

Paola
La Scala

DESIGNING MUSEUM EXPERIENCES: NARRATIVES, INTERACTION AND DIGITAL TRANSITION

Collana
Design+Future | 4



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A design perspective on **communication, engagement**
and the **future of museums**

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“La fantasia è un posto dove ci piove dentro.”

Italo Calvino

In these pages, I have gathered that rain.

Far from being a final destination, this book represents a living stage in an ongoing design research journey, nourished by time, encounters, and the places that have shaped its course.

It reflects a personal and scholarly path intertwined with many lives, from which it has drawn strength, direction, and meaning

I wish to express my deepest gratitude to **Toti Di Dio**, whose intellectual guidance and generous dialogue have inspired and enriched this research. His perspective has opened new directions of thought and helped me to frame this work within a broader disciplinary vision.

My sincere thanks also go to **Mladen Jadrić** for the many stimulating opportunities for exchange and reflection over the years, which have continually inspired my work and broadened its horizons.

My heartfelt thanks also go to my **husband Alberto** and my **son Dario**, for their patience, their waiting, and their presence that gives meaning to time.

To my **sister Maria Elena**, who believes in me, always one step ahead.

To my **parents**, for their constant support, their love of culture, and for teaching me to believe in things.

Finally, I extend my gratitude to all those who, in different ways, have crossed this path, leaving traces of trust, inspiration, and vision.

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FOREWORD

by Mladen Jadrić

With this book, Paola da Scala has tackled a very important and sensitive topic.

We have a long-standing collaboration, during which I have come to greatly value of her expertise and knowledge.

Therefore, I am convinced that this work makes an important and long-awaited contribution to this topic.

The contemporary museum stands at a crossroads. Once conceived primarily as a repository of cultural memory, it has now evolved into a dynamic space of interaction, interpretation, and participation. This transformation has been driven not only by curatorial innovation but by the growing recognition that design itself - architectural, spatial, and experiential - plays a central role in shaping how knowledge and emotion are encountered within the museum.

The study that follows, *Designing Museum Experiences*, enters this conversation at a crucial moment.

Across the world, museums are rethinking their mission, their audiences, and their forms of engagement. They are becoming laboratories of perception, social exchange, and imagination. Design is no longer a matter of providing containers for art; it is about constructing frameworks for meaning, emotion, and collective experience.

For those of us who work in architecture and exhibition design, this shift represents both an opportunity and a challenge. It demands that we move beyond the traditional boundaries of form and function to embrace design as a medium of communication and reflection. The museum, in this sense, is not a neutral space - it is a living structure that participates in the creation of its own narratives. Each wall, threshold, and beam contributes to the choreography of perception. The act of designing such spaces requires more than technical mastery. It calls for a philosophical and sensory understanding of how architecture mediates between material and immaterial realms. As Walter Benjamin suggested, architecture, like dreaming, can be prophetic - not in predicting the future, but in projecting human wishes and emotions into physical existence. Through design, we construct the conditions for experience; we translate memory, curiosity, and wonder into form.

This relationship between design and imagination has been at the heart of my own work. In the

Photography Seoul Museum of Art, for example, the design process began with a question: What do architecture and photography share? Both depend fundamentally on light; both attempt to capture what is transient and make it endure. The building was conceived as a frozen moment - a sculptural composition that embodies the fleeting and the permanent.

The result is not a monument, but a dialogue between the tactile and the ephemeral, between the city's movement and the stillness of contemplation.

In such projects, I have come to understand architecture as a language of reflection. The creative process, though seemingly rational, is guided by intuition, conversation, and silence. It unfolds through sketches, models, materials, and above all through dialogue - among teams, disciplines, and ideas.

The invisible labor that shapes a museum's atmosphere - the persuasion, the negotiation, the shared conviction - is as integral to its success as the visible form itself.

Design, when approached this way, becomes an ethical practice. It concerns not only how space looks, but how it behaves - how it welcomes, includes, and inspires. A museum designed with sensitivity can bridge the gap between art and everyday life, between individual memory and collective identity. It can invite participation rather than impose order, offering a space where visitors feel both guided and free.

In this regard, the role of design in museums extends beyond aesthetics. It is fundamentally social. Carlo Argan once described design as a methodology capable of uniting object and city, art and community.

The same can be said of museum architecture: it must act as an interface between the institution and the world around it. The museum should no longer be isolated from its context but should open itself to the city - becoming part of the public realm, an accessible platform for exchange and imagination.

Today, as digital technologies reshape the ways we experience art, the museum faces an even more complex task. It must balance physical presence with virtual extension, intimacy with immersion. Yet, even amid this technological evolution, the essence of the museum remains human. It is defined by the simple act of encounter - the moment when a visitor pauses before a work, when light shifts across a surface, when silence becomes part of the experience. These are the moments that design must protect and enable.

To design museum experiences, therefore, is to design conditions for awareness. It is to choreograph light, material, and time in a way that allows perception itself to become visible. It requires humility - an understanding that architecture does not dictate experience but invites it. The most successful museums are those that leave room for imagination, for the unpredictable responses that visitors bring with them.

The volume that follows takes up this vital discussion - not as a conclusion, but as an opening. It recognizes that designing museum experiences is an ongoing dialogue: between art and space, between designer and curator, between audience and institution. It is a dialogue that asks us to reconsider what museums can be in a world where information is abundant but true experience is rare.

Ultimately, to design a museum is to design a relationship - between people, between time and place, between memory and possibility. It is an act of translation between what we know and what we feel, between what is seen and what is imagined. As we continue to shape the museums of the future, design will remain the bridge that connects these realms: a bridge not of walls and ceilings, but of understanding and empathy.

Arch. Dr. DI Mladen Jadric,
TU Wien and principal at Jadric Architektur ZT

PREFACE

This book emerged from doctoral research on the latest technology employed in museums, and was developed at the University of Palermo in cooperation with the University of Leicester; it has since evolved through years of research, teaching, and interdisciplinary collaboration in the field of design for the cultural heritage. The original study, which explored the relationship between digital mediation and exhibition design, provided the foundation for a broader reflection on how communication and user experience shape the museum as a space inviting knowledge and participation.

Over time, the research matured into a more sharply-focused investigation into the communicative dimension of design, integrating theoretical frameworks with applied design practices. The chapters assembled here are the result of this long process of refinement, integrating academic inquiry with design practice, and critical reflection with experimentation.

Diverse research experiences, including co-design workshops and collaborative projects carried out in cultural and academic contexts, contributed to the development of the ideas presented in this book. The reflections gathered here are, therefore, not the outcome of a single line of research, but the result of continuous dialogue between research and action and between different disciplines and perspectives.

I am deeply grateful to all the people I have met and worked with over the years - colleagues, students, professionals, and institutions - whose insights and shared experiences have inspired and enriched this research, although they cannot all be mentioned individually.

This book aims to appeal to both scholars and practitioners, offering a design-based perspective on the transformation of museums into hybrid and dynamic cultural spaces. It seeks to bridge the gap between theory and practice, proposing design not simply as a means of communication, but as a form of critical thinking that can reconceive the relationship between people, knowledge and heritage.

INTRODUCTION

1. Background and Aims

The research presented in this book stems from a long-term investigation into the relationship between design, communication and museum experience. Building on earlier studies, it develops critical reflection on how design contributes to shaping the museum as a communicative and experiential environment. The focus is placed on the interaction between visitors, media and space, and on the ways in which design transforms curatorial and educational ideas into forms of engagement and meaning-building.

The book argues that museums today need to be understood as narrative and relational ecosystems, where communication and user experience are central to the design process. Within this framework, user-experience design and interaction design are not auxiliary tools but founding methodologies for creating environments capable of fostering participation, understanding and connection.

This perspective implies the centrality of interaction, accessibility, multisensoriality and participation. Design now prioritizes the visitor experience, making it the foundation of the entire process; it orients choices, it structures pathways, shapes space, shapes the use of technology and defines communicative tools. The shift toward prioritizing visitor experience not only transforms the physical space of museums, but also entails an innovative response to the digital age, ensuring that museums remain relevant and accessible in both physical and virtual dimension.

In the contemporary context, marked by speed, discontinuity and hyper-connectivity, museums are called upon to respond to new cultural and social challenges. The overflow of information and the loss of symbolic depth, which Han (2022) defines as infocracy, or a form of governance through excessive information, prompt the onlooker to seek experiences that are concrete, embodied and emotionally resonant. As emphasized by authors such as Latour, Massumi, Merleau-Ponty and Crane, knowledge is constructed through *in situ* experience, embodied perception and affective relationships. In this sense, the museum is no longer a place for merely observing objects, but an active environment—a space to feel, understand, and connect. It becomes a place where design is not only aesthetic or functional, but also a transformative language and a critical tool capable of generating meaning and fostering relationships.

2. Structure of the Book

Understanding the transformative role of design in museums sets the stage for a detailed exploration of specific design tools and strategies (as laid out in the subsequent chapters of this volume).

The book is structured in two parts: the first addresses the historical and theoretical framework of experience-centered museum design, offering a critical reinterpretation of key museum design paradigms and highlighting the shift toward visitor-centered approaches and spatial storytelling; the second focuses on design tools, communication media and emerging technology. Through a critical systematization and a selection of case studies, it investigates how designers can translate theory into practice, crafting museum experiences that are coherent, inclusive and meaningful.

Chapter 1 provides a historical overview of the great pioneers of exhibition design, whose work can be read as anticipating many of the strategies now considered central to contemporary museum design (Parry, 2010; Simon, 2010; Roppola, 2012; vom Lehn, 2021). From Hans Sloane to Charles Peale, from Henry Cole to Hazelius, to Alexandre Lenoir and du Sommerard, these are not merely transitional figures between simply collecting and the modern museum, but true pioneers of a design-oriented approach. Their choices, expressed through spatial organization, object selection and display techniques, may now be interpreted as early manifestations of what is today defined as the narrative museum.

Chapter 2 focuses on the concept of visitor-centered design, exploring the evolution of the museum from a place for objects to a space for experiences. It addresses concepts such as co-design, edutainment, and immersivity, which redefine museums as narrative and relational infrastructures. Special attention is given to practices that center on the needs, emotions and cognitive paths of the visitor. The museum is conceived as an open ecosystem, capable of adapting, listening and engaging, where the visitor's experience is not a passive result but the driving force of the design process.

Chapter 3 explores exhibition space as a narrative device. Spatial storytelling redefines the museum as an interpretive and relational environment; designing a museum today means composing a multisensory narrative in which architecture, rhythm, light, graphics, sound and technology come together to generate a multi-layered experience. The space is not a neutral container but a narrative medium capable of stimulating imagination, emotion and memory. Particular attention is paid to the concept of

interactivity, articulated across three dimensions: technical interactivity, involving responsive technology and sensors; spatial interactivity, concerning physical orchestration and bodily engagement; and dialogic interactivity, fostering interpretive and communicative relationships between visitor and content. These dimensions are explored through selected case studies that illustrate effective design strategies for building immersive, dynamic and participatory environments.

Chapter 4, which takes on an operational role as a toolkit for designers and practitioners, offers resources for designing coherent, inclusive and meaningful museum spaces. It presents an overview of the most widely-used tools and media in museum communication: panels, audio guides, videos, interactive kiosks, immersive installations, virtual reality and artificial intelligence. This review serves a dual purpose: to provide a comparative basis for understanding contemporary trends and design orientations and to offer an initial systematization of tools, strategies and approaches that are useful as a reference for practitioners and scholars. The goal is not to propose rigid models, but to offer a flexible, critically grounded framework that is being continuously updated and informed by direct experience. To support this, an open participation module is being developed, allowing designers, researchers and professionals to contribute with examples, thoughts and good practices, nourishing a shared and dynamic repertoire as back-up to contemporary museum design.

Chapter 5 focuses on hybrid and virtual museums, reflecting on how immersive technology is reshaping the relationship between physical and digital spaces. The museum opens up to the metaverse, there generating new forms of interaction, access and engagement. However, the heart of the project remains the quality of the experience; even in virtual environments, design must critically address the perceptual, cognitive, cultural and ethical dimensions of digital language.

The **concluding chapter** offers a forward-looking reflection on the future of museums and their design, outlining emerging trends and open-ended issues that encourage further explorations of design's role in shaping museums as adaptive, inclusive and socially engaged ecosystems.

In this scenario, design is no longer limited to organizing space or media but becomes a driver of cultural innovation, facilitating connections between people, content and technology.

These closing musings leave a series of open-ended questions designed to stimulate further inquiry. What role can design play in shaping museums of the future? How can technology foster encounters between people,

cultural dialogue and the construction of meaning? How can museums remain relevant in our rapidly evolving societies?

These questions open the doors to new design and theoretical exploration in a cultural landscape that demands vision, responsibility and creativity.

3. Methodological Note

The methodological approach underlying this work combines qualitative research and design-based study, acknowledging design as both a reflective and operative form of knowledge production. The work follows the principles of research-through-design and evidence-informed practice, integrating theoretical study with the observation and analysis of real-time projects.

The case studies presented throughout the book were selected not for their completeness, but for their capacity to illustrate diverse modes of communication and user engagement, from analogue to digital, from immersive installations to hybrid platforms. These examples, drawn from different cultural and geographical contexts, serve to identify recurring strategies through which design fosters participation, meaning-building and connection.

This approach reflects an understanding of museums as living laboratories, where design experimentation and critical reflection continually influence each other. The aim is not to prescribe fixed models, but to construct a dynamic, open framework that can support ongoing innovation in museum communication and experience design.

This book aims to stimulate profound and critical musing on the potential of museum design as a cultural and social language. It seeks to provide a contribution that is both theoretical and practical, grounded in the belief that designing a museum today implies caring for the relationship between individuals and knowledge, memory and imagination and present and future possibilities.

PART I

**REFRAMING THE
MUSEUM: FROM
COLLECTION TO
EXPERIENCE**



CHAPTER 1

The Transformative Role of the Museum.

The museum evolves from a repository of objects to an active agent of cultural transformation.

1.1. Defining the Museum: historical perspectives

To most people, the word ‘museum’ probably conjures up images of walls or a building such as the *British Museum* in London, an example of neoclassical architecture with a majestic staircase leading to a large entrance set under a portico with columns; or a more recent and innovative structure like the *Guggenheim Museum* in Bilbao; or, again, an understated building like the *Van Gogh Museum* in Amsterdam. Much less immediate is the image one has of the museum as an experience space, an environment made up of objects, showcases, dioramas, panels, displays, or reconstructions. «In fact, the real task of the museum is, through its objects, to connect the visible to the invisible» (Ruggieri, 2000, p.69), that is, to connect each object to a past that needs to be told.

In 1727, Caspar F. Neickel of Hamburg, in his *Museographia*, defined the museum as a temple of treasures, rarities, and objects of nature, art, and reason. This definition was, of course, very encyclopedic and referred to both natural and man-made objects, including paintings, artifacts, and books. However, books were a different type of object, and as far as conservation was concerned, they underwent a different evolution, to the extent that libraries became distinct from museums.

In 1755, in his *Dictionary*, Samuel Johnson described the museum as a repository for acquired curiosities; the clear reference here is to the public, with Johnson having in mind researchers, collectors, connoisseurs, and the well-to-do elite. There is only a vague reference to the masses, who were considered insignificant, uncouth, and often revolutionary and dangerous. Yet, more often than not, these curiosities, especially paintings and sculptures, were housed in the grand residences of noble collectors; paintings were displayed in long, narrow galleries lit by large windows, while sculptures and other artworks were kept in secure, inner rooms.

These two examples of modern definitions indicate not only the change in this institution but, above all, its connotations. In 1970, the *American Association of Museums* (now the *American Alliance of Museums*) referred to the museum as a permanent and organised non-profit institution, primarily for the purposes of education and aesthetics, with a qualified staff, possessing and handling ‘tangible’ objects, which it conserves and displays to the public at regular hours.

A few years later, in 1974, the *International Council of Museums* (ICOM), an association with standing committees in some 70 countries, agreed that a museum should be «a permanent, non-profit institution, serving society and its development, open to the public; it should acquire, conserve, research, communicate and exhibit, for the purposes of study, education and enjoyment, regarding humanity and its surrounding areas». According to the latest definition of 2022, «museums are to be open to the public, accessible and inclusive, fostering diversity and sustainability. They should operate and communicate in an ethical and professional manner and with community participation, offering diverse experiences for education, enjoyment, reflection, and knowledge sharing».

In contrast to the 19th century idea of the museum, the ICOM definitions refer to a broader public rather than a select circle of expert visitors, thus emphasising the collective value of the museum itself as contributing to the development of the whole community.

Over the last few decades, the debate on museums has been profoundly transformed, to the point of considering it no longer merely a cultural institution devoted to the conservation and exhibition of objects, but a real space deliberately designed to engender experiences, emotions, narratives, and relationships. In the evolution of the contemporary museum, design is not only a discipline supporting exhibition layout but also a systemic projectual practice acting on several levels: spatial, communicative, relational, and experiential. Museum design entails the orchestration of settings, objects, narratives, and interactions, considering the multiple cognitive, emotional, and social dimensions of the visitor experience. As stressed by Buchanan (1992), design can be understood as a form of thinking applied to 'indeterminate' or complex problems, such as the construction of a cultural space. In this sense, the museum is shaped as a design platform, where interdisciplinary knowledge converges to generate cultural values and social transformation. Design manifests itself as much in the physical layout of space as in the structuring of internal itineraries, in the interface between content and the general public, in the orchestration of mood, and in the mediation between objects and their significance. In this light, museum design adopts an intentional and narrative character capable of transforming cultural visions into situational and participatory experiences. In fact, in the contemporary context, the museum is a complex environment in which curatorial procedures, narrative strategies, educational needs, and experiential demands converge. The concept of spatial storytelling has become central; designing a museum no longer involves merely arranging objects in a space but constructing a sensory and cognitive narrative in which the visitor can navigate, recognise, and experience.

As Roppola (2012) points out, museum space can be read as a three-dimensional grammar capable of arranging content, orienting behaviour and creating significance. The visitor is no longer a marginal figure but becomes the protagonist of an experience constructed through architecture, scenography, and graphics.

1.2. Masters of Modern Exhibition Design

In order to understand the character of the museum, especially regarding exhibition design, one must examine the founding fathers of modern museography, who, through their various intentions, moved in new directions that still find meaning today.

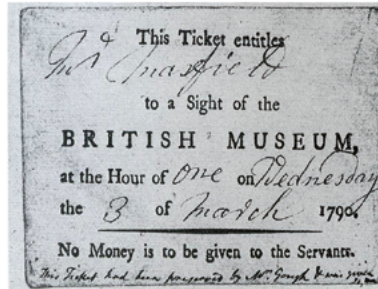


Fig.1 Admission ticket to the British Museum, introduced by Sir Hans Sloane in 1759.

First and foremost, Sir Hans Sloane, a well-known physicist and naturalist, is remembered not for being the director or curator of a museum but for bequeathing his vast collection to the government of England in 1753 to found the British Museum, items accumulated during his extensive travels. Sloane can be considered an early example of a traveller devoted to an understanding of geography, the history of places, flora, and fauna, but above all, the inhabitants and their customs. His collection included about fifty thousand volumes of rare books and about three thousand five hundred manuscripts, many stuffed animal species (from insects to fish to hippopotamuses), ancient artifacts, ethnographic materials, paintings, drawings, and prints. Sloane's collection was therefore extremely extensive and grew over the years. Over time, especially in more recent years, the collection was reorganised, mainly because it was so difficult to position objects (as difficult to contextualise, for example, as those related to natural history) within such historically connoted spaces. Sloane envisaged the museum as a large container, capable of accommodating his extensive collection; thus, in 1759, the *British Museum* opened its doors as a combination of a museum, in the 'classical' sense of the term, and a library, within *Montague House*. In 1873, the two institutions were separated, and the library was moved to

another building a few blocks away. The British Museum, as we know it today, was established in the Bloomsbury district of London. On January 5th, 1759, the British Museum officially opened its doors to the public. Innovative for those times was the decision to have opening hours for the museum; it could be visited from 9am to 1pm, every day except Saturdays, Sundays, at Christmas, at Easter, and on other religious holidays. In addition, an entrance fee was introduced and checked by security guards. The number of visitors that could be accommodated was managed daily, and the public was instructed on how to organize their visits. Here, we are approaching the modern idea of a museum. It is important to note that the museum was conceived as accessible to a wide and varied public; researchers and students were admitted, as well as men and women from the general public. Thus, the *British Museum* did not emerge as an art gallery containing ancient objects or as (for those times) a traditional, natural history museum displaying ethnographic collections; many already existed in Europe, and it followed an independent path. Throughout its long and multifaceted history, the museum founded by Sloane has always remained one of the world's greatest, capable of extolling the glories of the British nation and, above all, evolving precisely in accordance with the demands of modern culture (De Beer, 1953; Brooks, 1954, Alexander, 1999).

In the same years, in 1786, to be precise, Charles Wilson Peale opened a new museum of his own in Philadelphia, arranged very differently when compared to the important European prototypes. Peale believed that a natural history museum should be organised according to the Linnean classification¹ so that God's overall plan and the natural laws underpinning the universe could be clearly revealed. He also believed that museum visits might make visitors happy and bring them a feeling of serenity. One of the most fascinating paintings in modern American art is Charles Peale's self-portrait, *The Artist in His Museum*, from 1822, which represents the essence of Peale's idea of a museum. This painting shows an adult man in his eighties raising a red velvet curtain and directing the observer to visit the *Long Room* of his *Philadelphia Museum*, which we know today as *Independence Hall*. On the left, we can see wooden display cases containing birds, arranged in a realistic pose and enhanced by a perspective backdrop, which helps to put them in context. With this method of presentation, Peale may be regarded as the originator of the natural habitat setting in which animals are displayed, which is still in use in natural history museums today. Also in the same painting,

¹ Linnaeus' classification divides living beings into different hierarchical levels, originally starting with the realm level. Realms are divided into *phylum* for animals, and into divisions for plants and other organisms. These are divided into classes, then into orders, families, genera and species.

at the top of the same wall along which the birds are displayed, is a double row of portraits of the American Founding Fathers, which, according to Peale, is meant to stimulate great patriotism in the hearts of the public, who will therefore feel that they are a part of history. Here another fundamental concept for modern museography emerges: the purpose of the museum, and of a successful exhibition, is to enable visitors to discover their own cultural identity and stimulate their sense of belonging to the history of a place, through the objects on display. In the background of the picture, visitors can be seen walking around the hall and taking in the exhibition; there is a woman, and a man who seems to be show-casing and explaining the exhibits to her child; ordinary people are the new museum-goers. This paradigm shift can be interpreted as one of the first expressions of ‘audience development’, predating the current focus on the centrality of the visitor as co-designer of the museum experience (Falk & Dierking 2013).

In this sense, the museum opens up to narrative patterns capable of stimulating identification and emotional participation, foreshadowing approaches that are today considered fundamental in participatory museology. As John Adams wrote in 1776, Peale was «a tender, soft, affectionate creature» (Seller, 1999, p.122), and had a keen sense of humour; all this led him to imagine his museum as a fun place to visit. He also devised stimulating exhibits: he displayed live animals, especially snakes; he devised displays to explain electricity and chemistry and among Peale’s many ‘inventions’ one cannot fail to mention the machine that reproduced the silhouettes of visitors on a sheet of paper, which was then framed. The visitors could then buy these, thus taking with them a souvenir, an actual ‘gadget’ (to use a contemporary term), from the museum. However, Peale, unfortunately, was not so adept at securing sufficient funding to ensure a long life for his museum, and, after his death, it went bankrupt. Nevertheless, he had left a solid model for all other American museums, mainly for the creation of stimulating and entertaining exhibitions and the fostering of popular and educational activities (De Beer, 1953; Brooks, 1954; Alexander, 1999; Ruggieri & Rugino, 2005).

Some time later, in London, beginning in 1852, Henry Cole began to direct a museum, the *Kensington Museum*, which would later be renamed the *Victoria and Albert Museum*, the influence of which reverberated throughout the world. Cole was the managing director of the *Great Exhibition* of 1851, the first world ‘fair’, planned by Prince Albert and Cole himself, organised in London’s picturesque *Hyde Park*, inside a grand, impressive iron and glass structure, the *Crystal Palace*. On that occasion, more than six million visitors attended and, as Thomas R. Adam noted, the *International Exhibition* paved the way for the rebirth of the modern museum, especially as regarded its

relevance to the social life of the community. The experience and success of the Great International Exhibitions resonated strongly throughout the history of modern museography; by presenting themselves as the first events of mass public interest, they ushered in a new way of seeing the museum. The museum is to be a place capable of attracting large numbers by stimulating attention to history, in general, and, at the same time, to the popularisation of one's own local history. A parallel phenomenon to this was that of focusing on everyday objects, linked both to popular tradition and to the contemporary world. It was within the context of these new beliefs and awareness that Henry Cole's museum came into being, something which may in fact be considered the first real museum devoted to the minor arts. The success of the Exhibition, which managed to attract all social classes, prompted Queen Victoria to look upon this achievement as an opportunity to reinvigorate the city of London through the exhibition and dissemination of its art. Sir Henry Cole was consequently tasked with establishing and setting up a new museum. He therefore collected the materials left over from the Great Exhibition of London of 1851 and exhibited them at the South Kensington Museum in 1852. It was certainly not by chance that the choice was made to build the museum as a majestic structure of iron and glass, reminiscent of the structure of the Exhibition, already 'familiar' to the public. Cole, with his design and choice of objects to be exhibited, showed how a museum, dear to a community, could be created with items from the so-called minor arts or industrial arts. In fact, he was convinced that the museum's 'narrative' should be based on objects connected to everyday life and, above all, that these should be displayed tracking the course of their entire history, from the most distant past to the present day. Thus, with the Victoria and Albert Museum, the first contextualisations were created, of objects in their environments; we still find evidence of this in the hall dedicated to the Italian Renaissance or in the Dutch Room (Hobhouse, 1857; Alexander, 1999; Auerbach, 1999; Cole, 2002; Ruggieri & Rugino, 2005).

Another important museographer was Arthur Immanuel Hazelius, who, following his talk given at the *Paris Exhibition* in 1878, began to develop the fundamental themes of his theory, which would later see him recognised as the founder of modern ethno-anthropological museography. Hazelius began to take an interest in the historical tradition of Sweden, his homeland, at the precise historical moment that the Swedish claim to neighbouring Norway was increasing. Hazelius was driven, on the one hand, by a strong sense of patriotism that had matured over the course of his life and, on the other hand, by a desire to combat the growing conformity brought about by the industrial revolution, to the detriment of local tradition. Motivated by these sentiments, he decided to take a trip with his wife around the various regions of Sweden to rediscover their traditions. During his visit, he began

to accumulate a series of objects from the daily life of the Swedish people and to study the various architectural styles in the country. Hazelius was firmly convinced that «the people's products should belong to the people themselves, fascinating them, drawing them into the museum» (Ruggieri, & Rugino, 2005, p. 92). So, when, in 1878, the opportunity arose for him to display the traditions of his people at the International Exhibition in Paris, he exploited completely new, interesting devices. In fact, inspired by *tableaux vivants*, Hazelius decked out dummies in traditional costumes and reconstructed settings with actual reference to particular paintings. Famous are the scenes created by 'utilising' Amalia Lindegren's paintings, *The Little Girl's Last Bed* or *Sunday on a Dalecranian Farm*. The first depicts women surrounding a little girl on her deathbed, inside a traditional kitchen; in the second, there is a typical Swedish family enjoying a festivity in their own home. Inspired by paintings, therefore, Hazelius reproduced the daily life of his people through dummies and reconstructions. In some cases, instead of the dummies, he even had the guides or security officers dressed in traditional costumes. Given the success at the Exhibition using these 'innovative' exhibits, Hazelius gradually developed the idea that he had to 'give back' their history to the Swedish people. Thus, in 1880, he founded the Nordiska Museet, where the large epigraph at the entrance to the museum, bearing Socrates' phrase '*Know thyself*', was supposed to summarise Hazelius' intent: the general public was to discover its own identity through the presentation of the objects.

