a photo"*; (**right**) *ceiling: "Looking at the roof, I felt like entering somebody's house"*. The photos were taken by the participants.

After uploading the photos, participants commented on why they chose the scene to capture (A2). In Table 5, we added some of the sentences with indications of the domain and elements of authenticity.

Table 5. Example of the answers included in the activity workbook of the CPK.

CPK Nr	Comments	
11	*"Looking at the roof, I felt like entering somebody's house. That "somebody" that I learned to know through the visit. It is the narration of ancient stories that takes life in contemporary times"*	Self, Familiarity
12	*"I think that this is an authentic picture because it represents an experience and a situation that we lived in. In this picture we can see students talking about the ancient globe in front of them, so real people doing something not because I was taking a photo of them (they didn't realise it)"*	Others, Dialogue
46	*"It is an example of the many wall paintings in Palazzo Poggi. They give me a distinct sense of authenticity because they are still where they were originally painted"*	World, Truthfulness
16	*"It's the perception of something profound, intrinsic to humans themselves, and therefore authentic"*	Self, Reflection

After uploading the photos as in Figure 4 (A3), participants explained why they had chosen the scene (A4) (Table 6).

Figure 4. Example of a non-authentic photograph (task A3). The photo was taken by a participant.

Table 6. Example of the answers included in the activity workbook of the CPK (A4).

CPK Nr	Answer	
42	*"The photo shows a situation I purposefully altered from its natural state (I.e., tidied it up). This was a filtered photo, aware of itself as something to be looked at"*	World, Naturality
6	*"The anonymity and distance of the subject, which is perceived as an unimportant background"*	Self, Familiarity
1	*"No atmosphere, distance"*	World, Atmosphere

Furthermore, 81% of participants concurred (A5) that the absence of elements they used to describe the photographs would have altered the experience. Regarding A6, which inquired as to why the visit to Palazzo Poggi was perceived as authentic, several of the participants' most noteworthy responses are included in Table 7.

Table 7. Example of the answers included in the activity workbook of the CPK (A5).

"I saw a thing I have never seen before, made by people that studied a lot"	World, Unicity
"Because of the genuine interest of my friends and colleagues"	Others, Group Influence
"It was surprising, and I could share it with people I do care about"	Others, Familiarity

In A8, 75% of the participants reported believing that having the experience alone or with others can alter one's perception of its authenticity. Other comments in line with this comment (A9) are included in Table 8:

Table 8. Example of the answers included in the activity workbook of the CPK (A9).

"Alone could have been more emotional, but at the same time was nice to share my thoughts"	Others, Exchange
"Cause it creates the opportunity to share how different the perception of the visit and the artefacts seen are"	Others, Exchange
"Because as a group you can also learn from each other"	Others, Group Influence
"I think what a group of people perceive has a direct effect on individuals. I mean social acceptance of authenticity"	Others, Group Influence

In question A10, the answers with the most votes were: "Knowledge/Know How" and "Expectations", respectively, with 75% and 45.8%.

(b) Authenticity in daily life.

In this task, each participant shared a genuine experience from their past. A total of 13 responses were gathered, revealing several remarkable aspects. These diverse narratives demonstrated unique, authentic, and most notably, emotionally resonant moments, including peace, love, sorrow, anxiety, oddity, and honesty. Moreover, the images vividly conveyed the profound emotions experienced by the participants. Here, we have chosen to highlight two stories and one image, the latter being related to the second narrative.

"At the end of May 2012, I was working at a customer's office in the center of Bologna when an earthquake started to shake the building. Other employees in the office and I did what should not be done in these cases: we ran down the stairs. Fortunately, nothing happened, and we went outside unharmed. **At that moment, our fear was very authentic***".*

"My "authentic" experience is related to a very simple memory (described also in the photo). During my BA I lived in Venice and my dorm was in San Servolo, a wonderful island almost entirely occupied by a park. In spring, I spent many days studying together with my friends in the greenery. Nothing particularly special happened: we spent the breaks laughing together, chatting and, at lunch, we prepared simple meals sharing our food. It might seem quite naïve, but **I consider these very simple moments as some of the happiest and most genuine memories I have***".* (Figure 5)

Figure 5. One photo uploaded in Cultural Probe Kit Nr. 3. The photo was taken by a participant.

(c) Repeated/common behaviours and thoughts.

