LUISS

Degree Program in Marketing: Market Relationship & Customer Engagement

Course of **Marketing Communication & New Media**

Transforming Museum Experiences: Leveraging AI for Enhanced Communication and Personalized Engagement

Professor Stella Romagnoli

SUPERVISOR

Professor Paolo Peverini

CO-SUPERVISOR

Anna Pacilio

CANDIDATE

ID: 771151

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Abstract

Cultural heritage sector is experiencing a continue development, following new technological trends and techniques. When the crucial role of culture and arts in both the development of the individuals and cities was recognized, it became natural to experiment in this field in order to reach the best possible customer experience. This research adds to existing literature, investigating on the possibilities offered by 5.0 technologies.

This experimental study aims to investigate the relationship between the type of experience in a museum (AI museums versus physical museums) and customer satisfaction, measured in the intention to spread positive word of mouth. This study further examines whether the emotional engagement acts as a mediator, and whether personalization depth (low versus high) moderates this relationship. The study presented a 2x2 between-subjects casual conclusive research design tested on a sample of 200 active respondents who took part in an online survey. Results indicated that AI museums are preferred by consumers and result in a higher willingness to spread positive word of mouth, and that emotional engagement acts as a mediator, with higher emotional engagement leading to a higher intention to spread positive word of mouth. The role of personalization depth as a moderator is not confirmed. Existing research regarding effects of AI-based experiences in cultural heritage on customers' satisfaction, therefore, this study contributes to the understanding of implementation of AI-based technologies in the field of cultural heritage and experiential marketing.

Keywords: culture heritage management, experiential marketing, Artificial Intelligence, word of mouth, Virtual Reality, museums, emotional engagement

Introduction

The Aesthetic Movement used as its slogan “art for art’s sake”, in the meaning that art should not have other aim rather that aesthetic pleasure. Benjamin Constant, in 1804, stated: “Art for art's sake, with no purpose, for any purpose perverts art. But art achieves a purpose which is not its own”. Literature has longer been debating the meaning of arts and culture in society, and what role should cultural heritage and museums organizations play in the society. Over years the role of arts and culture in cities changed, and in 2007 the International Council of Museums recognized the cultural and social role of museums in society, redefining the term as a “non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment” (ICOM, 2007). Museums and cultural institution then entered the sector of entertainment, and since then the rules changes. Museums then needed to focus on marketing and how to attract customers and how to increase their satisfaction. Museum’s mission includes preserving cultural heritage over time, revealing aesthetic values, protecting community interests and deliver arts in an efficient, engaging, and interactive way. As for their crucial role in society, and the need for museums to develop new marketing strategies and adapt to new trends, due also to the challenges proposed by the Covid-19 pandemic, the cultural heritage sector became innovative and dynamic. In fact, it became natural for museums to adapt to new trends and follow the wave of changes of the digital transformation. In this scenario, AI-based technologies played a central role in operational efficiency, curatorial practices and enhancing visitors’ experience. AI-based technologies became crucial when increasing efficiency in all scenarios, proposing innovative, time efficient and advance ways to deal with old situations. This study focuses on the impact of AI-based technologies in experiential marketing, investigating the customer preferences regarding the implementation of AI techniques in the experience of a museum. From augmented reality to chatbots, over the past decades the cultural heritage sector changed radically, implementing interactive and engaging experiences, that helped visitors interact with art in a new way, enhancing customers’ experience.

The aim of this research is to analyze the relationship between the type of experience in a museum (AI museums versus physical museums) and customer satisfaction, measured in the intention to spread positive word of mouth. The mediating role of emotional engagement and the moderating role of personalization depth (low versus high) are both studied.

Chapter I and chapter II are dedicated to relevant literature review on the topic. Specifically, chapter I will be looking at the influence of technology in the cultural sector. First, the chapter will explain the scenario in which these changes are happening, describing the industry 5.0 and the relevant trends, and after with an overview of the cultural scenario and its digitalization, focusing on the role of the Covid-19 pandemic. The chapter is closed by a paragraph dedicated to the intersection of Artificial Intelligence and the cultural sector, describing its main implementation and trends.
Chapter II focuses on revieing previous research on relevant trends in the cultural heritage field, and relevant variables in measuring and achieving customer satisfaction. Specifically, the chapter analyzes personalization and its main applications in cultural heritage, word-of-mouth and emotional engagement in cultural heritage, focusing on techniques aimed to enhance museum experience for visitors and how they will impact these aspects, and the last paragraph will describe the applications of virtual reality and artificial intelligence in cultural heritage, describing the world -amous exhibition Van Gogh: The Immersive Experience as a case study. Chapter III will define the experimental study looking at the relationship of type of experience in a museum and its effects on consumers intention to spread positive word of mouth. Additionally, the study will look at whether the emotional engagement acts as a mediator, and whether the personalization depth (low versus high) moderates this relationship. This chapter will also summarize the results. Chapter IV will explain the general discussion, illustrating the main theoretical and managerial implications, and describe the study's limitation.

Chapter 1 - Art and Artificial Intelligence: how technology is disrupting the cultural sector

1.1 Industry 5.0 and the Digital Transformation

Last decades have been characterized by unpredictable and continuous changes. Since the beginning of the new century, the society has been characterized by a need of change and improvement, both from a social and an economic point of view. Klaus Schwab, founder of the Word Economic Forum and author of "The Fourth Industrial Revolution," coined the phrase Fourth Industrial Revolution to describe a radical revolution characterized by "a fusion of technologies that is erasing the boundaries between the physical, the digital and the biological" (Klaus, 2016). Schwab considers the Fourth Revolution different from the others, highlighting "the speed, scope and impact of the systems" as the points.

Nowadays we stand on the brink of a technological revolution, that will fundamentally alter the way we live, work, and interact. The First Industrial Revolution used water and steam to mechanize production, the Second used electric power to create mass production; the Third used electronics and information technology to automate production. Now a Fourth Industrial Revolution is building on the Third, the digital revolution has been occurring since the middle of the last century.

The Fourth Revolution is defined by a fusion of technologies that is blurring the line between the physical, digital, and emotional spheres. It differs from previous technologies in three main ways: (1) technological developments overcome humans' capabilities such that technologies are no longer controlled by humans or companies, (2) customers adapt to living in environments shaped by new technologies, (3) the boundaries between human and technology are becoming more and more confused.

There has been no historical precedent to the speed of current breakthroughs, and no such event is comparable for its exponential evolution. And the breadth and depth of these changes herald the transformation of entire systems of production, management, and governance. These are not exogenous perhaps over which we humans have no control; rather, we are driving evolution through our behaviors as citizens, consumers, and investors.

The Digital Transformation is considered one of the biggest challenges in all industries in recent years (Schuchmann e Seufert, 2015) and, as such, presents unprecedented opportunities. According to a study conducted by the Massachusetts Institute of Technology in 2020, companies that have changed their strategy based on Digital Business Transformation are 26% more profitable than others. It is essential to develop a shared global vision of how technology is reshaping economic, social, cultural, and human contexts, and, preserving that holistic approach, shape a future in which creativity, empathy, and managerial skills play a central role.

Digital transformation is not about technology, but about a new way of thinking and developing strategies, of communicating, connecting, and living, in order to enable new digital paradigms, closely linked to the use of data (Aronica, Abbiati, Bonfiglio, Idone, Ruffino, 2019).

The emerging Industry 5.0 technologies are having a significant impact on the global economy, representing a great opportunity to increase customer value in the service sector. These technologies are disrupting the environment, proposing innovative ways to deal with the same old problems.

These transformations are further amplified by advancements in technologies such as Artificial Intelligence (AI), autonomous robot, virtual and augmented reality (VR/AR), Bid Data, cloud computing, and the Internet of Things (IoT), to name a few. The rapid and inevitable integration of Technologies 5.0 into business operations sees AI as a main actor, playing a crucial role in many industries, including services.

1.1.1 Understanding Artificial Intelligence

The world is changing rapidly, and so is technology. This statement becomes even more self-evident when we compare technological devices from few decades ago from with recent ones.

In the first half of the 20th century, science fiction familiarized the world with the concept of artificially intelligent robots. It began with the heartless Tin man from the Wizard of OZ, and it kept radiating in the mass imagination that such thing was possible.

Since the early stages of development, computer scientists have strived to make machines as intelligent as humans. Initially, AI research focused on symbolic methods and problem-solving, with notable milestones such as the creation of the first AI program, Logic

Theorist, in 1955. The Logic Theorist was a program designed to mimic the problem-solving skills of a human, it was presented at the Dartmouth Summer Research Project on Artificial Intelligence (DSRPAI) hosted by John McCarthy and Marvin Minsky in 1956. This conference, considered to be the founding event of artificial intelligence as a field, brought together top researchers from various fields for an open-ended discussion on artificial intelligence. Everyone whole-heartedly aligned with the sentiment that AI was achievable: this event therefore catalyzed the next twenty years of AI research.

From 1957 to 1974, AI flourished. Computers became faster, cheaper, and more accessible; machine learning algorithms improved, and people became more aware of the potential of these technologies and its possible usages. In 1970, Marvin Minsky, considered to be a pioneer of AI, told Life Magazine "from three to eight years we will have a machine with the general intelligence of an average human being". However, while the basic proof of principle was there, there was still a long way to go before the end goals of natural language processing, abstract thinking, and self-recognition could be achieved. The subsequent decades saw periods of both progress and setbacks, due to unmet expectations. However, the field regained momentum in the 1990s with advancement in machine learning and neural network. Research was funded with the goal of revolutionizing computer processing, implementing logic programming, and improving artificial intelligence. During the 1990s and 2000s, many landmark achievements in artificial intelligence were realized. In 1997, IBM's Deep Blue, a chess-playing computer program, defeated the reigning world chess champion and grand master Gary Kasparov. This highly publicized match market the first time a reigning world chess champion loss to a computer, representing a significant milestone in the AI-driven decision making.

Figure 1: The match between IBM's Deep Blue and the grand master Gary Kasparov

Source: https://www.ilpost.it/2021/02/10/deep-blue-garry-kasparov-1-0/

In the same year, Dragon System developed a speech recognition software that was implemented on Windows, advancing the field of spoken language interpretation. It seemed that there was not a problem machines could not handle. Even human emotions were tackled, as demonstrated by Kismet[1], a robot created by Cynthia Breazeal that could recognize and display emotions.

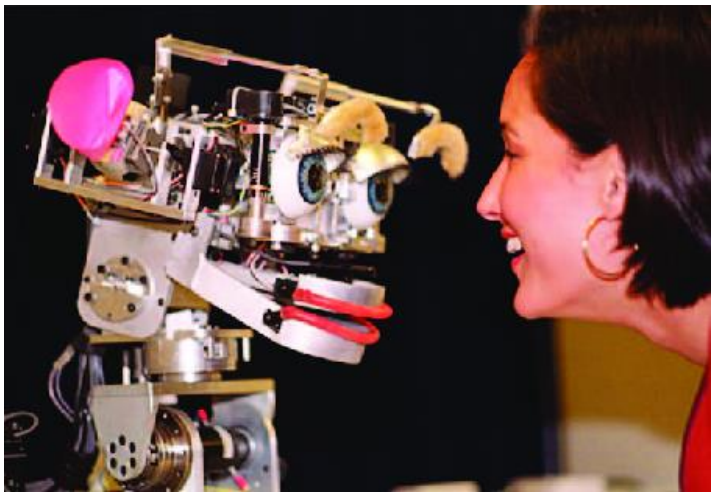


Figure 2: The appearance of Kimset

Source: https://news.mit.edu/2001/kismet

[1] https://news.mit.edu/2001/kismet

The explosion of big data and exponential increases in computing power in the following decades launched AI into a new era, enabling breakthroughs in deep learning, natural language processing, and computer vision.

AI is now being used in many aspects of daily life, from virtual assistants and driverless cars to advanced data analytics and predictive modeling. Only a few years ago, most of what is actual today would have seemed like science fiction. We are already impacted by this technology, which has numerous uses, and it will keep disrupting the way we see the world; therefore, it has become imperative to understand it.

1.1.2 Definition and Key Concepts of AI

Artificial Intelligence (AI) is a rapidly growing field of computer science that is disrupting several aspects of our lives. AI was born to allow computers to learn and control their environment, trying to imitate the human brain structure by simulating its biological evolution (Melanie, 1999). AI, a term coined by emeritus Stanford Professor John McCarthy (2007), was described by him as "the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable". This definition was given in 1955, but from there AI evolved, becoming crucial in the Fourth Industrial Revolution. In fact, nowadays it's used to tackle difficult challenges and implemented in several industries for everyday tasks.