However, the low turnout at the museum disappointed its creator, who, after carefully analysing the visitors and their behaviour as they moved awkwardly around the rooms, realised that the Nordiska, with its imposing size and overly traditional layout, would not be able to convey the sense of national identity he had hoped for. Hazelius therefore decided to move his exhibition outdoors to Skansen, a huge park on the island of Djurgården in Stockholm. He created a truly enormous Scandinavian village, not arranged in chronological or geographical order, but rather in a 'landscape-based' layout, reconstructing typical Swedish wooden houses. Inside, everyday objects were arranged in their appropriate places and used by figures dressed in traditional costume, in a natural setting that also showcased the flora, fauna and agricultural practices of the region.

Thus, the first true open-air museum was established, which was followed by numerous similar initiatives not only in Scandinavia but also in the rest of Europe. The new *Skansen Museum* began to attract large numbers of visitors from all walks of life, who, finding themselves back in their own culture, rediscovered a strong sense of belonging and, at the same time, felt powerfully connected to a venue of recreation and entertainment.

Musealisation is tied to theatre. Hazielius, therefore, with the creation of his Skansen, triggered issues that are most important for modern museography, such as the idea that the public needs to learn while having fun, effectively introducing the term 'edu-tainment' (Maragliano, 2008), which is now widely used in the field of museography, a combination of the words 'education' + 'entertainment'. The Skansen experience was an early example of immersive public participation, a model that can be linked to contemporary concepts of 'edutainment' and 'visitor-centered design' (Simon 2010), in which museum displays are designed to generate active interaction, stimulating informal learning through participation.

The history of delineating themes dear to modern museography also includes the creation of another important museum, the *Musée de Cluny* in Paris. The museum, now the *National Museum of the Middle Ages* (*Musée National du Moyen Age*), is the largest and most comprehensive collection of medieval art in the world. The museum was created in 1843 to unite two enormous, adjacent structures of extraordinary historical and cultural importance: the ancient Gallo-Roman baths in the ancient city of *Lutetia*, a colony dating back to the 1st-2nd centuries AD, and the *Hôtel de Cluny*, a late-medieval convent.

Much of the original structure of the vast spa complex in the city of *Lutetia Parisiorum* (Paris) is still standing, especially the magnificent spaces of the *calidarium* and *frigidarium* (below massive stone vaults), which contain precious remains of decorative mosaics. The *Hôtel de Cluny* was built between 1485 and 1510 as the Parisian headquarters of the powerful abbots of Cluny, from which it takes its name, and was the residence of the abbots until the 16th century. It is a late-Gothic, two-storey building with sloping slate roofs, overlooking a trapezoidal inner courtyard on three sides; this is sealed off on the fourth side by a crenellated wall with a very low arched entrance gate. The newly-destined *Hôtel de Cluny* dates back to 1843, when the then owner, the wealthy collector Alexandre du Sommerard (1779-1842), agreed to transfer to the State the palace and all the medieval collections it contained, some of which had been inherited from the collection of Alexandre Lenoir, previously exhibited in the *Museum of French Monuments*. In the years that followed, during which the Romantic movement sparked a veritable craze for medieval art and culture, King Louis Philippe I (1830-1848) purchased the ruins of the adjacent Roman baths from the city of Paris, thus laying the foundations for the development of the museum as we know it today. Today, the museum has been completely renovated and restructured according to the most modern exhibition criteria and has a total of 23 halls housing sculptures, paintings, furniture, gold and silverware, illuminated manuscripts, glassware, weapons and tapestries of

French and European origin, dating from the 4th to the 16th century. Finally, in 2000, the so-called 'medieval garden' was created on the northern side of the original Hôtel de Cluny, a large green area where flower beds alternate with fountains and tall trees, re-creating the main edible, medicinal and decorative plants that were widespread in the 13th and 14th centuries. The *Musée de Cluny* thus introduces two other individuals who were highly influential in the development of modern museography. Although seemingly quite different, these two figures were in fact complementary, tackling important issues in museography and effectively laying the foundations for the typical museum of the 19th century. Alexandre Lenoir, displaying his large collection of objects, which he had collected during the Revolution, founded the *Museum of French Monuments* in 1795, inside the *Petis-Augustin* convent. Lenoir was convinced that the objects in his possession, arranged in chronological order, through the centuries, might restore the glories of French artistic history; the absence of any scientific rigour led Lenoir to believe that he ought to present history without any omissions or gaps. To achieve this, he began to resort to forgeries, models, reconstructions and false attributions: any means necessary to restore a complete and detailed chronology were used. He was, therefore, simultaneously driven by a desire to preserve and to commemorate, mentally weaving together the narrative of the objects with the actual history. Undoubtedly, his decision to arrange the museum in strict chronological order laid the foundations for the classic linear layout typical of the 19th century; he was convinced that, in any case, the object had to be displayed as an indirect testimony to history, and that it lost its individual importance and value, becoming merely another means of presenting chronological history. Therefore, Lenoir did not worry about whether an environment was historically authentic or not, and as a result, the message took precedence over the authenticity of the objects on display. Alexandre du Sommerard, on the other hand, had a very different approach; he had a very distinct opinion about objects, even calling them 'relics': the object is more important than its history and does not serve merely to showcase this history, but is capable of recounting it and touching the onlooker even more than the history itself.

Objects are important in themselves and, if well-exhibited, may express and narrate a historical moment in such a way as to stir emotions. It was probably this conviction that led du Sommerard to decide to thin out the collection inherited from Lenoir, eliminating objects that were not from the medieval period, and to purchase the Hôtel de Cluny, a medieval building that, better than any other, could house the objects from that period. A visitor's comment on their first visit to the museum is significant: «furnishings, tapestries, stained glass windows, tableware, armour, tools and jewellery, everything miraculously discovered and preserved: you walk through a va-

nished civilisation, you are almost overwhelmed by the good old days of chivalry, and the cordial hospitality of the owner completes the illusion» (Bann, 1982, p.40). Therefore, the most significant thing Sommerard accomplished in his museum was to place objects in their original positions and reintegrate them into their original environment. In this case, chronological order was not important, but rather the realism of the entire reconstructed space. Thus, a plate was placed on a dining table, clothes in the bedroom, a reliquary on the altar of a chapel, and so on. Undoubtedly benefiting from the choice of a contemporary building for the exhibits, and, consequently, in keeping with this in terms of materials, du Sommerard may be considered the creator of 'period rooms', the designer of a reconstruction of a house in style, where precious objects are displayed alongside everyday items, all of which together express aspects of the culture of a community, its noble customs, but also its cuisine, clothing and religion, in a real journey through time, a plunge into the past. Although the Musée de Cluny has been altered over the years and recently refurbished, the intentions of its creator are still clearly visible when visiting it, providing an enthralling experience that allows visitors to learn about an era through the objects it produced.

1.3. Historical legacies and contemporary approaches

The history of modern museography, reinterpreted in the light of contemporary design, reveals a surprising continuity between early experimental exhibitions and the immersive and participatory practices that characterise today's most innovative museums. Peale's storytelling settings, Cole's educational displays, Hazelius's landscape reconstructions and du Sommerard's period rooms not only foreshadow techniques still in use today, but also herald a conception of the museum as an space designed to stimulate the imagination, encourage contextual learning and draw visitors into an emotional and cognitive relationship with the content.

These historical examples may be read as three-dimensional narrative prototypes, in which space is used not simply to display, but to narrate, evoke and educate. Contemporary museum design borrows from these experiences the awareness that the layout of a space, the choice of materials, the continuity of the exhibition areas and the language of the exhibition are never neutral: they are tools for creating meaningful experiences. In an era of visitor-centered design, the relevance of these historical models is heightened: they remind us that the museum of the present and future is increasingly taking shape as a dynamic cultural ecosystem, designed to generate social impact, intercultural dialogue and wide-reaching learning. In this context, design takes on a strategic role: not only as an aesthetic or functional practice, but as a critical and transformative device, capable of anticipating emerging needs and creating new links between content, space and the community.

CHAPTER 2

Visitor-centered design.

Design redefines the museum as a relational space built around participation and meaning-making.

2.1. A Debate between tradition and innovation

The museum, a complex machine for communication and knowledge transfer (Forte & Franzoni 1998), precisely like theatre or cinema, has established itself as a complex medium based on objects, but also on acoustic, visual, and direct manipulation devices, on written, graphic, oral, gestural, iconic, and even olfactory languages, or finally on theatrical performances, direct or simulated within a setting. If this 'complexity' that characterises the museum, is, on the one hand, sometimes the only means of making certain objects comprehensible, it can, on the other hand, have a negative effect, rendering the layout and spectacle more important than the objects themselves, (which are always the prime focus of the exhibition). In recent decades, museums have experienced a crisis of legitimacy, torn between fidelity to their traditional educational role and the need to respond to contemporary cultural, social, and technological trends. Against this backdrop, visitor-centered design has emerged as a design and cultural response to redefine the role of museums in a pluralistic, increasingly participatory, and interconnected society.

In 2001, the newspaper *The Australian* published an article describing a dispute between Dawney Casey of the *National Museum of Australia* in Canberra and Tim Flannery, director of the *Museum of South Australia* in Adelaide³; this began after Flannery issued a statement about the emergence of 'super museums', characterised by the indiscriminate use of multimedia and other strategies to attract visitors, undermining the traditional responsibility of museums to undertake serious research into their collections. In support of his arguments, Flannery referred to the expenditure incurred by Australia (500 million dollars) for the refurbishment of museums in Canberra and Melbourne, with multimedia facilities designed to compete with amusement parks, and to the detriment of research and collections.

This statement earned Flannery the accusation of being out of touch with contemporary needs and the label of 'dinosaur' from Casey, who, in defence of his museum and the use of multimedia, claimed that the objects were chosen, interpreted and displayed with great scientific rigour in order to be presented to the public in an intelligible way (Witcomb, 2003).

This exchange of divergent opinions is nothing more than an expression of the current debate in the sector on communication techniques in museums.

If, as Casey asserts, museums cannot underestimate the presence and proliferation of a contemporary audience that uses and interacts with sophisticated technology daily, often far removed from the traditional role of museums (as repositories of curiosities in the nineteenth century), it is also true, as Flannery points out, that today's museums have their roots in tradition. Therefore, it is important to maintain a dialogue between the past and present, creating continuity between them.

Considering these interesting cultural standpoints, new issues emerge in the field of museum studies: how have research practices and designers' expectations changed, and are changing? What impact do these expectations have on the role and effects of communication in museums? What are the characteristics of the new audience emerging in the current digital age? Are we sure that the multimedia use makes museums more interactive and communicative?

Museums play a fundamental role in passing on the culture and history of people. As 'communication experts', they must be aware of the importance and value of exchanging information with the public, who will then transform it into personal knowledge and preserve it as a valuable resource. For a community to become aware of its own history through the presentation and exchange of information, it is necessary to feel part of that community, especially in a museum, «the colossal mirror in which a finally contemplates himself in every aspect» (Leach, 1997, p.21).

This debate is often framed as a binary, multimedia spectacle versus scholarly rigour, but in practice the tension is design-able rather than irreconcilable. What the exchange really surfaces is a question of criteria: by what measures do we judge whether new media enhance or dilute curatorial meaning? A productive stance is to evaluate exhibitions along three axes: - epistemic integrity - are the claims warranted by the collection and the research? - narrative legibility - can non-expert audiences follow the proposition without reducing complexity to simplification? - and experiential proportionality - is the sensory apparatus proportionate to the ideas on offer, rather than an end in itself?

Read this way, tradition and innovation are not opposing camps but complementary constraints that keep exhibition design accountable to both knowledge and publics.

2.2. The Role of information, comprehension and knowledge

For the sake of clarity, it is worth specifying the significance of terms that recur throughout this publication, accepting the definitions given by Elizabeth Orna and Charles Pettitt (1980), British scholars who are experts in communication and management theories in museums.

Information is fundamental to knowledge. It is what humans extract and transform when they want to communicate with each other. Therefore, knowledge is made tangible and audible, in written or spoken form, collected in repositories such as books, articles or, more recently, databases. It might be useful to think of it as the fuel of knowledge, since we need information to nourish and maintain our knowledge and to put it to use. From these general definitions, the information that produces and feeds knowledge must be selected according to requirements that meet our objectives, in accordance with a system of values that allows it to be understood by the users.

Comprehension is a mental process that drives a person to perceive and ‘capture’ an idea and/or concept. This process, which allows for more immediate and simpler memorisation of information, is nevertheless strongly influenced by the time factor; comprehension can be a momentary event that does not necessarily lead to the consolidation of knowledge.

Knowledge is what we acquire through our interaction with the world and can be acquired in different ways, by reading, listening, speaking, watching and acting. Therefore, it is the result of experience stored in the mind of everyone, so that it is unique to everyone, even though there may be shared acquisitions. Knowledge is the most precious and essential thing that we possess. We make it our own by transforming external experiences into personal awareness.

The triptych information-comprehension-knowledge has immediate design consequences. Information is abundant in museums; comprehension is scarce and time-bound; knowledge is situated and durable. Exhibition devices should therefore be selected to reduce cognitive friction at the comprehension stage (clear affordances, layered messages, pacing), while inviting appropriation at the knowledge stage (open questions, prompts to connect with prior experience, social learning moments). A practical implication is to design graduated entry points, from quick ‘headline’ cues to deeper dives, so that visitors can self-pace meaning-making without losing the thread of the overall argument. This aligns interpretive strategy with the visitor’s temporal economy in the gallery and with the museum’s educational mission.

2.3. Memory, experience and the role of the visitor

The knowledge conveyed by an exhibition does not have to have the same characteristics as that presented in other information-related activities. Ivo Maroevic agrees with Miroslav Tadjiman when he argues that museums are also mediators of public knowledge, which is nothing more than the image of the world presented in a completely unfamiliar way.

This knowledge is not only a representation of reality, which is thus preserved and conserved, but is also the result of a symbolic work created on a symbolic system in which objects relate to each other. This creates a network of connotations, from which a new form of knowledge is derived, unimaginable before the visit and impossible outside a museum. Museums sometimes emphasise the significance of what we already know, the archives of information that we carry in our minds, and the memories that make up our knowledge. Over time, our memories float around in our minds, sometimes popping up, other times tucked away in bits of memory that we can no longer access, like codes that are no longer in use. As Daniel Dennett (2000) has shown, not all of us re-experience memory as something pure, but rather as a perfect playback of the past. Every act of remembering, though connected to memories, is not merely their duplication. Museums are no different in this respect: contact with their contents can revive memories. Every time we visit a museum (for the first time, on a subsequent visit, alone or in company), we experience the perpetuated and preserved present. Visitors bring their own accumulated life experience to the museum and, by interacting with the message conveyed by the museum, can create their own cultural and historical identity. Over time, some memories are preserved, while others fade or find repositories, such as museums. According to Crane (2006), the theory of modern memory is based on the idea that memories are never entirely subjective, nor do they rely solely on the recollection of a single person; moreover, collective memory is the basis for all memories, varying over time and in meaning, with every individual contributing.

The museum environment, therefore, creates new contexts that not only reconstruct the real world, but also confer value on a new artificial reality, in which objects interact and communicate various messages. This is where design plays a powerful mediating role between the collection and the surrounding reality. Since these artificial environments are set in the present, it could be said that, inside a museum, the representation of knowledge considers, and is oriented towards, the past, while the presentation

transforms the information system into future knowledge. However, for an exhibition to be communicative, presentation and representation must coexist, in a state of equilibrium and, at times, overlap each other in the present. Consequently, an analysis of the timeline of the objects and the viewing public is essential in order to recognise the importance of the difference between the presentation and representation of knowledge in an exhibition. The result is a greater awareness of exhibitions as a medium and a resource for potential new knowledge.

If memory is reconstructive rather than a perfect replay, then museum experiences are co-authored recollections in the making. This has two implications. First, evaluation should privilege evidence of transfer (what remains usable after the visit) over sheer recall of facts. Second, design should stage encounters that connect the collection with visitors' lived repertoires - biographical, sensory, communal - so that new memories are anchored in existing schemas. Rather than 'delivering' content, the exhibition hosts a dialogue between curated objects and the visitors' prior worlds; the value added by design is precisely this mediation between representation (past-oriented) and presentation (future-oriented) in the present of the visit.

2.4. From object interpretation to participatory design

Through the project, it is now well known to modern design that objects that manifest themselves simultaneously in their three defining features - form, material and meaning - express themselves, speak out and break their silence. 'Let the objects speak' has been the motto of leading Anglo-Saxon museums since the 1980s, precisely to emphasise that history should be told through objects; but they must speak a language that every visitor can understand. Thus, it is the role of the designer: to make knowledge tangible and accessible. Judy Rand states that the message of an exhibition is comprised of a hierarchy of messages: what the designer feels they must communicate; what they feel they are able to communicate; and finally, what they feel they want to communicate. In an interactive learning space, however, the single principal message to be communicated should be expressed clearly and precisely (Rand, 1999). However, since, there must be no interference or misunderstanding between the message one wishes to convey and what is perceived by the visitor, the message must be structured in a easily accessible manner. Above all, it is important that an exhibition enriches the visitor's prior knowledge of a given topic.

In accordance with the statement made by Ulla Keding Olofsson, a well-known English professor of history: «Let me say at once that I hate the idea of museums being used primarily as teaching aids of any sort. Their first job is to house valuable objects and display them attractively. [...] The second responsibility is to those who are already educated, to the student, the collector, the informed amateur. [...] A third responsibility to put above anything specifically educational is, in the case of certain museums, a loyalty to their own personalities» (Stone & Molyneaux, 1994, p.23).

The museum-going public, inevitably affected by the technological, scientific and cultural developments that characterise our digital age, has become increasingly varied.

Numerous theories and research projects in museum studies explore aspects of communication. These include studies on learning by the public and exhibition techniques. These studies highlight the need to select and use appropriate tools that can coherently be integrated into the narrative process of an exhibition (Tallon & Walker, 2008).

Understanding the differing characteristics of museum visitors and the nature of their experiences is important in order to tailor exhibition design practices, so that designers can respond to visitors' needs; in other words, to

tell them what they themselves want to communicate in the museum. One of the basic concepts of these theories is that we must deal with a modern public that has new demands, new needs and new cultural preferences, in a museum as a place for classifying and organising knowledge, reproducing an ideology and educating the public (Hooper Greenhill, 1995). Research shows that the purpose of the contemporary museum, and in particular of its exhibition design, is to communicate knowledge, inform and engage the visitor. Although this aim is widely acknowledged by all scholars, it gives rise to numerous debates, highlighting the opposing positions of traditionalists and innovators, who clash over exhibition design, the relationship between real objects and multimedia, between objects and ideas, and between the values of education and 'edutainment'.

As Eilean Hooper Greenhill explains, the term 'edutainment' - which she describes as clumsy- (Hooper-Greenhill, 2007), has often been used to refer to a teaching-based approach to the visitor in museums. It is evidently a term that has fallen out of favour in Europe, to the extent that it has disappeared from books on museums and education, although it is still used in other parts of the world (including Italy). The term edutainment is derived from the words 'education' and 'entertainment', implying that education may be seldom enjoyable and only concerns serious, intellectual pursuits, and therefore has no place in a modern museum, while entertainment is associated solely with pleasure and consequently has no educational value. However, modern teaching and learning methods, which are now multi-dimensional, have brought these two aspects considerably closer together. Consequently, it is necessary to look more closely at the approach and contemporary learning processes, rather than dwelling on generic definitions (Hooper Greenhill, 2007). Hein argues that is not easy to understand the learning process that takes place during the museum experience (Hein, 1998). Museum studies theorists increasingly emphasise the idea of experiential learning (MacDonald & Basu, 2007), shifting the focus from the object to the subject (i.e., the visitor). This implies a focus not only on how the museum environment is designed and constructed, but also on the reaction and perception of the visitor. This demonstrates once again how the quality of the space and the visitor experience are affected and conditioned by the manner in which new technology is integrated into the exhibition. The best museum (i.e. the one where knowledge is acquired) is the one where this knowledge is imparted by presenting a variety of interesting materials and appropriate experiences simultaneously to a public of different ages, educational backgrounds, personal interests, skills, and expectations. It is necessary to thoroughly understand the aspects that shape the visitors' experience in order to transform the way they come into contact with, and experience, the elements that make up the museum and give it its material character.

This is where the concept of visitor-centered design comes in. Reflecting changing attitudes towards public participation, it stems from the need to rethink contemporary museum as a space designed around visitor experiences. In contrast to object-centered or institution-centered museum models, visitor-centered design places visitors at the centre of the design process, recognizing them not as passive recipients but as active agents, interpreters and, in many cases, co-creators of meaning.

With the emergence of postmodernism and critical theory at the end of the 20th century, there was a shift in perspective that led to the recognition of the importance of the visitor's point of view in the design process. This shift can also be traced back to artistic movements such as Dada¹ (1916–1924) and Fluxus² (1960–1978), which emphasised interaction and participation, promoting a more communal experience in art venues (Goldberg, 2011). As Stiles and Selz (1996) point out, both movements challenged traditional notions of auteurship and passive appreciation, paving the way for practices in which the public is no longer merely a spectator but an integral part of the work itself. These movements also helped redefine the notion of artwork as a process rather than a product, laying the foundations for future participatory approaches in museums and cultural centres. Fluxus and Dada inspired the design of environments where the visitor's experience is fundamental, meaning is co-constructed, and active participation is considered a design value. As Nina Simon points out, 'the participatory museum' is also the museum that embraces openness, unpredictability and dialogue - much like the Fluxus artists did. This cultural shift has profoundly influenced how we conceive the visitor's role in museums today.

The visitor-centered design approach was established in the 1990s, in a context marked by declining public participation and a growing demand for inclusivity, accessibility and social relevance. In the 1990s, concerns about declining museum attendance prompted many professionals in the sector

1 Dadaism, which emerged in Zurich during the First World War, was a radical reaction to the absurdity of the conflict and bourgeois cultural institutions. Dadaist artists rejected traditional aesthetics and encouraged provocation, chance, play and audience participation as central elements of artistic creation. Cabaret performances, collective readings and deconstructed works anticipated modes of expression aimed at destabilising the hierarchies between artist, work and viewer.

2 In the 1960s, the Fluxus movement took up and extended this legacy, developing interdisciplinary, ephemeral and collaborative artistic practices. Figures such as George Maciunas, Yoko Ono, Nam June Paik, Alison Knowles and Joseph Beuys promoted art that could be created by anyone, anywhere, and was based on the principle of co-creation between artist and public. Event scores (instructions for simple, open-ended actions) are a typical example: rather than aesthetic objects, they were opportunities for experience.

to review their strategies. In 1992, John H. Falk and Lynn Dierking created the *Interactive Experience Model* to analyse the visitors' museum experience. It was designed to develop theories about the nature of experiences and learning. According to this model, each visitor is influenced by three contexts in their museum experience: personal, social, and physical. The *personal context* includes motivations, expectations, interests, knowledge and previous experience; the *social context* includes social interaction with other individuals present in the museum; and the *physical context* includes the architectural space, its composition and its relationship with the objects in the collection. When combined, these three contexts shape the interactive experience. At any given moment, one may prevail over the others without necessarily balancing between the three in shaping the experience. This model emphasises that each visitor, in their diversity, creates their own experience and meaning.

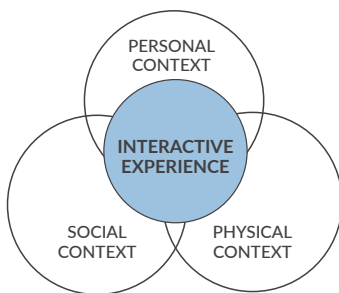


Fig.1 *The Interactive Experience Model* created by John H. Falk and Lynn Dierking in 1992.

Reports such as *A Decade of Arts Engagement* (2015) highlighted a significant decline in visitor numbers, urging museums to rethink their role and relationship with the public. This has led to a growing focus on understanding the needs and motivations of visitors, which in turn has led to the adoption of visitor-centered design principles. Theoretical debate has been fuelled by contributions from critical museology (Hooper-Greenhill, 2000), experience-based museum education (Falk & Dierking, 1992; Hein, 1998) and participatory practices emerging in artistic and social contexts (Simon, 2010).

Based on these theories, recent empirical studies have demonstrated new methods for attracting and involving visitors, emphasising how museums can be effective educational institutions if they cater to the needs of different types of visitors. The University of Leicester, for example, together with the *Research Centre for Museums and Galleries* (RCMG), ran a project from 2000 to 2014, on the concept and methods of learning and the impact

of new technology on public learning in museums, archives and libraries. The project created a conceptual framework based on five *generic learning outcomes* (GLOs): learning and knowledge; skills; enjoyment and creativity; skills and values; action, attitude and progression. The project, which was tested across 15 pilot projects in museums, libraries and archives, successfully demonstrated the model's potential for measuring the impact of visitor learning experiences, helping organisations in practice to design. GLOs are divided into five categories, reflecting the variety of educational experiences that visitors can enjoy at a cultural institution. The first concerns knowledge and understanding, i.e. the acquisition of new concepts, information and keys to interpretation that enable visitors to develop a more detailed and critical understanding of the content. The second area consists of skills and competencies, which relate to the development of cognitive, communicative and practical abilities stimulated by interaction with the spaces and objects on display. The third area is attitudes and values, which includes changes in visitors' perceptions and attitudes, promoting sensitivity, empathy and critical thinking. The fourth area concerns entertainment, inspiration and creativity: the museum is also an emotional and imaginative space, capable of arousing curiosity and stimulating creative processes. Finally, the last area concerns activities, behaviour and progression, i.e. the actions that visitors take after their museum experience, such as the desire to explore a theme in greater depth or adopt a new behaviour or perspective (Hooper Greenhill, 2007)³.

³ Created in the early 2000s by the Museums, Libraries and Archives Council (MLA) and the Research Centre for Museums and Galleries (RCMG) at the University of Leicester, the GLOs framework was introduced as part of the Inspiring Learning for All initiative to provide a common language and practical tools for measuring informal learning in cultural contexts. This model enables the design of meaningful and transformative experiences, anchored in informal learning and active visitor engagement. Retrieved from <https://le.ac.uk/rcmg>

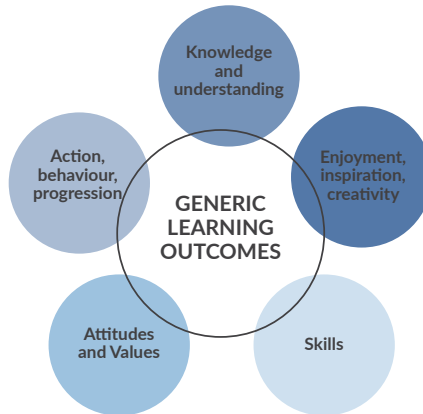


Fig.2 The framework based on five generic learning outcomes (GLOs) ©Research Centre for Museums and Galleries (RCMG).

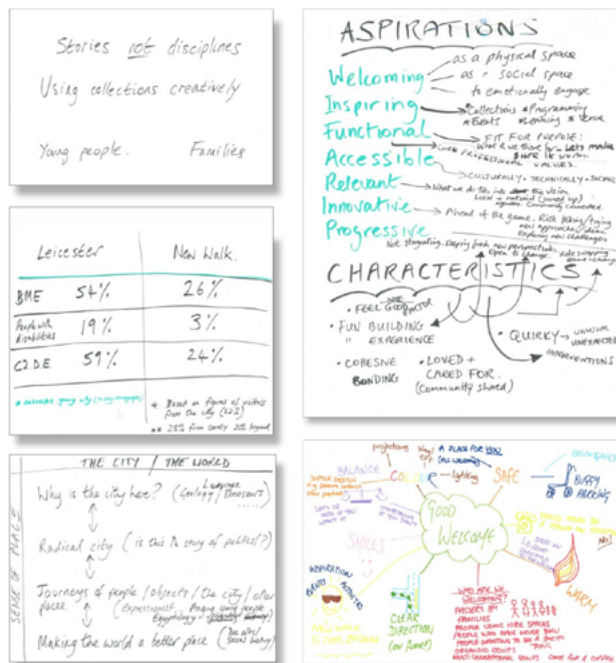


Fig.3 Notes and design sketches from the co-design process for the new exhibition project of the New Walk Museum in Leicester, (2013), based on the GLOs framework, illustrating diagrams that explore the required expectations, visitors' needs, and the relationship with the city ©Research Centre for Museums and Galleries (RCMG).