The diary results have been particularly significant as they closely aligned with other findings from the second activity (b) and from literary studies. As previously mentioned, the emotions experienced by participants stand as a crucial element in every narrative. It is noteworthy that participants often left spaces blank in the diary entries, possibly indicating the uncommon and often singular nature of these events. This activity revealed that genuine moments often stem from new experiences and engaging in something previously untried. Below, we present a curated selection from various days across two Cultural Probe Kits (Tables 9–11).

Table 9. The answers to one CPK and the comments. A curated selection from various days across one Cultural Probe Kits.

Day	What Was Authentic	Rate	Emoji	It Was Authentic Because	Elements of Authenticity	I Felt...
1	*"I saw a movie together with my friend"*	8	smile	*"We laughed out loud"*	*Company, Happiness*	*Happy*
2	*"I shared moments at lunch with dorm mates"*	9	tongue— Winking eye	*"I wasn't alone"*	*Company, Laughter*	*Accepted*
3	*"I did an oral exam"*	6		*"I was quite anxious"*	*Anxiety, Fear*	*Nervous*

Table 10. The answers to one CPK and the comments. A curated selection from various days across one Cultural Probe Kits.

Day	What Was Authentic	Rate	Emoji	It Was Authentic Because	Elements of Authenticity	I Felt...
1	*"I was having breakfast and I saw a post on Instagram about Russia having attacked Ukraine"*	8		*"I felt very sad, and my eyes got wet"*	*"the emotions I was experiencing"*	*sad and worried*
2	*"I felt happy talking and laughing with a colleague during work, because we need some distractions and little happy moments during this tough period"*	9		*"I felt really happy and I laughed quite a lot"*	*"My spontaneous Smile, The good emotions that the experience left me and that lasted for a couple of hours after it"*	*Happy and wanting to live it more often*

Table 11. The answers to 3 CPKs and the comments.

Day	What Was Authentic	Rate	Emoji	It Was Authentic Because	Elements of Authenticity	I Felt...
1	*"My sister is bringing mozzarella in Bologna next month"*	10	*love*	*unexpected*	*unexpectation, kindness, food*	*loved*
2						
3	*"My friend ordered a hamburger, and the paper envelope was full of draws and beautiful decorations"*	7	*happy*	*it was a beautiful package*	*colours, details care*	*surprised*

(d) Authenticity in digital experiences.

For (D1), we asked participants if there was a correlation between emotions and authenticity. Remarkably, all 16 participants (100%) affirmed this connection with a positive response. Subsequently, we posed the question (D2) regarding which specific emotions were associated with the authenticity of these experiences. The participants reported the following emotions and comments:

- *Feelings are involved;*
- *Sadness/probably sadness;*
- *Loss;*
- *Spontaneity;*
- *Happiness*
- *Maybe happiness and joy but even sadness;*
- *Pity;*
- *Human connection and empathy;*
- *Deep emotions,*
- *Involvement/the feeling of being involved;*
- *Love, passion;*
- *Relief*
- *Tiredness.*

The third question (D3) sought to explore the potential link between reliability and authenticity and the reasons behind it. This question was posed after participants viewed the video ("Modigliani VR). The feedback was affirmative: 86.7% of respondents agreed that the credibility of an institution enhances the authenticity of an experience. Here are some of the responses:

- *"When such experiences are produced by "reliable" institutions I think the user feels safer in trusting what he is seeing, closer to it, and less suspicious towards it: reliability makes it easier to dive in the experience and connect with it, therefore perceiving it as more authentic".*

- *"Yes, I think that virtual experiences like the one shown in the video could be very useful to allow the spectators to immerse themselves in the artist's world. It makes the artworks and everything shown in the exhibition more interesting and easier to catch in its meaning for the spectator".*
- *"No, it makes the experience more accurate, not necessarily more authentic. That's because authenticity has to do with passion, and reliability doesn't necessarily go with passion".*

Following that, we posed question D4, asking participants to describe an authentic digital experience. Impressively, nearly all respondents (93.3%) shared at least one authentic digital encounter. Below, we highlight a selection of these diverse experiences:

- *"I haven't experienced a lot of virtual exhibitions yet, but one I enjoyed and found particularly authentic was the one called "Monet Experience" which was connected to a travelling exhibition around Italy. It relied on panels and projection of details from Monet's paintings. Once entered the exhibition I remember a long aisle with projections of Monet patterns all over it that first contributed to making me enter a different state of mind; the projection together with the soft lights and music in the background created a sort of parallel reality where one could feel absorbed at the moment, as much that coming out of the exhibition felt like a shock"*
- *"The happiness I felt during some precise moments with the most important people I have had a relationship with"*