AI systems are designed to adapt to new situations, learn from experience, and improve performance over time without explicit instructions. The goal was to create machines that can simulate human intelligence, including reasoning, problem-solving, creativity, emotional intelligence.

To give a more current and broader definition of AI, it is a branch of computer science and engineering that focuses on developing intelligent machines that can perform tasks that typical require human intelligence, such as visual perception, speech recognition, decision-making, and language translation.

We can sum up five main aspects that have contributed to the importance of AI in modern society: efficiency, improved decision-making, personalization, accessibility, innovation. AI drives innovation in many industries: its approach is extremely broad, from data

analysis to make accurate predictions or recommendations, to automating and repetitive tasks that help human workers save time in order to focus on more complex and creative tasks.

Indeed, AI can be used for automating and repetitive tasks, allowing humans to focus on more complex and creative tasks. It is also definitely game changing in terms of accessibility and personalization: it can assist people with disabilities and improve accessibility in several areas, such as communication and mobility, and it can also be used to personalize individual experiences, tailoring services according to specific and individual needs.

To understand AI, it is essential to be familiar with key concepts and terminology commonly used in the field.

1.1.2.1 Machine Learning

Machine Learning is a subset of AI and computer science that involves training algorithms to make predications or decisions based on input data. The goal is to use data and algorithms to enable AI to imitate the way humans learn, generating gradually improvements.

In this scenario, ML algorithms are trained using large datasets to learn patterns and make decision, unlike traditional programming, where rules and logic are explicitly defines.

In general, machine learning algorithms are used to make a prediction or a classification. It is possible to break out the learning system of a machine learning algorithms into three main parts. At the beginning, based on some input data your algorithm will produce an estimate about a patter in the data. The prediction of the model is evaluated by an Error Function, which will make a comparison with known examples to assess the accuracy of the model. The last step involves a model optimization process: if the model can fit better to the data points in the training set, the wrights are adjusted to reduce the discrepancy between the known example and the model estimate. The algorithm will repeat this iterative “evaluate and optimize” process, acting autonomously until a threshold of accuracy has been met.

Machine Learning can have several applications, including image recognition, analyzing images, and identifying objects, people, other features, used in applications such as facial recognition and security cameras; speech recognition, analyzing speech and converting it

into text or identifying specific words or phrases; personalization, providing personalized recommendations and experiences in applications such as e-commerce, entertainment, and social media.

1.1.2.2 Deep Learning

Deep Learning is a subset of machine learning that involves training neural networks with multiple layers, the so called deep neural networks, to simulate the complex decision-making power of the human brain and recognize patters in data.

It consists of layers of artificial neurons, each processing input data and passing it on the next layer. Thanks to the layer, the model is allowed to learn increasingly complex representations of the input data, ultimately making predictions or decisions based on the known patters.

Deep Learning drives many applications and services that improve automation, performing analytical and physical tasks without human intervention. It lies behind everyday products and services, such as digital assistants, voice-enabled TV remotes, credit card fraud detection - as well as still emerging technologies such as self-driving cars and generative AI.

Some applications include image recognition, used to identify objects, people and other features, enabling applications such as facial recognition and object detection; speech recognition; natural language processing, analyzing and generating human language; robotics, enabling robots to perform complex tasks and learning from demonstrations.

1.1.2.3 Natural Language Processing

Natural Language Processing (NLP) is a subfield of AI that involves training machines to understand, interpret, and generate human language. NLP is used by machines to process and analyze large amounts of text and speech data, enabling applications such as language translation, sentiment analysis and chatbots.

NLP can be applied in several fields, such as language translation, accurately translating from one language from another (i.e. Google Translator); sentiment analysis, analyzing large amount of data, such as social media posts and customer reviews, to determine the sentiment or emotion expressed, and it can be used to determine the sentiment or the

emotion expressed; chatbot, enabling them to understand and respond to natural language inputs from users, used for virtual assistants and customer service chatbots.

1.1.2.4 Robotics

Robotics is a field of technology and engineering that deals with robot design, construction, operation, and use. A robot is a machine that replicate or substitutes for human actions, carrying out a complex series of actions automatically, typically by being programmed or controlled by a computer.

Robotics can be applied in several fields, such as manufacturing or healthcare, to increase efficiency and precision, exploration, and military, to perform dangerous tasks or access inaccessible environments.

1.1.2.5 Computer Vision

Computer Vision is a field of AI and engineering that focuses on enabling machines to interpret and analyze visual data from the world around them. Machine learning and neural networks are used to tech computer and system to derive meaningful information from digital imagines, videos, and other visual inputs, and to make recommendations or take actions when they see defects or issues. If AI enables computers to think, computer vision enables them to see, observe and understand.

Computer Vision can be used for object recognition and image segmentation, using the algorithms to identify, classify and segment images, or augmented reality and robotics.

1.1.3 Different Types of AI

Early iterations of AI applications were built on traditional machine learning models, relying on learning algorithms developed and maintained by data scientists. This kind of traditional machine learning models need human intervention to process new information and perform any kind of new tasks that fall outside their initial training.

However, AI has been evolving steadily since the breakthrough development of artificial neural network in 2012, a technology that allowed machines to engage in reinforcement learning and simulate how the human brain processes information.

Differently from basic machine learning models, deep learning models allow AI applications to learn how to perform new tasks that need human intelligence, engage in

new behavior, and make decisions without human intervention. As a result, this enables task automation, content generation, predictive maintenance, and other capabilities across industries.

Therefore, the field of AI remains in a constant and fast-paces state of transition. However, the types of AI can be largely understood by examining two encompassing categories: AI capabilities and AI functionalities.

1.1.3.1 Categories of AI based on capabilities

The three kinds of AI based on capabilities are: Narrow AI, General AI, and Super AI.

The first type, Narrow AI, is the only type of AI that exists today, whereas all other forms are theorical. This type of AI in which a learning algorithm is designed and trained to perform a single or narrow task, and any knowledge gained from performing that task will not automatically be applied to other tasks. As a result, it cannot perform outside of its defined task. Some applications include language transaction, image recognition and natural language processing, and can be seen in Siri, Amazons' Alexa, or even OpenAI's ChatGTP.

General AI, also known as Strong AI, is just a theorical concept. Differently from Narrow AI, AGI can use previous learnings and skills to accomplish new tasks in a different context without the need for human beings to train the underlying models. This ability allows this type of AI to learn and perform any intellectual task that a human mind can.

Super AI is also just a theorical model. If it ever becomes real, Super AI will think, reason, learn, make judgements, and possess cognitive abilities that surpass those of human beings. The applications possessing Super AI capabilities will have evolved beyond the point of understating human sentiment and experiences to feel emotions, have needs, beliefs, and desires of their own.

1.1.3.2 Categories of AI based on functionalities

There are found types of AI based on functionalities: Reactive Machines AI, Limited Memory AI, Theory of Mind AI, Self-aware AI.

Reactive Machines AI can only react to the current situation based on pre-programmed rules, without the possibility to store past outcomes or decision. They have no memory, they cannot use historical data to make future decision, they can only work with presently available data. Examples of Reactive Machine AI include IBM Deep Blue, and the Network Recommendations Engine, powered by models that process data sets collected from viewing history to provide customers with content they're most likely to enjoy.

Limited Memory AI is able to store past experiences and use them to make informed decision in the future. It can use past and present moment data to make decisions, improving its performance with the use of historical data. However, it is only able to use past data for a specific amount of time, it cannot retain that data in a library of past experiences to use them over a long-term period. As it is trained on more data over time, it can improve in performance.
Examples of Limited Memory Ai include self-driving cars, which use data from sensors and cameras to make driving decisions, and virtual assistants and chatbots, like Siri, Alexa, Google Assistant, that combine natural language processing technologies and Limited Memory AI to understand questions and requests.

Theory of Mind AI is an unrealized from of AI that falls underneath the General AI. It would be able to understand human emotions, beliefs, intentions, and desires. It would allow the AI to simulate human-like relationships, personalizing its interaction with individuals based on their unique emotional needs and intentions. This kind of AI would be great to understand and contextualize artworks and essays, which today's generative AI tools are unable to do. Emotions AI it a theory of mind currently in development, but to date it is unable to understand and respond to human feelings. As this is in its early stages of development, no commercial applications exist yet.

Self-aware AI is the most advanced type of AI, it would possess Super AI capabilities. This type, as the one mentioned before, is strictly theorical. If ever achieved, it would be able to understand its own internal conditions and traits along with human emotions and thoughts. It would also have its own set of emotions, needs and beliefs.

The different types of AI are categorized based on their level of complexity and sophistication. These models are currently in development, there is no type of AI that can understand and respond to human feelings. As technology advances, we may see new categories emerge.

1.2 Overview of the Cultural Sector

1.2.1 The intersection of Culture and Economy

The intersection between culture and economics in the academic tradition has always been despised as it presents a commodified version of culture, with a feeling of inadequacy of economic theories in relation to the cultural world.

This is happening for two main reasons. In the first place, culture has always been deified, placed in an aseptic bubble of inspiration unrelated to the "dirty" concept of money. Secondly, this is happening because the cultural sector itself is difficult to frame, define and analyze. Culture is regarded as a set of values, traditions, customs, and lifestyles that characterize a group or community. The influence of culture on communities and the way they think and behave will also interfere with economic behavior: culture is a pervasive phenomenon of all human activity (Santagata, 2009). Macroeconomic and microeconomic actors (individuals, firms and households, communities, local and central institutions) live and act within an environment in which culture plays a central role in economic behavior.

Identifying specific laws defining the cultural sector is challenging since the relationship between culture, individuals, communities, and institutions is different in every country and historical period.

For instance, the economist David Ricardo excluded art and culture goods from his analyses because he was aware of their peculiarity, the impossibility to frame culture and its products into models, and the consequent incompatibility of culture with general and systematic theories, based on the analytical tools and axioms of both classical culture, based on labor-value theory and income distribution theory, and neoclassical culture, based on given individual preferences and rational models.

We move from a vision of art and culture that is pure and unrelated to economic mechanics to a series of studies, theories, welfare policies, and policies to justify public intervention in the cultural field.

As described by Santagata (2009a) cultural policies are divided into four functional categories, three of which are oriented toward the past, and only one is oriented toward the future, representing an engine of development for new cultural industries.

The first policy concerns the destruction of tangible and intangible culture. In certain historical phases, specifically wars, revolutions, and colonial periods, peoples deliberately choose to destroy their cultural heritage as a sign of rebirth, renewal, and departure from the past. From a historical perspective, the motivations for such actions are ideological-religious, arising from the replacement of old symbols with new ones better suited to reflect the changed society. Other factors involved in the destruction of culture are improper and demolishing use of cultural heritage sites, or even international competition in global markets with the implementation of elimination prices that undermine the survival of small local cultic industries.

The destruction of a population's cultural heritage results in the destruction of the landscape, cultural identity and history of a place and a community, as well as intangible costs.

Over the years, as a result of armed conflicts and the disastrous consequences on local cultural heritages, the international community has felt the need to carry out a process of codification of international law aimed at protecting cultural heritage in the event of armed conflict. Significant treaties include the Declaration on the Intentional Destruction of Cultural Heritage (UNESCO, 2003). The preamble reads: "cultural heritage is an important component of the cultural identity of communities, groups and individuals, and of social cohesion, since its intentional destruction can have consequences that may be detrimental to human dignity and human rights".

The second policy depends on negligent behavior, referring to historical eras characterized by poverty or foreign domination, or even meager funding, in contexts in which the absence of policies was the only interaction with culture, irreversibly damaging national cultural heritage and weakening cultural identity, with inevitable consequences for economic development (Santagata, 2007).

A further avenue concerns models of cultural heritage preservation. Preservation encompasses several facets, from protection understood as the public service of preserving heritage removed from the commodification of art, to making it available to the public and the community; including the defense against the pauperization of an area

by controlling the mobility of works or by prohibiting demolition or allowing destruction. A third meaning concerns restoration and maintenance.

Conservation over the years remains tied to the authoritarianism of the "conservative legal tradition, built on contingent norms and progressive, ever-widening prohibitions" (Emiliani, 1974). The model is closely identified with a museum that preserves, conceals, and becomes a place of refuge and preservation (Santagata, 2007).