The success of an exhibition is not based solely on its aesthetic appeal or the spatial arrangement of the objects on display, but also on the relationship between the objects and visitors who are increasingly curious and participatory. The purpose of museum design is to transform certain aspects of visitors' interests, attitudes and values into a discovery, for the visitors themselves, of the meaning of the objects on display; a discovery that is stimulated and supported by the public's confidence in perceiving the authenticity of these objects (B. Lord & G. D. Lord, 2002).

Anglo-American scholars summarise the museographic issue with the principle of needing to integrate *object-based epistemology*, i.e. the substantial typological-chronological-technological rationality of the old museum, with an «interpretation of artefacts in their social and cultural context» (Pierce, 2004, p. 58). This principle also directly leads to a shift in focus from the objects themselves to the environment in which they were created.

Visitor-centered design thus becomes an interpretation, establishing an ideal continuity between past and present, between past and present communities. To achieve this, a story must be chosen for each object and the entire collection. Objects are no longer significant in themselves, but for their meaning within a global context, the *holistic perspective* according to Anglo-Saxon museology, from which stems the need for integration and multidisciplinary approaches. Thus, objects studied in accordance with a set of values can no longer be restricted by outdated selection and display criteria. Furthermore, if museums strive to reduce the physical and intellectual distance between people and objects, and if exhibitions and interpretations are designed to facilitate a broader and deeper sensory and emotional engagement, with objects rather than simply providing information, visitors may better understand and appreciate the objects and their histories (Dudley & Barneys & Binnie & Petrov & Walklate, 2012).

Visitor-centered design is a cultural and design response to systemic challenges: the democratisation of culture, the plurality of visitors, and the need for museums to remain relevant in a connected, dynamic, and interactive society. By integrating spatial aspects, such as: the smooth organisation of visitor itineraries, physical and cognitive accessibility; clear signposting and a pleasant atmosphere; communicative aspects, such as the creation of engaging and personalised narratives; technological aspects, via the use of digital interfaces, augmented reality and immersive environments, designed not as attractions, but as tools for cultural mediation; and emotional and relational aspects, which foster empathy, curiosity, a sense of belonging and connection with other visitors and with the communities represented. This is not a mere methodology, but a real paradigm shift: an invitation to think of the museum as a space that is inhabited, experienced,

negotiable and transformable via the relationship between people, objects, environments and technology. From this perspective, the museum becomes an experiential ecosystem, where physical, sensory and cognitive interaction with the space and its contents is designed to trigger processes of learning, emotion, reflection and socialisation. In this model, the layout, narrative rhythm, choice of media, exhibition language and visual interface become integrated design elements that create a meaningful and memorable experience. Thus, the museum is reimagined as a space for interaction, where individual and collective experiences come together in the dynamic creation of meaning.

‘Let the objects speak’ remains a powerful curatorial ethic, but the language those objects ‘speak’ must be made legible to heterogeneous publics. Participatory moves - co-interpretation, prototyping with users, feedback loops - do not replace curatorship; they test intelligibility and surface blind spots (e.g., cultural frames, accessibility hurdles) before they fossilise in the final layout. Practically, this means sharpening the message hierarchy you cite (must/able/want to communicate) with two added filters: for whom (persona-anchored clarity) and under what conditions (light, crowding, dwell-time). It also reframes the ‘edutainment’ dispute: the goal is neither to entertain at the expense of substance nor to moralise at the expense of engagement, but to achieve purposeful pleasure, affect in the service of understanding.

2.5. Tools and strategies for designing visitor experiences

In addition to representing a theoretical paradigm, visitor-centered design can be translated into a series of design tools and methods that drive operational choices in the design of meaningful museum experiences. Visitor-flow mapping allows one to visualise the user's experiential journey through the museum by identifying touchpoints, critical moments and opportunities for interaction. The use of personas allows one to construct representative archetypes of different sections of the public, helping designers make more targeted and empathetic decisions. Exploratory interviews and ethnographic observations *in situ* provide qualitative insights into the behaviour, expectations and emotions experienced by visitors. Another fundamental tool is rapid prototyping, which allows exhibition solutions to be tested in draft form using physical or digital models, collecting immediate feedback and allowing for continuous refinement. This experimental and adaptive approach reduces design risk and allows exhibits to be developed that are truly visitor-centered. These tools, derived from service design and user experience design, are now widely adopted in museums seeking to foster authentic and immersive interaction with increasingly diverse visitor groups. At the heart of these operational tools lies a cross-cutting element: empathy in design. This represents the designers' ability to put themselves in the visitor's shoes and understand their emotions, implicit needs, limitations and expectations. Empathy allows us to design spaces and experiences that are truly accessible, welcoming and relevant. In a visitor-centered museum, empathy is not just an attitude, but a methodological skill to be cultivated throughout the design process (Brown, 2009; Gokcigdem, 2019). The integration of these methods into museum practice makes it possible to move beyond a self-referential approach to curation, by facilitating collaborative and data-informed design capable of responding to the real needs of the public (Tallon & Walker, 2008; Boiano et al., 2012).

OPERATIONAL TOOLS OF VISITOR-CENTERED DESIGN

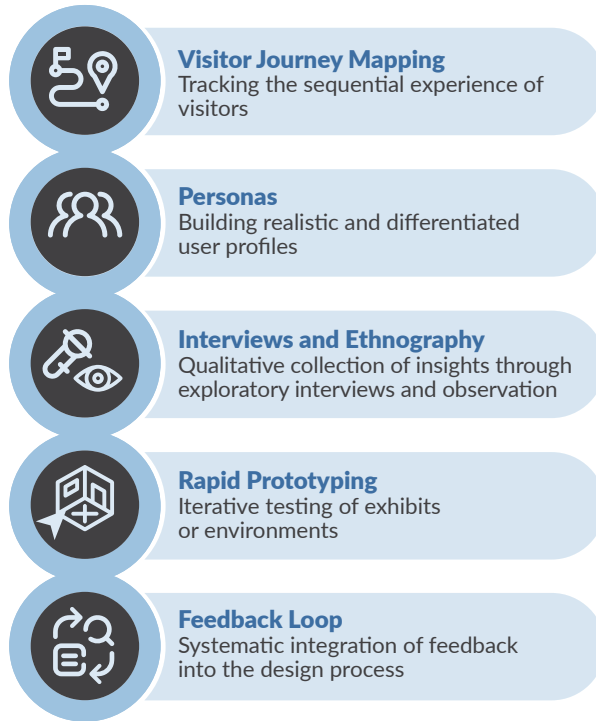


Fig.4 Diagram of the operational tools of visitor-centered design.

Today, visitor-centered design is increasingly interconnected with practices and methodologies from contemporary user-oriented design fields, such as design-thinking, co-design, service design, and user experience (UX) design. This collaboration has given rise to a hybrid and interdisciplinary design ecosystem capable of tackling the complex and changing challenges that characterise museum design in the post-pandemic and digital context. Design-thinking, with its emphasis on empathy, needs definition and iterative prototyping, provides a useful framework for understanding and assessing visitors' needs, promoting innovative solutions based on active listening and real experience (Brown, 2020; Liedtka et al., 2021). Co-design, or participatory design, takes this rationale beyond consultation, involving the public (particularly historically excluded individuals) as active players in the design process.

Museums that adopt co-design approaches question the univocal authority of curators and open up areas for cultural negotiation (Sanders & Stappers, 2018; Björgvinsson et al., 2012). In service design, the museum is seen not only as a physical place or repository of objects, but as a system of services and experiences spread out over time, space, and diverse channels (Stickdorn et al., 2023).

This approach allows for the design of personalised experiential journeys, split between frontstage and backstage, moments of interaction, welcome, learning and relationship building. Finally, UX provides tools and metrics to assess the quality of interaction between users and interfaces, both physical and digital, and to continuously refine the experience based on user behaviour, feedback and expectations. In the museum field, UX design techniques are now used in the design of interactive exhibits, mobile applications, augmented tours and immersive experiences (Maye et al., 2014; Damala et al., 2012).

Although this methodology originated in diverse contexts, it shares a common focus with visitor-centered design: the centrality of experience as the core of the project. Together, they enable us to tackle challenges such as cultural diversity among visitors, inclusion, sustainability, digital transition, and the transformation of cultural institutions into open, dynamic, and participatory ecosystems. Attention to objects, their materiality, their emotional and multisensory qualities, their integration in a context, as well as cognitive interaction with the objects themselves, were the guiding principles behind the new layout of the National Museum of Australia, in Canberra, designed entirely by Kirsten Wehner and Martha Sear in 2010, curators of the museum, which focuses on indigenous history and cultures. The permanent exhibition, 'Australian Journey', recounts some of the many different stories of migration to and from Australia over the centuries through displays of clothing, maps, everyday objects and ancient treasures, examining the social, political and economic repercussions of these journeys, starting from the period before European settlement and continuing into the 21st century. The layout is quite simple, without any major set pieces, but the space is well-designed. The goal, as the curators themselves have stated, was to connect visitors to the richness and details of others' life worlds, encouraging them to connect imaginatively with others' subjective experiences and understandings and with objects that can reunite people with their own history. In line with the features of their previous projects, this exhibition was also object-centered rather than text-based: through the objects themselves, the aim was to evoke a selection of episodes and experiences, historical and contemporary, creating a representative exhibition that also stimulates understanding.

Contrary to the trend of some exhibitions that communicate mainly through words, the curators of the Australian museum want to emphasise the power of objects to inspire curiosity, encouraging visitors to rediscover the significance of the things around them «to inspire that slightly dislocating delight that comes from recognising that an object was ‘there’ at another time and [...] place and is now ‘here’ in this time and [...] place and in our own life» (Sear & Wehner, 2010, p. 145).

By selecting objects with aesthetic qualities or significant connotations linked to events or people linked to history, the curators’ piece together the biography of the selected objects, highlighting how these items are connected to, or have participated in, the migration of people to and from the Australian continent.

The two curators aimed to create an exhibition in which these stories were not narrated through a large amount of written text but were revealed to the public through the physicality of the objects themselves, with their juxtaposition and contextualisation, in an exhibition that they themselves describe as intense and interactive. The visual process shows how the objects were used, by whom, where and when, all to stimulate the imagination and involvement of the visitor. The curators, keen to offer visitors an immersive experience that went beyond a superficial exploration of the objects, installed sensory stations next to each display: visitors could, for example, actually smell fish by looking towards a large pot typically used on the beach by Indonesian fishermen, or they could indicate points or trace routes on an interactive map, a copy of the one displayed adjacent to it.

In *Australian Journeys*, a direct relationship is created between objects and visitors, through a stimulating link between people, places and past events associated with the objects themselves, illustrating their uses, significance and context. Visitors view objects set in a distant place and time but recognise them as being as close as possible to the present, almost experiencing the feelings of those who lived in that past, with those objects. The museum aims to highlight the importance of experience, memory and imagination in understanding one’s roots. This aim is encapsulated in the museum’s motto, written on a large panel at the entrance: ‘The past is never fully gone. It is absorbed into the present and future. It stays to shape what we are and what we do’. However, this museum, which was sensitive to the needs of the public, could not remain indifferent to the widespread use of new information technology. Before starting the tour, visitors can choose to participate in an audiovisual experience at the *Circa Theatre*.

A 16-minute video introduces the audience to the museum's collection via a journey through Australian history, combining images of the most significant objects with historical photos or footage of everyday life or important historical events, emphasising that the narrative between the past and present is built up from objects, people, places and events. It is a rotating theatre, where visitors sit on a revolving platform that spins as the story unfolds, framing scenes that, through multiple screens projecting simultaneous images, illustrate different periods in the history of the Australian continent.

2.6. The museum as narrative and transformative environment

From the *studio* to the *exploratorium*, museum spaces have been designed and influenced by their exhibition strategies (La Scala, 2013). The use of these practices, and above all, the need to invent new practices in order to display a large number of objects, often in small spaces, has only served to emphasise the significance and meaning of the museum as an immersive experience, bringing the public closer to the collection in both a symbolic and physical sense. The museum is being made more theatrical and visual, so visitors can have an active, hands-on experience; the museum should be a place where people are transported to a different time and space. The development of these display techniques over the centuries has turned museums into the multi-sensory environments we know and love today.

All these communication systems are still being used in museums, in the design of what Flora Kossak calls 'Productive Exhibitions', exhibitions that are closely linked to the architecture that hosts them and that *produce* meaning. The scholar specifies that the adjective 'productive' could suggest that there are unproductive exhibitions, but all exhibitions generate new meanings, applying Karl Marx's concepts of productive consumption and consumption-related production to exhibitions. Kossak points out that only carefully constructed displays will enable the public to define the production of an object through its application. Understanding the message is therefore made explicit by the display itself, so that the 'production cycle' is complete when the object (product), visitor (consumer) and message (result of consumption) coexist and interact (Kossak, 2012).

In the museum, it is as if there is a 'space' between an object and its description (information tools), between the *narrator* (curator) and the public, and between the visitor's perception and imagination. This distance is precisely what influences the construction of the narrative. This space often contains the essence of what visitors are looking for and is the place where the most exciting discoveries can take place through exhibition design (Fraser & Coulson, 2005).

The contemporary museum is changing; it is both creative and complex. It is undergoing a period of fundamental reinvention in its conception and design, as well as a profound structural transformation (Miles & Zalava, 2001; Dal Falco & Bonomi, 2021), increasingly positioning itself as a forum for discussion, experimentation and debate (Cameron, 1972), and a place for people to meet and engage in dialogue. Fascinating examples of the new

way of conceiving and designing museums *inspire* characteristics) to create what current Anglo-Saxon theories on contemporary architecture call 'narrative environments'¹⁰. These narrative environments provide visitors with experiences that (to use a word borrowed from digital language) connect objects and spaces, histories of people and places, as part of a process of storytelling that describes everyday life and enables the public to reassert a sense of being unique and special. The museum narrative is highly influential because of its multidimensional nature. The museum represents a complete experience of objects and media in a three-dimensional space, subjected to a constantly changing timeline. In order to accommodate this transformation, the design of the exhibition must be multidisciplinary, ranging from architecture to cinema and theatre, in an attempt (by integrating objects and space) to create these narrative environments. In this regard, the statement made by British film director Peter Greenaway during his talk at the 'Narrative Space conference' at the Victoria & Albert Museum in London, is emblematic of English literature on the subject: cinemas are not good enough for cinema anymore, but museums are (Greenaway, 2001).

However, as a space with strong narrative potential, the museum is, so to speak, full of voids: its interior is home to a temporal gap between past and present; a geographical gap between remote locations; a cultural and social gap between different types of visitors; and a physical gap between objects and their place of origin. Exhibitions featuring powerful interpretative tools and designed with a compelling narrative can fill these gaps by offering the public an immersive experience that restores value to history. However, to paraphrase Suzanne MacLeod, we must not forget that narrative is an artificial and subjective construct and can therefore be challenged; it may be simultaneously useful and problematic, universal and divisive, contemporary and timeless. It may mean different things to different people; if not well constructed, it can easily fall into contradiction or convey falsehood. If narrative is a construction, it is then open to creativity and is almost deliberately provocative and involving through the wealth of its creative potential. However, while it may be possible to denigrate the term 'narrative', it is also possible to denigrate narrative itself in order to impose an artificial layer of order on the chaos of random reality.

It is precisely this aspect of true artificiality that renders it precious; the falsehood of history generates creative inspiration, drawing the reader (visitor) into a creative dialogue that is both stimulating and revealing (MacLeod, 2012; Parry, 2025). This is the approach taken by visitor-centered design, which represents not only a change of perspective, but also the affirmation of a new way of understanding the museum as a relational, dynamic and transformative space.

In this perspective, the museum is no longer merely a repository of objects, but a catalyst for shared meaning, experiences and multiple narratives.

The following chapters explore how these concepts can be translated into architectural spaces and hybrid environments in which the physical and digital coexist.

CHAPTER 3

Storytelling through space.

Spatial design becomes narrative, turning movement and perception into forms of interpretation.

3.1. Exhibition space as a narrative device

As discussed in the previous chapter, visitor-centered design has introduced a paradigm shift that places the visitor at the centre of the design process, not only as the target audience but also as a co-author of the experience. This shift also entails a profound reinterpretation of the role of the exhibition space, which is no longer a neutral vessel but rather a narrative device capable of influencing content, emotions and relationships. From this perspective, the design of the exhibition space takes on a dramaturgical function: the space becomes a narrative.

Storytelling in space always implies authorship and choreography: decisions about rhythm, thresholds, and narrative arcs. Yet in design terms, authorship is distributed among curators, designers, educators, and the visitors themselves. Recognising this distributed authorship reframes exhibition space as a performative text rather than a static container. Meaning arises from the sequencing of stimuli, light, sound, texture, proximity, and from the affordances that let visitors pace or even subvert the intended route. The designer thus acts as a dramaturg of possibilities: defining constraints tight enough to sustain coherence yet open enough to allow personal interpretation.

One of the most representative examples of this approach is the ‘Triangle of Suspense’ developed by Atelier Brückner studio¹. This conceptual model visualises the complex relationship between content, space and visitor through a three-dimensional triangle whose vertices are the exhibit (content), architectural space (architecture) and dramaturgy (concept), which converge at the apex where we find the visitor (recipient). At the centre of the base is the exhibition design, intended as an immersive context and mediator between content and form. The triangle encapsulates the vision of the museum space as a narrative and interactive environment in which every element is designed to generate experiential energy and significance.

This model underscores that narrative tension in museums is not purely textual but situational. Suspense emerges from controlled asymmetries of information: the visitor knows enough to anticipate, yet not enough to predict. Designing for suspense entails balancing orientation and mystery, revealing just enough cues to keep the cognitive and affective circuits engaged. In this sense, spatial storytelling becomes a cognitive choreography, guiding curiosity through rhythm, light, and partial concealment. Such calibration transforms the visit into an act of inquiry rather than consumption.

¹ To learn more about the design group Atelier Brückner, known for its immersive and narrative scenography, <https://www.atelier-brueckner.com/en>

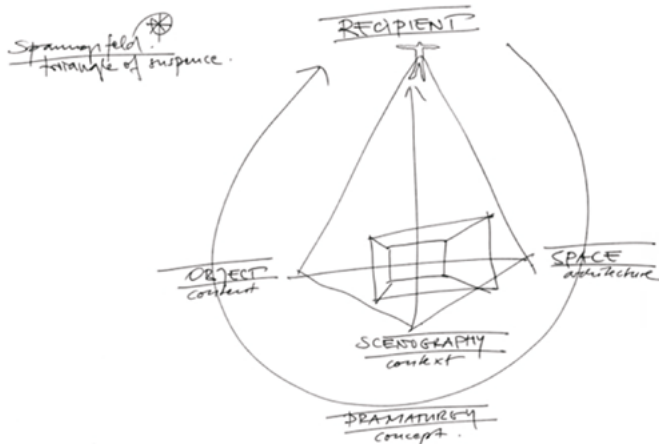


Fig.1 The Triangle of Suspense ©Atelier Brückner Studio.

Research on spatial cognition shows that visitors remember not only what they saw but how they moved; narrative paths that combine orientation cues with episodic surprises tend to maximise both recall and delight. Designers should therefore think in terms of tempo and legibility, treating the exhibition as a composition whose clarity depends on the alternation of focus and release. (Töpfer et al., 2024)

One application of this model is represented by the *BMW Museum* in Munich where the entire exhibition occupies a fluid, continuous space, divided into chapters with a strong dramatic structure. Visitors are guided through rooms where light, rhythm, materials and technology combine to create a choreographed experience. The narrative impact lies not only in the content on display, but also in the way it is orchestrated in the space, in a constant balance between immersion and interpretation.

3.2. The integration of space and meaning

The importance of the physical context is now recognised as an essential component of museum experience. Space does not merely house the narrative: it is an active and defining part of it. From this perspective, content and container are no longer separate entities, but interdependent poles of a complex design process that needs to be proffered with responsibility, creativity and sensitivity towards the public. The quality of the space, its formal and functional layout, its relationship with light, materials and visitor itineraries all contribute to defining the experience itself.

The realisation that communication could become more instant and effective when viewed on a screen or immersed in a virtual environment, was understood a long time ago. One example among many is the collaboration between Le Corbusier, Xenakis and Varèse in designing the *Philips Pavilion* at the Brussels Expo in 1958 where the trio staged a multimedia event in the enclosed space of the pavilion using projected images and music.

The Philips Pavilion, the first multimedia architectural structure of the nascent electronic age, continues to amaze visitors with the genius of its formal innovation. It was commissioned by a prominent Dutch company strictly for advertising purposes, as a venue for displaying its range of electronic products, particularly those related to sound and lighting. It soon became one of the most remarkable structures of poetic inspiration, designed by Le Corbusier. He designed an enveloping structure that evoked the ephemeral nature of the exhibition and expressed the modernity of Philips' intentions. Thus, the pavilion, built according to a complex and rigorous geometric design of thin self-supporting shells, became identified with the *Poème électronique* that was performed inside. Upon receiving the commission from Philips, Le Corbusier stated:

«I will not produce a building, but rather an electronic poem in which colour, images, rhythm, sound and architecture will merge in such a way that the audience will be completely captivated by what Philips can do» (Capanna 2000, p. 18).

Starting from the idea that in order to excite the audience, it is necessary to showcase the effect that instruments produce, i.e. their result, rather than the instrument itself, the 'promotional' show was designed as an orchestral work in which the virtual instruments were the lights, loudspeakers, images projected onto curved surfaces, shadows and expressions of the onlookers, in a clear connection between space and sound.

The *Science Museum* in London is a particularly significant example of how the Anglo-Saxon tradition of museum design, based on the integration of visitor-centered design and evidence-based design (EBD) is still applied today. The latter is a methodology that bases every design decision on empirical data and systematic observations, with the aim of creating more effective, involving and inclusive ambiances. Recognised as one of the most authoritative scientific museums internationally, the museum presents itself with the slogan 'Choose your adventure and discover a universe of unforgettable experiences', emphasising the outset an experiential and personalised approach to visiting. The exhibition design demonstrates how architecture, exhibition graphics and storytelling can be integrated to create an immersive, coherent and visitor-centered experience (Schwarz Frey, 2007).

The scientific content is organised into themed displays that use evocative materials, carefully calibrated lighting and visual aids to stimulate emotion and critical thinking, in line with the principles of experiential learning. In this museum, the first phase of the design process entailed an in-depth conceptual analysis, conducted with the support of researchers and experts, which included the evaluation of themes, educational objectives, pedagogical theories, the state of conservation of the objects, spatial factors and communication tools (Løvlie et al., 2020). At this stage, the role of objects is analysed from an educational and theatrical point of view, exploring their three-dimensionality, communicative potential and place within the narrative. A systematic assessment of communicative resources such as texts, images, graphics, colours, lighting, sound and multimedia tools is then carried out.

Subsequently, in line with the principles of visitor-centered design, the project involves the active participation of the public through interviews, observations and tests with visitors in order to identify their needs, expectations and emotions. This phase also involves the application of the a forementioned Generic Learning Outcomes (GLOs) framework. The next phase involves the actual design of exhibits and installations, following an iterative and multidisciplinary approach based on cycles of continuous testing and evaluation.

3.3. Rethinking and classifying interactivity

‘With over 100 interactive exhibits distributed throughout the various galleries, the *Museum of New Zealand Te Papa Tongarewa*² is a national museum, renowned for being bicultural, scholarly, innovative, and fun. Our success is built on our relationships and our ability to represent our community’. Thus, the Te Papa Museum in New Zealand attributes its success with visitors to the use of fascinating displays and high-tech fun (Freeder & al., 2021). The result is a sense of wonder, the ‘wowing effect’. With this description, museums emphasise the distinction between interactivity on the one hand and the ordinary display of objects and images on the other, specifying that the two aspects are opposed rather than complementary. They promise adventure, fun, play and experiences not generally associated with traditional museums. Therefore it is worth examining, in the context of museum communication and the relationship between the museum, exhibition design and visitors, what Patrick Hughes, in his analysis of the use of interactive exhibits in the design of science museums, defines as ‘an interactive fetish’ (Hughes 2001)³, namely that there is a widespread belief that introducing interactive tools into museums affects the success of a museum exhibition. In a short article on interactivity in museums, John Stickler (1995) offers a critical assessment of how museums are defined in relation to contemporary communication media culture: museum exhibitions are seen as static, uninteresting and requiring a passive form of appreciation, while films, videos and multimedia presentations are interactive. Stickler states:

«How can today’s museums compete with television? Viewers are captivated by the action and excitement on the TV screen while museum visitors face only static exhibits in glass cases» (Sticker 1995, p.36).

2 The Museum of New Zealand Te Papa Tongarewa, commonly known as Te Papa, is New Zealand’s national museum, located in Wellington. The Māori name “Te Papa Tongarewa” roughly translates as “treasure house” or, more poetically, “treasure house of things and people from Mother Earth here in New Zealand”. Opened in 1998, Te Papa is renowned for its bicultural approach, reflecting the partnership between Māori and Pākehā (European New Zealand) cultures based on the principles of the Treaty of Waitangi. The museum houses over 800,000 works of art, objects and natural artefacts, offering interactive and innovative exhibitions covering art, history, Māori and Pacific culture, and New Zealand’s natural environment.

3 In his article, Patrick Hughes points out that many museums, mostly scientific ones, in a context of a growing “entertainment economy” based on entertainment *tout court*, promote themselves by focusing on interactive technology to create an image of themselves as places of entertainment. Through two case studies, two science museums in Texas, he criticises this type of promotion, which equates science with mere entertainment, specifying how this leads, in the long run, to little cognitive gratification for the public but, above all, to a homogenisation of the identities of different museums.

However, the idea of interactive exhibitions has a long history; in 1981, Bonnie Pitman-Gelles, with a rather broad vision of interactivity, explained how, in her opinion, interactive exhibitions «provide a sense of discovery or direct experiences with objects. They appeal to a variety of senses and generally require adults or children to handle materials, play roles, daydream, operate equipment and participate in play or work. An interactive exhibit can be a single station involving push buttons or computer terminals, more complex visitor-activated units, or entire environments such as those at Colonial Williamsburg and the Florida State Museum's cave» (Pitman-Gelles 1981 in Witcomb 2003, p.131).

Later, McLean (1993), with a more limited conceptual idea, perhaps a consequence of technological evolution, traced it back to 1889 when Berlin's Urania, a well-known scientific society, founded in 1888, with the aim of bringing the latest scientific discoveries to the general public, introduced models that could be 'activated' by visitors as well as a theatre for science.