Regarding the questions related to the video "Matrix with Unreal" (D7), we observed that 50% of the participants answered affirmatively, while 37.5% responded negatively. However, 12.5% remained undecided or expressed partial disagreement. While most participants provided straightforward yes or no answers, we report here the only two responses that were accompanied by reasoning:

- *"Partially, [...] I can see it's very subjective",*
- *"It depends on the definition of authentic".*

The responses to question (D8) proved to be quite insightful about a comparison between the elements or indicators of authenticity present in the Unreal 5 video and those identified in the diary. A majority, 52.25% of participants, pointed out various elements of commonality. Conversely, 31.25% saw no elements of authenticity, and 12.5% were unsure. As a result, we can identify three main results:

1. Emotions triggering authenticity may come from immersive sounds, hybridity (real-digital interconnection) and interactivity.
2. Involvement (sense of presence) is fundamental in the perception of authenticity, and it can be built by an involving atmosphere (visual digital scenarios) and narrative.
3. Authenticity may provoke a generated interest (beyond the experience).

Regarding other authentic digital experiences reported by participants, they included 3D virtual environments for CH, Assassin's Creed Odyssey (https://www.ubisoft.com/it-it/game/assassins-creed/odyssey (accessed on 3 June 2024)), MAV museum in Ercolano (https://www.museomav.it/ (accessed on 3 June 2024)), Kid A Mnesia Exhibition by Radiohead (https://kida-mnesia.com/ (accessed on 3 June 2024)), and Van Gogh's room.

To conclude, for question D10, we asked participants to select the emotion that best characterises an authentic experience. In total, 68.8% of the participants selected "Happiness", and 62.5% opted for "Surprise". Conversely, 37.5% chose "Sadness", while a mere 3% identified with "Fear". Notably, there were no votes for "Anger" or "Disgust". In question D11, we inquired about which senses participants felt were most involved in perceiving authenticity: 81.3% of respondents highlighted "Sight/visual elements", while 62.5% selected "Hearing/sounds". Additionally, 56.3% indicated "Touch" as a significant sense, and the remaining 25% chose "Sense of Smell". A small fraction, 6.3%, felt that "Taste" played a role in their perception of authenticity. In the concluding question D12, we explored other crucial aspects or indicators of authenticity. Although the question was structured with predefined options, participants had the liberty to select multiple responses. The most frequently chosen aspects were "Emotional impact", receiving 15 selections, and "Unpredictability of what happened", with 7 selections.

5. Authenticity Framework: A Multidimensional Analysis

To move from the theoretical foundations and empirical insights discussed earlier toward a more actionable framework, it is crucial to transition from abstract concepts to specific dimensions and components that constitute an authentic experience. This next section provides the practical bridge between understanding authenticity in principle and applying it in practice, breaking down the complex concept into its constituent parts. From the studies carried out and described in previous chapters, we have understood that the approach to understanding and evaluating authenticity in hybrid and XR cultural experiences necessitates a deep and multidimensional analysis. This section is dedicated to exploring the intrinsic complexity of authenticity, highlighting how it emerges from the intersection of theoretical perspectives and empirical observations. Through this approach, we aim to outline a conceptual framework that can effectively guide both the design and analysis of authentic experiences. The complexity of authenticity manifests in various ways, reflecting the diversity and depth of its dimensions and components. These observable characteristics extend far beyond the mere sum of their parts, intertwining in unique configurations that give rise to deeply personal and meaningful experiences. Our investigation starts with the assumption that authenticity cannot be considered a static definition or a limited set of criteria; rather, it reveals itself through a mosaic of qualitative and quantitative elements that interact in complex and often unpredictable ways. In this context, the role of literature and empirical evidence becomes crucial in unveiling the multiple characteristics of authenticity. The literature has provided us with the theoretical foundations and key concepts that form the basis of our understanding (Section 2), while empirical observations, derived from field studies and qualitative analysis, have enriched this foundation with direct and contextualised insights (Section 3). The synergy between these two approaches creates new perspectives, suggesting that each authentic experience is the result of a unique configuration of connected components, with an unavoidable personal and subjective perspective. Nevertheless, aware of this complexity, we aimed at reaching a general and synthetic definition of an "authentic experience", with the specific goal of supporting the design of interactive experiences. Addressing this complexity, therefore, requires a wide approach that recognizes and integrates the variety and interconnection of its components. This entails careful consideration of how they combine to create an experience that resonates as authentic. It is in this intricate weave of elements that the true essence of authenticity lies, making each experience unique and unrepeatable.