Finally, the most significant view of cultural heritage preservation concerns the management and enhancement of works of art, as in the absence of good management and attention to public use value and enjoyment, preservation is ineffective. Good conservation, moreover, turns out to be strategic input to produce new culture.

The last category concerns policies related to the production of culture, understood as the creation of new expressions of tangible (monuments, archives, museums), intangible (painting, music, festivals, landscape) and material (design and decorative arts) art (Santagata, 2007). Production is a fundamental aspect, and therefore is superordinate to the other categories. This is because in the absence of production there is no object of possible future cultural use or consumption. Conservation and production turn out to be closely linked, as conservation is an essential prerequisite for production, and the latter is the object of conservation. In a context where the needs of tourists and visitors reign supreme, the need to return to interventions related to the reform of the country's artistic and creative productive capacities is essential.

Policies oriented toward protection, enhancement, management, preservation, and enjoyment of cultural heritage must be accompanied by a structured organization of the value chain of an art asset, linked to economic policy and illustrating the roles and tasks of the main actors, public and private. Five phases are identified. The first stage concerns the selection of artists and creative actors, as well as formative process, through institutional instruments such as private patronage, public competitions and academies, and increasing of quality of public and private programs for art and creativity. The next stage concerns the creation of ideas, since art is an intellectual good. This results in a need for protection of intellectual property rights and the fight against commercial piracy markets (Benghozi & Santagata, 2001).

The following is the production stage, a complex articulation of coordinated activities. It includes organizational structures, particular machinery, places, facilities, experts. This

is followed by the distribution phase, in which there is the close interaction between the business and creative worlds: entrepreneurial creativity must deal with innovative distribution logics that are distant from classic consumer goods, as well as with artists. The final stage is consumption-related, which concerns demand variables and then leads to the development of cultural industries and innovations to be related. In a broader picture, it becomes evident how the model of conservation for consumption is obsolete as it interacts and encounters a few other economic sectors, such as tourism, small restoration company, small construction company and so on (Santagata, 2007).

Indeed, the production of culture has greater systematic value and economic potential, feeding the labor market through training and selection, nurturing what Florida (2002) considers the most strategic segment: "the creative class". Through the curation of the making process, the production of culture extends to an extremely growing productive sector worldwide. Estimates by the European Commission indicate that at the European level the cultural and creative sectors have a turnover of more than 654 billion euros, or 2.6 percent of European GDP, in 2003. The following year the sector had more than 5.8 million workers, or 3.1% of the working population (European Commission, 2006).

The cultural industries sector has been growing for decades, occupying an increasingly prominent position. It is a sector that greatly influences national economies, defining the identity of peoples and countries and generating significant levels of income and employment.

1.2.2 Museum economics and management, the museum as an enterprise

The museum can no longer be regarded as a mere container of cultural goods of historical and artistic interest: while on the one hand it retains this function, on the other it becomes a seismograph of an increasingly dynamic, global, and transversal present. As an educational institution it must necessarily respond to the new demands arising from the innovations of the new century, as well as the needs of ever larger, more up-to-date, and more demanding audiences. The museums must now be perceived as a business, a structure oriented toward a social and a cultural purpose.

In the dynamic context of the 21st century, policies oriented toward protection, enhancement, management, preservation and enjoyment of cultural heritage need to be

accompanied by a structured organization of the chain of production of the value of an art asset, linked to economic policy and illustrating the roles and tasks of the main actors, public and private.

In Italy, in the *Code of Cultural Heritage and Landscape* (2004), in Art. 101, paragraph 1, a museum is defined as a "permanent structure that acquires, preserves, orders and exhibits cultural goods for purposes of education and study". Article 115, Paragraph 2, indicates the different organizational models: direct, that is carried out by means of organizational structures within the administrations and endowed with scientific, organizational, financial and accounting autonomy, and indirect, through concession to third parties with public service contracts. Paragraph 3 specifies: "Institutes and places of culture that belong to public entities are intended for public use and perform a public service". Thus, the museum is perceived as a public service, and has a social and economic dimension. The services that museums offer are not just spaces dedicated to regular visitors, there are other facilities relevant and it is no longer just about the collections. These services are autonomous and independent facilities, on one hand they dialogue with the museum, but on the other hand they have their own attractiveness. Bookshops, restaurants, libraries, educational spaces, are no longer secondary or ancillary services, but protagonists of the structure (Vanni, 2018).

At the legislative level, referring to a museum governance, the museum assumes to all intents and purposes the characteristics of a private enterprise and, consequently, is managed with managerial criteria. Thus, in addition to the traditional functions, the museum organization will have to assume those behaviors typical of businesses and it becomes necessary to develop the social and economic dimension of the museum itself, including a precise study of target audiences and careful profiling of the audience. The museum thus takes on the dimension of an educational institution for every level of knowledge: it is no longer just a container for cultural goods, but is an institution that must respond to the new needs of articulate and broad audiences, resulting in a necessary increase in the services offered. In this context, to compete with its competitors, the permanent collection is no longer sufficient as the only attraction, but the museum must behave as a private enterprise. The museum is part of people's leisure market, and as such, its competitors are leisure companies and facilities: theaters, sports fields, restaurants, etc.

A further definition of a museum is provided by ICOM, International Councils of

Museums, Italy, during its 21st General Conference in 2007 in Vienna, defining the museum as: "a permanent non-profit institution, serving society and its development, which carries out research and tangible and intangible evidence of man and his environment, acquires, preserves, communicates and specifically exhibits them for purposes of study, education and dialect". The museum facility takes on a central role in society, absorbing functions of research and study, but also enters the entertainment sector.

As an element with an active role in society, the museum inevitably dialogues with multiple parts of the society itself. First and foremost, it aims to engage and retain the largest segment of the public with innovative and novel cultural offerings, creating an ongoing, two-way relationship with the public, but on the other hand, it dialogues with tourists, industrial districts, schools, and private enterprises.

An example of such a model of a museum that dialogues with different entities and offers a wide range of services with the aim of building the loyalty of different segments of the clientele is the Centre Pompidou, opened in 1977 in Paris, built by the architects Renzo Piano and Richard Rogers.

Figure 3: Centre Pompidou in Paris

Source: https://www.centrepompidou.fr/en/

This structure was created as an exhibition center for modern and contemporary visual arts, but at the same time it is a library, a design museum, and an exhibition space open to interdisciplinary activities, workshops, ateliers. It focuses on multimedia, electronic art, video art, photography, and it offers services such as cafeteria, bookshop, giftshop. All its services are oriented not only to the exhibition and preservation of cultural works with educational and training purposes, but also to the entertainment in its various forms, in the visitor is always the protagonist. The museum then becomes an enterprise by entering the market of private businesses and people's leisure time.

The ICOM Code of Ethics (2004) indicates that the main mission of the museum is to enhance its didactic and educational role, orienting it to all levels of the community, thus creating novel strategies, and personalized, tailor-made cultural offerings, providing the forms of entertainment aimed at sharing the cultural and emotional experiences offered by the entertainment sector. In this sector competition is high, and it is therefore important to act like a business and assume a "private-sector" approach, combining institutional, scientific, and art-historical roles with governance that is more appropriate to the new goals, and is able to create social and economic value, increasing its own funding channels since public ones are insufficient, producing profits to invest in fulfilling its functions. In Italy, the *Legge Ronchey* [Ronchey Law] (No. 4 of 1993), proposes the vision of the museum as an opportunity to create economic value, establishing the possibility for private individuals to take part in the management of certain services. The *Legge Paolucci* [Paolucci Law] (No. 41 of 1995) also extends the possibility of private management of services related to guided tours, editorial productions, and production of temporary exhibitions, through a contract of "contribution in use".
Finally, the *Code of Cultural Heritage and Landscape* (2004) establishes the formula of "indirect management," which allows the Italian State to entrust third parties (foundations, private institutions, corporations, cultural associations), after assessing their levels of efficiency and effectiveness, with the management of its cultural assets, including museums.
The main target markets for culture are public administration, private companies, and the general public, each with specific needs. First, there is an increase in the traditional demand for paid consumption within museum facilities and a desire to belong to a

community and place, which sees the museum as a hub. In addition, there is a more dynamic and interactive relationship with government and local stakeholders. Finally, there is an unprecedented and interactive involvement of private businesses through creative, virtuous partnerships that serve mutual goals for sponsorships.
The museum thus tries to adopt management tools and models derived from the business world, with the goal of surviving with strategies aimed at creating economic value. Governance is in harmony with the double aspect of museum institutions, on one hand the dissemination and the protection of culture, and on the other the entertainment and the necessity to generate value based on its positioning in the target markets.
The traditional functions of the museum are regulated by national laws regarding the preservation, protection, and study of cultural heritage. To these functions are added new ones that respond to society's needs, people's needs, and economic goals. Key aspects are connection and promotion of the territory, dissemination of technological innovations, internationalization and networking with other countries, emotional and social well-being.

From the moment in which the museum is considered in the same way as an enterprise, the concept of competition becomes broader. Being part of the entertainment sector, museum institutions have as competitors' leisure market-related enterprises belonging to the same sector (museums, art galleries, cultural foundations), but also those belonging to a different sector (theaters, concert halls, cinemas). Sector competition is related to the diversification of cultural offerings with the goals to involve the largest segment of visitors, to build their loyalty, to obtain part of the funding from public administration, private individuals, and bank foundations.

The gradual increase of the role of the museum in the society and its continuous interaction with social and economic aspects, have contributed to the development of an image of a museum institution whose services promote the well-being of the visitor and simultaneously foster an increase in economies, which will be re-invested in the facility itself.

The museum breaks away from its traditional definition as a place for the preservation and dissemination of works of historical and artistic value, but becomes part of the entertainment sector, taking on characteristics typical of that sector, including customer loyalty, use of managerial management techniques, and orientation to an economic result,

an indicator of project success and an important source of self-financing. Museum business models have consequently changed from collection centered models to audience centered models, with visitor as the protagonist.

In addition to public financial support, museum institutions have different ways of generating revenue: ticket and subscription sales; facility management projects including cafeteria, restaurant, bookshop and giftshop; voluntary contributions as donations or membership forms; collateral and parallel events, such as guided tours or workshops; lending of works or sponsorships; and state bonuses. The involvement of private companies through creative partnerships and oriented to common goals turns out to be of fundamental importance, intercepting modes that have the same targets of interest and carrying out projects that focus on culture to social, welfare and environment, becoming important unconventional marketing levers of companies.

1.2.3 Digitization of the Cultural Sector in Italy and the impact of Covid-19

Digitization has been at the center of transformations in all productive sectors and educational directions for years, and the cultural sector is no stranger to these processes. Digitization of the sector is an essential process, not only to foster the preservation of cultural heritage, but also to promote its enjoyment. To this end, it is necessary to ensure accessibility to digital resources and platforms, which can revolutionize the cultural site visitation experience with innovative and original experiences.

Digitization of the sector is at the center of a series of reforms proposed by the Ministry of Culture in Italy, at a national level, and by the European Union, at an international level.

In 2019, the Ministry of Culture proposed a Three-Year Plan for the Innovation and Digitization of Museums, with the aim of informing and directing Italian museums toward a necessary change and the following implementation of strategies in the digital field. In this process, digitization plays a key role, placing itself at the center of this renewal plan, with the implementation of innovative services, such as immersive exhibitions, gaming, 3D experiences, but also from an organizational and administrative point of view, using integrated analytics, AI and big data systems. The plan addresses as a crucial point the need to have an effective presence on digital channels, with appropriate

content that engages the public, but also with marketing services, museum mapping, digital catalog, and ticketing.

Since the Covid-19 pandemic, there has been a growing push for digitization in all sectors, including museums. A survey conducted by NEMO, Network of European Museum Organizations[2] (2020), showed that more than 60% of the world's museums have increased their online presence. In Italy, on the other hand, according to research carried out by the Digital Innovation in Cultural Heritage and Activities Observatory of the Politecnico of Milan[3], 76% of museums, since after the first lockdown in 2020, have at least one social network profile, but only one in four museums (24%) have a strategic plan for digital innovation.

There are numerous plans at the national and international level pushing to accelerate this process all around Europe, including the NRRP. The NRRP, *National Recovery and Resilience Plan*, is part of the European Union's program known as Next Generation EU, approved in 2021 in Italy to revive its economy after the Covid-19 pandemic to enable the country's green and digital development.