The scholar also recalls that the *Deutsches Museum* in Munich began experimenting with exhibitions containing films and working models as early as 1907. The choice of these examples explains three of the main assumptions that must coexist in a contemporary discussion on interactivity: first, the presence of certain multimedia tools; second, that an interactive exhibit is a physical object to be added to the main exhibition; and lastly, that interactive exhibitions are something with which visitors can interact, requiring actual physical activity. This suggests that interactivity is both a physical and conceptual activity. Reid and Cave (1995) point to the exhibition at the *Palais de la Découverte*⁴, in Paris in 1937, as the first example of interactivity, followed by the *New York Hall of Science*⁵, which opened in

4 The museum was created in 1937 by Jean Baptiste Perrin, winner of the Nobel Prize for Physics in 1926, opening with an international exhibition on the theme "Art and Technology in Modern Life". Subsequently, in 1938, the French government decided to transform the structure into a new museum. Today, following its merger in January 2010 with the Cité des Sciences et de l'Industrie, the museum has an exhibition area of 25,000 square metres with permanent exhibitions on *la science vivante*, topics related to mathematics, physics, astronomy, chemistry, geology and biology, occupies the west wing of the Grand Palace, Palais d'Antin, built for the Universal Exhibition in 1900, designed by architect Albert Felix Teofil Thomas (Retrieved from <http://www.palais-decouverte.fr> on 22/05/2025).

5 The museum, NySCI, was established in 1964 as part of the New York World's Fair and was one of the few science museums in existence at the time. Unlike other institutions that closed at the end of the World's Fair, the Hall remained open, often used by students as a resource for study and learning. It remained open until 1979, when it was closed for renovation and refurbishment, which was completed in 1984. The museum, with its extensive permanent exhibition dedicated to science and technology, the only one of its kind in New York City, explores the broader aspects of these disciplines, attracting over 500,000 visitors a year. Today, the museum states that its mission "is to nurture passionate learners, critical thinkers, and ac-

1964, and the Exploratorium⁶ in San Francisco in 1969.⁷

At the same time, Koester (1993), representing the latest approach to interactivity, disagrees with the other theories, opposing the previous definition of interactivity in favour of a narrower and more technology-oriented definition. In a report written for the Canadian company *Archives and Museum Informatics*⁸, the author explains how the previous definition showed interactivity as a complex of multi-level actions, including the possibility of moving freely within a museum space and the combined use of multiple communication tools (objects, panels, videos, etc.), which merge into the museum experience. However, this can be defined as a ‘multimedia experience’, while she defines an interactive as an experience with «computer-generation technologies that incorporate multiple media, such as text, sound, video, or graphics, into an integrated computer system, which then serves as an exhibit that can inform the visitor on a relevant museum topic using the most appropriate communications media» (Koester, 1993 in Witcomb 2003, p. 131).

The features McLean talks about are often, and rightly, described as a ‘hands-on approach’, meaning a ‘mechanistic’ understanding of interactivity (Witcomb, 2003), which is seen as the set of tools that «the visitor touches [...] and something then happens: for every action, there is a reaction» (Lewis 1993: 33); a technical process of action-reaction between visitor and exhi-

tive citizens through an approach we call Design Make Play”. Retrieved from <http://www.nysci.org> updated on 22/05/2025.

⁶ The Exploratorium was founded in 1969 by a physicist with a passion for teaching, Frank Oppenheimer, a British perceptologist, Richard Gregory, and a group of young enthusiasts and creatives who animated the cultural scene of San Francisco at the centre of the protests of the late 1960s. This diverse group transformed an industrial warehouse into the first modern Science Centre (Hein 1990). In April 2013, the museum was renovated and refurbished and moved from its original location to a new building on the San Francisco waterfront, designed by the renowned US architecture firm EHDD, Esherick Homsey Dodge and Davis. Lively and vibrant, with working machines that visitors can use, a visit to this museum is not an individual, introspective experience, but rather an opportunity to share opinions and reflections with other visitors, becoming a place for encounters, dialogue and socialisation. As the museum itself describes itself, it is “a public learning laboratory exploring the world through science, art, and human perception”. (information taken from the museum’s official website www.exploratorium.edu)

⁷ The examples cited highlight the strong link between interaction, interactivity and science museums: exhibitions dealing with science-related topics and theories require experimentation by the public in order to facilitate understanding.

⁸ Archives&Museum Informatics is a well-known Canadian company based in Toronto, founded in 1989, which organises conferences and publications in the field of cultural heritage, mainly in the museum sector.

bit. The consequence of this idea is that interactivity seems to be generally understood as a process that is superimposed on an existing exhibition and often involves some form of computer technology. This has the limitation of reducing the idea of interactivity to multimedia tools, or interactives. For this reason, many museums consider only some of their exhibitions to be interactive, recognising them as very different from conventional forms of interpretive display.

One of the fundamental aspects of this perceived difference is that interactive displays, as opposed to traditional ones, are typically associated with greater entertainment. However, this view is not straightforward. Moreover, there is a well-established body of research showing that the inclusion of interactive tools in a display can increase the amount of time visitors spend at an exhibition (Stevenson, 1994).

It is sufficient to consider, as Witcomb (2006) points out, that as early as 1990, there was an increase in visitor numbers when the Science Museum in London introduced the 'LaunchPad Gallery', the first modern interactive gallery, which was refurbished and reopened in 2010. The gallery attracted over 500,000 visitors per year, corresponding to approximately 714 visitors per square metre per year, compared to 44 visitors per square metre per year in the rest of the museum.

Recent research has shown that displays with interactive exhibits are particularly effective in attracting children and families and fostering deeper and more meaningful educational experiences (Dorph et al., 2019; Sobel et al., 2020; Ten Voorde, 2023).

It should also be emphasised that this recreational aspect of interactive exhibitions has become important in a socio-cultural context in which museums are increasingly seen as part of the media industry, owing part, or all, of their income to visitor admission fees and therefore having to cater to their needs.

Some researchers consider interactive workstations in museums to be elements of a contemporary mass media language, through which museums, as cultural institutions, need to express themselves, if they wish to communicate with the public, especially younger visitors. On this point, the aforementioned Andrea Witcomb quotes the founder of the *Museum of Tolerance* in Los Angeles, who defended the extensive use of multimedia:

«Where are your kids now? [...] They're at the computer, and after that they're going to watch television. That's the kids of America. This Museum wants to speak to that generation. We have to use the medium of the age» (Witcomb, 2006, p. 355).

George MacDonald, director and founder of the *Museum of Civilisation* in Ottawa and the *Museum of Victoria* in Melbourne, was one of the first to argue that museums must become an integral part of the information society, pointing out that this meant not only incorporating tools that support new information systems but also adopting the cultural language of contemporary media (MacDonald, 1992).

Among contemporary scholars, there is also a widespread belief, which emerged in the early 1990s, that interactive exhibitions, including hands-on methods, offer more effective pedagogical tools than traditional forms of exhibition (Screven, 1992; McLean, 1993; Stevenson, 1994; Simpson, 2002; Witcomb, 2003). John Stevenson, for example, speaks of the ability of interactivity «to inspire and provoke exploration [...] and to tempt people to look more thoughtfully at traditional museum display» (Stevenson, 1994, p. 32), emphasising how interactive exhibits can encourage visitors to explore and think more deeply. Building on these seminal contributions, more recent studies have extended the debate on the educational effectiveness of such interactive exhibits. Lykke et al. (2021), for example, analyse how exhibitions that involve the whole body, allied to collaboration among visitors, stimulate experiential learning in scientific centres.

Similarly, Yanner et al. (2022) show how ‘smart’ exhibits, capable of adapting to visitor interaction, enhance engagement and learning in museums. Finally, recent research on the implementation of gamification in museums (Cuseum, 2025) highlights the role of fun and interactive elements in encouraging independent exploration, curiosity and visitor satisfaction.

Today, as in the past, particular attention is being paid to interactive processes in relation to design tools aimed at enhancing the knowledge, communication and understanding of exhibits. In the current debate, the use of technologically advanced tools is often associated with the concept of interactivity, with a view to making museums more democratic⁹ and accessible to the public. Technological media are considered as an important strategy for making museums culturally significant. In fact, in literature dealing with interactive activity in museums, what is often emphasised is precisely the idea that technology brings museums to life, transforming them from static places into interactive spaces, providing greater enjoyment, especially for young visitors, and introducing a fun way of learning.

⁹ Today, there is an increasing tendency to talk about the “democratisation of culture”: the use of technology such as the internet, now widely used by users of all ages and social and cultural backgrounds, allows greater access to information, given the speed with which such information is disseminated.

As Stickler points out «[t]wo key words, ‘immersion’ and ‘interaction’, combine with newly developed technologies to allow today’s museums to hold their own with television, films and video games. If the diorama is the stereotypical example of traditional museum presentation, the ‘immersion’ concept takes away the viewing window and allows the public to walk right into the exhibit» (Stickler 1995 in Witcomb, 2003, p. 129).

Contemporary technology is therefore seen as an effective tool for the ‘sequential locomotion’ described by Bennet (1995) for educational purposes. Like Stickler, the text focuses more on how visitors can move around the exhibition, ‘walking right into the exhibit’, how the tools fit into the layout, and how this contributes to the message that the museum wants to convey. If, as argued by New Museology, the fundamental issue for a museum is the narrative communicated within it, it is not interactive multimedia that will reveal the story underlying the exhibition design; rather it is the actual exhibition spaces and their layout that need to be rethought to become interactive. Interactivity, broadly understood, must be designed following a simple communication process (from the museum to the visitor) in which the visitor’s actions, learning and even feelings are monitored. Designing an interactive exhibition therefore involves integrating communicative objectives, ‘what you want visitors to learn’, with behavioural objectives, ‘what you want visitors to do’, and finally emotional objectives, ‘what you want visitors to feel’: McLean’s learn-do-feel triad (1993).



Fig. 2 Scheme of McLean's learn-do-feel triad.

In this sense, it is important to understand what is meant by ‘interactivity’ and ‘interactive experience’ in museums. According to Witcomb (2003), the concept of interactivity is articulated across three main dimensions: technical interactivity, involving responsive technologies and sensors; spatial interactivity, concerning bodily engagement and physical orchestration; and dialogical interactivity, fostering interpretive and communicative relationships between visitors and content.

Technical interactivity is a feature based on a stimulus-response system, where visitors receive feedback for correct answers (through sounds, lights, messages). The goal is often to simplify and reinforce specific messages. When used in a targeted manner, this type of interaction may resemble a form of prescriptive pedagogy or even indoctrination. A significant example is the *Holocaust History Museum* at Yad Vashem, in Jerusalem, where interactive technology is used to reinforce a strongly ethical and memorial reading of the Holocaust, rewarding 'correct' interpretative behaviour and directing the experience towards a guided and profoundly emotional understanding. The museum opened in March 2005, with the project being entrusted to architect Moshe Safdie, an Israeli-born Canadian citizen known for his architectural approach that profoundly integrates structure and landscape. Safdie conceived the museum as a triangular prismatic structure that cuts into Mount Herzl, creating a symbolic path that guides visitors through the narrative of the Holocaust. The exhibition route winds through ten themed galleries, documenting the history of the Shoah through personal testimonies, original objects and multimedia installations. The tour culminates in the Hall of Names, a conical structure commemorating the victims of the Holocaust through photographs and personal documents of the victims. In this museum, visitors are guided through quizzes or interactive testimonies at numerous digital stations, where participation is 'rewarded' with access to additional content, while mistakes are often accompanied by immediate correction or the presentation of traumatic data. The museum uses interactive media with a few unusual effects: the sound of the human voice, for example, is used to create imaginary and reconstructed dialogues; text is not used in the standard way for interpretative captions (from generic panels to detailed labelling), but is inscribed directly on the walls; the graphics tend to use digital video footage rather than photographs, which represent an exhibition in itself. The effect of all this is that visitors are constantly urged to ask themselves questions, with suggestions that tend to fix the museum's storyline in their memory. The design is highly narrative; every interactional element seeks to confirm an ethical and political interpretation of the historical event and leads visitors towards a very clear moral stance. The design choices are intended to involve and emotionally guide users: lights, sounds, narrating voices, scene darkening and focusing effects are triggered in response to certain gestures or input from museum visitors.



Fig. 3 Holocaust History Museum at Yad Vashem, Jerusalem. ©Ilya Varlamov, CC BY-SA 3.0 <<https://creativecommons.org/licenses/by-sa/3.0/>>, via Wikimedia Commons.

Another example of technical interactivity can be found in the *Museum of Tolerance* in Los Angeles, specifically in an area of the museum entirely dominated by interactive media aimed at helping the visitor understand how intolerant they are (even if they do not believe this to be possible). One example is the experience of entering the hall: visitors must choose between two doors, the one on the left marked 'intolerant' and the one on the right marked 'tolerant'; if they choose the right door, the path will be closed off and visitors will be channelled into an exhibition space with predetermined subjective perspectives. This strategy is controversial and contrived, even for those who understand that the museum's message is geared towards communication. However, while this controversy may encourage self-awareness, it also prevents a deeper understanding of the social roots of intolerance. The exhibition often favours emotional engagement over in-depth historical analysis; the outcome is a sense of self-censorship in the presence of suffering so intense that it prevents the visitor from developing a critical attitude to the exhibition (Witcomb, 2003). Interactivity here is not geared towards independent discovery but is primarily aimed at reinforcing a collective memory and an ideologically accurate reading of history. Visitors are placed in a state of controlled involvement, in which the educational effect is achieved through the mechanisms of response and emotional reinforcement.



Fig. 4 AI-generated image (chatGPT) based on a scene from the *Museum of Tolerance*, Los Angeles.

The *Lindt Home of Chocolate*, in Kilchberg, near Zurich, may be considered an example of *spatial interactivity*: within the exhibition space, the layout encourages visitors to follow a specific route; they are part of that ‘journey’ within the museum, but are in fact guided by the layout itself. The wish to engage visitors on various levels reflects an approach to interactivity that requires input from both the visitor and the exhibition design.

This approach views communication as two processes without a predetermined hierarchy, in which the mission of the museum is to educate an ‘uneducated’ visitor. The public is encouraged to play an active role in creating meaning from the exhibition. However, this activity does not necessarily imply, or at least not initially, the use of technology. In this case, the exhibition design begins with the idea that the exhibition space itself must be interactive, with interactivity seen not only in its technical and technological aspects, but also in its narrative function.

The tour, curated by Atelier Brückner and inaugurated in 2020, takes visitors through seven themed rooms that explore the origins, history and manufacture of chocolate. The tour begins with a reproduction of a cocoa plantation in Ghana, continues with the history of chocolate from pre-Columbian civilisations to the European continent, and culminates in its disco-

very by Swiss chocolate pioneers. Visitors can then observe the chocolate manufacturing process in a modern production factory and participate in tastings of various Lindt specialties. The layout is designed to encourage spatial interaction: the fluid design and multimedia installations draw visitors in, inviting them to actively explore and construct their narrative route through the museum. This approach emphasises interactivity as a narrative function of the exhibition space, rather than relying exclusively on digital technology.

The third approach, which is increasingly being discussed today, involves *experiential* or *dialogic interaction* (Witcomb, 2006), in which visitors actively contribute to the construction of meaningful experiences. Recent studies (Parry et al., 2021; Tallon & Walker, 2021; Simon & Moscone, 2016) highlight how the design of interactive experiences should integrate technology, storytelling and spatial design to foster an empathetic and reflective relationship between the public and the content. In this light, interaction is no longer an additional feature but an intrinsic quality of exhibition space. It acts as a tool to facilitate situated learning, inclusion and emotional engagement.

One example is the *Lavazza Museum* in Turin, created in 2018 by Ralph Appelbaum Associates. Located in the heart of the Nuvola Lavazza (Lavazza Cloud) headquarters, the museum offers an immersive experience that explores global coffee culture through the history of the company and its imagery.

The exhibition is divided into five themed areas, each with its own narrative and spatial identities. The Lavazza House introduces visitors to the family and historical dimension of the brand through archive items, letters and photographs that tell the story of the entrepreneurial family. This space, conceived as a domestic setting, creates an initial emotional connection based on memories and authenticity. This is followed by La Fabbrica (The Factory), which simulates the coffee production cycle - from plantation to roasting - through sensorial installations that stimulate touch, smell and hearing. Here, interactivity is both technical, using interactive screens and devices that explain industrial processes, and spatial, with a layout that physically immerses visitors in atmospheric environments such as a greenhouse or a roasting workshop. The Piazza celebrates the ritual of espresso and the public and social dimensions of coffee. The layout evokes a genuine Italian piazza, with architectural elements, seating, warm lighting and displays of the most iconic coffee machines. The interaction in this case is behavioural and relational, with visitors being invited to explore freely, look around, listen to stories, and linger, sit down and chat. In the Atelier, a space devoted to artistic collaborations and advertising, visitors can check out digital

archives, historical campaigns and immersive videos. Interactive interfaces allow visitors to navigate content, change viewing modes and listen to the voices and sounds that have shaped the brand's visual and audio identity. The interactivity here has a narrative quality, enabling visitors to reconstruct stories, compare languages and rediscover cultural references. Finally, the Universe concludes the journey with a spectacular 360° immersive installation, where videos, sound and projections wrap visitors in a symbolic and poetic expedition into the world of coffee. This space not only embodies the experience, but also represents a prime example of immersive interaction, where the body and senses are fully involved in the narrative. A key feature of the museum is the interactive cup, an individual digital gadget provided at the entrance that enables visitors to trigger personalised features along the way, gather data, take photos and record their experiences. This gadget offers the ultimate in personalised interaction, perfectly in tune with the principles of visitor-centered design: each visitor creates their own itinerary, choosing the pace, focus and depth of their experience.



Fig.5 Lavazza Museum, Turin ©Ralph Appelbaum Associates.

However, in the interests of clarity and precision, it is worth highlighting the difference between the terms 'interactivity' and 'interaction', beginning with one key distinction: 'interaction' occurs when 'equal' subjects, physically present or connected through an interpersonal medium and with interchangeable roles, communicate with each other; 'interactivity', on the

other hand, is generated when different subjects with interchangeable roles enter into a relationship with each other, at different times, through a system programmed by the author (object, machine, programme) to take on different modes of operation depending on the behaviour of the player.

Furthermore, unlike interaction, interactivity lacks what Goffmann (2009) considers its strategic component. According to the Canadian sociologist, the fundamental characteristics for establishing an interactive relationship are «two or more parts must be in a structured situation of mutual collision, in which each part must make a move and in which every possible move has crucial consequences for all parts. In such situations, each user's decision must be influenced by their knowledge of this likelihood. Courses of action or moves will therefore be decided considering what one imagines the other imagines about him or herself. The exchange of moves made based on this type of attitude towards oneself, and others can be defined as «strategic interaction» (Goffmann, 2009, p. 25).

Therefore, the conditions for interaction are interchangeability and the activation of an equally communicative dynamic; interaction is thus a circular process, involving continuous communication between several actively involved parties. In the context of interactivity, however, the opposite is true, i.e. the condition is precisely the absence of one of the interlocutors; this is why it is regarded as a distinctive feature of new media. In new media, information is not exchanged between the two subjects of communication but between the individual and the tool, as a result of the individual's own activity.

A recurring issue is the aesthetic of busyness: exhibitions often equate engagement with constant motion and noise. Yet overstimulation can fragment attention and erode narrative coherence. A mature interactive design culture must reclaim silence and pause as integral to participation. Alternating kinetic and contemplative zones restores rhythm, allowing visitors to metabolise information emotionally and cognitively. Designing for attention spans, not just interaction counts, constitutes a new frontier for responsible exhibition design.

3.4. From hands-on to minds-on

The human predisposition to physical contact is deeply rooted in sensory and cognitive experiences. The desire to touch an object is not only an instinctive impulse, but also a means of visually confirming what we perceive and consolidating the memory of the experience. Studies in sensory museology have shown that tactile interaction with museum objects can significantly improve learning and memorisation. For example, research carried out by Romanek and Lynch (2008) demonstrated that direct handling of objects has a lasting impact on memory, which is superior to learning based solely on written texts.

Furthermore, the concept of 'haptic memory' emphasises how information acquired through touch is stored in a specific form of sensory memory, which, although short-lived, plays a crucial role in processing tactile information and shaping of memories. This evidence stresses the importance of integrating tactile experiences into museum exhibitions, not only to foster the inclusive participation of members of the public with different sensory abilities, but also to enhance the overall visitor experience, making it more immersive and memorable.

In view of the development of exhibition practices and the growing need to actively involve the public, many museums have chosen to combine digital technology with more direct and physical forms of interaction with the public. Among these, the hands-on approach encourages visitors to touch, handle and experiment with the objects and elements of the exhibition. This represents one of the most effective strategies for stimulating participation and active learning. Some institutions opt for installations designed entirely along these lines, while in many other cases we see a gradual integration of hands-on devices into traditional displays, thus creating hybrid environments where different interpretative media coexist. This approach not only meets the needs of a diverse public, but also enhances experiential, sensory and inclusive modes of enjoyment.

In British museums, the hands-on approach has found fertile ground since the early days of interactive scientific centres, before becoming widespread in historical and cultural museums thereafter. This approach was first adopted and has been progressively adopted in museums in the United States and Europe, establishing itself as one of the most recognised practices in contemporary museology. Looking back at the growth of communication techniques in museums, we can see how the hands-on approach, which is now seen as an essential part of many exhibitions, has its roots in a long tradition of experimentation that has changed over time to keep up with

cultural, technological, and social changes.

In the early 20th century, modernists launched a critical attack on the classical idea of the museum, which was considered a place with a strongly encyclopedic character where 'dead things' were preserved¹⁰; thus, change was called for. At the same time, the concept of 'over-accumulation' appeared for the first time in international debate, causing confusion, disorientation and bewilderment among visitors. New museum exhibition methods were sought to arouse the viewer's curiosity while encouraging their participation and attentiveness. From the 1920s to the 1940s, avant-garde artists understood the importance of tactility, handling, space and the need to actively involve the public in their exhibitions. The main members of the European avant-garde movement, especially the Dadaists, belonging to groups such as De Stijl, Bauhaus and Constructivism, devised new and innovative exhibitions: a theatrical space in which there was a close relationship between the audience, objects and performers.

Therefore, avant-garde designers created spaces that integrated the 'dramatic' organisation of theatre space with elements drawn from graphic design and typography. They reconfigured the exhibition environment to allow visitors to interact with the display by changing their point of view, a result which was achieved using different exhibition strategies capable of interrupting the narrative flow and disrupting the theatrical illusion.

The need for a continuous relationship between objects and the public had already been identified by the work of painter, architect, graphic designer and typographer El Lissitzky, who simultaneously employed photo-montages, sculptures, three-dimensional settings, moving objects and special lighting effects to stimulate the public to enter into the complexity of the subject matter on display (Gough, 2002).

An example of an avant-garde exhibitions is the *Abstract Cabinet* commissioned by Alexander Dorner, director of the Landesmuseum in Hanover, and created by El Lissitzky between 1927 and 1928. The installation consisted of thin vertical metal slats positioned in a corner of the wall; these were white on one side and black on the other, so that they appeared to change colour as visitors moved around the space. One might also consider: El Lissitzky's works, such as *Proun* in Berlin, 1923, or those exhibited in Cologne in 1928, mounted on sliding panels and rotating drums; the light ma-

¹⁰ At the beginning of the 20th century, the idea of progress that had begun in the previous century began to take hold, affecting all areas of society, from transport to communications, from industrial technology to new consumer goods. In this sense, museums were seen as the most suitable institutions to represent and present this evolution to the masses, in order to convince them of the advantages of industry and capital.

chine that projected Moholy-Nagy's abstract drawings onto the walls and ceiling when the visitor pressed a button, and the device developed in 1947 at the International Surrealist Exhibition in Paris, which enabled visitors to view Duchamp's works through a peephole by turning a large wooden spiral (Henning, 2006).



Fig.6 El Lissitzky's artwork, 1923.

However, what exactly is a hands-on exhibit?

According to Caulton (1998), traditional forms of exhibition are either passive, as in the case of display cases, or active, as in the case of models, but in both cases they can be described as hands-off. Visitors are encouraged to look, think, listen and sometimes even smell, but they are often discouraged from touching. On the contrary, exhibits designed in accordance with the hands-on approach or interactive exhibits (i.e. with the characteristics explained in the previous paragraph) encourage the public to explore more directly¹¹. The hands-on approach involves visitors physically interacting with an exhibit, pressing a button, using a computer keyboard or engaging in more complex activities with a variety of possible outcomes.

For example, a hands-on exhibit that simply involves pressing a button cannot be considered definitive, according to Swift (1997), as it is not truly interactive, but rather reactive, i.e. it leads to a single outcome.

¹¹ The terms 'hands-on' and 'interactive' have similar meanings and are widely used interchangeably.

When the term hands-on is normally used, there is an acceptance that hands-on activities will involve interaction and offer added educational value; this means that hands-on becomes minds-on¹². However, a hands-on exhibit means that visitors will be involved in mental activity, which may clearly occur without any physical interaction (Kennedy 1994).

A precise definition becomes even more complicated by the fact that now, more than ever, the term 'interactive' is often associated with computer-based entertainment, where physical activity takes place via a keyboard, video or virtual reality device, and where fun and learning are not necessarily common goals.

In short, although the terms hands-on and interactive have become widely interchangeable in both everyday and academic language, neither term adequately defines an exhibit that also includes physical interaction, has clear educational objectives and offers a variety of outcomes depending on the individual exploration of the various visitors.

An applicable definition, broader but still accurate, might be that of Caulton:

«A hands-on or interactive museum exhibit has clear educational objectives which encourage individuals or groups of people working together to understand real objects or real phenomena through physical exploration which involves choice and initiative» (Caulton 1998, p. 2).

The shift from hands-on to minds-on suggests a change in design metrics. Instead of counting touches or dwell-time, designers should assess cognitive resonance, moments when interaction triggers insight or dialogue. Evidence from visitor studies indicates that such outcomes correlate with affordances that invite self-explanation (why did this happen?) and social negotiation (what do you see?). The implication is that interactivity should be designed less as an interface and more as a conversation catalyst.

12 That is, it involves the user mentally as well as physically. In fact, a growing number of researchers argue that interactive displays based on a hands-on approach are actually ineffective for learning. These scholars, replacing the expression "hands-on" with "minds-on", have highlighted a pedagogical difference between this latter approach, which is based on a learning model geared towards behavioural psychology, and the one they suggest, which instead draws on a constructivist approach based on cognitive development psychology, defining it as more effective and democratic, since learning is conceptualised as a process of experience in relation to one's own mind, i.e. one's own cultural context (Russell 1994; Hein 1998).

3.5. Designing meaningful experiences

One of the developments in museums that has changed and continues to alter the traditional approach to displaying objects is the introduction of electronic technology and, more generally, the impact of media on museum displays. Museums have been greatly affected by this, undergoing major changes in contemporary design. One of the most noticeable effects is the relationship between visitors and the objects on display. The ability of objects to speak within a hegemonic system of representation has been challenged: on a practical level, exhibitions now also contain 'non-objects', i.e. audiovisual technology and interactive exhibits, or other media such as films, soundtracks and virtual reconstructions; on a theoretical and conceptual level, this introduction can be understood, from a post-modernist perspective, as a continuous link between museums and modern forms of communication media (Malpas, 2008).

The use of advanced media in museums connects them to the global flow of ideas and information, preventing the significance of museum objects from remaining confined within museum walls. As Roger Miles stated several years ago: «Modern multimedia exhibitions reflect not the international world of museums as repositories, but the external world in which museums now find themselves. This is the world of our post-industrial society – dominated by technology, with pervasive media and advertising industries, and instantaneous electronic communications; a society with pluralistic culture in which the boundaries between high art and mass culture have broken down» (Miles, 1993, p. 27).

Every design choice, from the use of immersive media to the layout of objects, contributes to building a coherent narrative, capable of engaging visitors in a profound and personal way. The designers, understood as cultural intermediaries, possess fundamental skills in constructing meaning and energising the visitor. Their knowledge of perceptual and communicative dynamics, as well as physical and cognitive modes of engagement, makes them key figures in the transition from a static museum to an experiential one. In this process, the ethical and cultural responsibility of the designer is not secondary; communicating through space means taking on the burden of interpreting, selecting and mediating knowledge, stories and identities. In this interpretative process, the aspect related to communication cannot be left to chance, but must be constantly researched and updated, especially in times when technological change is happening at a rapid pace and the public demands ever greater involvement. In the Anglo-American world, which has always been attuned to the needs of the public and is adept at making museum collections appealing and accessible, there has been a

growing awareness that museum design should be the result of a multidisciplinary process based on collaboration between experts from different fields. A fundamental step in this development occurred in the second half of the 20th century, when exhibition design began to be recognised as an autonomous and strategic practice in cultural mediation.