In this section, we detail dimensions, components and elements, following the methodology explained in Sections 3.3 and 3.4.

The "**Self**" dimension refers to the users as the main protagonist of the digital or hybrid experience. It includes eight main components, each with specific elements (we have specified 34 elements here, although the list is not exhaustive) (Table 12):

1. *Disposition (personal),*
2. *Context (personal),*
3. *Cognition,*
4. *Perception,*
5. *Emotion,*
6. *Embodiment (personal),*
7. *Familiarity (personal),*
8. *Time.*

Table 12. The "Self" dimension refers to the users as the main protagonist of the digital or hybrid experience. It includes eight main components, each with specific elements (we have specified 34 elements here, although the list is not exhaustive).

COMPONENTS	ELEMENTS	AUDIENCE GOAL
Personal Disposition	Attention/Distraction	STRENGTHEN PERSONAL DISPOSITION
	Curiosity	
	Extroversion/Introversion	
	Identification: Identity	
	Spatial Memory/Sense of Direction	
Personal Context	Challenge	STRENGTHEN PERSONAL CONTEXT
	Choice	
	Expectations	
	Meaningfulness	
	Value	
Cognition	Comprehension	FOSTER COGNITIVE PROCESSES
	Knowledge	
	Memory and re-call	
	Reflection	
	Self-monitoring	
Perception	Hear	STIMULATE SENSORY RESPONSES
	Taste	
	Touch	
	Sight	
	Smell	
Emotions	Anger	STIMULATE EMOTIONAL RESPONSES
	Disdain	
	Fear	
	Joy	
	Sadness	
	Surprise	
Embodiment (personal)	Interaction	STRENGTHEN PERSONAL EMBODIMENT
	Immersivity	
	Sense of Presence	
Familiarity (personal)	Accessibility	DEVELOP SENSE OF FAMILIARITY
	Comfort	
	Comprehensibility—Usability	
	Ergonomy	
	Security	
Time	Evolution (personal)	DEVELOP PERSONAL EVOLUTION

The self also has a social dimension. Following Davidson's epistemology, if we consider the way we experience, there are three types of knowledge: the knowledge of the self, of other minds, and of the external world (none has priority) [69]. We have named, therefore, the second dimension of authenticity "Others". The "**Others**" refers to the interconnection

and relations people have with each other. A self encounters, identifies, and collides with the other (who is also a self) in a temporal and spatial environment (the world), through a system of interactions. Although authenticity always starts with the self, it also has a social dimension: humans are social creatures because of their ability to make and sustain connections with others. The ability to relate to others is a hallmark of humanity, and people have developed various methods of communication and interaction to establish and maintain social ties. An individual's authenticity is influenced by the social environment in which he or she lives. The proposed framework shows for instance that it is possible to increase the perception of authenticity through strategies that create a sense of belonging to a group. Designers can also develop collaborative experiences and solicit exchange dynamics; include the presence of a guide or a master, as in role-playing games, with whom users can interact; or design hybrid experiences in co-presence to improve social embodiment. This dimension includes seven different components, each characterised by different elements (we have included a list of 22 elements that do not represent the entire range of possibilities. Table 13):

1. *Language,*
2. *Social practices,*
3. *Social norms,*
4. *Unpredictability (social),*
5. *Embodiment (social),*
6. *Familiarity (social),*
7. *Time.*

Table 13. This dimension (Other) includes 7 different components, each characterised by different elements (we have included a list of 22 elements here that do not represent the entire range of possibilities).

COMPONENTS	ELEMENTS	AUDIENCE GOAL
Language	Exchange	FACILITATE DIALOGUE
	Perspective	
	Provocation	
	Storytelling	
Social practices	Challenges	FOSTER SOCIAL PRACTICES
	Competition	
	Cooperation and co-creation	
	Interaction	
	Relationships	
Social norms	Constraints	FOSTER SOCIAL NORMS AMONG VISITORS
	Rewards	
	Roles	
	Penalties	
Unpredictability (social)	Casualty	INCLUDE SOCIAL UNPREDICTABILITY
	Influences (group)	
	Unpredictability, unexpected	
Embodiment (social)	Gestures (Social)	IMPROVE SOCIAL EMBODIMENT
	Tone of voice	
Familiarity (social)	Communion (common aspects)	IMPROVE GROUP FAMILIARITY
	Connection	
	Identification: Sense of Belonging	
	Hospitality	
Time (social)	Evolution (social)	DEVELOP SOCIAL RELATIONS INCREASINGLY