Italy has chosen to include the Ministry of Culture in Mission 1, which includes the main drivers of the country's competitiveness: digitization, innovation, competitiveness, culture and tourism, Component 3, namely Tourism and Culture 4.0.

The pandemic Covid-19 crisis has impacted many sectors, including the cultural and museum sector, which has been subjected to a forced closure for several months under the anti-Covid-19 regulations adopted by governments all around the world. According to the report, State Museums at the time of Covid-19, edited by the Italian *Istituto Nazionale di Statistica* [National Institute of Statistics] in Italy (May, 2020), the effects of the crisis have been destructive, with a sharp reduction in receipts and visitors. Between March and May 2020, the health emergency and related lockdown are estimated to have caused a lost attendance of nearly 19 million visitors and a lost revenue of about 78

[2] https://www.ne-mo.org/fileadmin/Dateien/public/NEMO_documents/NEMO_COVID19_Report_12.05.2020.pdf

[3] https://www.som.polimi.it/event/convegno-dei-risultati-di-ricerca-dellosservatorio-innovazione-digitale-in-sanita/

million. In the same quarter last year, state museum facilities had recorded more than 17 million visitors, realizing gross receipts of 69 million euros, for a loss of between 80% and 90%.

In this context, inevitably, cultural institutions have focused on producing content to stay in touch with their audiences, while on the other hand expanding the scale of users and enabling them to experiment with alternative revenue models. This process was made possible by national and international plans, which set goals to be achieved, European standards and guidelines for museums to follow, to ensure uniform and authority-supported development.

In Italy, the *Osservatorio Innovazione Digitale nei Beni e Attività Culturali [Observatory for Digital Innovation in Cultural Heritage and Activities]* as part of the "Conference Extended Experience: the challenge for the cultural ecosystem", found that 80% of local museums, monuments and archaeological areas offered at least one digital content. The main trends were online workshops and educational activities or online tours and guided visits. Most organizations were involved in offering online workshops, higher education courses and video games, while only a smaller slice focused on offering podcasts and other multimedia content. Moreover, in addition to changing their offerings, cultural institutions had to reformulate their management models and adjust their skills, including, for example, implementing growing digital trends such as the use of big data or artificial intelligence.

The Covid-19 pandemic has undoubtedly had a major impact on every aspect of the economy, altering trends and confronting every sector with challenges and changes. The cultural sector, and specifically museum organizations, have certainly been victims of these changes.

As we explored before, since the introduction of the idea of the economy of culture, the cultural sector faced several changes and challenges, adapting to a new vision of culture and the whole sector and new needs of its audience. This has happened by creating a dialogue between the cultural sector and the external environment, both nationally and internationally, entering the leisure market. Particularly regarding the museum sector, we have seen how over the past decades the reforms have been aimed at making it more involved in various aspects of local economies, as well as setting out precise guidelines for creating an active, innovative, connected, digital museum sector.

Considering this, it is inevitable to question how Covid-19 has altered that path and influenced its evolution.

The thesis aims to focus on how artificial intelligence has impacted the museum sector, and what the principal trends have been, dwelling on how this process has impacted three different aspects: the operational efficiency, the curatorial practices, the visitor experience.
Through the study of the main challenges and trends in this field, the aim is to understand how it has evolved driven by the now inevitable processes of digital transformation and implementation of new technologies that permeate all economic sectors, focusing on Artificial Intelligence.

1.3 Artificial Intelligence and the Cultural Sector

Digitalization and the advent of new technologies creates a different chapter for the cultural and creative sector, presenting unknown challenges and opportunities. These institutions are no longer simple means for preserving and exhibiting past and present traces of human societies: museums and cultural heritage develop a tangible and material identity.
In this scenario, it is important to adapt and find alternatives to traditional fruition, and the main way to do this is resorting to technology. Therefore, the whole sector is and has been experiencing an increasing digitalization of its collection and its practices. The first steps of the process were quite simple: the aim was to increase the amount of extra content, accessible thought the use of tools such as QR codes or by replacing the classic audio guides with apps to be downloaded onto smartphones. Later, interactive experiences were born to create direct contact with the artworks, and didacts began to make use of tech tools, creating interactive museums.
Cultural institutions slowly started being more present online, in the first place by implementing their websites, and after a while being present on social media platforms. Cultural organizations emerged as labs of the future culture, where all kind of technological experiments are testes to fulfil their mission. However, experimentation between art and technology had a huge boost until the early 2020's when museums, no

longer able to offer the possibility of physically visiting exhibitions, where forced to adapt to a new way to interact with art and develop alternatives.

The immediate response was an increase in content on social media platforms, and the opening of other channels online. The most striking example was the Uffizi Gallery's account on TikTok[4], being one of the most popular accounts during the pandemic. In a few months, the whole sector was revolutionized, and museums significantly improved their presence online. In 2021, NEMO, Network of European Museum Organizations, conducted a survey[5] interviewing 600 museums, asking about the impact of Covid-19 and digitalization. Almost most of the museums interviewed, the 93%, stated that they improved their digital presence during Covid-19, and 75% of museums declared that they improved their presence on social media or joined news platforms.

While museums, as cultural institutions, are not necessarily driven by the same market forces as enterprises, the context of the Covid-19 pandemic has revealed their exposure and created an incentive to extend beyond their traditional consumers and delivery methods (Vidu et al., 2021). Increasing the need for more and more tech and cutting-edge solutions, artificial intelligence played a crucial role within digital museums, with multiple purposes: speeding up the work of employees, enriching the experience of visitors, providing more information to scholars and management sectors, improving accessibility and usability.

AI offered long-term opportunities to diversify museums' offers, to enhance its educational and entertainment features, as well as to better manage collections or even research heritage (Vidu et al., 2021).

In this scenario of increasing digitalization, some players in the culture sector have begun to take an interest in the use of AI techniques applied to their collections, needs, and audiences. AI has been implemented in the field for a long period now, from the beginning of the 21st century, with elements such as Bayesian Networks and Natural Language Processing, or more simply chatbots. These technologies will be explained in the following paragraphs.

[4] https://www.tiktok.com/@uffizigalleries

[5] https://www.ne-mo.org/

AI is a powerful tool being used all around us, and its influence continues to grow. The potential use of AI and computer technology in museums and cultural institutions is vast and it provides a significant opportunity for museums to reach a wider audience and help create more meaningful and engaging experiences for the visitor.

1.3.1 Operational efficiency and Curatorial practices

Artificial Intelligence has enabled museums to enhance their operational efficiency in addressing problems such as ticketing, data analysis, and resource management, and much more. AI is also used in curatorial practices by introducing advanced tools for curation, preservation, and research.

This allows museums to be more efficient, save time and reduce costs. Overall, this results in being able to offer a better experience to visitors, creating smoother processes, being able to use data to develop a better tailored offer and selection, and in the long run better manage the museum.

1.3.1.1 Visitor Analytics

Predictive analytics and machine learning techniques are used by AI systems to predict future outcomes based on current data. AI can understand into visitors' behaviors and habits with in-museum sensors, mobile app interactions, Wi-Fi and GPS data, and ticket sales data across different channels. Predictive analytics can be used to analyze consumer behaviors to anticipate demand for product or services, while machine learning can be used to develop more accurate models for predicting effects of certain decisions. The outcome is to develop strategies that anticipate customer preferences and needs. In fact, by leveraging data from customer interactions, AI can make data-driven decision. These are essential tools to provide invaluable insights into the future, and help organizations gain a competitive edge (Lee et al., 2022).

These analytics help museums know which exhibits are more visited, peak visiting hours, visitor engagement levels, where is better to locate artworks in museums. All this enables the adjustment of exhibits' placements and staffing and, therefore, resource allocation. One example of this is the UK's National Gallery creation of a project to predict the future number of visitors to a given exhibitions based on the characteristics of that exhibitions

back in 2017[6]. The project involved using machine learning algorithms to predict exhibitions visitors' numbers, with the goal to help the Gallery gain deeper insights into the visitor experience, better plan future exhibitions and even introduce a dynamic ticketing model. Chris Michaels, the National Gallery's IT Director, explained that the project was going to enable them to offer better value to their audiences by offering different prices for different exhibitions, while also analyzing the behaviors of visits[7].

Social media posts and tourist website ratings, such as TripAdvisor, are also another significant source of data used by museums to identify potential visitors or analyze the quality of exhibits, with the same goal as before: make strategic decisions regarding communication and operational activities. Sentiment analysis and topic modelling are few AI techniques used by museums to analyze feedback and provide insights on how to improve exhibits, visitor experience, orientation in the museum, and their communication strategy (French & Villaespesa, 2019).
This also allows museum to adapt their marketing and communication campaigns, launching targeted campaigns by understanding their visitor demographics, preferences, and behaviors.

1.3.1.2 Inventory and Collection Management

Another significant application of AI in operational efficiency is on issues related to inventory and collections management. Computer vision and machine-learning AI technologies are used to catalog and monitor museum's collections, track their location, and recognize and classify artifacts, as well as monitor their condition. Using AI to create a digital record allows to maintain and securely store documents, images, videos, making them easier to access and manage over time. This is a game changing technique when it comes to archive and preserve records for posterity.

AI can be used as a tool for information management and cataloguing digitized cultural artefacts through automated process of labelling, classifying, or organizing based on

[6] https://dexibit.com/resource/national-gallery-predicts-future/
[7] https://www.computerworld.com/article/1655344/the-national-gallery-turns-to-ai-to-better-predict-attendance-figures.html

similarities (also known as clustering in machine learning). Artificial intelligence (AI)-powered classification and tagging can automatically associate tags with a document based on a pre-trained set of associations. By automatically tagging new artifacts, this procedure can assist in sorting big collections of artifacts or adding new artifacts to an existing catalogue. Without requiring the content of the data items to be defined, clustering can automatically arrange them based on similarities (i.e., with annotations or meta-data).

Optical Character Recognition is another tool used to extract character from a scanned document, which aids in the creation of digital text output. AI can be used to analyze text or image similarity, to better understand content and arrange documents based on similarity. An example on how these technologies can be employees is Qurator, an ongoing project at the Staatsbibliothek zu Berlin (Berlin State Library, SBB), that aims to make curation activities and the generation of digital content in various industry contexts higher quality, more efficient and more cost-effective[8].

Another important improvement in collection management is object recognition technology. This tool, in fact, enables museums to better preserve artwork, as wells as provide access to digital records of the artwork. This software allows museums staff to identify which pieces are in need of a conservation, track their changes over time, while digital records can be uses to create virtual records and make it accessible to a larger audience. Also, AI object detection can help with the authentication of artworks, detecting details, such as patterns or brush strokes, that are not visible to the naked eye. The Cleveland Museum of Art is a leader in using AI technologies to improve visitor experiences and provide valuable contents online, with immersive exhibitions, their ArtLens AI, and their Open Access Collection[9]. As the website states, "The primary goal of ArtLens Gallery is to use innovative technology to provide visitors the tool sets to look closer, dive deeper, and feel comfortable exploring every gallery in the museum"[10]. Open Access Collection is the real gem of the museum projects, as due to Ai object detention and digital records, the museum is able to offer the public "the ability to download, share, collaborate, remix, and reuse images of public-domain artworks from the museum's

[8] https://qurator.ai/
[9] https://www.clevelandart.org/digital-innovations
[10] https://www.clevelandart.org/artlens-gallery

collection, as well as metadata for the entire collection—all without asking permission"[11]. As the official website of the museum states, the project was started with the purpose of follow the CMA's mission "to create transformative experiences through art, for the benefit of all the people forever". Therefore, thanks to the Open Access Collection, the museum is capable to let everyone access their collection from everywhere, transforming access to the collection and its usability inside and outside the walls of the museum itself.

1.3.1.3 Curatorial Practices

AI is revolutionizing curatorial practices ai it helpt with the curation and preservation of museum collections. Machine learning algorithms are used to analyze massive datasets, single out patters, and provide recommendations for exhibit themes and item arrangements. Predictive analytics and digital records can be used to predict what will be popular in the exhibit, but also what king of artifact will need conservation work and keep track of this. Also, digital records can help create virtual exhibitions or can be used as references in object of restoration.

These technologies make sure the collections are maintained at museums while also being accessible to a worldwide audience through the use of virtual tours and online exhibits, as the case of the Cleveland Museum of Art explained before[12].