A pioneering figure in this regard was James Gardner, who achieved international fame in 1946 with his exhibition design for *Britain Can Make It*, hosted at London's Victoria & Albert Museum. This was one of the first exhibitions in which the role of the designer was conceived in terms of the creator being aware of the narrative form of the exhibition (Velarde, 2001). Institutional interest in design soon followed: in 1950, the Liverpool Museum established the first Department of Design, followed by the British Museum, which appointed its first official exhibition designer in 1965 (Miles, 1988).

This approach entails exhibition design being conceived not only as a spatial organisation of objects, but also as a narrative interpretation capable of conveying meanings on multiple levels, both denotative and connotative, and of activating the cognitive and emotional participation of the public (Maroević, 1998). In this sense, as Otto Neurath pointed out, it is the task of the designer, or transformer, to understand the data, gather information from experts, decide what to communicate to the public and how to make it comprehensible and connect it to commonly shared knowledge: «the transformer's duty [is] to understand the data, collect information from experts, decide about what is worth transmitting to the public, and about the way in which this is made intelligible and linked with general knowledge» (Neurath in Miles, 1982, p. 101).

Ultimately, spatial storytelling and interactivity are two expressions of the same design ethic: meaning emerges through action in space. The challenge is to choreograph freedom within form to let visitors navigate, interpret, and sometimes resist, without losing the coherence of the museum's proposition. As in architecture, constraint is the enabling condition of play; the art of design lies in composing these constraints so that curiosity, reflection, and social exchange can flourish.

In the following chapter, spatial storytelling is not limited to architecture and exhibition design but is now enhanced by a wide range of analog and digital communication media, which extend the narrative potential of museum spaces and multiply interpretative experiences.

PART 2

**DESIGNING THE DIGITAL
MUSEUM: MEDIA,
IMMERSION AND
TRANSFORMATION**



CHAPTER 4

Designing with Technology.

Digital media expand the language of visitor experience, merging communication, usability and emotion.

4.1. From analogue to digital museum media

In recent years, a growing number of museums, increasingly aware of their educational role in society and keen to encourage visitors to become involved in the activities on offer, have decided to exploit the opportunities provided by information technology, multimedia and interactive technology. When used effectively and integrated into the exhibition design, these tools can immerse the public in a sophisticated learning and research environment.

The evolution of museum communication has always been closely tied to the development of media technologies. From the first didactic displays and audio guides to contemporary immersive installations, each technological step has shaped how visitors perceive, understand, and emotionally engage with exhibitions. The history of museum media is therefore not a neutral account of tools, but a narrative of changing relationships between people, space, and knowledge. The design of communication tools in museums has long balanced between two poles: informative clarity and experiential engagement.

In the twentieth century, the introduction of slideshows, film, and later video expanded the possibilities of visual communication, adding movement and narration to static displays. These early integrations of media anticipated what would later become the multimedia turn in exhibition design. By the late 1980s, the appearance of digital devices - CD-ROM stations, computer-based kiosks, and touchscreens - transformed museums into interactive learning environments, reflecting broader cultural shifts toward participation and personalization.

The arrival of mobile devices and smartphones in the 2000s further redefined the visitor's relationship with information. Audio guides evolved into mobile apps capable of offering layered content, multilingual accessibility, and location-based interaction. These tools changed not only how visitors accessed information but also the rhythm of the visit itself: pauses, routes, and choices became increasingly personalized.

This transformation corresponds to what scholars such as Parry (2010) and Bonacini (2023) describe as the rise of the post-digital museum, where analogue and digital coexist in hybrid configurations. The focus shifts from technology as display to technology as experience. Instead of replacing physical exhibits, digital media augment them, opening new forms of storytelling and emotional resonance.

In this sense, the history of museum media can be read as a gradual movement from mediation to relation: from tools that explain to systems that engage, from didactic presentation to experiential dialogue. As technologies evolve, the museum's communicative role expands beyond representation toward active participation, where visitors co-construct meaning through interaction.

One of the first documented examples of the use of a portable technological tool for museums dates to the 1950s, when the *Stedelijk Museum* in Amsterdam, during renovation, introduced an innovative system called 'Short-Wave Ambulatory Lectures'. This was a radio device equipped with headphones, designed to allow visitors to listen individually to pre-recorded audio content, available in several languages (English, German, French) and delivered via magnetic tape. Though analogue, this device anticipated many of the features that would later become standard in digital audio guides and interactive mobile apps: portability, personalised content selection, simultaneous viewing and listening, and multilingualism.

As Tallon (2008) recalls, the programmers involved in the Stedelijk project immediately recognised the transformative potential of this technology: «The possibilities of this device are so great that in the future shortwave lectures cannot be ignored in any museum. In the future shortwave lectures discussing individual works of art will be installed in such a way that they can be heard by any visitor at will» (Tallon, 2008, p. xiii).

This vision anticipated the idea of individual, non-linear interpretation based on the visitor's direct control of the experience, without the need for panels or written instructions. This logic was fully achieved in the 1990s with the introduction in museums of Personal Digital Assistants (PDAs), such as the 'Palm Pilot' (1996), which evolved into touchscreen audio guides, smartphones and customisable museum apps. Among the first advanced applications was the 'SPECTRE' project developed at the Louvre in 1998, which used PDAs with internal geolocation to provide information based on the visitor's location (Damala et al., 2008).

Today, smart mobile technology, powered by augmented reality, artificial intelligence and cloud access, represents an evolutionary leap forward from that first prototype: dynamic, adaptive and context-aware tools that integrate content, interaction and personalisation into a single experiential setting. However, the original vision of the museum as a controlled space for individual listening remains a fundamental constant in the design of contemporary experiential settings.

Multimedia technology, with its ability to support a combination of information, text, images and video in a flexible linking system, offers great

potential for research support at various levels, increasing accessibility to collections, stimulating interest and inviting active public participation, encouraging different learning styles and offering multiple levels of interpretation of the exhibition. Despite the need for continuous updating and, albeit less than in the past, high maintenance costs and problems related to content copyright, museums are encouraged to experiment with the ample possibilities offered by the variety and complexity of these tools. The demand for technological applications in museums has increased greatly over the last 20 years.

Over the years, museums have made extensive use of analogue media – text panels, photographs, models, display cases, captions – to communicate regarding their collections. These tools are based on a predominantly linear, sequential and observational communication logic, aimed at conveying information in a clear and straightforward manner. The visitor experience is mainly based on reading or observation, which encourages slow and in-depth reflection; the visitor is faced with pre-packaged content, presented in a single, identical way for everyone. The advent of digital technology has radically changed the way knowledge is built up and shared in museums. Digital technology breaks down linearity and introduces networked itineraries, asynchronous experiences and personalised navigation. New media – from interactive installations to augmented reality (AR), touch screens to conversational Artificial Intelligence (AI) – also offer more dynamic and participatory ways of experiencing, often simultaneously involving sight, hearing, movement and decision-making, where visitors can choose their own paths, activate content and modulate their own exhibition. This marks a shift from communication of ‘one-to-many’ towards an interactive and adaptive logic that recognises the heterogeneity of the public. Recent studies have categorised the impact of digital technology in museums, highlighting how it contributes significantly to improving accessibility, engagement and experiential learning. Studies from the last twenty years show that immersive and interactive technology enhances the effectiveness of visiting museums, especially when integrated with clear narrative and curatorial design (Liu & Sutunyarak, 2024). At the same time, AR applications are crucial in building personalised and sensory-rich experiences that involve visitors more deeply, particularly younger generations (Bonacini, 2023).

The current situation is part of what is called the post-digital phase of design: a point where technology is not just an extra, but a key part of cultural strategy and how things are set up (Stylianou-Lambert & Shehade, 2023). In this context, artificial intelligence, extended reality and adaptive systems are designed as integrated components of flexible, inclusive narrative experiences (Song & Evans, 2024).

Given the growing complexity of technology and the variety of its applications in the exhibition context, the use of innovative and immersive media may appear, at least at first glance, difficult and technically inaccessible, especially for non-specialists. However, above and beyond the technical specifications, there are fundamental design principles that direct the incorporation of these devices in exhibitions. Once these principles have been understood, in terms of narrative coherence, sensory balance, accessibility and the pace of the visit, the interpretative potential of the technology becomes not only more comprehensible but also easier for designers to programme. The greatest risk in museum multimedia design is not the absence of innovation, but rather the excessive use of technology without a clear design vision. Incorporating a series of high-tech devices without a solid narrative structure or without assessing their impact on the public's viewing experience can lead to a distortion of the exhibition content, as well as a loss of focus and sensory overload. In these cases, technology is reduced to gadgetisation of the museum space, where form prevails over meaning (Parry, 2007). As Tallon (2008) points out, in order to be effective, digital media must help visitors build cognitive and emotional connections between the elements of the exhibition, promoting the recognition of a coherent overall narrative. Only in this way can an experience be triggered that is meaningful and, at the same time, memorable and inclusive.

Designing museum media does not therefore mean choosing the most advanced technology, but understanding how each medium can contribute to constructing meaning, intensifying the relationship with objects and orchestrating a narrative that engages the visitor's senses, emotions and memory. When used superficially, technology can alienate the public; when integrated strategically and sensitively, it can enhance understanding, participation and the aesthetic pleasure of the museum experience (Stylianou-Lambert & Shehade, 2023).

The *Fryderyk Chopin Museum*, with its 'Experiencing Chopin' project¹, is a pioneering example of the integration of museum storytelling and interactive technology. The permanent exhibition, housed in the Gniński Palace, stands out for its use of interactive multimedia systems that allow visitors to personalise their experience using a Radio Frequency Identification card (RFID). This technology provides access to audiovisual content on four levels of analysis, adapted to different types of visitors, including children and people with visual impairments, and available in eight languages. Although the project was conceived over a decade ago, its concept remains relevant today, as it anticipates many of the practices now common in interactive

¹ Retrieved from <https://architettimiglioreservetto.it/portfolio-posts/chopin-museum-war-saw> on 27/05/2025]

museums. With sheet music, letters, personal items and musical instruments, the museum offers a visitors' experience that is not simply a documentary exhibition, but a personalised journey.

To mark the bicentenary of Chopin's birth, the museum was completely refurbished to become an international centre celebrating his life, not only as a musician but also as a cultural icon. The entire exhibition is spread over four floors, each presenting different aspects of the composer's life and work: from his youth in Poland to his time in Paris, from his loved ones to his relationship with George Sand, and finally to the circumstances surrounding his death. The experience is multisensory: for example, in the room devoted to the period spent in Nohant, visitors can listen to birdsong and activate music composed in that place by removing plates from an interactive panel. In the memorial room at the end, silence and darkness evoke Chopin's death through his death mask, a lock of his hair and invitations to his funeral. The more than 70 interactive terminals in the museum are not simply information aids, but narrative tools designed with interpretative care and selected for their consistency with the overall storytelling. The aim is to stimulate curiosity and involve visitors through the intelligent use of technology, which does not intrude but accompanies their cognitive, emotional and sensory experience. The Chopin Museum is still a methodological benchmark as regards the use of technology in personalised museum experiences. However, in order to provide an up-to-date overview of immersive museum experiences, it is also worth considering more recent examples that exploit the latest technological innovations.

One of the most emblematic examples of contemporary immersive design is *teamLab Planets TOKYO*², which opened in 2018 and will be enlarged in 2025. This experiential museum offers multisensory installations that involve visitors' physical bodies as an integral part of the lay-out, blurring the boundaries between space, image, matter and perception. Visitors walk barefoot through interactive aquatic environments, through ever-changing digital gardens, and are immersed in dynamic landscapes of light and sound that respond to their body movements. The project exemplifies a growing trend towards an all-encompassing experiential design, in which the museum becomes a performative, reactive and participatory environment.

Another significant example is the *Sarajevo VRX Immersive Museum*³, opened in 2023, which uses virtual reality to take visitors on a journey through key historical events in the city.

² Retrieved from <https://www.teamlab.art/e/planets/> on 27/05/2025

³ Retrieved from <https://www.sarajeovrx.com> on 27/05/2025

Among the most iconic experiences is the immersive reconstruction of the assassination of Archduke Franz Ferdinand in 1914, which marked the symbolic beginning of the First World War. The museum offers an interactive and emotional historical narrative, where visual immersion is accompanied by accurate soundscapes, detailed architectural reconstructions and digitally recreated oral accounts. The aim is not only to inform, but to bring the complexity of history to life, creating a profound and memorable experience.

4.2. Communicating through media: design, usability and visitor experience

If museum technologies shape new ways of perceiving and learning, their design determines how knowledge is accessed, interpreted, and remembered. Media are not neutral interfaces but communicative artefacts that embody curatorial intentions, narrative strategies, and cognitive models. The success of any medium depends on its ability to establish an effective dialogue between content and visitor.

To fully understand the role of media in shaping the contemporary museum experience, it is worth considering the specific features of the various communication tools adopted over the years up to the present day. Each medium activates a distinct relationship between content, space and visitor: while some encourage silent contemplation and sequential information, others favour dynamic interaction and participatory creation of meaning. In this regard, it is possible to distinguish between analogue media, such as text panels, models, photographs or display cases, and digital media, such as touch screens, interactive installations, augmented reality (AR), virtual reality (VR) and artificial intelligence (AI). Each of these categories corresponds to different forms of sensory stimulation and cognitive involvement on the part of the visitor. In this chapter, we shall be analysing the main communication tools employed in museums – from panels and touch screens to artificial intelligence – observing their potential, limitations and possibilities for integration into a coherent and accessible narrative system. This overview is not intended to be exhaustive, but rather a useful design map for designers to select and consciously integrate media into the narrative space of the museum in constructing the overall experience.

The layout should not be seen as just a collection of parts, but as a coherent system where exhibits, visual aids, interactive devices, and content all work together to create an integrated narrative environment (Falk & Dierking, 2013; Parry, 2021).

David Dean (1994), in a classification that is still applicable today, identifies three main cognitive levels that museums target:

- Words, whether read or heard, require greater mental effort and greater textual literacy.
- Images, perceived visually, are immediate, recognisable and often more enduring in the memory.
- Sensations, triggered by sensory stimuli (sounds, smells, touch), are associative, immersive and emotionally charged.

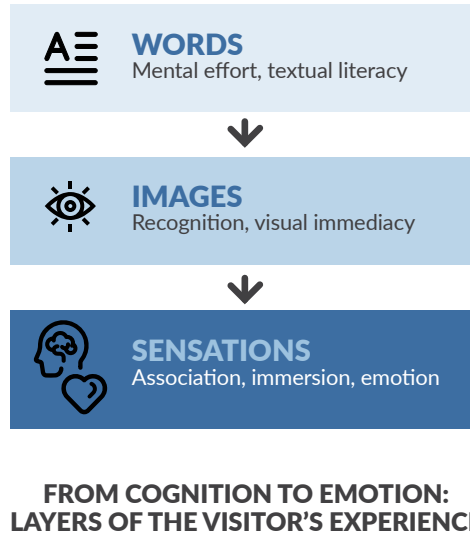


Fig.1 Scheme of David Dean's (1994) classification of the three cognitive levels addressed by museums: words, images, and sensations.

This three-part concept can be examined today considering studies on the situational and sensory experience of museums (Hooper Greenhill, 2000; Stylianou-Lambert & Shehade, 2023): each medium has its own 'perceptual signature' and contributes in a different way to the creation of meaning. The designer's task is to orchestrate these tools in a balanced design, taking into account the characteristics of the collection, the public and the spatial context. Traditionally, museums have entrusted much of their cultural mediation to written texts. However, although numerous studies show that written or spoken language is one of the most effective means of acquiring new concepts and information in museums (Falk & Dierking, 2013; Hein, 1998; Serrell, 2015), the use of text always involves a delicate balance: if poorly designed or graphically inadequate, it can compromise the mystery and fascination that the object is capable of evoking.

This does not mean that the texts should be discarded, but rather that they should be carefully integrated with the subject matter to facilitate additional understanding or stimulate questions in visitors: What is this object? Where does it come from? What was it used for? Who made it?

With the emergence of graphic design as an autonomous and conscious discipline, exhibition panels have taken on an ever more strategic role in organising museum content, integrating text, images and visual devices. In recent decades, graphic design as applied to museums has become the

subject of in-depth research, as a fundamental component of exhibition design (Serrell, 2015; Ruggieri, 2004). Since the 1950s and 1960s, with the emergence of exhibition design, the value of visual graphics as a narrative component has now been acknowledged (Dean, 1994). As early as the 1920s, Otto Neurath developed the 'Isotype system' in Vienna, promoting a universally comprehensible visual language for scientific and cultural dissemination (Neurath, 2021). Shortly afterwards, in the 1930s, Walter Gropius and the Bauhaus school experimented with the use of graphic panels, photographs, typographic lettering and statistical visualisations for exhibition and educational purposes, significantly influencing modern museography (Wingler, 1969). However, it was not until the 1970s that the systematic use of floor plans, text panels and backlit graphics became established as common practice, thanks in part to the emergence of graphic design studios specialising in cultural communication (Lord & Lord, 2002).

Within this process, the museum designer acts as a genuine co-author of the exhibition project. The task is to enable visitors to understand the museum narrative through clear and accessible visual language, transforming the curator's interpretative intentions into a legible, concise and coherent graphic form. Graphic images may range from faithful reproductions to abstract or ironic representations, with the use of colour often following evocative criteria.

It is a well-known fact that visitors only read what seems interesting and easy to understand and expect text and images to provide answers to questions that arise spontaneously when viewing an exhibit. The growing sophistication of the public has made the designer's job even more complex, thanks in part to the introduction of advanced software and digital technology. The use of the written word in museums has come a long way: it is not just a tool for interpretation but may become an expressive element that can influence the design of the space and the overall tone of the exhibition.

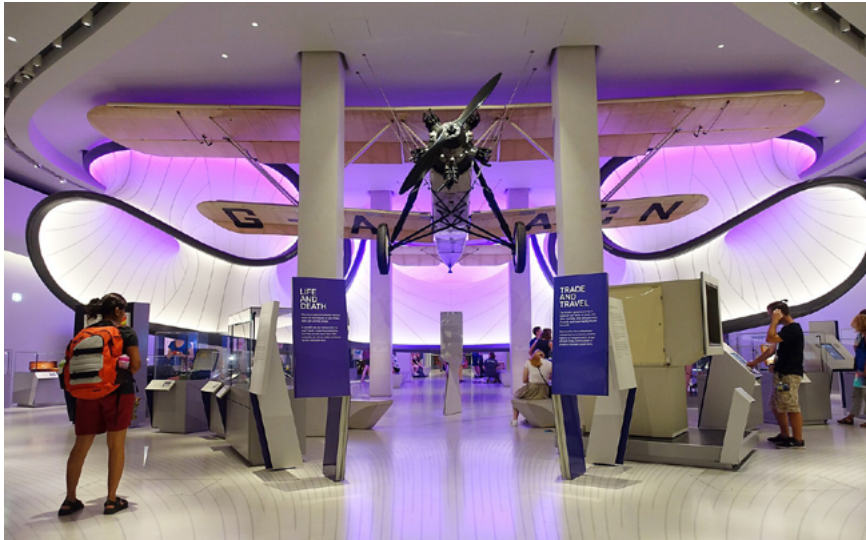
The design of **information panels** cannot be limited to the organisation of content but should be guided by an awareness of visual design, something which shapes the reading experience and influences the relationship between object and content. As Riccardo Falcinelli points out, looking is a form of thinking (Falcinelli, 2014): every graphic choice involves a worldview, a way of structuring experience and attributing meaning. In museum panels, the layout of the text, the font used, the images chosen, the figure/background ratio, the margins and colours are never neutral but actively contribute to the visitor experience. A well-designed visual design should consider not only legibility, but also the visual hierarchy of information, consistency with the visual identity of the exhibition, and cognitive accessibility for a variety of visitors.

One of the better-known methods for drafting accessible museum texts is that of Swedish museologist Margareta Ekav, according to whom a good panel should use simple language, everyday terms, short and clear sentences, dark characters on a light background, with a maximum of 45 characters per line and a total of about 100 words. The panel should include an evocative title and an explanatory subtitle, so that it can be understood by a varied audience (Gilmore, 1994; Ruggieri, 2004).

A significant example of the contemporary development of textual communication in museums is once again provided by the *Science Museum* in London, which in recent years has implemented a radical rethink of the graphic and interpretative elements in its galleries. The museum has adopted a visitor-centered approach to improve the accessibility, legibility and narrative capacity of its panels and labels, based on extensive research into its , focusing mainly on short, concise texts organised into clear thematic sections; the use of prompting questions (Why does this matter?, How does it work?) to stimulate curiosity and personal involvement; highly legible fonts (sans serif, larger font size, wide line spacing); simple, active and inclusive language, developed for a target public with varying levels of literacy; consistent integration of images and illustrations to support visual understanding of the content.

This strategy has been applied in new sections such as ‘Medicine: The Wellcome Galleries’ (opened in 2019) and ‘Information Age’, where the exhibition is accompanied by a system of panels designed not only to explain but also to engage with the public, stimulate questions and build a relationship between the object and the visitor. The design was entrusted to studios specialising in inclusive design and developed in collaboration with public consultation groups, including adults with dyslexia, young people with cognitive disabilities and immigrant families, to ensure genuine, not merely theoretical, communicative efficacy. According to museum reports, this strategy has led to an increase in time spent reading the panels and greater satisfaction expressed by visitors in post-visit surveys. The case of the Science Museum demonstrates how textual graphics are not merely an informative support, but a design medium, which might contribute decisively to the quality of the experience and cultural inclusiveness. But alongside the written word, panels can and should also be designed as visual interfaces, where text interacts with images, graphics, illustrations or photographs. This integration is not only decorative, but functional: it enhances clarity, stimulates attention and fosters immediate understanding, especially in multicultural contexts or with mixed audiences. The ability to combine text and images in panels allows for more inclusive and multisensory communication. Images have the advantage of overcoming language barriers, providing accessible con-

tent to visitors who either speak different languages or have varying levels of literacy. Good graphics can help visitors find their way around, visualise the original function of an object, or reconstruct its context of use without the need for long explanations. In accordance with visual semiotics, a key factor in choosing images is their level of iconicity, i.e. their similarity to the object they represent (Nöth, 1990).



Science Museum of London. ©Tiia Monto, CC BY-SA 3.0 <<https://creativecommons.org/licenses/by-sa/3.0/>>, via Wikimedia Commons.

Depending on the type of message to be conveyed, designers can opt for realistic images (such as renderings or historical photographs) or symbolic or simplified illustrations, such as comic strips or timelines, which are useful for simplifying complex concepts. In this sense, the expression “a picture is worth a thousand words” finds concrete application in exhibition design. A well-designed panel can contain drawings, diagrams, photographs, reproductions or conceptual visualisations that clarify the function or form of an object briefly, fill in gaps in perception or suggest cultural connections. In some cases, the text can be reduced to a minimum, leaving the image to convey the main information. The panel, therefore, is not just a repository for text, but an integrated mediation device, in which words and images work together to activate a coherent, inclusive and engaging cognitive and visual experience.

Ultimately, in the exhibition setting, text and graphics are not mere ac-

cessories, but media, capable of triggering cognitive, emotional and imaginative processes. Effective text design not only conveys information, but also actively contributes to the creation of meaning, in interaction with objects, space and itineraries.

Apart from text and graphic panels, which are fundamental tools of traditional museum communication, it is natural to consider the digital forms representing their interactive development: **multimedia kiosks**, **workstations** and **touchscreens**. These tools retain a similar informative purpose to panels, but enhance it through the possibility of interaction, the modularity of content and more sophisticated visual and narrative management (Parry, 2021; Stylianou-Lambert & Shehade, 2023).

With the greater amount of information available, the possibility of linguistic adaptation and the immediate updating of digital content make these tools particularly flexible. In addition, the graphic and visual quality achieved contributes to creating a refined and engrossing aesthetic experience. However, these tools do not come without their critical issues. As some researchers (Samis & Michaelson, 2016) point out, in line with McLuhan's theories, digital technology can be perceived as 'cold media' if forcibly inserted into environments that the general public associates with 'warm' and familiar experiences, such as those offered by contemplating the original object.

Interface design is therefore crucial: a good layout should ensure intuitive, aesthetic and functional use, combining text, graphics, icons, audio and movement in a coherent system that encourages navigation and learning. The interface, thinks Serrell (2015), is not just a vessel: it is part of the content, mood and voice of the exhibition. A confusing or overloaded interface can cause disorientation or frustration, especially among less technologically adept visitors (Falk & Dierking, 2016). When well designed, these devices enable visitors to personalise their interpretive experience and explore content in an active and meaningful way. Successful examples can be found in museums that integrate interactive devices in a structural way. The Lifeline Table at the *Churchill Museum* in London, for example, is a 6-metre-long touchscreen table that enables visitors to explore 90 years of the Prime Minister's life through documents, photographs and sounds, synchronised in real time with the visitor's position at the table. This device is located near the display cases, maintaining a visual and narrative relationship with the original objects.

In this case, interaction is not an extraneous element but an integral part of the cognitive setting of the exhibition (Hooper-Greenhill, 2000). Such tools are increasingly used in so-called "learning rooms": digital learning spaces where touch tables become social environments, where knowledge

is constructed in groups through discussion and exploration. These spaces not only cater to different learning styles (visual, tactile, collaborative), but also provide a complex and layered museum narrative that goes beyond the reading of individual panels.

A further development of kiosks and interactive stations is represented by **video walls** and **multi-screen systems**, which operate by synchronising or alternating multiple screens to create a shared visual narrative. These systems transform the exhibition space into an immersive narrative environment, where visitors are surrounded by a multitude of images and sounds that are no longer concentrated in a fixed point but diffused and choreographed throughout the architectural space, acting as mediating interfaces between object, space and public, providing an adaptive, multi-level cognitive experience. Unlike linear or static installations, video walls provide a simultaneous, layered experience that also evolves through the movement of the body in space. As Ross Parry (2021) observes, these configurations mark the transition from sequential exhibition to an environmental narrative structure, in which the public is invited to construct meaning by moving within a (not necessarily linear) visual story. An example of the effective application of this principle can be found at the *M9 - Museo del '900* in Mestre, a museum designed entirely with digital technology in mind. Inside its permanent galleries, digital screens house video walls that tell the story of Italy's transformation in the 20th century through the coexistence and interweaving of historical photographs, archive footage, animated infographics and audiovisual testimonies.

The images flow in real time over surfaces that surround the exhibition space, creating a visual flux that sparks the visitor's sensory and cognitive involvement. This narrative strategy helps bring back the historical and social complexity of the period, avoiding simplifications and encouraging active and selective learning, as Stylianou-Lambert and Shehade (2023) pointed out in their analysis of post-digital museums. In the case of *M9*, the presence of multiple screens is not limited to a decorative or spectacular function but constitutes the very heart of the exhibition design. Immersed in this audiovisual setting, visitors become part of a narrative mechanism that works through stratification and association, based on a logic like that of film editing. Contemporary digital museology frames exhibitions as assemblages that bind together heterogeneous materials - born-digital objects, "reborn" digital surrogates, historical records and interpretive visualizations - making them publicly accessible and affectively meaningful.

In this view, the museum acts as a curatorial editing mechanism that connects fragments into shared, intelligible narratives. (Zuanni, 2021; Hooper-Greenhill, 2000)

Although similar solutions have also been adopted in archaeological museums, where video walls are used to show virtual reconstructions of fragmented objects or lost settings, the M9 experience demonstrates how this technology can constitute a genuine exhibition language. It is not merely a question of showing more items, but of constructing a complex, wide-ranging and participatory visual narrative that encourages freedom of interpretation, comparison between sources and the active creation of meaning. Here an interactive sound and visual table allowing visitors to discover Italian dialects by listening to simple phrases. The installation also features a quiz-style game focused on the pronunciations and verb forms used across different Italian regions.