The last dimension, the "**World**", refers to the authentic perception of the environment, intended here both as a physical setting where the experience takes place, as in the case of hybrid or AR/MR experiences, and as a digital environment, especially in the case of immersive VR applications. In order to strengthen this dimension, it is possible to not only develop 3D interactive realistic environments but also to focus on their reliability, providing users with tools that support their validation and interpretation process, to strengthen the embodiment, improving the atmospheric effects of the environments (light, material, sound effects), or even to include unexpected elements. This dimension includes 7 components and 23 elements (Table 14):

1. *Verification*
2. *Physical Context*
3. *Atmosphere*
4. *Unpredictability (environmental)*
5. *Embodiment (environmental)*
6. *Familiarity (environmental)*
7. *Time*

Table 14. The world dimension includes 7 components and 23 elements.

COMPONENTS	ELEMENTS	AUDIENCE GOAL
Verification	Realism	USE PLAUSIBLE AND REALISTIC ELEMENTS
	Reliability	
	Truthfulness	
	Validation	
Physical Context	Dimension	PHYSICALLY SIMULATE THE ENVIRONMENT
	Physics (laws of physics)	
	Visual Aspect/appearance	
Atmosphere	Light	CREATE APPROPRIATE MOOD (VISUAL STYLE, SOUNDS, LIGHT)
	Sound	
	Synesthetic	
	Style (i.e., visual)/effects	
Unpredictability (environmental)	Originality (novelty)	INCLUDE ENVIRONMENT UNPREDICTABILITY
	Peculiarity	
	Randomness	
	Uniqueness	
Embodiment (environmental)	Feedback	INCLUDE INTERACTIONS AND FEEDBACKS BETWEEN VISITORS AND ENVIRONMENT
	Immersivity	
	Interaction (with the world)	
Familiarity (environmental)	Comfort	MAKE VISITORS FEELING FAMILIAR WITH THE ENVIRONMENT
	Reference	
	Safety	
	Sense of place	
Time (world)	Natural conditions	LET VISITORS TIMEFLOW
	Time flow	

The following figure summarises the dimensions, components and elements with a focus on the self dimension (Figure 6).
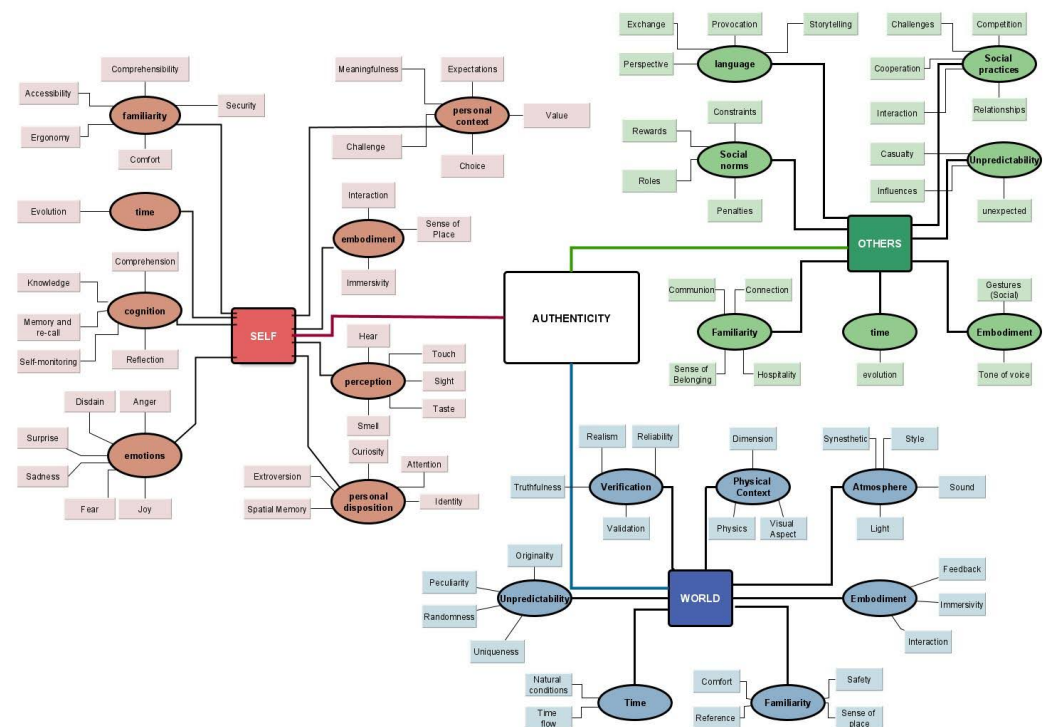
Figure 6. The authenticity conceptual framework: a graph with its hierarchical visualisation of domains and components.