These technologies make sure the collections are maintained at museums while also being accessible to a worldwide audience through the use of virtual tours and online exhibits.

Content generation is another significant AI technique employed in curatorial practices. Due to data analysis and reflection on existing collections of data, content generation techniques can can be used for generating multimedia content. It can have several applications, but the most relevant to curatorial practices is its usage in restoration of works of art. In fact, generative AI techniques can be used to restore missing parts of artworks. Museums can train the AI-based technique to replicate colors and styles, learning from dataset based on the artist's paintings.

The Rijksmuseum in Amsterdam, for example, has collaborated with companies using generative AI techniques to restore missing edges to Rembrandt's painting "The Night

[11] https://www.clevelandart.org/open-access
[12] https://www.clevelandart.org/digital-innovations

Watch". In fact, the original painting was slightly larger than the existing one, but the edges of the original one had to be cut off in the past in order to fit into a smaller frame. Thanks to AI-based techniques, it was able to learn both the colors and the brushstrokes and thus recreate the missing edges of the painting[13].

Other improvements in operational efficiency offered by AI include automated ticketing, predictive maintenance, enhanced security. By implementing these AI technologies, museums can significantly enhance visitor experiences, streamline operations, and improve the curation and preservation of their collections, ensuring that they remain relevant and engaging in the digital age and that museums are run in an effective and sustainable manner, optimizing resource efficiency.

1.3.2 Enhancing visitor experience

AI is influencing the way visitors can experience a museum, creating an impactful difference with the inclusion of various interactive and personalized technologies. New technologies can revolutionize the way art museums operate, from catalogues artworks to creating immersive experiences for visitors. AI is an essential tool for museums and cultural institutions to reach a wider audience, by both creating a new enhanced experience and improving their online presence. Additionally, AI-powered personalization services can create tailored experiences for each visitor, making the museum more engaging and enjoyable.
In brief, AI has the potential to transform the way museums operate and how they interact with their visitors (Rani et al., 2023).

1.3.2.1 Interactive Exhibits, Virtual and Augmented Reality

Virtual and augmented reality technologies have created new ways for visitors to explore and experience artworks, both in museums and outside their walls. Virtual Reality (VR) technologies enable remote or virtual tours that allow distant visitors to view artworks online, while Augmented Reality (AR) experiences can be created within the museum space to provide an immersive, localized experience (Koltsakidisetal, 2022). These

[13] https://www.bbc.com/news/technology-57588270

technologies allow users to view from multiple angels, zoom in for closer examination, explore the artwork in different lighting conditions. Historical scenarios can be reacted, or artwork can become alive and move around the area. There are endless possibilities, all with the purpose of offering an enhanced, interactive experience with artworks. In fact, these technologies can be used to create 3D models and simulations of artwork, allowing further exploration into its historical context or potential restoration techniques (Borodkin, 2022).

These tools can be used for virtual tours, interactive exhibits, and immersive experiences. The benefits of using these techniques in cultural settings include providing interactive experiences that generate greater engagement and memorability as well as giving additional content to create engagement based on gaming techniques or sensory stimulation. They originated as technologies to entertain audiences in innovative ways and have since become alternatives to physical museum visits.

In fact, immersive exhibitions use these technologies to take artworks outside of museums places, and lead the visitor in a new world, in which works of art are projected onto the walls, ceilings and floors of museum rooms, accompanied by audio narratives or matched music. These exhibitions are based on video mapping and its declinations, bringing together digital images, lighting effects and soundtracks, projected into a physical space where the viewer moves.

One example is the “Imagine Van Gogh” exhibition on the Dutch painter, which was first presented in Paris in 2017 and then continued around the world[14]. This exhibition takes advantage of the artist's most famous works, which are projected on the walls and come to life, move, and the painter's brush is visible, bringing the works to life. The exhibition is accompanied by a virtual reality experience, which, through a visor, allows visitors to walk among the works while entering a colorful and lively world.

These exhibitions focus on the viewer, no longer on the artwork, concentrating on engaging the viewers in all his senses. The educational and playful aspects come together, to create a more engaging and stimulating experience, different from traditional exhibitions.

[14] https://vangoghexpo.com/

1.3.2.2 Chatbots, Robotic Assistants and Interactive Displays

AI-driven chatbots, robotic assistants and interactive displays are establishing a new way for visitors to interact with museums and opening new possibilities for engagement and assistance. There technologies can have various applications, from customer service to entertainment. Interactive displays are becoming increasingly popular, offering an interactive and stimulating alternative to basic text explanation of artworks. Interactive displays allow users to interact with digital content in a more natural way, deciding their own path and creating a tailored experience. On the other hand, robotic assistant can be used to aid customers, such as helping them find products or providing recommendations. Finally, chatbots can be used to answer customer inquiries or provide helpful product information on websites (Schaffer et al., 2022).

Chatbots are mostly accessible though museum apps or interactive kiosks, offering immediate responses to inquiries by visitors, providing information about museum collections and several topics, and even offer personalized recommendations. These AI applications ensure that visitors are provided with a lot of information on the spot to make their museum experience more informed and enjoyable. At the same time, these interactions allow them to manage visitor flows and provide individual experiences tailored to the visitor's need. These elements can be combined and can be employed to provide a better and more adequate offer. Visitors can interact with chatbots in many museums around the world, and it can be associated with the museums' websites or integrated into apps or social media platforms, but also inserted in museums to enhance the visiting experience. These technologies evolved from a very simple form, to a more complex and involving structure. For example, the first ever chatbot used in a museum was MAX, an avatar used by Heinz Nixdorf MuseumForum, the largest computer museum in the world, to engage the audience, used as a virtual guide, launched in 2004 (Kopp et al., 2005).

Figure 4: Max at Heinz Nixdorf Museum Forum

Source: Kopp et al., 2005

Some visitors would briefly interact with MAX, while others would engage in extensive conversations. Both positive and negative feedback were received, but nevertheless, most visitors proved to cooperate with MAX, take his "human" side seriously. Today, these avatars evolved at least from a design perspective, combining some of the elements mentioned before, and they are in most cases friendly robots welcoming people enter museums (Vidu et al., 2021).

Standard forms of chatbots are of course still used, and still make a significant difference regarding operational services, whereas, regarding their use for enhancing customer experience, several improvements have been made.

These chatbots, in fact, can be designed to learn from visitors' experiences and reactions to have more appropriate reactions and give higher quality answers. One example is the IRIS+ chatbot of the Museum of Tomorrow in Rio de Janeiro. When the museum opened in 2015 its original digital assistant, IRIS, was already a core part of the experience. Through IRIS, each visitor used a chipped card to compile and personalize their experience as they interact with exhibit components in the exposition. With the collaboration with IBM Watson, the museum was able to create IRIS+, an AI chatbot developed to enhance visitor engagement and promote social and environmental initiatives. IRIS+ engages visitors in conversation with an interactive interface, understanding their concerns, and recommending relevant initiatives aligned with the museum's mission of shaping a better future.

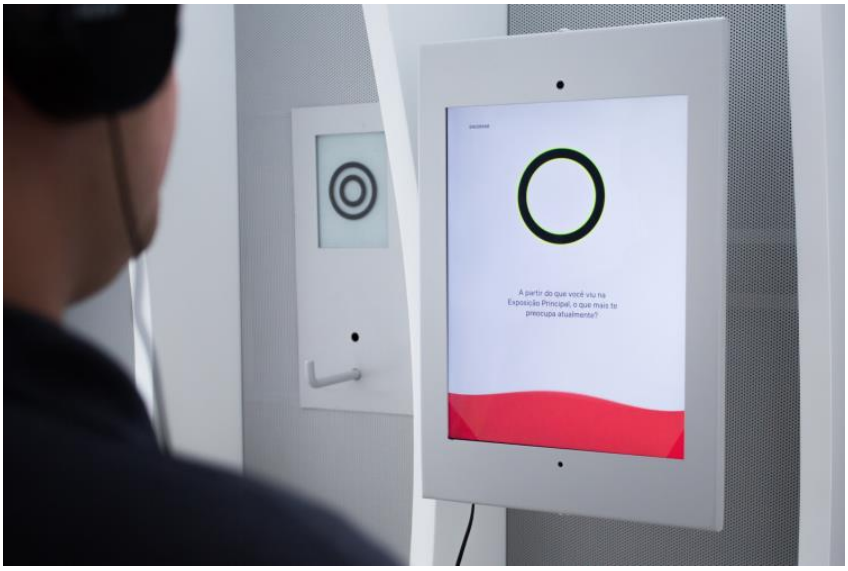


Figure 5: IRIS+ interface at Museum of Tomorrow in Rio de Janeiro

Source: https://www.aam-us.org/2018/06/12/iris-part-one-designing-coding-a-museum-ai/

Some chatbot interfaces are robots or have various types of interactive displays. One example is TEMI, a robot tour guide and a chatbot, present in the National Gallery of Singapore. National Gallery Singapore in 2021 presented Y-Lab, an art and tech innovation lab that showcases technology solutions that make art more accessible to all and inspire the use of technology across various sectors. TEMI is one of the projects on display, it is an autonomous robot guide with an AI based chatbot. The purpose of the museum was to provide an alternative experience to on-person tours of the art galleries. It started with a pilot project designed around a quick tour based on people and portraiture, TEMI would introduce visitors to a selection of four portraits, providing stories behind the artwork and vivid insights about the painters. The survey provided at the end of the tour showed that 90% of the audience cited that they really enjoyed the experience, and with only 1% citing dissatisfaction[15]. The ongoing project now offers several themed tours and a chatbot that can answer common questions by visitors, with the purpose to offer different means of interactions and engagement with visitors.

[15] https://www.robotemi.com/tv/national-gallery-singapore/

Figure 6: TEMI appearance and main interface at National Gallery in Singapore
Source: https://www.straitstimes.com/tech/tech-news/robot-tour-guide-chatbot-among-tech-projects-featured-in-new-national-gallery

Chatbots can be employed in other innovative way to engage with museum visitors, such as the case study of four historic houses in Milan. The project aimed to engage teenagers with a combination of chatbot technology, AI and gamification, creating a Facebook messenger chatbot game. The purpose was to attract young audiences by offering and interactive and competitive experience by offering a treasure hunt-like experience in the four museums involved. Users interact with the character via Facebook Messenger to find clued hidden in museum collections to solve a mystery. Both open-ended questions and multiple-choice questions are asked to users by the chatbot, ensuring and engaging and educational experience. The game was piloted with 80 teenage students, and it resulted in positive feedback (Gaia, G. et al., 2019) demonstrating that new technologies can be a valuable insight for museums to offer innovative ways to interreact, involve and expand their audience.

1.3.2.3 Imagine Recognition and Facial Recognition

Image Recognition is a form of AI that uses computer vision algorithms to detect and identify objects, places, or people in images or videos, based on specific characteristics, such as colors, details, age, gender, ethnicity, and other aspects. Image recognition has several applications, including facial recognition.

This technology has potential applications in museums with the purpose of personalizing the museum experience for individual visitors. In fact, Facial recognition technology would be able to determine repeating visitors, track them through the visit, and even determine their emotional reactions to the exhibits. These kinds of data can allow

museums to go even more in-depth when personalizing the experience for the visitor, tailoring individual tours or recommended artwork in which a specific user might be more likely to engage (Miller, 2023). Additionally, facial recognition can be used for security purposes, and for marketing strategies when it comes to track customer metrics and preferences. Potential ethical implications and privacy concerns must be taken into accounts.

Facial recognition technology can also be used in art museum for curatorial practices when it comes to the authentication of artworks.

Image recognition can be used for cataloging artworks and understanding their meaning, and it can be used to increase user engagement. The Barnes Foundation in Philadelphia, for instance, utilized an image recognition tool to enhance the visitor experience. The tool, the Barner Focus guide, works on a website created by the museum[16], and the visitor can use their phone camera to scan ad artwork and the program will recognize it and direct the user to the result pace where there is an image of the painting with a text narration, including the title, the artist, the date, and other information. It also gives the user the possibility to translate this information in their preferred language. Other museums can also emphasize user engagement with app specifically designed to interact. For example, the National Portrait Gallery in Australia, created an interactive application called "Headhunt!", with the purpose to attract young visitors. The app allowed users to take pictures of the portraits in the gallery and instantly access interactive learning experiences, turning the visit into a game.