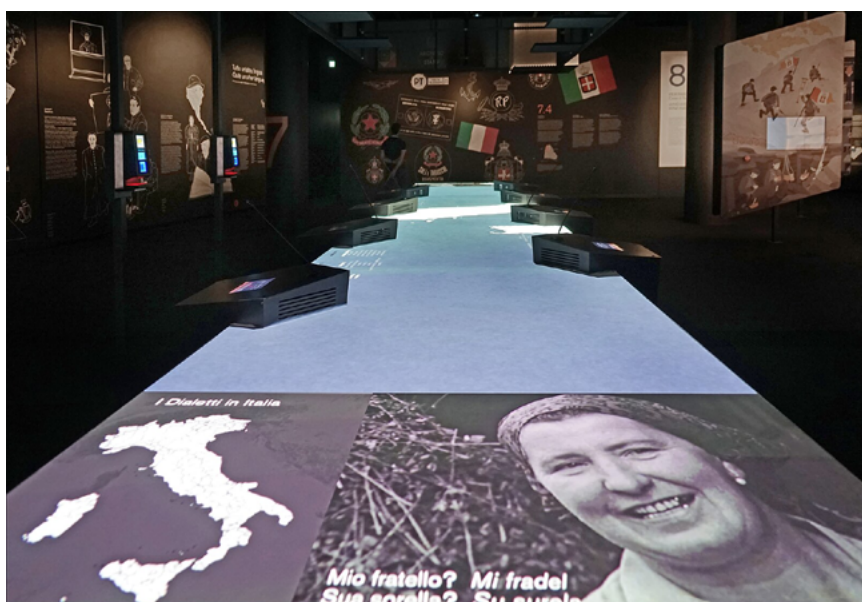


Fig.3. An interactive table at the M9 - Museo del '900 in Mestre. ©dalbera, CC BY 2.0
 <<https://creativecommons.org/licenses/by/2.0/>>, via Wikimedia Commons.

The comparison with text panels therefore reveals a profound transformation of the exhibition medium: from one-way transmission to the participatory construction of meaning through interaction between object, space and interface. This comparison will be explored in greater depth in the table at the end of the chapter, where the various museum tools will be analysed based on comparable criteria of communicative effectiveness, immersiveness and accessibility.

Before the advent of digital technology and interactive media, museums

had already been experimenting with analogue means of evoking complex and evocative settings. Among these, the **diorama** stands out historically as one of the first tools capable of combining objects, space and visual storytelling, representing one of the earliest forms of an immersive exhibition in the history of museums. Its origins are traced back to the experiment carried out by Charles Willson Peale in 1822 at the Philadelphia Museum (see chapter 1), where it was used to create realistic settings capable of visually depicting a scene or context by combining real three-dimensional elements with painted backgrounds viewed in perspective. The principle behind the diorama is as simple as it is effective: through the skilful combination of authentic objects, painted backgrounds, lighting effects and perspective controls, a representation frozen in time is achieved, capable of evoking complex narratives in a confined space. From a design perspective, the diorama is structured as a device in which visual distance, the observation point, the positioning of objects and the quality of the pictorial details are essential elements for creating a convincing effect of depth. It is essential that the observer is in the optimal position to view the scene from the intended angle. The age, height and visual decoding ability of the onlookers significantly influence the communicative effectiveness of the display. A few museums have begun designing dioramas with differentiated heights for children and adults, or with sloping planes that allow for a more accessible interpretation of the entire scene, offering different perspectives and levels of interaction.

Traditionally used mainly in natural history museums, dioramas have for years made it possible to recreate realistic habitats and natural settings, providing a contextualised environment for displaying stuffed animals or plant specimens. As Macdonald and Basu (2007) observe, these devices are powerful means of cultural transmission because they allow for a ‘silent dramatisation’ of content, making an entire spatial narrative intelligible briefly. In this sense, their effectiveness lies not so much in their realistic representation as in their ability to stimulate the imagination and convey a sense of ‘simulated presence’.

Although partially superseded by digital installations, dioramas continue to be used in many museum settings. A notable example is the *Muséum national d'Histoire naturelle* in Paris, which has retained and restored numerous historical dioramas in the Galerie de l'Évolution. Here, the narrative of biodiversity is conveyed through a sequence of spectacular dioramas, updated in terms of graphics and lighting but still profoundly analogue in their construction. Another interesting example can be found at the *National Natural History Museum* in Los Angeles, where dioramas are integrated with digital media in the form of immersive hybrid settings, mixing objects,

painted backgrounds and video projections to create a multisensory narrative without sacrificing the evocative impact of the three-dimensional display.



Fig.4. A diorama at the *Natural History Museum* in Los Angeles. ©James B Cutchin, CC BY 4.0 <<https://creativecommons.org/licenses/by/4.0/>>, via Wikimedia Commons.

Semiotic analysis provides a useful key to understanding the communicative value of dioramas. Stephen Harold Riggins (1994), in his essay 'Fieldwork in the Living Room', proposes an ethnographic approach to interpreting material culture that can also be effectively applied to museum displays. By analysing the arrangement of objects, their relationship with the background and with the onlooker, it is possible to decode complex cultural messages that go beyond a simple didactic function. In this sense, the diorama not only reveals, but also tells a story: it builds up a picture structured in accordance with a symbolic and narrative logic that reflects both the time and context represented and the intentions of the curator.

The design of a diorama therefore requires careful visual management, capable of coordinating the background, object, point of view and emotional involvement. Even today, in the post-digital era of museum design, dioramas retain their own expressive importance, representing a form of visual storytelling capable of integrating aesthetics, pedagogy and scenic composition.

Virtual Reality (VR) can be considered, in many ways, a conceptual and technological development of the traditional diorama. Both communication devices share the goal of depicting an immersive narrative setting, but they do so in radically different ways.

Whilst dioramas offer a static three-dimensional display, physically constructed with objects and painted backgrounds to simulate a natural or historical context, virtual reality enables visitors to immerse themselves in dynamic, interactive digital worlds, where they can explore, manipulate and interact with multimedia in real time (Griffiths, 2013; Champion, 2021). This transformation is not only technical but also involves a different form of participation: moving from external observers of the world represented in dioramas, Virtual Reality users become active protagonists within the story, free to move around the simulated space thanks to input devices such as controllers, optical sensors and, in the most advanced cases, haptic gloves and omnidirectional treadmills (Mikropoulos & Natsis, 2011). The multisensory nature of VR - which combines sound, images, movement and, on occasion, tactile feedback - enhances the intensity of the experience, resulting in a high level of cognitive and emotional involvement (Slater & Sanchez-Vives, 2016).

A notable example of VR being applied in museums as a development of the diorama is the *VR @ Smithsonian* project, in which objects from the collection are explored in three-dimensionally reconstructed digital environments, allowing visitors to freely enjoy the space and personalise their experience. Similarly, the 'History of a Soldier' at the *National Museum of the United States Army* uses VR to position the visitor in the shoes of a soldier during World War II, transforming the passive perception of a war diorama into an immersive, interactive and empathetic experience.

However, although virtual reality represents a significant innovation in museum storytelling, capable of overcoming many of the spatial, narrative and sensory limitations of traditional media, it also presents significant challenges that need to be carefully assessed during the design phase. Firstly, the costs of producing, updating and maintaining VR applications are still high, especially for small and medium-sized institutions, limiting growth potential and accessibility (Bonacini, 2023). Furthermore, the need for portable devices - such as headsets, controllers or haptic gloves - may constitute a barrier to access, both technical and cultural, for certain target groups; another important issue regards the risk of sensory and cognitive overload.

Yet VR also offers new possibilities for creating collective experiences: some museums are experimenting with collaborative VR installations, where groups of visitors can share the same virtual environment, interacting with each other via avatars or multi-user systems (Champion, 2021).

This trend opens up a more relational use of technology, overcoming the rigid opposition between individual and collective experience.

Several studies have shown that immersive experiences in virtual worlds can induce fatigue, disorientation or distraction in less experienced visitors, especially if the interface is not designed in a clear and progressive manner (Slater & Sanchez-Vives, 2016; Stylianou-Lambert & Shehade, 2020). Excessive visual and auditory stimuli can hinder content assimilation, creating a fun rather than educational experience. Another critical issue with VR – and, more generally, with individualised immersive experiences – is the potential reduction in social interaction between visitors.

The use of headsets often physically and perceptually isolates the user from the surrounding space, reducing opportunities for spontaneous interaction and sharing with other participants, which are among the most widely recognised educational objectives in museum exhibitions. On the other hand, dioramas, despite their static nature, offer a shared contemplative experience: school groups, families or individual visitors can observe and comment on the scene depicted together, activating collective and intergenerational learning dynamics. The educational value of dioramas – as a concrete, multisensory and collaborative tool – therefore remains high; they stimulate the imagination, encourage interactive storytelling and can be understood at different levels of complexity, offering an inclusive approach to groups of viewers with different cognitive styles. In this sense, VR and dioramas should not be seen as competitive media, but as complementary solutions: one capable of actively and individually engaging the user in dynamic and personalised scenarios, the other capable of encouraging observation, reflection and discussion within a collective space. However, the development of visual media has gradually integrated dynamic and immersive media; of these, video and film have taken on a central role in reshaping the relationship between space, narrative and viewer, introducing new levels of sensory and temporal involvement.

Ever since the earliest experiments, the inclusion of **video** and **film** in exhibition areas has represented a decisive turning point in visual display communication.

These media allow stories to be told, amplify the emotional component and integrate voice, image and sound into a single immersive narrative, connecting visitors with objects and with the historical or symbolic narratives of the museum. While text-panels and dioramas offer a predominantly visual and static experience, videos introduce a time-based dimension, transforming the visit into a dynamic audiovisual experience, where sensory interaction plays a central role.

The relationship between design and cinema is not accidental: both practices share the use of *mise-en-scène* to represent reality or evoke worlds distant in space and time.

As early as the first decades of the 20th century, film projection became a fundamental medium in natural science, history and anthropology museums in integrating educational and narrative content (Hein, 1998; Griffiths, 2008). These visual experiences enhanced the traditional communicative repertoire and encouraged active visitor participation.

A prime example of integration between architecture, audiovisual storytelling and sound design is the *Imperial War Museum North* in Manchester. The building itself, designed by Daniel Libeskind and inspired by an exploded bomb, forms part of the narrative approach. Inside, it uses large-scale video on curved and sloping walls combined with surround-sound and dramatic lighting. In this setting, audiovisuals are not an added element but are structural to the museum's design: the architectural space becomes a narrative medium (Parry & Sawyer, 2005). The interactive set-up responds to a principle of communicative coherence and narrative immersion. The use of large-scale video projections is not limited to an informative function. On the contrary, it contributes to the "humanisation" of the museum experience: the size of the images, the three-dimensional perception and the intensity of the sound generate an emotional bond with the story being told. The life-size characters, their gaze focused on the camera and the carefully synchronized silences create an emotional connection between the visitor and the content, stimulating empathy, reflection and involvement (Griffiths, 2008; Gregory & Witcomb, 2007). A particularly significant example in the *Big Picture Show* is the exhibition devoted to the attack on March 5, 2007, in Baghdad, in the street of the historic Al-Mutanabbi market. The exhibition features the car destroyed by a bomb as the centrepiece of the scene, placed in the middle of the exhibition space and illuminated by red lights emphasising its symbolic value. The lights suddenly go out, leaving only a blood-red glow, while a voiceover recites verses from the Koran. Immediately afterwards, a film with archive footage and interviews with survivors recounts the attack. This example shows how audiovisual storytelling can amplify the emotional impact of the object on display, transforming the visit into a sensory and deeply moving experience.



Fig.5 Videos at the *Imperial War Museum* in Manchester.

Apart from video, **sound** is a design element. In addition to the narration, the use of ambient sound effects can contribute significantly to creating the atmosphere of an exhibition. According to Velarde (2001), sound can generate a sense of transition, reinforce emotional intensity and encourage cognitive orientation. In historical and archaeological museums, the use of sound has also taken on a central role in the recovery of the oral tradition: interactive audio stations allow the public to record or listen to first-hand accounts, reinforcing their emotional connection with the topics covered and stimulating processes of participation.

In this context, audiovisual communication design in contemporary museums represents a strategic component that requires careful consideration not only regarding the quality of the content, but also the form in which it is presented. The length of the clips, the physical location of the devices, the legibility of the texts, accessibility for diverse visitors and, above all, consistency with the overall exhibition design are all determining factors in ensuring an engaging and meaningful cultural experience. However, the effectiveness of these tools depends on the quality of the design of the actual interaction. As Stylianou-Lambert and Shehade (2023) point out, a multimedia interface should be designed with usability, inclusion and accessibility criteria in mind, fostering tailored and compelling journeys. Similarly, Bonacini (2023) emphasises that multisensory design is now crucial for at-

tracting visitors with different needs, ensuring empathetic, interactive and adaptive engagement. In this context, audiovisual communication is no longer a complement but a structural narrative component of the post-digital museum (Parry, 2021). Lastly, it is essential to consider the public's feelings. Recent studies show that well-designed audiovisual experiences generate emotional engagement, reinforce experiential memory and increase visitors' active participation (Kumar & Singh, 2024). When interaction design is fine-tuned and integrated into the exhibition design project, visitors are no longer passive spectators but become protagonists in an immersive narrative, equipped to reflect on meanings, awaken memories and shape personal connections.

Audiovisual storytelling combines moving images, sound and voice to engage the visitor's senses in time-based and immersive experiences, whereas **holography** represents a further technological advance in museum exhibition language. It has always attracted the attention of researchers and designers for its natural connection between image and viewing environment. Its ability to render three-dimensional figures floating in space sparks an immediate perceptual impact; viewers, placed in an unusual visual context, tend to isolate themselves and immerse themselves in the experience provided by this communication system. While the figurative style may initially cause disorientation, this sensation is generally overcome by the evocative power of the images, which leave a lasting impression on the memory.

Since its earliest applications, holography has attracted the attention of designers and curators for its unique ability to merge images and exhibition spaces in a three-dimensional setting hovering between reality and illusion. Unlike video projections or conventional immersive installations, holography renders figures suspended in space, visible from multiple angles, capable of generating a strong emotional and perceptual impact. As Liu and Yao (2016) point out, projective holography technology (particularly 360°), is increasingly being used to create immersive environments that merge sound and exhibition space, offering a fresh visual and narrative style; the public, immersed in an unusual visual environment, experiences an immediate sense of surprise or alienation, but also a greater willingness to listen and suspend disbelief, which are fundamental elements in museum storytelling.

From a technical point of view, holography has its roots in the scientific research of Gabor, who in 1947 developed the theory of optical images reproducible via coherent light; this was then subsequently elaborated with the use of lasers. The final effect – a luminous image visible at 360° – is achieved using special photographic film or cylindrical supports illuminated

from below, capable of creating a virtually life-like figure perceived through the movement of the visitor (Gabor, 1948; Robertson & Harvey 1970).

This is a form of 'physical virtualisation' which, albeit not interactive in the traditional sense of the term, encourages active participation due to its immersive potential. This ability to dematerialise bodies has led some scholars to consider holography as the technological development of the invisible string theatre strategies tested by Henri Rivière in shadow theatres and early community-based museums. In both cases, what emerges is an attempt to re-establish the human presence as a fundamental narrative element, especially in museums where the story of the past takes on a strong emotional and symbolic dimension.

A pioneering example is the show 'Ghosts of the Library' (2005) at the *Abraham Lincoln Presidential Library and Museum* in Springfield, Illinois, produced by BRC Imagination Arts. In this installation, which is still popular with the public, a live actor interacts with holographic figures, historical images and suspended objects that make up an emotional and multisensory account of historical memory and the value of conserving the cultural legacy. The team's patented Holavision® technology enables Lincoln to appear intermittently, telling his story before disappearing and reappearing throughout the account.

In a particularly significant scene, the actor displays a music box that belonged to the President, while a voiceover raises fundamental questions: Why study all this old stuff? Who cares?. The objects thus become instruments for shared reflection on the role of history. At the end of the show, the actor dons a military overcoat and, as the setting is transformed into a battlefield, he disappears into the mist, walking off towards the horizon. As Decker observes, this staging, although spectacular, does not trivialise the historical narrative, but rather extends its educational and communicative potential. The museum, he writes, «intelligently and compellingly uses visual culture to meet its mission as a public pedagogical institution, opening up historical inquiry to a wider audience than merely specialists» (Decker, 2005, p. 937).

In subsequent years, the museum expanded its holographic repertoire, adding novel digital experiences that enable visitors to learn about other historical figures or objects through interactive narratives, in an extension of museum historical narratives shifting towards multichannel and accessible forms of storytelling⁴.

In a similar way, the *Château du Clos Lucé*, located in the Loire Valley near

4 Abraham Lincoln Presidential Library and Museum (2024). "New Digital Experiences." [Retrieved from <https://presidentlincoln.illinois.gov/News/111> on 27/05/2025]

Amboise, engages visitors through sensory and emotional experiences. It is a historic residence where Leonardo da Vinci spent the last three years of his life (1516-1519). The site invites visitors to dive into French history by exploring 800 years of architectural and social development - from its medieval origins through its transformation into a royal residence under Louis XI, Charles VIII and Francis I. Within the château, guests can visit rooms restored to reflect the period of Leonardo's stay: his bedroom, his workshop environment, as well as an oratory and library with artefacts and reproductions. On the ground floor of the château, in the section known as 'Leonardo da Vinci's Living Workshops', there is an audiovisual production that employs what is described as 'ghost technology' or an advanced version of the Pepper's Ghost illusion⁵.

Visitors encounter a life-size holographic presentation of Leonardo da Vinci himself - or a representation of him - which appears to speak and interact within the historic space, creating an immersive, emotional encounter with the master. This technology serves to bridge the Renaissance past with a present-day multimedia experience, allowing visitors to 'meet' Leonardo in the ambient setting of his former home, enhancing engagement and the sense of presence.



Fig.6 Holograms of the Cardinal of Aragon and Leonardo da Vinci at the *Château du Clos Lucé* in Amboise. ©Pieter van Everdingen, CC BY-SA 4.0<<https://creativecommons.org/licenses/by-sa/4.0>>, via Wikimedia Commons

⁵ The Pepper's Ghost illusion is a 19th-century theatrical technique that uses angled glass and carefully controlled lighting to make a reflected image appear as a translucent, life-sized 'ghost' within a real environment (Grau, 2004).

Concurrently, the *MIT Museum* in Cambridge-Massachusetts, has developed one of the world's largest collections of holographic art, with installations that explore the relationships between light, perception and cultural memory. These installations, often designed in collaboration with artists and scientists, demonstrate how holography may be used not only to evoke the past, but also to interpret the complexity of the technological present in a poetic and conceptual way (MIT Museum, 2024)⁶.

From a design point of view, holograms require precise fine-tuning; there needs to be careful planning of the technical installation conditions, such as the light source, viewing angle, distance and optical support, which demand precise solutions that cannot be improvised (Picardo, 2002). However, it is precisely because of this need for a guiding hand that holography is regarded as a scenographic device, capable of blending with the setting and amplifying its narrative potential. When used consistently and in moderation, holograms may offer an engaging, educational and multisensory narrative experience that stimulates memory, wonder and reflection. Their flexibility – an image that is visible but also easily hidden, able to be transparent or fully visible depending on the lighting – also makes them suitable for a variety of museum contexts.

Today, one of the most radical theoretical changes in the digital museum sector is the use of **artificial intelligence (AI)**, which offers the possibility of adapting, learning and generating content and interactions based on visitor data, behaviour and preferences. Unlike virtual reality or holography, which operate mainly on a perceptual level, AI acts on a cognitive and knowledge-based level, transforming the relationship between the public, content and the institution.

The history of AI applied to the arts has deep roots. After its founding in 1956 with John McCarthy's seminar at Dartmouth College, AI saw its first implementations in conversational chatbots such as *ELIZA* (Weizenbaum, 1966) and *PARRY* (Colby et al., 1975). However, it was not until the early 2000s that significant museum experiences began to be documented.

Among the first experiments were two chatbots presented at the *Museum and the Web* conference in 2003: one developed at Nagoya University as a virtual guide and another created for the *Museum of Science and Technology* in Milan, by Boiano, Gaia and Caldarini, designed to interact remotely with students. Since the 2010s, thanks to the evolution of digital technology and neural networks, AI has begun to spread more systematically within museums. A pioneering example is Culture Chatbot, developed as part

⁶ MIT Museum. Collection: Art (Holography) [Retrieved from <https://mitmuseum.mit.edu/> on 27/05/2025]

of the European programme Europeana by the Jewish Heritage Network, which collaborated with the *Jewish Historical Museum* in Amsterdam, the *Polin Museum* in Warsaw and the Italian ICCU. This multilingual chatbot allows an assisted search among digitised cultural materials, offering semantic responses based on conversation-driven input (Castellucci & Gomelino, 2021).

Its advanced state has been evident since 2015, when the digital ecosystem became more stable and accessible, with the introduction of chatbots not as assistants or information support, but as a new form of cultural mediation based on conversation, personalisation of experience and narrative interaction.

According to Gaia, Boiano and Borda (2019), chatbots may offer visitors an engaging, conversational experience that can transform their relationship with the museum: no longer a place to be explored passively, but a space where dialogue – albeit processed by a machine – becomes a stimulus for learning and discovery. A central element of this design is the construction of a precise voice and personality for the chatbot, which may create a sense of familiarity with the audience. The language used can be friendly, ironic or emotional, depending on the target audience and the communication objective. In this sense, conversation is not only an informative tool, but also a means of emotional and mental engagement. The adoption of chatbots allows for highly personalised communication scenarios, ranging from gamification – with quizzes, challenges and tasks – to storytelling, in which the chatbot becomes a narrator and guide within the museum. This form of communication encourages free and contextual exploration, tailored to the specific needs of the visitor and facilitating a more immersive enjoyment of the content on display. Lastly, the authors emphasise the importance of an ethical and conscious design approach that considers the implications relating to privacy, data use and the accuracy of the information provided. From this angle, chatbots become a concrete example of how artificial intelligence can contribute to achieving distributed intelligence, in which knowledge is not transmitted from above but co-constructed through dialogue between museums, technology and visitors. Significant examples include the ‘Case Museo Bot’ developed for the four *Case Museo* in Milan,⁷ using gamification and interactive storytelling techniques; the ‘MAXXI chatbot’ at the National Museum of 21st Century Arts in Rome⁸, which guides vis-

⁷ InvisibleStudio, *Museum Chatbot Game* [Retrieved from <https://www.invisiblestudio.net/museum-chatbot-game> on 27/05/2025]

⁸ Arte Magazine. (2018, March 28). *Chatbot, la guida robotica del MAXXI* [Retrieved from <https://artemagazine.it/chatbot-la-guida-robotica-del-maxxi/> on 27/05/2025]

itors with personalised quizzes and conversational interaction; and ‘Máximo’, the AI chatbot at the *Field Museum* in Chicago⁹, which impersonates a titanosaur capable of answering questions about prehistoric ecosystems.

Significant experiences have also been documented in Italy: the *National Cinema Museum* in Turin has introduced a multilingual chatbot system designed to help both international tourists and school groups, providing real-time answers to contextual questions and adapting language and content mediation in accordance with the interlocutor. In this case, the chatbot acts as a versatile and flexible mediator, capable of replacing, at least in part, traditional guided tours, facilitating unrestricted and more accessible use.

Another interesting example is provided by the *Deutsches Museum* in Munich, which has experimented with the use of conversational AI in avatar mode to explain complex scientific experiments utilising an animated and interactive visual interface. In particular, the ‘Intelligent.museum’ project explored the use of AI to generate images based on analysis of visitor photographs, using the StyleGAN algorithm. This project allowed us to consider the social implications of AI via an artistic and curatorial approach. In addition, the museum collaborated with Devanthro, a robotics and AI company based in Munich to exhibit a prototype of ‘Robody’, a robotic avatar designed to assist the elderly. This prototype has been included in the museum’s permanent exhibition, highlighting the interest in AI applications in everyday life.

Similarly, the *MUNCH Museum* in Oslo collaborated with Tata Consultancy Services (TCS) to develop ‘New Snow’, an interactive experience rooted in artificial intelligence. This project allows visitors, through an AI assistant that talks about topics related to the life and work of Edvard Munch, to generate tailored responses that combine historical data and curatorial content and to explore the archive of over 7,000 drawings by Edvard Munch, creating digital sketches that are analysed by AI to find matches with the artist’s works. The aim is to render Munch’s art more accessible and engaging using advanced technology¹⁰. Another emerging area is the use of AI for processing behavioural data, transforming the museum into a responsive ecosystem; analysing visitor flows, time spent and route-planning choices allows for a rethinking of space design, accessibility and communi-

⁹ Ledesma, A. (2019, May 8). Want To Text a Dinosaur? The Field Museum Will Now Let You. *Block Club Chicago* [Retrieved from <https://blockclubchicago.org/2019/05/08/want-to-text-a-dinosaur-the-field-museum-will-now-let-you-send-messages-to-maximo-the-titanosaur/> on 27/05/2025]

¹⁰ [Retrieved from <https://www.tcs.com/who-we-are/newsroom/news-alert/tcs-munch-museum-launch-interactive-ai-based-drawing-experience> on 27/05/2025]

cation strategies (Chng, 2023). As museums seek to connect with increasingly diverse visitors, AI-driven data analysis can provide valuable insights into visitor behaviour and preferences. This data can guide communication strategies and help shape exhibitions to be more relevant to varied demographic segments, thereby increasing participation and attendance.

In this vein, a new interactive user experience designed for the *Museum of the Cities of the World* in Palermo¹¹, curated by Odd Agency, is currently being tested. It involves collecting and processing visitor feedback. The integration of artificial intelligence will allow the data collected to be updated in real time, providing a dynamic and constantly evolving museum experience that can progressively adapt to the responses of the public. However, the use of AI demands critical and ethical reflection. The risk of standardising experiences, or replacing curatorial judgement with algorithmic mechanisms, calls for the need for 'algorithmic curation' (Marty, 2022). True innovation lies in the ability to design intelligent, participatory and inclusive relationships, in which technology becomes an extension of the curatorial vision, maintaining the centrality of cultural content and the human dimension of the museum experience (Bertocci et al., 2025).

These case studies highlight not only the educational and communicative potential of artificial intelligence in museum settings, but also the range of approaches with which it can be adopted: from conversational mediation to fun interaction, from assistance to the personalisation of visitor itineraries. AI is thus emerging as a multi-faceted technology, capable of supporting and enhancing other exhibition systems, integrating smoothly into different models of use and helping to build increasingly dynamic, inclusive and participatory experiences. This is a rapidly evolving field, where technology's ability to communicate, propose and adapt goes hand in hand with the need to ensure accessibility, inclusion and respect for cultural content. Artificial intelligence should therefore not be seen as a substitute for museum educators, but as an extension of the museum's design, capable of making it more inclusive, accessible and responsive to different cultural and communicative needs. The current challenge is no longer merely about the technical implementation of strategies, but about integrating them cohe-

11 The interactive device is currently being designed as part of the OSMOSI project - Observation and Study of Design and Development Models for Hybrid Spaces, places of urban experimentation and social inclusion through creative and cultural activities, a PRIN 2022 project funded by the European Union - Next Generation EU research-action involving the Politecnico di Milano (Design, DESIS, DABC, DIG) and the University of Palermo (DARCH, SP-PEFF). The Museum of the Cities of the World is the case study of the Palermo research unit. Located in the former Convento dei Crociferi, a historic building granted temporary use for five years by the State Property Agency to Farm Cultural Park, it is a hybrid cultural space, a platform for active citizenship, cultural production and intercultural exchange, contributing to the regeneration of the historic centre and the strengthening of the social fabric.

rently with the curatorial vision, the design of the space and the needs of the public. In this sense, AI represents a design device for redefining the relationship between museum and visitor, introducing more participatory, adaptive and potentially inclusive modes of enjoyment. In conclusion, applying analysis of the examples presented, we have attempted to outline the growing popularity of various technological media in exhibition spaces and comment on how this communication technology is becoming increasingly ubiquitous and integrated in museums. Today, the choice between analogue and digital media is a false dichotomy.