6. Mapping the Framework on Real Examples

In this chapter, we use the conceptual framework to describe two interactive applications developed in the field of cultural heritage: a hybrid XR experience (Brancacci POV) and a serious game (Hwæt! The Vercelli Book Saga). The goal is to test the usability of the components and to verify the position of the applications as referred specifically to the "Self" domain.

6.1. Brancacci POV

The Brancacci POV (Point of View) experience was developed as a multi-user hybrid and collaborative webXR experience (Figure 7). It enables a group of tourists to visit the Brancacci Chapel together, either remotely or in person, and be guided by an expert. The UX is fully described in [70]. The Chapel is considered one of the most important masterpieces of the early Renaissance, with the frescoes painted by Masaccio and Masolino da Panicale and completed by Filippino Lippi. The monument has undergone a long diagnostic and restoration campaign, and it is now again accessible to tourists and citizens. The results of this campaign can be accessed through scientific publications, but the amazing discoveries can not reach the wider public beyond scholars, experts and professionals. Moreover, despite its importance, the Chapel is not well-known and visited. Furthermore, its visit requires standing on the floor, quite far from the painted walls; thus, it is impossible to appropriately appreciate this piece of art. BrancacciPOV has been developed to overcome these limitations. The experience was developed as an iterative interaction loop between the guide and the group of participants, who can use a smartphone or a tablet, through which they can explore and carry out five main tasks proposed by the guide as in a sort of collaborative treasure hunt. In the end, when all tasks are completed, the participants are given the possibility to enter "inside" the chapel as scientists, wearing a VR headset, and explore the frescoes using special diagnostic tools (such as an ultraviolet lamp and an oblique lighting lamp) (Figure 6). The entire UX was designed at the time when we were working on the concept of authenticity; therefore, we developed different strategies in line with the three dimensions to be able to obtain a more authentic experience. The

website describes the project and offers a single user access to the web3D application (http://brancaccipov.cnr.it/ (accessed on 3 September 2024)).

Figure 7. BrancacciPOV experience: the visitors interacting through the tablet with the guide and other visitors, while one of the participants is wearing the VR headset for a fully embodied experience (photo by CNR).

We report in the tables below the components and elements that were considered during the design process, as explained in Section 5 (Tables 15–17).

Table 15. The 21 "Self" elements that were integrated in this study.

COMPONENTS	ELEMENTS	AUDIENCE GOAL
Personal Disposition	Attention/Distraction	STRENGTHEN PERSONAL DISPOSITION
	Extroversion/Introversion	
	Identification: Identity	
Personal Context	Challenge	STRENGTHEN PERSONAL CONTEXT
	Choice	
	Meaningfulness	
	Value	
	Comprehension	
Cognition	Comprehension	FOSTER COGNITIVE PROCESSES
	Knowledge	
	Reflection	
Perception	Hear	STIMULATE SENSORY RESPONSES
	Touch	
	Sight	

Table 15. *Cont.*

COMPONENTS	ELEMENTS	AUDIENCE GOAL
Emotions		STIMULATE EMOTIONAL RESPONSES
	Surprise	
Embodiment (personal)	Interaction	STRENGTHEN PERSONAL EMBODIMENT
	Immersivity	
	Sense of Presence	
Familiarity (personal)	Accessibility	DEVELOP SENSE OF FAMILIARITY
	Comfort	
	Comprehensibility—Usability	
Time	Evolution (personal)	DEVELOP PERSONAL EVOLUTION

Table 16. The 9 "Other" elements that were integrated in this study.

COMPONENTS	ELEMENTS	AUDIENCE GOAL
Language	Exchange	FACILITATE DIALOGUE
	Perspective	
	Storytelling	
Social practices	Challenges	FOSTER SOCIAL PRACTICES
	Interaction	
Social norms		FOSTER SOCIAL NORMS AMONG VISITORS
Unpredictability (social)	Casualty	INCLUDE SOCIAL UNPREDICTABILITY
	Unpredictability, unexpected	
Embodiment (social)		IMPROVE SOCIAL EMBODIMENT
Familiarity (social)		IMPROVE GROUP FAMILIARITY
	Hospitality	
Time (social)	Evolution (social)	DEVELOP SOCIAL RELATIONS INCREASINGLY

Table 17. The 16 "World" elements integrated in this study.