These applications of AI give the possibility to create a more responsive and immersive museum environment, making the museum experience more dynamic, personalized, and interactive. Engaging with interactive exhibits, chatbots, application designed for interaction, personalized tours, visitors can have an exclusive and unique personal museum journey. Visitors' data can be used to create a customized tour including past visit history, preferences thought app interactions, or even real-time behavioral data. These developments are thus a contribution to visitor experience, and directly supports museums' educational and cultural goals by increasing accessibility and engagement of art and history.

[16] https://barnesfoc.us/

Chapter 2 - Theoretical Perspectives on Personalization, Word of Mouth, Emotional Engagement and AI in Cultural Contexts

2.1 The impact of Art on Society: Role of Art in Shaping Culture, Challenging Societal Norms, and Sparking Social Change

Art and culture have always been an integral part of human civilization, serving as a medium for expression, communication, reflection. From cave paintings to contemporary street art, from Renaissance masterpieces to digital installations, art transcends boundaries and connect people across cultures and generations. In addition to being a mirror of cultural values and social norms, and a tool for immortalizing and preserving thought years those aspects, arts and culture have longer being recognized for their transformative powers. In fact, beyond its aesthetic appeal, art carries immense power to influence, challenge and impact society.

The notion that art impacts society beyond its aesthetic value has a long history, in fact it has been traced to Aristotle's Poetics, where he introduced the concept of catharsis (Belfiore & Bennett, 2007), coming from the Greek term *katharsis*, Aristotle states that the purpose of tragedy is to evoke feelings of "terror and pity" and thereby leading to the purification and the catharsis of these emotions. The philosopher recognizes the art's power to embrace and purify human emotions, playing a central role in the society. Since the 1990s, the social effects of the arts have increasingly been explored by researchers, policymakers, and other stakeholders (Belfiore, 2002; Belfiore & Bennett, 2010). The arts are understood to redefine people's relationship to the word by being an extension of themselves (McLuhan, 1964). Today, the understanding that the arts can positively impact individuals and societies is still widespread (Birchall 2015).

The social impact brought by arts and culture can also be used as a justification for public funding of the art itself (Belfiore, 2002; Gray, 2007). For instance, the United Kingdom has been placing arts and culture in a central position in their governance. According to David Edgar's (2004), in the book entitled Creative Britain, by Chris Smith, the first Secretary of State for the cultural sector in the New Labour era, "celebrated the power of art in cementing community identity, drawing people together and overcoming isolation and rejection". The same concept was echoed and emphasized by the then new Arts

Council Chair, Gerry Robinson, in a speech delivered in 1998, in which "he celebrated the role of arts in urban rejuvenation, reskilling, strategies for disablement and even healthcare". In 1998 in the United Kingdom with the DMCS, Creative industries mapping document, the promotion of culture become central to the process of city redevelopment with the introduction of the concept of creative industries. This approach became popular in Europe, and later evolved into the concepts of creative city, creative industries, and economy (Evans, 2009). Creative cities have been described by Comunian (2011, p. 1158-59) as places in which the focus is on the "production of cultural and creative products, creative workers and infrastructure." Other central elements have been identified, such as the relationship with tourism and the influence of events and festivals in the development of creative places.

Art is therefore recognized as a powerful tool that can shape culture, challenge norms, ignite social change. Culture is thus invested with a double meaning: on one hand, the development and central role of human growth, a tool for personal development, expression, and communication, and on the other hand, the role in the society and the economic development. In fact, as McCarthy et al. (2004) state, on one side there are the intrinsic effects of art that enrich individuals' lives, but on the other side there are the public spillover component in that it cultivates the kinds of citizens desired in a pluralistic society. Referring to the intrinsic benefits of culture, McCarthy et al. state that "these are the social bonds created among individuals when they share their arts experiences through reflection and discourse, and the expression of common values and community identity through artworks commemorating events significant to a nation's (or people's) experience".

The impact of art as a means of aesthetic pleasure, cultural preservations, and personal expression has longer been recognized. However, its ability to drive social change and promote development is often underestimated. Art, in all its manifestations, holds the unique ability to question societal norms, evoke emotions, and ignite conversations on critical issues. It serves as a catalyst for social change, empowering communities, promoting dialogues, and establishing a more inclusive and equitable society. The concept that engagement in the arts can result in deeply transformative effects for both the individual and the society has always been debated, and is no settled yet. If, on one side, the idea that arts can produce changes in the conciseness of the collective is

closely associative with the social engineering efforts aggressively implemented by the dictatorships during the years (as the Nazi, Fascist or Communist regimes); on the other side, there exists a more enlightened European tradition, rooted in Modernism and tracking back to cultural theories of Goethe and Schiller in the Weimar period, or the English Romantics, which perceive arts as a source of ethical insight and a guardian of human values in an increasingly mechanistic word (Bennett, 2001). Arts and culture are also perceived as a need for humankind, something we are inclined to. By sociology, the ability to create and consume art is considered as a mean to create social differentiation and establish an advantage from and evolutionary point of view for artists and other creative people (Belfiore & Bennett, 2007). Dissanayake (1998) reinforces this point when she states: "The fact that people everywhere value the arts and take the trouble to express themselves aesthetically suggest to an evolutionary biologist that there is a reason: doing this, (rather than not doing this) contributes to human evolutionary fitness. Faced with the overwhelming evidence that people everywhere make and respond to the arts, the ethologist would have to presuppose that the arts must have survival value". The art is endowed of both educational and cognitive function, perceived as a tool that influences people and society as a whole. The original concept of catharsis developed by Aristoteles in the ancient Greece, is still up to life, as art is perceived as a way to "stimulate cognitive activity that might teach us about the world" (John, 2001). As John (2001) states, as a result, "we learn from artworks, we acquire fresh knowledge, our beliefs are refined, and our understanding is deepened", and this would result in a natural appreciation and enhancement of art itself.

Art acts as a reflection of the realities and struggles faces by society, though their artworks artists examine, criticize, portrait political, social, and environmental issues, drawing attention to crucial issues. Art is a way to stimulate critical perspective of individuals, whether is a photography exhibition to plays, all forms of art are able to initiate discussions and motivate action on a variety of pressing issues. For Read (2002), art and culture play a central role in the process of self-cultivation of people, and society in its whole, and hence is entrusted with a greater purpose than mere entertainment: "Art is not necessarily a moral activity, and its tonic effect is made through the senses. Nevertheless, even in its purest, or most abstract – in Oscar Wilde's sense, its most useless forms: in one of Shakespeare's songs, or a minuet by Mozart, or a drawing by Boucher – even then

art is radically different from amusement. It does not leave us without affecting us, and affecting us, according to some scale of value, for the better. ... works of art speak more directly to us: for by their form and style they give us a measure of the refinement of a civilization".

The impacts that culture and creative produce on society are not only from a moral and educational point of view but can also generate economic growth. John Hartley, professor of cultural science and director of the Centre for Culture and Technology in Australia, defines culture and creativity as "leverage for social and economic change in the next century" (Hartley, 2005). Culture is the engine of creativity, and creativity in turn, drives social and economic innovation (Santagata, 2009a) and stimulates investment in technology.

Arts and culture are an essential tool in the development of individuals, a powerful tool to transform societies, and are also able to generate economic growth and lead development in different fields, as Tusa (2002) states "The arts are probably instruments for social improvement, agents for social change, for social equality, or for community harmony". If the arts play such a crucial role in the development of humankind, societies, communities, it is not only natural for this field to be a mirror of society and its transformations, for instance considering how this sector adapted during Covid-19 pandemic, leading the way in co-creative strategies and techniques, it is equally natural for the arts to be a fertile ground for disruptive innovations, such as the implementation of AI and other 5.0 technologies.

2.2 Personalization in Cultural Heritage

Arts and culture are a significant tool to shape communities, societies, individuals, and have a primary place when it comes to implement innovations and trends, becoming a fertile ground for changes.

Over the last decades, culture heritage has been a favored domain for personalization research, experimenting with the cutting-edge technology of the day (Ardissono et al., 2012). In fact, the large amount of existing cultural heritage material, which far exceeds the museum walls, and the increasing willingness of consumers to being able to interact with arts, have motivated institutions to adopt web-based and mobile information's tools as a means for presenting their collections (De Benedictis et al., 2021). Cultural heritage,

museums and cultural institutions, and cultural experiences in general can foster the development of creativity, including within the learning process. For this reason, cultural heritage represents an ideal environment for stimulating and enhancing knowledge, serving as an inspiring foundation for individual cultural growth.

In the cultural heritage domain, for its vastity and heterogeneity, both based on content and geographically, the relevance of new technology and AI-based approaches is undeniable. These tools allow to aggregate information and make them available for a customized fruition, significantly impacting users' experiences (De Benedictis et al., 2021). During Covid-19 this became an impellent urge, due to forced closures and radical changes of habits. In fact, when culture became physically inaccessible, cultural institutions boosted their online presence, disrupting the sector and paving the way for new techniques to be adopted.

This change highlights, on the one hand, the need to develop alternative forms of learning and fruition, and, on the other, the great opportunities provided by technology.

Even though Covid-19 pandemic highlighted the urge of new strategies and the significant improvement brought by technologies, cultural heritage has been a privileged application domain for personalization for many years, and recent museum research also acknowledges the need for personalized, individual support. As pointed out by Falk (2009), museum visitors' experiences are composed by four dimensions: the physical, the personal, the socio-cultural context, and the identity-related aspect. Hence, proving a personal support that considers contextual and personal attributes can have a significant impact on users' experience. However, cultural heritage sites have a huge amount of information and contents, and, to enable individual users to easily access it, it is crucial to filter and to personalize. This personalization process needs to consider the individuality of the user (or the group of users), with aspects as interests, knowledge, cultural background, as well as contextual aspects, to deliver the content in the most suitable way (Ardissono et al., 2012).

The integration of internet and wireless technology has made the exploration of cultural heritage a continuous process, starting before the visit and potentially continuing indefinitely, as users can plain their visit online, explore the site, and later revisit point of interest digitally and continuing to explore. However, novel technologies also introduce

new challenges: firstly, largely web-based collections can be difficult to browse and risk to overwhelm users with too much information; secondly, visitors are highly heterogenous and require different types of information, at different levels of detail. This creates a dual challenge, on one hand visitors require assistance in locating relevant information, while on the other hand, providing them with suitable content is difficult because their interests and needs are unknown.

While technology-based personalization of cultural heritage started back in the '90s, when pioneers projects developed techniques aimed at adapting suggestions and presentation of information to the individual users, museums research studies started to explore research on personalized-based services only in the last few years (Ardissono et al., 2012).

2.2.1 Methods and techniques for personalization in cultural heritage over the decades

2.2.1.1 Early applications of personalization

Personalization of cultural heritage can be traces back to the early '90s, when some of the adaptive hypermedia systems looked at museum content (AlFresco, Stock et al., 1993; Oberlander et al., 1998) and tourism (Fink at al., 1998) as possible applications domain. With the advent of the museum, museums focused on creating information-rich web site, and personalization was considered to be a good way to support users to not feel overwhelmed and being able to browse the collections easily. The list of museums and institutions who explored personalization techniques is endless, as it became essential. For instance, the online Marble Museum of Carrara (Paternò, & Mancini, 1999) offered three choices to users to personalize their experience: (1) a static stereotype of either 'tourist', 'student', or 'expert', which gave predefined views on the information; (2) a user profile that should be set manually, selecting which information was preferred; and (3) an adaptive virtual guide that suggested additional relevant information based on what had been seen.

Figure 7: The initial access for the different users.

Source: Paternò, & Mancini, 1999

The Active WebMuseums used the metaphor of 'corridors', organizing sets of related painting dynamically, e.g., same art movement, same time frame, same artist (Kohrs & Merialdo, 2001). Collaborative filtering techniques were used to select the artworks (Konstan & Riedl, 2012), and the users could explore the collection moving along corridors and changing path at any time, exploring the content as preferred. As web technology start to be available on phones, cultural heritage applications followed, evolving in parallel with Adaptive Hypermedia and Virtual Reality. Regarding Virtual Reality, the iCITY tourtist guide (Carmagnola et al., 2008) provided recommendations about cultural events and resources to visitors in the city of Torino, either in textual format or over a city map.