4.3. Towards a design toolkit to integrate media

The analysis of analogue and digital media reveals that no single tool or technology can fully express the complexity of museum communication. Each medium offers a distinct cognitive, emotional, and relational affordance. The challenge for contemporary design lies in orchestrating these affordances into coherent, inclusive, and meaningful experiences.

The role of design in museum communication is to mediate without dominating. The goal is not to showcase technology but to create a choreography of encounters, between people and objects, knowledge and imagination, memory and discovery. When designed with empathy and intentionality, media become bridges rather than barriers: tools that foster understanding and emotional resonance through meaningful interaction.

Contemporary museums should not have to choose between texts and interfaces, between physical models and augmented reality, but should learn to enhance the specific characteristics of each medium and design their integration in accordance with the communication objectives and needs of the public.

The goal is not innovation for its own sake, but the creation of a layered communication system that can alternate moments of immersion with pauses for reflection, reading with interaction, and physical contact with augmented visualisation.

The designer acts as an orchestrator of heterogeneous media, conceiving the exhibition as a layered, multisensory narrative system, adopting a visitor-centered and scenario-based logic, evaluating the most effective medium for each aspect of content in relation to the type of visitor, the communicative objective, the nature of the exhibition and the architectural and technological context. There is no such thing as a best medium, but rather media that are best suited to specific experiential contexts; analogue and digital tools must be integrated into a coherent structure of the museum experience, capable of guiding, stimulating, exciting and provoking introspection. Only in this direction is it possible to transform the visit into a meaningful, accessible, inclusive and memorable experience.

When comparing the various exhibition tools and technology, from dioramas to artificial intelligence, significant differences emerge in terms of sensory stimulation, the type of experience offered, the target audience and design issues. With its static immersive quality and strong spatial and visual component, the diorama represents traditional but still effective analogue technology, especially for children or naturalistic storytelling contexts.

However, its formal rigidity and difficulty in updating make it less suitable for dynamic contexts or complex themes. Touchscreens, the digital evolution of information panels, extend the possibilities for interaction but expose the risk of narrative fragmentation if not properly integrated into the exhibition itinerary. The autonomous and individual application of these tools might compromise the overall view if not supported by a coherent design of the overall experience. Immersive and augmented technology - AR and VR- radically transform the role of the visitor, who goes from being a passive observer to an active protagonist. AR enriches the actual environment with visual and contextual content, maintaining a direct relationship with the object, while VR immerses the visitor in a wholly reconstructed reality. Both enhance the sensory and narrative experience, but have limitations linked to the need for personal devices and the risk of exclusion from the actual context. Artificial intelligence represents a paradigm shift; rather than a visual or immersive medium, this adaptive and cognitive technology allows for radical personalisation of the museum experience, adapting itineraries, languages and content to the visitor's profile. However, it raises profound questions about the transparency of algorithms, data ethics and the risk of standardising the cultural experience. If well designed, AI can help to enhance accessibility, inclusion and active participation by the public, making it one of the most promising tools for the future of museums.

To navigate museum design in an increasingly hybrid and technologically complex context, a comparative summary of the main tools analysed is provided below.

Tool	Interaction Level	Engagement Level	Type of Experience	Main Strengths	Main Criticalities	Best Usage Contexts
Text Panels & Visual Design	Low	Medium	Visual/ Informative	Clarity, Accessibility, Durability	Static, Limited Sensory Involvement	Introductory and informative sections
Dioramas	Medium	Medium	Visual/Spatial	Spatial Context, Craftsmanship, Physicality	Resource-Intensive, Static POV	Historical, naturalistic, educational contexts
Video & Audiovisual Media	Medium	High	Audiovisual/ Emotional	Narrative Power, Emotional Resonance	Overload Risk, Requires Context	Biographical, narrative and immersive sections
Immersive Theater	High	High	Immersive/ Performative	Theatricality, Emotional Impact	High Cost, Risk of Spectacle	Historical reenactments, dramatic storytelling
Holography	Medium - High	High	Immersive/ visual Cognitive	3D Visualization, Memory Retention	Lighting Dependency, Integration Limits	Historical/ archaeological settings, character revival
Virtual Reality	High	High	Fully Immersive/ Simulated	Immersion, Multisensory Stimulation	Expensive, Requires Equipment, Isolation Risk	Reconstruction, exploration, education
Artificial Intelligence	Variable	Variable	Adaptive/ Dialogic	Personalization, Adaptivity, Scalability	Ethical Concerns, Accuracy, Cold Mediation	All museums aiming for personalization and innovation

Fig.7 Comparative framework of the main technological tools in museum experience design.

The aim of this framework is to present the fundamental characteristics, strengths, weaknesses and most suitable contexts of application for each technological item in a practical structure, as an actual toolkit for designers.

A critical design toolkit for museums must therefore begin not with technology, but with intention. It starts from questions rather than solutions: What kind of experience do we want to generate? What emotional or cognitive response do we expect from visitors? How can the design of media contribute to that goal without overwhelming perception or fragmenting attention?

Rather than a rigid classification, it is a strategic map, useful for reflecting on the relationships between media, users and spaces, and for providing informed choices in the planning of the museum experience.

This model was developed based on a careful study of documentary and design datasets related to the tools analysed and is based on a taxonomy that emerged following consultation with university lecturers and experts in museum communication and interaction design. The comparative grid was created by examining key categories for contemporary museum experience design: the type of interaction required, the degree of sensory and cognitive involvement, the nature of the experience provided, the communicative and educational potential, as well as the technical, perceptual or interpretative issues of each medium.

In order to keep the outline dynamic and continuously updated, in line with the evolution of exhibition languages and emerging technology and the experiences they transmit, a participatory survey tool has also been developed: an online survey for collecting feedback and qualitative data from designers, museum operators and visitors¹².

This device aims to refine classification by heeding the actual experiences of the public, transforming the model into a flexible and incremental device capable of adapting to the transformations taking place in contemporary museums.

The integration of media is thus less about adding layers of technology than about composing relationships, between visitors, contents, and environments. The goal is to achieve narrative coherence across heterogeneous systems, ensuring that every technological component contributes to the story rather than competing with it. In this sense, the design of museum

¹²<https://docs.google.com/forms/d/e/1FAIpQLSdl8Qwv43SMmJH2swD7pOAKSI-t-V5Fe2LMBIEVZ18Vn0tfb52w/viewform?usp=header>

communication should be understood as an open system, continuously evolving with social and technological change. The museum becomes a dynamic interface between past and future, physical and digital, contemplation and participation. It is within this fluid and interconnected context that the next chapter explores the emergence of hybrid and virtual museums, where the boundaries between real and digital space increasingly blur, and experience itself becomes the primary medium.

CHAPTER 5

From the digital museum to the metaverse.
Museums enter hybrid worlds where physical and virtual experiences converge into shared cultural ecosystems.

5.1. The digital revolution and new media

In 1964, Marshall McLuhan coined the now-famous phrase ‘the medium is the message’. With this expression, the Canadian philosopher was emphasising how the actual form of a medium, the means by which a message is conveyed, becomes incorporated into the message itself, creating a symbiotic relationship; the medium influences the way the message is perceived. For instance, McLuhan noted how cinema, through montage and the pacing of separate sequences, had transformed the concepts of speed and time, reconfiguring the narrative experience into an entirely new creative form. He argued that the content of any medium is yet another medium; the content of writing is the spoken word; that of printing is writing; and printing, in turn, constitutes the content of the telegraph message. This insight highlights the fact that every new medium is not neutral, but brings with it its own language and logic, which influence human action and communication processes (McLuhan, 1964).

In contemporary debate, we define a medium as a means of dissemination that conveys an informative message in accordance with the specific characteristics of that medium. From the final decades of the twentieth century, with the advent of the so-called digital revolution, the media landscape has broadened with the emergence of so-called new media: digital devices and platforms capable of making content accessible at any time, anywhere, often with a high degree of interactivity and manipulability by the user. The Internet, interactive multimedia stations, video games, virtual reconstructions, augmented reality and social media are examples of new media that have redefined the ways in which cultural content is produced and consumed.

Andrew L. Shapiro (1999) observed that «the emergence of new, digital technology signals a potentially radical shift of who is in control of information, experience and resources» (Shapiro cited in Croteau & Hoynes, 2003, p. 322). In other words, the rise of digital technology has the potential to profoundly transform the control and distribution of information, experience and resources, shifting it from traditional authority-bearers to a more widespread network of users. Bolter and Grusin (2000), with their theory of ‘remediation’, described how new media incorporate and transform previous media, generating hybrid and innovative forms of expression. Paul Levinson (2001) also spoke of mind tools, referring to digital technology as a cognitive prosthesis that extends human capabilities for communication and knowledge. According to Neuman «we are witnessing the evolution of a universal interconnected network of audio, video, and electronic text com-

munications that will blur the distinction between interpersonal and mass communication and between public and private communication» (Neuman cited in Croteau & Hoynes, 2003, p. 322). This prediction has largely come true: the Internet and digital networks have eroded the boundaries between personal and mass communication, between the public and private spheres, creating a global information ecosystem in which every individual may potentially become both a sender and receiver of content. New media alter the concept of geographical distance, enable the rapid dissemination of information and facilitate unprecedented forms of interactive communication.

However, not all experts view these developments from a utopian perspective. Herman and McChesney (1997), for example, have warned that the digital revolution has enabled a few powerful transnational telecommunications corporations to achieve a previously unimaginable level of global influence by concentrating their control over infrastructure and information flows. This highlights how the democratisation promised by new media is accompanied by new forms of concentration of media power. From a technical point of view, Lev Manovich (2001) has identified five fundamental principles that characterise new digital media: numerical representation, modularity, automation, variability and transmediality (or transcoding).

In the cultural sphere, these principles have specific implications: the numerical (digital) representation of environments and objects allows information to be manipulated in spatial and temporal terms, creating virtual reconstructions and non-linear experiences; modularity allows content to be broken down into reusable and reorganisable components (e.g. digital collections that users can explore according to personalised paths); automation introduces algorithms and artificial intelligence into content management and presentation (such as in automated guided tours or personalised recommendations); Variability implies that digital content may exist in many different versions and may adapt to the user's needs or preferences; finally, transmediality indicates the ability of content to be translated from one medium to another (for example, a digitised museum object can be viewed via a website, a mobile app, a VR headset, etc.). This flexibility of digital content is profoundly transforming the presentation, management and communication of cultural messages.

Digital convergence, or the translation of all types of information (text, images, audio, video) into digital format, is at the heart of the digital revolution (Hoare, 1998; Charlesworth, 2008). The computer becomes the universal tool which, through the binary language of bits, can simulate all other media and allow the user to interact with them. Unlike older analogue technology, digital media are interactive; users can interact with the

information, choose paths, manipulate digital objects, and thereby build a customised experience. Furthermore, the simultaneous use of multiple languages (text, audio, video, animation), which we term *multimediality*, makes communication more effective and engaging, facilitating understanding and memorisation of content by activating different sensory and cognitive modes.

All these technological changes are accompanied by profound social and mental transformations. The widespread diffusion of digital products and the application of technology in increasingly broad areas of everyday life have led to rapid cultural change. Terms such as *cyberspace*, *virtual reality* and *metaverse*, once almost unknown, are now in common use. The way we read, interpret the world and interact with each other is influenced by new media: one only has to think about how social networks have changed social dynamics, or how the immediate availability of information online has changed our relationship with memory and learning. In the museum sector, some experts such as Miles and Zavala (1994) have interpreted the incorporation of advanced media in museums as part of a process of democratisation: museums are transformed from traditional elitist ‘temples’ that preserve objects into spaces for the dissemination of knowledge that are more open and accessible to the public. The introduction of virtual technology has sometimes been interpreted as the demise of the material world, in favour of more accessible and participatory knowledge. Certainly, terms such as *multimedia* have become commonplace in museum design, referring to information systems for education, dissemination, collection management and even entertainment. The lack of standardised terminology reflects the rapid evolution of these systems: different definitions coexist for concepts such as *virtual museum*, *digital exhibition* and *interactive installation*, making it necessary to clarify their usage on a case-by-case basis. In this discussion, we will employ terminology consistent with the most frequent usage in current scientific literature, endeavouring to avoid ambiguity.

5.2. From digital museums to virtual museums and the metaverse

As discussed in previous chapters, the concept of the museum has undergone a radical transformation in recent decades, propelled by technological advances and changing public expectations. Initially, the digital museum was conceived as a simple online transposition of the physical museum's collections and information: navigable databases, photo galleries of works, static 360° virtual tours of the rooms. This phase, which accompanied the diffusion of the Internet in the late 1990s and early 2000s, aimed mainly to enhance the accessibility of heritage: to ensure that anyone, anywhere, could consult museum artworks and data. It was an approach still anchored in the logic of transposition: museum content was digitised and presented in a new medium, without however profoundly changing the visitor experience, which remained essentially that of passive consultation of information.

As Bonacini and Mazzaglia (2018) and Parry (2010, 2021) point out, the concept of the digital museum has now moved beyond its pioneering phase, becoming a complex ecosystem of media, networks and participatory practices. Today, talking about digital museums means recognising their relational and systemic dimension, in which digital technology is no longer a simple tool for mediation, but a cultural and design condition.

Nonetheless, over time, the concept of digital or virtual museums has been enhanced and expanded. Since the early 2000s, the introduction of interactive and augmented reality technology into museum experiences has paved the way for more engaging modes of interaction: multimedia workstations in exhibitions, audio guides on mobile devices, apps for exploring additional content, sensory and interactive installations, and even the first experiments with fully online exhibitions. Global initiatives such as *Google Arts & Culture* (launched in 2011) have made museum collections from around the world accessible in high resolution, fuelling the idea of cultural enjoyment anytime, anywhere. Despite this, in many of these pioneering projects, the concept remained one of primarily informative and individual enjoyment, where the virtual museum served as a showcase or navigable archive rather than a space for shared interactive experiences.

A decisive drive towards new forms of virtual museums came with the COVID-19 pandemic in 2020, which forced the prolonged closure of physical museums in many countries. This event accelerated experimentation and investment in digital technology: museums saw a sharp increase in onli-

ne visits and multiplied their virtual offerings - streaming of guided tours, online conferences and workshops, and enhanced social media - to maintain contact with the general public. In many cases, these digital initiatives have not been limited to temporarily replacing physical visits, but have opened up new opportunities for engagement, encouraging hybrid approaches that combine in-person and online experiences (Vilardo & Mazali, 2022). The crisis has therefore demonstrated that virtual museums may not only serve as a substitute in times of emergency, but also as a permanent complement to the museum experience, capable of reaching wider and more diverse audiences and offering different and enriching modes of interaction.

Today, the contemporary virtual museum is much more than an informative and exploratory website: it is an autonomous cultural environment capable of engendering aesthetic, educational and participatory experiences even without being present in the physical location. Augmented reality, immersive virtual reality, three-dimensional reconstructions, artificial intelligence, multisensory interfaces and multi-user platforms are the tools of this new museum dimension.

The virtual museum does not merely display objects on a screen, but presents narratives, creates explorable environments, and allows users to interact with content and at times with other remote visitors. As Parry (2021) asserts, the digital museum may become a hybrid space of inclusion, where access to culture is not limited by the physical, economic, or geographical capabilities of the visitor. For instance, one might consider how a virtual platform may enable visits by people with mobility impairments that prevent them from travelling, or by audiences in areas of the world without museums: digital heritage removes – or at least reduces – many traditional barriers.

The most recent qualitative shift in this development is represented by the emergence of the metaverse as a new frontier. The term, coined by Neal Stephenson in his science fiction novel *Snow Crash* in 1992, refers to a durable, three-dimensional digital environment shared at the same time by a large number of users, who access it through avatars and can interact with each other in real time (Stephenson, 2022). In recent years, thanks in part to Facebook's rebranding as Meta and huge investments in the technology industry, the concept of the metaverse has gained popularity as a vision of the future of the Internet. In the museum context, the metaverse takes the logic of the virtual museum to extremes: the museum is no longer merely an online archive or virtual tour, but becomes an immersive place, a parallel digital world that can be entered and actively explored.

In a metaverse environment, the museum ceases to be a simple collection to consult and becomes a fully-fledged inhabitable space: three-di-

mensional environments in which visitors can move freely, virtual galleries where works can be enlarged, seized, perhaps altered in creative ways; historical reconstructions in which the visitor-avatar can walk and re-live past eras; virtual exhibitions where users from different countries interact and discuss with each other while observing a work, each represented by their own avatar. The borderline between the real and the virtual is becoming increasingly blurred, merging into a unified experience. Luciano Floridi (2014), with his concept of the 'infosphere' - or the subsequent idea of 'onlife' - reminds us that we now live in an environment where the analogue and the digital intermingle to such an extent that they are indistinguishable in everyday experience: the museum in the metaverse is an emblematic example of this condition, as it blends the cultural dimension with the virtual one in an experiential continuum. In this scenario, the museum takes the form of an onlife cultural infrastructure, capable of integrating the cognitive, perceptual and ethical spheres. Designing in the metaverse therefore implies taking on the responsibility of creating environments that not only inspire emotion but also educate people about digital awareness and cultural citizenship (La Scala & Di Dio, 2024).

It should be underlined that this transformation from digital to immersive virtual has not been linear or uniform for all institutions. It has progressed through trial and error, avant-garde initiatives and experimentation, often in a haphazard manner. Some museums embraced innovation early on, while others remained more cautious. However, global trends and momentous events (such as the pandemic) have prompted museums to question their role in an increasingly connected and mediatised world. As noted by Parry (2007, 2021), the digital museum is not a neutral repository of information, but a cultural form, involving specific narrative, political and relational choices on the part of curators. Deciding which works to digitise, how to present them online, and what communicative mood to adopt in virtual tours means interpreting and narrating culture, not just transferring it to a new medium. In this rapidly changing landscape, many innovative projects demonstrate the potential of museums in the metaverse. For example, the University of Glasgow's *Museums in the Metaverse*¹ project is a research and development initiative that aims to bring parts of museum collections online in high-fidelity VR environments, creating immersive experiences for educational and accessibility purposes. Another example is the Sarajevo VRX *Immersive Museum*², which reconstructs scenes from the siege of Sarajevo in the 1990s, allowing users to relive historical events first-hand through interactive and emotional storytelling.

1 Retrieved from <https://www.gla.ac.uk/research/arc/xr/mim/> on 21/10/2025.

2 Retrieved from <https://www.sarajevovrx.com/> on 21/10/2025.



Fig.1 Frame of a movie at VRX Immersive Museum in Sarajevo.

Numerous museums are also experimenting with existing metaverse platforms: the *National Cinema Museum in Turin*, for example, has developed an innovative project that bridges tradition and digital experimentation within 'The Nemesis' platform: an immersive 3D experience celebrating three legendary figures of classic cinema - Maciste, Marilyn Monroe, and Frankenstein. The initiative reimagines the heritage of classic film through interactive storytelling, inviting users to explore and reconnect with emblematic characters in a contemporary digital setting. Its purpose is twofold: to introduce younger audiences to the masterpieces of the past while offering film lovers a fresh, experiential perspective on timeless icons of cinema history. To create an integrated experience between the physical and virtual dimensions, visitors who complete the digital journey receive a discount on their museum admission ticket, a way to seamlessly connect the online experience with the in-person visit and encourage deeper engagement with the museum's content.

There are also projects with a strong social and civic impact: *Peace of Art*³, created by the Italian company Skylab Studios, is an immersive virtual museum designed to safeguard and display important Ukrainian artworks online during the ongoing war, offering a safe space where they can be enjoyed by the public without risk of being destroyed.

³ Retrieved from <https://www.skylabstudios.it/metaverso/#peace> on 21/10/2025.



Fig.2 The virtual museum *Peace of Art* about Ukrainian artworks.

These examples - and many others that are emerging - demonstrate the variety of approaches possible in the museum metaverse, combining research, education, storytelling, heritage preservation and cultural activism.

5.3. The metaverse as a socio-technical and cultural space

The metaverse may be defined, as a first rough approximation, as a durable, navigable, three-dimensional digital environment inhabited by users, represented by avatars who interact in real time both with each other and with virtual objects. This technical definition is shared by many (from Stephenson 1992 to Weinberger 2022), and though useful, does not fully capture the cultural complexity of the phenomenon. The metaverse is not merely a technological platform or a graphic simulation; it is a genuine socio-technical system, a space in which digital infrastructure, cultural practices, social relations, and shared aesthetic-narrative experiences are interwoven (Zhou et al., 2024; Davis et al., 2009). In other words, the metaverse is an environment of cultural negotiation in which users do not merely navigate passively, but actively inhabit the space, modifying it with their actions, leaving traces, and constructing meanings and relationships. This approach falls within the broader neurosociological paradigm of the metaverse (Maslova & Susharina & Pyatin, 2025), which interprets the digital experience as a dimension that is at once cognitive, physical and social. This perspective goes beyond the traditional distinction between sensory perception and cultural construction, showing how interaction in immersive environments generates neural and behavioural responses comparable to those of actual experiences. From this point of view, the metaverse is not simply a simulated space, but a neurocognitive learning and relational environment, in which perception, emotion and sociality are interwoven in an experiential continuum.

For museums, this paradigm provides a powerful interpretative key: the immersive experience does not replace the actual visit, but rather extends it, rendering possible a form of distributed 'embodied cognition' (Clark, 2016), in which meaning stems from action and interaction. In this context, museum design takes on the task of orchestrating sensory stimuli, narratives and social interactions in order to facilitate processes of attention, memory and empathy. Thus, the interface is not just a technical device, but a shared cognitive environment, where the body, technology and social context cooperate in the production of knowledge.

According to Grimaldi vision (2023), which highlights the embodied and relational nature of immersive experience, it is useful to consider the cognitive and social mechanisms that regulate interaction in virtual worlds, expressed through the dynamic theory of intentions, which distinguishes between:

- M-intention: motorial intention, which presupposes a direct correspondence between intention and action (performing the gesture);
- P-intention: proximal intention, which involves a connected set of close or related motorial intentions;
- D-intention: distal intention, the most complex level, which involves the prediction of chains of motorial and proximal intentions directed towards future actions.

In digital and immersive environments, effective understanding cannot be achieved without knowledge of the other person's meanings. It is not external information alone that generates intentional reciprocity, but coordination (i.e. the ability to synchronise shared actions), and cooperation (i.e. simulating the actions of others in relation to one's own intentions).

This theory enhances the neurosociological paradigm: interaction in the metaverse becomes not only perception and presence, but intentional projection and shared emotional awareness. Immersive design, therefore, should include not only realistic settings, but contexts in which shared intentions emerge as implicit semantic structures, allowing virtual actions to be interpretable, synchronous and provided with common sense. Therefore, this suggests that the effectiveness of immersive museums does not depend on the degree of visual realism, but on the ability of the design to create experiential situations that trigger complex neural and affective networks, encouraging an embodied and relational understanding of cultural heritage. The transition from two-dimensional interfaces (such as traditional websites) to three-dimensional immersive spaces radically changes the user's perception of space, the temporality of the experience and the modes of participation. In the traditional world-wide web, users browse content and remain external to it; in the metaverse, users enter the content, experience a synchronous temporality with other participants, and move within a virtual space that has depth and geographical scope. In the museum context, this means completely rethinking the role of the visitor: no longer a simple user who follows a set path, but an actor and co-author of the cultural experience. Users can choose their own itinerary, linger over what interests them, activate different narratives in accordance with their curiosity, interact with other visitors, and even contribute by adding comments or content in certain participatory contexts.

Designing a museum in the metaverse therefore requires consideration of its ontologically hybrid nature. It is at once an immersive sensory environment and a symbolic space laden with meaning; a technological platform and a place for social interaction; a computer interface and a narrative infrastructure. This awareness implies a paradigm shift in museum design. As

Ruocco (2025) points out, the virtual museum space becomes a ‘cultural interface’ rather than a repository: it is not merely a matter of placing objects in a (virtual) room, but of creating environments that convey meaning and actively communicate through their form and the possibilities they offer. The mediation of content, traditionally entrusted to panels, audio guides or educational assistants, in the metaverse takes place through the very design of the virtual space: the shape of the rooms, the layout and appearance of the digital works, the configuration of the visitor itineraries, the presence or absence of other avatars with which to interact, the behaviour of the visitor’s avatar (e.g. the ability to fly, teleport or manipulate objects). All these elements function as a set of signs that guide and shape the user experience, determining what is accessible or hidden, what is emphasised and central, and what type of interaction is encouraged or forbidden.

From this perspective, the metaverse acts as a powerful semiotic device that structures the public’s perceptual, cognitive and emotional experience. Designing an immersive museum is like writing a multi-dimensional narrative text: every design choice - from the colours and sounds of the virtual environment to the speed of movement of the avatars and the concentration of objects in a space - contributes to telling a story and eliciting certain reactions in visitors. It is no coincidence that Mirzoeff was already talking about the culture of visibility in 1999, stating that modern life increasingly takes place on screens, foreshadowing a world in which the experience of reality is constantly mediated by digital interfaces. Today, extending that insight, we could say that a growing part of our real experience takes place in hybrid environments such as the metaverse, where physical and virtual presence intermingle.

Within these socio-technical spaces, museums may take on new forms and functions. They are no longer simply for places for conservation and silent contemplation, but may become relational and collaborative platforms, where the collections interact with the community, local memories interweave with global narratives, and heritage is constantly reworked through interaction with the public. A prime example is the Museums in the Metaverse project mentioned above, it does not simply digitise objects so that they can be viewed in 3D but builds actual virtual narrative environments that serve as educational tools and instruments for the co-creation of knowledge, involving researchers, the general public and external stakeholders in a collaborative process. In the same way, the Sarajevo VRX Museum allows visitors from different parts of the world to come together in a virtual Sarajevo, discussing and sharing their emotions about a tragic historical event, creating a collective memory experience that transcends geographical and generational boundaries. These possibilities highlight not only an extraor-

dinary potential, but also ambivalence. On the one hand, museums in the metaverse can become powerful tools for cultural inclusion, giving voice to otherwise marginalised identities and narratives and actively engaging new audiences. On the other hand, there is a risk that they will reproduce or even amplify existing inequalities: for example, communities without access to fast internet or expensive VR headsets would remain excluded. Or, without careful attention, virtual experiences could degenerate into superficial spectacles that betray the complexity of the issues addressed. It is therefore essential to consider the metaverse not as a simple technological upgrade, but as a field of cultural and political striving, in which the choices made by museums have significant ethical and social consequences. In this context, museums are called upon to play a critical and reflective role: not only offering captivating experiences, but also guiding the public to understand their meaning, stimulating questions, and contextualising content and technology within a broader perspective. Ultimately, the metaverse compels us to reconsider fundamental notions such as reality, truth, authenticity and memory. When an object or environment is virtually reconstructed, every element is inevitably reinterpreted: a painting digitised in 3D and placed in a virtual gallery is not the original object, but a remediation of it. Every VR tour itinerary is the result of careful choices about what to show, in what order, and with what narrative emphasis. Nothing is natural or neutral in the virtual world; to remind Bolter and Grusin (2000), we are faced with a process of cultural remediation that implies a design and epistemological responsibility. The challenge then becomes not only to create spectacular immersive spaces, but also to shape culturally meaningful experiences that are rigorous in content, respectful of historical complexity and open to a plurality of interpretations.