COMPONENTS	ELEMENTS	AUDIENCE GOAL
Verification	Realism	USE PLAUSIBLE AND REALISTIC ELEMENTS
	Reliability	
	Truthfulness	
	Validation	
Physical Context	Dimension	PHYSICALLY SIMULATE THE ENVIRONMENT
	Visual Aspect/appearance	
Atmosphere	Light	CREATE APPROPRIATE MOOD (VISUAL STYLE, SOUNDS, LIGHT)
	Style (i.e., visual)/effects	
Unpredictability (environmental)	Originality (novelty)	INCLUDE ENVIRONMENT UNPREDICTABILITY
	Peculiarity	
	Uniqueness	
Embodiment (environmental)	Feedback	INCLUDE INTERACTIONS AND FEEDBACKS BETWEEN VISITORS AND ENVIRONMENT
	Immersivity	
	Interaction (with the world)	
Familiarity (environmental)	Comfort	MAKE VISITORS FEELING FAMILIAR WITH THE ENVIRONMENT
	Sense of place	
Time (world)		LET VISITORS TIMEFLOW

6.2. The "Hwæt! The Vercelli Book Saga" Video Game: The Self Dimension Design Process

Regarding the second example, we will give an example of how components and elements of the self dimension guided the design of a serious game created as part of the "God Save the Nerd! Realtà aumentata al #mtdvercelli" project. A brief description of the game will be followed by a detailed and annotated examination of the components and elements of the dimension.

"Hwæt! The Vercelli Book Saga" is a video game inspired by two different types of games: (a) role-playing-games where players, assuming the role of a character, take part in actions, conversations, and events inspired by the Vercelli Book and its history; (b) the so-called graphic adventures where puzzles and enigmas are a peculiar aspect and are scattered throughout the game, materialising in the form of mechanisms to be unlocked, objects to be recovered/found, etc.

The narrative core of the game can be found in one of the prose poems in the Vercelli Book (Andreas), where at the end of the text, on one page, a word has been deleted for unclear reasons. The word indicates the feminine name eadgip (Edith).

According to the experts' perspective, the name Edith can be traced back historically (this is one of the hypotheses) to St. Edith of Wilton, who was famous for her prophetic

gifts and some anecdotes according to which, after her death, her body awoke from eternal sleep and terrified anyone who tried to steal her relics. These anecdotes, which are a natural support to creating a captivating narrative atmosphere at the base of a video game, are strengthened by some historical traits that link Edith's figure to the Vercelli Book: her friendship with Dunstan, Archbishop of Canterbury, who was probably the one who wanted the book to be composed or, at least, one of its first owners.

The video game Hwæt! is, therefore, set in 11th century Europe and focuses on the figure of Edith of Wilton (the main non-player-character (NPC)). Players will retrace some of the possible stages that brought the famous manuscript from Canterbury to Vercelli through the adventures of Eve of Wilton (the player-character), the favourite pupil of Goscelin (another narratively central NPC), Edith's "official" hagiographer.

Eve's goal will be to find and bring back to England what was taken from Edith, which is linked to the Vercelli Book. Players will experience Eve's adventures by unravelling mysteries, conducting investigations, and engaging in dialogue with various NPCs, some of whom represent real-life historical figures. Herem in the figures below, you can see all the elements that were integrated into the video game Hwæt! (Tables 18–20 and Figure 8).

Table 18. The 31 "Self" elements integrated in this study.

COMPONENTS	ELEMENTS	AUDIENCE GOAL
Personal Disposition	Attention/Distraction	STRENGTHEN PERSONAL DISPOSITION
	Curiosity	
	Extroversion/Introversion	
	Identification: Identity	
	Spatial Memory/Sense of Direction	
Personal Context	Challenge	STRENGTHEN PERSONAL CONTEXT
	Choice	
	Expectations	
	Meaningfulness	
	Value	
Cognition	Comprehension	FOSTER COGNITIVE PROCESSES
	Knowledge	
	Memory and re-call	
	Reflection	
	Self-monitoring	
Perception	Hear	STIMULATE SENSORY RESPONSES
	Taste	
	Touch	
	Sight	
	Smell	
Emotions	Anger	STIMULATE EMOTIONAL RESPONSES
	Disdain	
	Fear	
	Joy	
	Sadness	
	Surprise	

Table 18. *Cont.*

COMPONENTS	ELEMENTS	AUDIENCE GOAL
Embodiment (personal)	Interaction	STRENGTHEN PERSONAL EMBODIMENT
	Immersivity	
Familiarity (personal)		DEVELOP SENSE OF FAMILIARITY
	Comfort	
	Comprehensibility—Usability	
Time	Evolution (personal)	DEVELOP PERSONAL EVOLUTION

Table 19. The 8 "Other" elements that were integrated in this study.