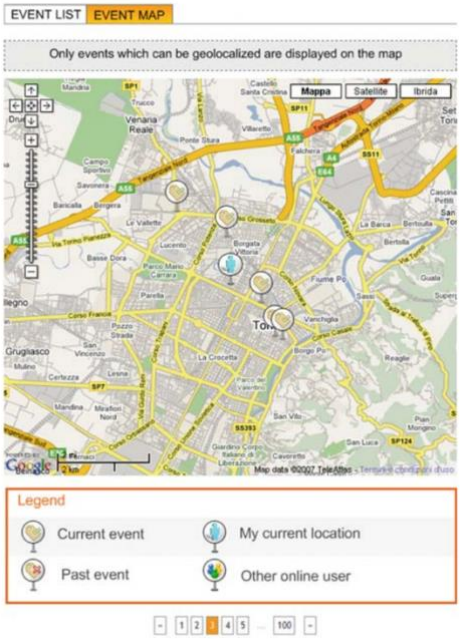


Figure 8: iCITY map: geolocalized events are displayed on a map together with the current user location

Source: Carmagnola et al., 2008

Other examples include PeVEP (Bonis et al., 2009), a platform for creating 3D virtual museums with personalized content, including both a personalized experience and the social context. The platform allowed visitors to enter non-personalized thematic rooms but had a personalized one that contained elements selected on the basis of their individual interests and behavior. In addition, users could see other visitors and chat with them, enter each other rooms, rate objects, and leave or read comments, implementing the social aspect.

Digitalization of cultural heritage items is not enough to support their retrieval in large collections, an aspect which challenges users when navigating through them (Schmitz & Black, 2008). Concerning this issue, personalization techniques can significantly impact users experience, by allowing the selection of contents based on the user or the group interests and context, thus protecting them from data overload (Ardissono et al., 2012).

2.2.1.2 Technologies 5.0 implemented in personalization: new horizons arise

Novel technology techniques can impact visitors by providing a personalized experience, but specially creating an ongoing experience: thank to websites, social media, mobile applications, users can interact with cultural institutions at any given time and can not only enhance their visit at the museum but can have a fully enhanced experience. With new tools the museum is able to engage its visitors, offer them new learning opportunities, create loyalty as it enters the daily life of users. These technologies not only impact directly the user experience, but they can also be used to process data in a more efficient way, resulting in more relevant experiences and personalized experiences for visitors. The Covid-19 pandemic is a turning point: in that moment, the urge for museums and art institutions to create new ways to communicate with users became impellent, changing irrevocably the sector. During Covid -19, in fact, museums started publishing content online urgently due to the need to overcome the closure of the museums to prevent the spread of the virus (Gutowski et al., 2020). In this scenario, publishing content online was not the answer, and museums started to implement new technologies to find innovative and unique ways to present their collections and their offer, and do it in an easy, involving way.

Nowadays, the use of social media is hugely relevant both in young ages and more mature people. In the backdrop of the digital and informational era, social media has become the mail platform for visitors to share and access information (Gao, & Yu, 2024). This affects largely also the cultural sector, in fact, with the evolution of social networks, people are increasingly willing to share their cultural consumption experiences on social media platforms (Oliveira et al., 2020). Abbasi et al. (2023) conducted empirical research that showed that informativeness, entertainment, credibility, and personalization of social media content posted by tourism organizations can influence consumers' perceived value of tourism images, generating in a higher participation in a positive e-word-of-moth and destination choices. This research underlines the influence of social media, that is able to shape consumer behavior and preferences and guide organizational strategies to engage with cultural consumers.

Social media trends is just one mean though which museums are engaging with their users and just one implementation of technology 5.0 trends.

During and after Covid -19, many museums started offering immersive interactive virtual tours. They became rapidly popular as for their simple process of acquisition and virtualization (Ferretti et al., 2022; Kersten, 2018; Lee et al., 2024; Pirbazari et al., 2022). Moreover, tools for creating panoramic tours typically offer user-friendly interfaces, making it easy to add different kinds of panoramic images and embed functionalities, which play a crucial role in the digital transformation of museums. Virtual tours incorporate hotspots and floorplans for navigation, informative panels about the exhibits, and audio guides, among other elements (Vasic et al., 2024). In some cases, traditional chatbots are involved (Chen, 2019). All these elements are in ongoing development and experimentation, shaping a constantly changing scenario.

Some technological trends include the MuBot museum chatbot platform, a platform that allows museum visitors to chat with an "intelligent" exhibit and ask questions via text or voice, to receive written or spoken answerers (Varitimiadis et al., 2020). AI technologies such as Machine Learning, Natural Language Processing/Generation and Semantic Web, are employed to learn and memorize the new knowledge. MuBot platform goal is to offer visitors an interactive and creative museum experience, able to narrate stories of the exhibited pieces in a human and engaging way.

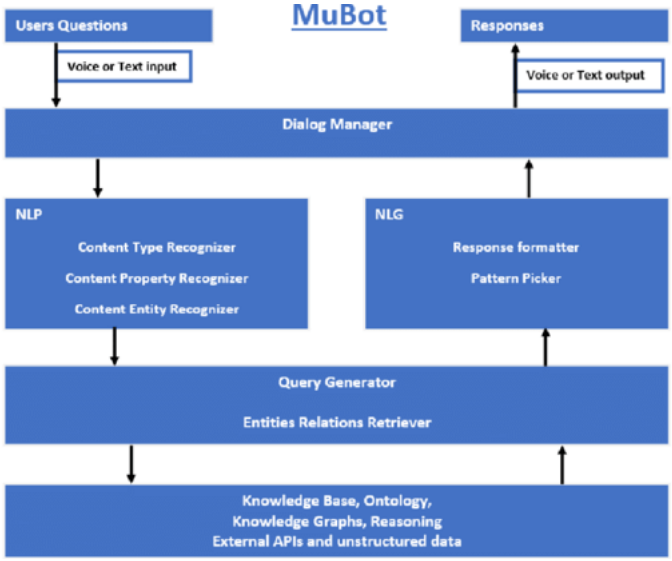


Figure 9: Museum Bot (MuBot) platform early design architecture.

Source: Varitimiadis et al., 2020

In the National Museum of Korea, research about the impact of chatbots on historical educational and their role in enhancing the overall museum experience was conducted. Noh & Hong (2021) developed three chatbot models based on embodiment and refection factors, testing them at the museum. Results showed that visitors with different learning styles interacted differently with chatbots, and their behavior in the museum varies depending on the chatbot model used.

Fabbri et al. (2023) studied how AI tools can be adapted into storytelling tools that align with the museum's path, offering personalization while preserving the museum's identity and uniqueness. In National Museum of Ravenna, Italy, a chatbot guide was created, with the purpose of suggesting artworks ad interest.

In fact, Conversational Artificial Intelligence (e.g. chatbot) can engage visitors through conversations aimed at providing them with domain knowledge about museums and their exhibits, generating and unique and personalized experience (Varitimiadisn et al., 2021).

An earlier but significant work by Gaia et al. (2019) examines the application of AI in museums and galleries to enhance visitor experience. The project objective was to develop innovative and interactive methods to attract teenagers to visit these museums, using storytelling visualization, chatbots and gamification platforms.

Other gamification examples include the collaboration between Animal Crossing, the famous Nintendo game, and museums such as the Met and the Cincinnati Art Museum, with the 2020 version of the game, Animal Crossing: New Horizon. In fact, with the purpose of interacting with a very young audience and to introduce the museum space into a pre-existing virtual space, generating a new channel of communication with users. In this version of the game, players can add works from the collection of the partnered museums to their personal virtual collection.

Figure 10: Animal Crossing x MET

Source: https://www.metmuseum.org/articles/animal-crossing-new-horizons-qr-code

Augmented Reality (AR) multi-sensory technologies are also used to create personalized museum visit experiences, combined with chatbots. In their research, Spadoni et al. (2023) describe a prototype of a visor, that equipped with AR technology, allows the user to ask questions about the exhibited objects and receive accurate and contextually relevant answers from the digital assistant, which can appear virtually as an avatar with accompanying AR multimedia information.

Other applications of new technologies include robots combined with AI-based chatbots, as the robot developed by the Smithsonian American Art Museum (Castellano et al., 2020). Pepper is equipped with a vision module that enables it to recognize visitors, estimating their age and gender, and the artworks they are looking at. This way, the robot can analyze those data and provide recommendations on artworks that may interest at the visitor.

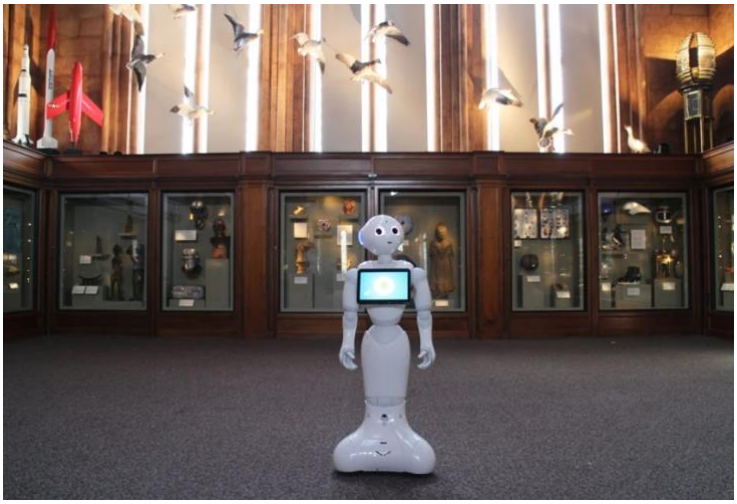


Figure 11: Pepper at the Smithsonian American Art Museum

Source: https://news.artnet.com/art-world/smithsonian-introduced-interactive-robots-facilitate-viewers-experience-1274915

The web soon became an experimental ground for personalization technology, with elements such as the Web 2.0, the semantic and social web, network infrastructures, allowing online and onsite services to converge into a set of integrates services to be used before, during and after the visit (Ardissono et al., 2012).

The cultural heritage has recognized the value of delivering different content and presentation style to different users (Falk, 2009), and some institutions have been differentiating their offer over the years, paving the way to implementation and novel technologies, such as AI-based technologies.

The cultural heritage experience is now perceived as an ongoing lifelong experience: curators and museums research are continuously looking at how visitors' attention can be captured and retained dover time, both online and onsite (Lord, 2007; Wilkening & Chung, 2009; Falk, 2009). In this scenario of continuous interaction, personalization plays a major role, being the only tool able to link past, present, and future experiences. Dealing with the social aspect of the museum experience represents a challenge for personalization, as individual user models cannot be directly applied to groups, as group members can have different interests, contains, capabilities (both educational and physical), cultural backgrounds, and so on. Therefore, the group visiting experience must be adapted to facilitate user interaction and socialization during the visit.

2.2.2 Literature review on Personalization

Cultural heritage has long been a favored domain for personalization through the years. Aspects such as the heterogeneity of the visitors, who need different types of information at varying level of detail (Falk, & Dierking, 2016); the large amount of information and content provided by arts institutions, which entail the risk of overloading and overwhelming the visitors with information (Ardissono et al., 2012); and the diversity of the organizational resources of the institutions (Antoniou et al., 2013); are all aspect that make personalization necessary.

Personalized services are based on individual characteristics, and take into account human factors, such as users' preferences (Basile et al., 2009), interests (Roes at al., 2009), personality (Naudet et al., 2015), and behavior, resulting in an enhanced visitor experience and an increased learning gain.

Personalization is a valuable tool for managing the multi-dimensional content of cultural heritage institutions, such as museums, art galleries, archeological sites, and effectively communicating it to a heterogenous audience. Personalization techniques have been applied in a growing number of cultural heritage institutions worldwide, each varying in terms o personalization factors. In fact, some focus on visitor's preferences and characteristics, such as interests (Rajaonarivo et al., 2019) and shared experiences (Sumi, & Mase, 2000), while other emphasize the technological aspect, such as space-sensitive and location-based applications (Cheverst at al., 2000) and interaction context (Tanenbaum et al., 2014; Vassilakis et al., 2018), and other focus on the social context (Tolmie et al., 2014; Fosh et al., 2016), organizational and environmental aspects (Baltrunas et al., 2012), among others.