Recent experiences described by Charr (2024) demonstrate how numerous museums are already experimenting with prototypes of environments in the metaverse that integrate social interaction, dynamic exhibitions, and forms of storytelling mediated by avatars. These initiatives highlight both the potential and the fragility of such systems; crucial questions remain open regarding interoperability, governance and the creation of truly meaningful involvement.

5.4. User Experience Design in immersive museums

Designing the User Experience (UX) within an immersive museum means going beyond the mere technical usability or appealing aesthetics of an interface. Rather, it is about constructing narrative and symbolic environments capable of welcoming, engaging and guiding visitors in a multisensory, interactive and meaningful experience. In a context where digital space is no longer merely a showcase but a place to inhabit, designing the user experience becomes a profoundly cultural act; it shapes the way the public interacts with content, with other users and with the museum institution itself.

In immersive museums, visitors are no longer static observers looking at a screen, but active subjects equipped with a digital body (an avatar), with freedom of movement and the ability to make choices. This transformation forces us to rethink the design of virtual environments with a truly visitor-centered approach, which considers the characteristics, expectations, and perceptual and cognitive abilities of a variety of target audiences. Accessibility becomes a fundamental value; interfaces and environments should be usable by as many people as possible, including children, the elderly, people with sensory (visual, auditory) or cognitive disabilities, and users with different levels of digital or linguistic literacy.

As ICOM emphasises in its guidelines, accessibility in museums – whether digital or physical – is not a secondary technical function, but a fundamental ethical and design principle that needs to be incorporated from the earliest stages of design. For example, the use of subtitles and audio descriptions for the deaf or blind, the implementation of voice commands for those with mobility difficulties, and the ability to adjust sensory stimulus levels (sounds, lights) for neurodivergent people, are measures that extend participation and break down barriers to enjoyment. In multi-user VR experiences, particular attention needs to be paid to avoiding motion sickness and disorientation; the design of virtual locomotion (teleportation, continuous movement, etc.) and spatial coherence become crucial elements for user comfort. In addition, facilitator avatars or virtual guides may be provided to help users find their way around, offering suggestions and contextualisation, much as a museum mediator in the flesh would do.

The integration of artificial intelligence might further enhance the UX: chatbots or virtual assistants capable of answering questions, recommendation systems that suggest personalised itineraries based on the visitor's

interests, and even adaptive interfaces that modify the environment based on the reactions. The information infrastructure in an immersive museum merges with the experiential infrastructure. Virtual environments should be designed to be navigable and coherent; visitors should be able to intuitively understand where they can go and what they can do without feeling lost. At the same time, the experience should not be so overly guided that it becomes banal or strictly linear; it is a delicate balance between orientation and exploration. Visual elements - icons, maps, environmental cues -, auditory elements - 'guiding sounds' -, and even tactile elements - haptic feedback in controllers - can be orchestrated to steer the user's attention and actions. Good design provides clear feedback for every interaction; for example, if the visitor clicks or touches an object, it should react in a recognisable way (lighting up, moving, opening an information tab, etc.), confirming the action taken.

In this context, UX effectively becomes a form of designed cultural mediation and a form of 'situated narrative design' (Roppola, 2012), in which meaning emerges from the interaction between body, environment and narrative. As Norman (2013) and Garrett (2011) point out, the quality of the experience depends not only on the efficiency of the interface, but also on the system's ability to generate emotional connections and a sense of belonging. Without trivialising it, designers transform complex content (artistic, historical, scientific) into accessible and engaging experiences. The challenge is to maintain the rigour and profundity of the content while offering modes of interaction that make it intelligible to diverse target audiences. A prime example is the Google Arts & Culture platform mentioned above, which, while not an immersive metaverse, offers an extremely refined user experience. Users can easily explore faraway museums, zoom in on works of art in ultra-high resolution, read concise but accurate explanations, and watch in-depth videos, all with an intuitive interface that combines simplicity and a wealth of information. Similarly, the Sarajevo VRX Museum, mentioned above, has worked extensively on narrative and sensory design. As soon as a visitor enters virtually, he is enveloped by sounds and settings that evoke the city; navigation is marked by episodes (narrative checkpoints) that allow one to experience history step by step, while leaving one the freedom to choose what to explore in depth and when.

A crucial aspect of UX design is personalising the experience. Not all visitors have the same interests or background. Being able to tailor content and itineraries to individual profiles increases both satisfaction and educational effectiveness. Some virtual museums are experimenting with initial questionnaires to understand user preferences (e.g., ancient vs. contemporary art, technical insights vs. curious anecdotes) and tailor the

experience accordingly. Others are exploring emotional models of UX: for example, Mengoni (2025) proposes a system in which the interface dynamically adapts to the visitor's emotional states – detected via sensors or interaction analysis – generating individualised narrative paths. Let us imagine a visitor who displays signs of sadness or distress when faced with tragic content: the system might offer a moment of pause in a contemplative virtual area, or propose content based on resilience and hope to counterbalance the emotion. Conversely, in the face of enthusiasm and curiosity, it might suggest further insights and interactive challenges.

In short, designing the UX in an immersive museum entail taking care of visitors in every way possible, not only providing them with information, but also accompanying them emotionally and cognitively, respecting their timeframe, needs, and individuality. The success of a virtual museum is not measured solely by how many users visit it, but by how these users experience it, whether they feel engaged, whether they will learn something new, whether they experience meaningful emotions, and whether they wish to return or share it with others. Ultimately, the task of the UX designer in this field is to act as a mediator between technology and culture, between sensory immersion and critical reflection, between individual exploration and collective knowledge building.

5.5. The transformation of the museum experience and narrative

The museum's introduction to the metaverse involves a profound rethinking of the visitor experience and the narrative methods used to present and interpret cultural heritage. In traditional physical museums, the visitor experience was often restricted to pre-established routes, one-way communication - from the museum to the public - and relatively rigid visiting times. In the metaverse, on the other hand, these constraints are slackened or disappear: interaction becomes freer, more dialogical and customised (Dal Falco & Vannini, 2021). In an immersive virtual museum, the visitor-avatar does not just passively observe display cases or panels, but performs actions; he/she explores environments, interacts with objects, activates multimedia content, plays games or participates in educational simulations, and can meet other visitor-avatars with whom to exchange opinions in real time (Ruocco et al., 2021). The museum experience thus takes on the features of an exploratory and performative process; the very act of moving through virtual space and making choices becomes an integral part of the building of meaning. In a sense, the visit itself becomes a narrative, of which the visitor is the co-author, alongside the curators who designed the environment.

This transformation demands new curatorial and narrative strategies. In order to be effective in the metaverse, museum content cannot simply be transferred from the real to the virtual world without modification. Instead, museum narratives need to be rethought in terms of the immersive medium, in accordance with the logic of remediation theorised by Bolter and Grusin (1999). Every digitised object can become a node in a hypertextual narrative network; by clicking or drawing closer, users can bring up related stories, historical contexts, audio/video contributions or enter into an interactive simulation. The narrative becomes rhizomatic, plural, non-linear; different visitors experience different narrative routes based on their choices (Chang & Suh, 2025).

Museum storytelling becomes interactive: instead of being narrated, it is enacted by the visitor. This approach is consistent with the principles of constructivist learning (Hein, 1998), according to which knowledge is actively constructed through personal and situated experience.

The possibility of multiple users co-existing in the same virtual space adds a fundamental social dimension. The perception of sharing the experience with others – even if only as avatars – generates instances of dia-

logue, discussion and collective reflection. The museum in the metaverse thus takes the form of a social and performative space, closer to a collective event than a silent individual visit (Dal Falco & Vannini, 2021). This leads to a relational aesthetic, in which the meaning of the experience is also constructed through interaction with others (Bourriaud, 2010).

This co-authorship manifests itself on several levels. Visitors are co-authors of the itinerary (they choose what to explore independently), co-authors of meaning (they interpret and reinterpret the content based on their own experience), and in some cases even co-authors of the content itself (they contribute personal materials, notes, and comments). This approach reflects the culture of convergence described by Jenkins (2006), according to which consumers become prosumers (producers + consumers), active participants in the production and sharing of content: «in the world of convergence culture, media content flows across multiple media platforms, and consumers are encouraged to seek out new information and make connections» (Jenkins, 2006, p. 2).

The museum, as a place for the transmission of knowledge, is thus transformed into a platform for participation and co-creation. Its value lies not only in the objects on display, but in the way they are interpreted, shared and experienced. This vision is in line with participatory design practices and a post-museological approach that no longer considers the museum as a temple of knowledge, but as an open and dynamic cultural laboratory (Hooper-Greenhill, 2000). The educational implications of this approach are considerable. Numerous studies in museum pedagogy argue that learning is most effective when it is active, situated, socially mediated, and linked to empathy (Hein, 1998; Falk & Dierking, 2013; Roppola, 2012).

From this perspective, the immersive experience can be interpreted as a form of embodied learning in which knowledge and emotional involvement are interwoven in a process of constructing shared meaning; visitors learn by doing, remember better because they associate information with emotions and actions experienced first-hand, and build knowledge in collaboration with others. For the younger generations, who have grown up in interactive digital environments (the so-called digital natives), these modes of engagement are often more intuitive and stimulating than reading long educational panels (Prensky, 2001). This does not entail the trivialisation of content, but rather its translation into contemporary narrative and experiential languages. For example, a history museum could offer a VR mission in which the child has to solve a puzzle by exploring a reconstructed medieval town; during the game, the child learns about the customs and traditions of the period in an engaging and non-linear way (edutainment). Or a science museum could offer a simulation of a natural ecosystem where students in-

teract with virtual flora and fauna to understand environmental equilibria. The social and collaborative dimension that characterises digital and virtual museums extends the possibilities of situated learning, fostering not only cognitive understanding but also the development of empathic and relational skills. These results indicate that immersive design in museums should not aim for illusory realism, but rather emotional and cognitive relevance, creating the conditions for visitors to construct meaning through action, perception and dialogue.

Several museums have already taken pioneering steps into this new virtual world. The *British Museum*, for example, has collaborated with the Roblox platform to create interactive experiences geared towards younger audiences, combining education and play in a way that is fully consistent with the language of digital platforms. In the entirely virtual domain, the *Museum of Crypto Art* has established itself as an entirely digital institution, exhibiting blockchain-based works in an immersive online space. These early examples highlight the potential of the metaverse to transcend physical limitations, offering museums new ways to attract and inspire diverse audiences. In virtual worlds, visitors are no longer mere observers, but participants in interactive narratives, where experience is built up through action and connection (Museum Next, 2024; Longo & Faraci, 2023).

Today, the hybrid museum represents the culmination of an evolutionary process that has gradually transformed digital technology from a tool into a cultural condition. The digital museum is no longer an alternative environment, but an integrated dimension of the museum experience, in which the boundaries between the physical and the virtual dissolve in the interests of an experiential continuum.

In this scenario, design takes on a critical role, orchestrating relationships between bodies, technology and content, translating the complexity of heritage into accessible and meaningful experiences. Immersive technology does not replace presence, but amplifies its narrative and cognitive power, shaping learning that is sensory, emotional and reflective. The musing on museums in the metaverse ties in with the overall theme of this publication, which has demonstrated how narrative, interactive and cultural dimensions are now inseparable in museum design.

The latest research in digital museology emphasises that immersion alone does not guarantee visitor engagement. As Roppola (2012) and Giannini and Bowen (2019) affirm, a meaningful experience arises out of a skilful orchestration of sensory, narrative and social dimensions. The visitor's body becomes an interpretative medium, while design acts as a cognitive interface, capable of connecting the emotional and rational dimensions of the experience.

In this sense, the museum of the future, whether immersive or hybrid, is not only a technological cutting edge but also an ethical and cultural workshop, a cognitive and relational ecosystem, a space for cultural citizenship in which design becomes an instrument of awareness and social cohesion. Designing museum experiences today entails designing new forms of presence and relationship, environments in which knowledge is built up through interaction and where technology, driven by design, establishes itself as a critical and generative practice, restoring human depth to the digital experience.

Thinking about virtual museums and the metaverse opens up a broader perspective, in which design is not only a tool for mediation but also a generative principle for relationships, capable of connecting space, language and community in a hybrid museum ecosystem.

CONCLUSIONS

Towards a hybrid and dynamic museum ecosystem

More than thirty years after the event, Bolter and Grusin (1999) revised and updated McLuhan's thinking by introducing the concept of remediation. According to the two experts, no new medium ever actually arises in isolation but is defined in relation to previous media, which are then absorbed and reworked. For example, photography reinterpreted painting, cinema reinterpreted photography and theatre, television has reinterpreted cinema, and the web has reinterpreted all of these previous forms of expression. Remediation thus involves a twofold process: on the one hand, the striving for transparency, for the erasure of the medium in favour of the immediacy of experience; on the other hand, the awareness of mediation itself, which is capable of being thematised and made an active part of communication. New media, therefore, do not simply replace old media, but incorporate and transform them, giving rise to hybrid and multi-layered forms of communication in which past and future overlap. This process of remediation also affects the language of museum exhibitions; many traditional devices have been transformed into digital equivalents, maintaining the same communicative function but altering their form and medium. Panels have been converted into interactive screens; dioramas, originally conceived to recreate immersive and realistic environments, have now found a new lease of life in virtual reality experiences; projections and holograms continue to explore the manifestation and aura of objects; whereas audio guides have evolved into personalised mediation systems (relying on artificial intelligence). In this sense, the history of museography appears to be a continuous sequence of remediations, in which each technical innovation does not cancel out, but reworks previous practices, projecting them into the language of the present. From this perspective, the design phase entails careful consideration of the selection and combination of various communication tools, as highlighted in the comparative map outlined in Chapter 4. This framework does not propose prescriptive models, but rather provides a useful methodological basis for steering design choices in accordance with experiential objectives, context and target audiences. The designer's ability to read, integrate and modulate these tools becomes part of the process of building up meaning and communicative effectiveness in the museum experience.

This concept provides a key to understanding the transformation of contemporary museums with the advent of digital technology; museums have gradually evolved from physical spaces for the preservation of artefacts into complex communicative environments, where digital media are not

mere supports, but tools that reshape the visitor experience, the relationship with the public and narrative logic. The transition from traditional museums to virtual museums – and, more recently, to the metaverse – can be interpreted through the medium of remediation, in which traditional exhibition practices are transformed into new forms of interaction, immersion and participation.

The growing integration between the physical environment and the virtual dimension is driving museums towards a hybrid model, in which cultural space is constantly expanding and transforming, adapting to the needs of contemporary society. In this new paradigm, the museum is shaped as a relational ecosystem of places, experiences and communities in which analogue and digital are not in opposition, but rather enhance each other in a continuous dialogue between presence and distance, material and immaterial, direct and mediated interaction. This transformation should not be seen as a break with museum tradition, but rather as its natural evolution. The hybrid museum does not reject the physical dimension – on the contrary, it enhances it thanks to digital technology – but at the same time extends its activities beyond the confines of the building. The visit becomes a process extended over time and space; it may begin long before the visitor arrives at the museum, through preparatory online content (videos, social media, introductory virtual tours). It will be enhanced during the actual visit with digital media on site (augmented reality apps, QR codes for instant insights, interactive installations) integrated into the exhibition layout; and it may continue afterwards, with access to additional materials, online discussion communities, virtual events linked to the exhibitions being visited or new materials on display. In this way, the museum experience is no longer an isolated event lasting a few hours, but a journey, extended over time, comprising many small points of contact with the cultural heritage.

Visitors, therefore, become an active part of this ecosystem. They are not just occasional guests, but may become members of a lifelong learning community. They may contribute online with reviews, comments and creations inspired by their visit, participate in challenges launched by the museum on social media, join thematic interest groups, and perhaps return to the museum with new friends intrigued by what they have shared. Each person builds up a sort of personal cultural biography in relation to museums, in which physical and virtual experiences are interwoven.

In this context, the transition to a hybrid model requires museums to re-organise their internal and external policies. From a curatorial perspective, exhibitions need to be designed from the outset on two levels: in-person and online, with complementary – but not necessarily identical – content and formats for each. From a communication perspective, cultural marke-

ting should integrate physical and digital events, holding the public's attention not only during the most important moments of the exhibition, but also throughout the long run of online activities. On the educational front, the appropriate museum services need to acquire e-learning skills and design activities that can be accessed remotely - virtual workshops, webinars with experts, digital kits for schools. Business models might also be developed: a hybrid museum could explore forms of digital membership such as subscriptions for exclusive online content, partnerships with technology platforms, or co-production of events with other institutions via the web.

In all this, design plays a crucial role as a facilitating factor in conceiving the museum as an integrated and coherent system of services over several channels and a seamless user experience. For example, a visitor might start by pre-booking their ticket online, receive a preparatory virtual guide on their phone, enjoy the experience on site following a specific route, and then find a summary of what they have seen on their personal account, with suggestions for further exploration in the metaverse space. All this necessitates omnichannel UX design, interconnected information architectures and shared databases. Otherwise, there is a risk that the digital and physical parts will remain separate repositories, nullifying the unified vision. As Parry (2021) observes, the true added value of hybridisation lies in the possibility of articulating multiple languages, formats and devices, giving a voice to a public that is often marginalised in traditional contexts. A museum might set up a physical exhibition devoted to a historical theme and, at the same time, create a virtual version enhanced with content that broadens its perspective, including, for example, the voices of minorities or the views of other countries on the same subject. In this way, even those who cannot attend in person would have the opportunity to contribute and interact, making the overall experience more enriching, communicative and inclusive.

An interesting aspect of the hybrid museum is the redefinition of the concept of authenticity. Traditionally, the aura of a museum derives from the originality of its objects; seeing a thousand-year-old artefact or an autographed painting by a master in the original is considered an authentic and unparalleled experience. In the digital world, however, authenticity takes on different nuances as it is no longer linked to the single material object, but to the authenticity of the experience and the narrative intent.

A virtual experience may be authentic if it is genuine, well-documented, transparent about what is reconstruction and what is original, and if it succeeds in conveying the deeper meaning of the work or story. The two things are not mutually exclusive; on the contrary, they reinforce each other. Having a VR experience could make us appreciate the painting more when we see it in real life, and vice versa, seeing it in real life could prompt us to seek

out the VR experience to learn more. Well-engineered hybridisation may thus enhance the participatory and relational dimension of the museum. A hybrid museum may welcome into its ecosystem individuals who will never set foot in the physical building, but who actively contribute online – and are, to all intents and purposes, part of the museum’s public. It may involve digital artists in creating AR or VR works that interact with the physical collection, blending conservation and contemporary creation. As previously mentioned, it may provide space for alternative and local community narratives, perhaps hosting virtual exhibitions on its online portal that are co-created with local associations, student groups, etc. In this way, the museum becomes a living organism, a platform for discussion and cultural output. A hybrid museum is inevitably a dynamic museum. The rapid pace of technological and social change means that museums will have to embrace a logic of continuous innovation. It is not feasible to create “the perfect virtual museum” and then leave it unaltered for years. On the contrary, it will be necessary to embrace more flexible methodology, to experiment, try things out with the general public, and improve on-going processes. The principles of design thinking – putting the user at the centre, prototyping, learning from mistakes, making things work – and those of social innovation – working with the community, assessing social impact, accommodating feedback – will be valuable companions on this journey. For example, a museum might launch an initial beta version of its virtual environment, gather user feedback, and then update it regularly by adding features or modifying those that are ineffective. This is a new way of operating for institutions accustomed to long timeframes and to stability in their collections, but it might represent a way to remain up-to-date. In reflecting on the future of museums, Debono (2025) proposes considering the ‘cone of futures’ – possible, plausible, probable and preferable – as an interpretative tool for designing institutions that are not limited to the present but imagine communities, materials and technology in interaction. In this sense, the museum becomes an on-going laboratory of transformation, where materiality and digitality coexist and mutually regenerate each other. Ultimately, imagining the museum as a hybrid and dynamic ecosystem means considering it as a constantly evolving process. This vision entails investment in terms of technology, resources and research, but it could amplify the original mission of museums, namely to educate, inspire, include, and create a shared identity, bringing it, with powerful resources, into the contemporary world.

As Parry (2021) and Kidd et al. (2022) point out, the true value of the hybrid ecosystem lies in its openness: open to new languages, open to new audiences, open to diverse voices. In this scenario, the metaverse is not merely a technological environment, but a laboratory for rethinking the museum of the future; a future in which the museum will be both local and global,

rooted in the local area but spread out over the internet, guardian of the past but also creator of new meanings, a space for contemplation but also for interaction and creativity. The journey from digital museums to virtual museums and the metaverse has only just begun. It is not a conclusive destination, but rather a journey of continuous transformation. Each step raises new questions: what will the museum experience be like in ten or twenty years? What role will emerging technology such as holography, biofeedback, and Web3 play in redefining the relationship between the general public and cultural heritage? It is impossible to say for certain, but what seems clear is that museums will need to be ready and accommodative. Museums will not only survive but thrive as vital institutions, by maintaining their core values – openness to the public, research, education, inclusion – while embracing the complexity and fluid nature of the modern world.

These developments raise even more profound questions about the role of design in virtual environments and the very nature of the digital experience, especially in metaverse design. In most cases, current experiments are limited to replicating the activities of physical museums in a virtual space, transposing existing exhibition and behavioural models. However, a genuine museum in the metaverse cannot be reduced to a mere transposition: there is a need for a radical rethinking of the modes of interaction, how we evaluate things, how we actually attend and participate. It is essential to develop new design criteria and analytical tools capable of interpreting immaterial, relational and cognitive experiences in an environment that transcends traditional physicality and opens up new ways of enjoyment that are still being defined. In this scenario, design emerges as a critical and generative idiom, capable of transforming complexity into experience, rendering the invisible visible, and bridging the gap between the visitor and technology. Ultimately, the designing of museum experiences means creating opportunities for encounter and learning, traversing physical and digital boundaries, both individual and collective, to create a museum capable of engendering connection and imagination in both the present and the future.

AFTERWORD

by Salvatore Di Dio

Designing connections – Social design in the hybrid Museums

In a moment when museums are renegotiating their public mandate under the pressure of platform logics and AI-augmented mediation, La Scala's work offers a necessary shift in museum thinking. The move towards remediation, the undeniable influence of digital technology, and the embrace of hybrid models represent a fundamental recalibration of the museum's role. And, most importantly, the conversation has shifted from *what* museums should do in this new landscape, to *how* we should do it.¹

As the Author underlines, the visitor is no longer a passive recipient of information but an "active" participant. But being "active" is just a means, of course, and it can have multiple aims: from just being "entertained", to being "engaged" in a new vision of societal values. That's why we need to consider how design can *actively* shape that agency, directing it towards specific goals connected with public institutions missions, such as collaborative learning, shared interpretation, or even the construction of new social connections and communities. This requires moving beyond a purely transactional model of engagement and embracing the principles of design of social interaction, where design interventions deliberately influence social processes.²

So the challenge of reimagining the museum's role in the digital age might be the opportunity to give a new and community rooted meaning to the "museum experience", but this demands a shift in perspective.

La Scala's research clearly shows how urgent it is to develop a framework for designing interactions that foster genuine connection and meaningful social engagement.

From a "digital experience" perspective, the ambition should be to cultivate "digital gathering points" – intentional spaces within the virtual environment where individuals can organically connect, collaborate, and explore shared interests.

Such gathering points should be curated, time-bound, and thematically anchored to the museum's narratives, so that online interaction reinforces – rather than disperses – the institutional value of the experience.

1 Eklund, L. (2020). A shoe is a shoe is a shoe: Interpersonalization and meaning-making in museums—research findings and design implications. *International Journal of Human-Computer Interaction*, 36(16), 1503-1513.

2 Garner, J. K., Kaplan, A., & Pugh, K. (2016). Museums as contexts for transformative experiences and identity development. *Journal of museum education*, 41(4), 341-352.

This extends beyond mere access to information; it necessitates designing for reciprocal interaction, recognizing that authentic community formation requires more than just offering a digital interface. We must move deliberately to foster opportunities for sustained engagement, acknowledging that the casual browsing of a digital exhibit is unlikely to generate the deep, reflective connections we seek.³

The imperative for “diversity & inclusion by design” stems from the well-documented risk of amplifying existing biases within digital spaces. A apparently neutral, AI-powered environments can easily become a site where dominant narratives are reinforced, silencing marginalized voices and perpetuating systemic inequities. Therefore, design interventions must actively challenge these underlying assumptions, not simply by promoting representation – though this is crucial – but by creating structures that deliberately elevate diverse perspectives.⁴

This demands a constant vigilance, a willingness to scrutinize the design choices and their potential impact, and a commitment to ensuring that all participants have equitable access to opportunities for influence and participation. Critically, this requires a move beyond the reactive measure of “accessibility” – often focused solely on physical or cognitive barriers – and embracing a sustained commitment to equitable design principles.⁵

Furthermore, the architecture of experience must actively empower visitor agency. Rigid, linear narratives can ultimately stifle creativity and limit the potential for transformative encounters. Instead, design should facilitate exploration, encouraging individuals to forge their own connections, construct their own interpretations, and ultimately, own their experience. This is not about relinquishing control, but about creating a system that allows for divergence, celebrates individual perspectives, and recognizes that meaning is often co-created through interaction.⁶

3 Katifori, A., Perry, S., Vayanou, M., Pujol, L., Chrysan, A., Kourtis, V., & Ioannidis, Y. (2016). Cultivating mobile-mediated social interaction in the museum: Towards group-based digital storytelling experiences.

4 Shams, R. A., Zowghi, D., & Bano, M. (2025). AI and the quest for diversity and inclusion: a systematic literature review. *AI and Ethics*, 5(1), 411-438.

5 Zallio, M., & Clarkson, P. J. (2021). Inclusion, diversity, equity and accessibility in the built environment: A study of architectural design practice. *Building and Environment*, 206, 108352.

6 Antón, C., Camarero, C., & Garrido, M. J. (2018). Exploring the experience value of museum visitors as a co-creation process. *Current issues in Tourism*, 21(12), 1406-1425.

Finally, a critical consideration must be the ethical dimension. The immersive nature of these experiences raises profound questions regarding data privacy, informed consent, and the potential for subtle manipulation. Transparency is paramount: visitors need to understand how their data is being used, how their choices are being influenced, and the inherent limitations of the experience.

Success, in this scenario, would not be solely measured by engagement metrics (time spent in the environment), but rather by qualitative data gathered through post-experience surveys and ethnographic observation – assessing the nature of interactions, the quality of critical thinking, and the extent to which diverse voices were heard.

In this evolving scenario, the work of Paola La Scala sets the foundation for the future discussion about what principles will evolve in response to technological advancements and shifting societal values. A sustained commitment to critical reflection, ongoing dialogue, and a deep understanding of human social dynamics will be essential to navigating the complex challenges and opportunities that lie ahead. The future of museums, increasingly intertwined with in real-life community-building practices as well as in digital realms, hinges not just on our ability to create engaging experiences, but on our capacity to design for genuine social connection, critical reflection, a more inclusive understanding of the world and a more engaged and active society.

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Designing Museum Experiences: Narratives, Interaction and Digital Transition traces the transformation of museum design from its historical roots to the challenges of digital transition. The book explores how design has become a critical language through which museums transform knowledge, foster engagement, and construct new experiences, adopting a design research perspective that connects theory, communication, and practice.

From the early masters of exhibition design to contemporary immersive environments, the book investigates how narrative, interaction, and communication tools shape visitor experience and meaning-making. Through theoretical reflection and selected case studies, it redefines the museum as a living interface - an inclusive and evolving environment where physical and virtual dimensions, human presence and digital extension coexist and interact.

Building on this approach, *Designing Museum Experience* proposes a design framework for analysing and integrating communication tools, offering a practical methodology to support coherent and meaningful museum experiences.

Seen through the lens of digital transition and the metaverse, the museum appears as a hybrid and evolving ecosystem where storytelling and design innovation connect up people, insight, and exchange, transforming content into experience and experience into creation.



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