COMPONENTS	ELEMENTS	AUDIENCE GOAL
Language	Exchange	FACILITATE DIALOGUE
	Perspective	
	Provocation	
	Storytelling	
Social practices	Challenges	FOSTER SOCIAL PRACTICES
	Competition	
Social norms	Constraints	FOSTER SOCIAL NORMS AMONG VISITORS
	Rewards	
Unpredictability (social)		INCLUDE SOCIAL UNPREDICTABILITY
Embodiment (social)		IMPROVE SOCIAL EMBODIMENT
Familiarity (social)		IMPROVE GROUP FAMILIARITY
Time (social)		DEVELOP SOCIAL RELATIONS INCREASINGLY

Table 20. The 14 "World" elements that were integrated in this study.

COMPONENTS	ELEMENTS	AUDIENCE GOAL
Verification	Realism	USE PLAUSIBLE AND REALISTIC ELEMENTS
	Reliability	
	Truthfulness	
	Validation	
Physical Context		PHYSICALLY SIMULATE THE ENVIRONMENT
	Visual Aspect/appearance	
Atmosphere	Light	CREATE APPROPRIATE MOOD (VISUAL STYLE, SOUNDS, LIGHT)
	Sound	
	Style (i.e., visual)/effects	
Unpredictability (environmental)	Originality (novelty)	INCLUDE ENVIRONMENT UNPREDICTABILITY
	Peculiarity	
	Uniqueness	
Embodiment (environmental)	Feedback	INCLUDE INTERACTIONS AND FEEDBACKS BETWEEN VISITORS AND ENVIRONMENT
Familiarity (environmental)	Comfort	MAKE VISITORS FEELING FAMILIAR WITH THE ENVIRONMENT
	Sense of place	
Time (world)		LET VISITORS TIMEFLOW

Figure 8. An image from the serious game "Hwæt! The Vercelli Book saga". Photo by CNR Istituto per le Tecnologie Didattiche, Palermo.

7. Conclusions and Further Developments

In this paper, we have discussed and detailed the dimensions, identifying interconnected components and elements of an authentic experience. We have understood how the concept of authenticity is similar to family dynamics, in which features frequently share commonalities, occasionally converge completely, and other times remain individually separate. These characteristics overlap and cross over in similar ways. In the structure of our real-life experiences, there is always a unifying theme, a convergence of twisted threads, which reflects Wittgenstein's theory. There are several commonalities among the participants' various accounts in the stories that were recorded using the Cultural Probe Kits. These components are always different, even though they are similar in subtle ways, such as parents and children. Organised data represent an "Authenticity Conceptual Framework" that can be used to support the design of UX and hybrid experiences in the field of cultural heritage.

To better explain this approach, we have included "actionable" indications for designers and described two applications following this approach. We have in fact understood that authenticity has a key performative property: it is an action with actors, tools, context of execution, space, time (it is not static but it develops), and modalities of execution.

In Section 5, we clarified that designers can obtain higher authentic experiences just by appropriately using some of the components, and it is not compulsory to focus on all components or elements.

What remains open to further study is that the interplay among these three dimensions remains an unresolved question. If we enhance one dimension, for example, by integrating a specific component, how does this affect the other dimensions? Are they so intertwined that enhancing one dimension necessitates a reduction in another, or both, to maintain equilibrium? For instance, if we create an experience with well-crafted self and world dimensions (such as immersing a user in a realistic environment with a meaningful atmosphere, accompanied by engaging storytelling that evokes reflection or strong emotions), should we then diminish the "other" dimension to preserve the authenticity of the experience (for example, by not introducing other users, allowing the individual to focus solely on the experience)?

Furthermore, a further step regards the identification of appropriate measures to evaluate the components quantitatively and qualitatively, with the goal of developing an "index of authenticity" that would be extremely useful. Such cross-evaluation would help to better understand the needed components that could be used in design to create an authentic experience. Such an index could support early-stage evaluation (pre-production) and analysis of final prototypes to determine whether the experience is sufficiently authentic or needs to be modified.

To conclude this work, and for the purpose of interactive media design in a cultural heritage context, we can define authenticity in virtual experiences as *a multi-dimensional concept made of three dimensions (self, others, world), each characterised by specific components and elements, that works by touching the deeper self through performative actions that transform the unfamiliar into familiar and by creating social connections and an embodiment in the environment.*

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