Focusing on the human factor, various elements influence the visitor experience (Falk, & Dierking, 2016; Packer, & Ballantyne, 2016), including intrinsic motivations (Kempiak et al., 2017), perceived quality of the cultural heritage experience (Chen, & Chen, 2010), and emotional connection (Light, 2017). Insights into visitor behavior and experiences from such studies have shaped the design of technology-mediated services, which provide personalized cultural heritage activities based on multiple human factors. These factors include visitor location (Alexandridis et al., 2019), interests (Rajaonarivo et al., 2019), social behavior (Sansonetti et al., 2019), background knowledge (Wang et al., 2007), preferences (Pechenizkiy, & Calders, 2007), motivation (Dim, & Kuflik, 2014), themes

(Antoniou et al., 2016), mood (Tanenbaum, & Tomizu, 2008), visiting style (Lanir et al., 2017), visit duration and viewing time (Bohnert, & Zukerman, 2014), visit history (Petrelli, & Not, 2005), and accessibility needs such as disabilities (Ghiani et al., 2008). Several frameworks have been developed based on these human factors, mainly focusing on users models that leverage visitors' preferences and interests through either active interaction (Pechenizkiy, & Calders, 2007) or passive observation (Karaman et al., 2013), at both individual and group level (Hong et al., 2017). These frameworks support both implicit and explicit user modeling, providing adaptive interventions of varying characteristics, such as storytelling (Pujol et al., 2013). Often, these interventions are delivered by recommender systems, which provide adaptations to different aspects, such as exhibit content (Cramer et al., 2008), visitors' personality traits (Naudet et al., 2015), and visitors' location and trajectory (Rodríguez-Hernández et al., 2017). These frameworks can be used by cultural heritage stakeholders to design adaptive activities that integrate emerging technologies, including the Internet of Things (Ardito et al., 2017), blending of physical and digital worlds (Petrelli et al., 2017), and tangible interactions in cultural heritage contexts (Not, & Petrelli, 2018).

2.3 Word-of-mouth and Emotional Engagement in Cultural Heritage

Far before Covid-19 happened, museums had shifted from a role of mere container of artworks, to an active player in the entertainment sector. Museum have faces increasing pressure to broaden their appeal and attract a broader range of visitors because of reduced museum budgets (Goulding, 2000), increased competition, and evolving visitor needs and desires (Kotler, & Kotler, 1998). In fact, the museums become a player in the entertainment field, and therefore competes with other leisure activities (theatre, cinema, restaurants), and need to increase their offer. Consequently, the focus of museums shifts from their collection to their audience (Kotler, & Kotler, 2000), and research in the field shift to facilitating satisfying visitor experiences (McIntosh, 1999; Chan, 2009).

It is widely recognized that the quality of customer experience is a fundamental element in creating value (Pencarelli, & Forlani, 2018) and enhancing competitiveness in all type of organizations (Homburg et al., 2015). In fact, customers interest is attracted by unique and memorable experiences, rather than simply purchasing service delivery or quality

(Pine, & Gilmore, 1998; Kim, & Chen, 2019). As museums adopt a more marketing-oriented approach, they need to center their research focus on visitor experience (Kelly, 2004). In particular, understanding the experiential world of museum visitors and utilizing this knowledge for enhancing museum service experiences is crucial for effective marketing (Chan, 2009).

Museum visitors seek holistic and sophisticated experiences that are not only cognitive, but also emotional and social (Brida et al., 2016; Del Chiappa et al., 2014) and involve active participation (Sheng, & Chen, 2012) in experiencing cultural heritage. Studies have explored how experiences relate to satisfaction and post-purchase intentions (Harrison, & Shaw, 2004; Pekarik et al., 1999; Chan, 2009), emphasizing that in the museum context, intention to recommend is a more appropriate measure of loyalty than intention to return, as a museum visit is an "unfrequently repurchased product" (Harrison, & Shaw, 2004). In fact, differently for other purchasable element, it is reasonable to expect that most visitors will not come back to visit the museum in the short term, in the same way consumers will act with a book or a movie. As a result, intention to recommend, or a positive word of mouth, is considered to be a valid scale to measure customer satisfaction.

2.3.1 Enhancing museum experiences: the impact on visitor satisfaction

Positive and memorable customer experiences have a positive influence on customer satisfaction and value creation (Pine, & Gilmore, 1998; Schmitt, 1999), and providing high-quality services also promotes customers' loyalty, which subsequently increases the profitably of service providers (Dagger, & Sweeney, 2007). Hence, for museums is important to ensure a high-quality experience to achieve long-term growth and assure high levels of visitor satisfaction and loyalty. In the tourism sector, providing memorable or "positively remembered" experiences resulting from positive impressions end emotions (Larsen, 2007) has become a key strategy (Knutson et al., 2006; Kim, & Ritchie, 2014) and is fundamental to tourist satisfaction and revisiting intentions (Anggraeni, 2019). Some authors have emphasized the direct relationship between satisfaction coming from visitors' experience and WOM. For instance, Huo and Miller (2007) and Simpson (2000) found that visitors to small museums who experience a high level of satisfaction are more willing to recommend the museum to others.

Word of mouth is considered a consequence of environmental perceptions and customer attitudes or satisfaction (Okzul et al., 2020). Positive environmental perception may generate the spread of positive information, such as recommendations about a service provider, positive comments regarding specific aspects of a service, and encouragement for friends and family to engage with the providers of those services (Ng et al., 2011). Therefore, positive WOM is given to be a critical factor for the success of service enterprises.

2.4 Virtual Reality and Artificial Intelligence in Cultural Heritage

Contemporary museums have evolved beyond mere spaces for displaying collections and artworks, indeed, they are nowadays considered a key mean for communication, and they play a crucial role into making the culture accessible to a broad and diverse audience. An effective way to approach and engage the general public is thought the implementation of novel technologies and innovative interaction methods. These means allow curators to tailor cultural experiences to different user profiles (Carrozzino, & Bergamasco, 2010). Virtual Reality (VR) stands out as one of the most compelling and potentially effective technologies to serve this purpose and are rapidly increasing in their application in museums and cultural institutions. Virtual Reality consists of a three-dimensional reconstruction of a real or imaginary environment that totally replaces physical reality, due to the application of helmet and visors that transfer the visitor into a totally digital environment. The stimulus is not only visual: the visors are usually equipped with motion detectors and interactive buttons that give the user the ability to interact with the virtual environment in a 360-degree immersive view, and usually have audio stimulus to help the user soak into the new reality.

When discussing “new technologies”, it includes a series of visual technologies that put the image at the center of communication, and interactive technologies that require user input. These technologies fundamentally alter the learning process by letting consumers to engage with object through their senses and movements, offering a more natural and intuitive way of learning compared to traditional symbolic methods (Galluzzi, & Valentino, 1997). On one hand this helped making culture accessible to the mass audience, on the other side it has started a process of desacralization of the museum institution, blending it with the modern entertainment industry (Carrozzino, &

Bergamasco, 2010). In the contemporary scenario this type of development and change is though necessary to maintain competitiveness, and the idea of museum has evolved. Museums will address their offer to real users, potential users, internet users, and the only mean to do so is by exploiting new technologies so as to effectively communicate and promote their heritage. Virtual Reality, as a complex technology, integrates various low-level technologies (such as computer science, 3D graphics, and robotics) to create immersive digital environments that users can fully and easily interact with.

Although the use Virtual Reality (VR) is widespread in some specific sectors such as industry, medicine, and training, its adoption in the cultural heritage has rapidly increased in the recent years, with several applications. They are widely used in the field of conservation and restauration, giving the possibility to reconstruct artworks or artistic/historical environments that time have damaged or destroyed, helping to preserve and safeguard cultural assets (Levoy, 1999). VR can also serve as a tool for restoration action, performing a virtual restoration on damaged areas of artworks with affecting the original pieces (Gruen et al., 2002). Moreover, due to its compelling nature, VR is more and more used as educational, divulgation or storytelling tool, as information are conveyed primarily through sensory feedback (images, sounds, etc.) rather than linguistic tool, making it accessible to a larger number of non-specialized users (Magnenat-Thalmann, & Papagiannakis, 2005; Di Blas, & Poggi, 2006).
VR technology is being used to enhance customer experiences, and it can have different applications. For example, in contemporary art it can used to create new experiences and create new universes or new pieces of art where users can dive and explore, whereas in science or educational-based museum it can be used to improve the learning process. One of the first applications of VR in museums is London Science Museum, who launched in 2017 an immersive experience where visitors experienced descending from space within a Soyuz capsule using a Oculus powered Samsung Gear VR headset[17].

[17] https://www.borntoengineer.com/first-permanent-virtual-reality-science-museum-experience-opens

Figure 12: People at the London Science Museum using VR helmets

Source: https://www.borntoengineer.com/first-permanent-virtual-reality-science-museum-experience-opens

The implementation of Artificial Intelligence (AI) and Virtual Reality (VR) into museums generated a wave of change, profoundly impacting the way art is presented and experienced, leading to significant advancements in both technology and user engagement. AI is reshaping the art scenario in a both profound and massive way, revolutionizing its development ad unprecedented pace. Artists are using AI to create dynamic, responsive, and personalized experiences for their audiences (Manovich, 2019). Through machine learning algorithms, interactive installations can respond to visitor behaviors in real time, transforming the museum experience. In addition, AI algorithms allow to create a responsive and immersive experience for the audience, leading to more profound emotional responses (Chen, & Ibrahim, 2023). By responding to users' emotional states, interactive devices can evoke a range of feelings, such as surprise, joy, excitement, curiosity, or awe, deepening interaction with the artwork and creating a personalized experience (Xu, & Wang, 2021). In this scenario emotions can be triggered by various elements, such as visual and auditory stimuli, physical interaction with artwork, narrative, or conceptual content. Emotions can range from positive emotions, like joy or excitement, to complex and negative ones, such as fear, anxiety, confusion (Savas et al., 2021). In addition to making art more responsive and increase interaction,

AI significantly enriches the emotional experience of museum visitors, fostering a feeling of presence and immersion. In order to create impactful experiences for the viewers, designers must understand the role of emotion in aesthetic experience of interactive installation arts (Duarte et al., 2020). Designers should prioritize evoking emotions when creating interactive experiences, focusing on elements like storytelling, personalization, interactivity, user expectations, and cultural factors (Duarte et al., 2020). The emotional engagement is shaped by elements such as the design of the installation, the sensory experience provided, and the characteristics of the relevant actors (Szubielska et al., 2021; Capece, & Chivăran, 2020). For instance, the "Rain Room" installation at the Museum of Moder Art in New York[18] allows visitors to walk in the heavy rain without getting wet, creating a sense of wonder and awe among visitors and evoking a strong emotional response.

Figure 13: Rain Room at MoMa New York, 2013
Source: https://www.moma.org/calendar/exhibitions/1352

[18] https://www.moma.org/calendar/exhibitions/1352

User experience should be designed to create engagement and active participation opportunities, and the more AI becomes integrated into our lives, the more its role in enhancing engagement and emotional resonance and generating user satisfaction in art is inerasably significant (Chen, & Ibrahim, 2023). Interactive art, enhanced by Virtual Reality, by responding to the actions and input of the viewers, creates a dynamical and reciprocal relationship between the artwork and the participants, enabling individuals to engage with the artworks on their terms, influencing and shaping the experience (Edmonds, 2011). By personalizing content and feedback, AI enhances emotional responses and user engagement, creating a sense of ownership of the experience (Raptis et al., 2021).

Parallel to the development of AI, Virtual Museums have emerged as a power tool for cultural preservation and access. Virtual Museums are computer generated environment that present exhibit collections from real or fictional museums and aim to educate and entertain users by offering them an experience similar to an actual museum visit, but, at the same time, aiming to overcome the limits of physical spaces by offering unlimited access to digital artifacts and allowing users to explore anytime from anywhere (Tsichritzis, & Gibbs, 1991). These virtual environments are often enhanced by VR technology, allowing users to interact with 3D representation of artifacts, dive into immersive experiences, and engage with multimedia elements like videos, audio guides, and panoramic views. This new perception of the museum introduces new forms of presentation and interactivity, leaving behind the passive viewing of the artifacts and moving towards new experience. Virtual Museums can both be a complementary source of information to existing museums or individual approaches for the presentation of artifact collections (Ciabatti, et al., 1998). As AI and VR continue to evolve, museums are at the forefront of integrating these technologies to create more personalized, interactive, and emotionally resonant experiences.

From real-time biometric feedback in interactive installations (Röggla et al., 2017), to adaptive virtual spaces adaptable to individual preferences, AI and VR are transforming museums into dynamic places, and art is no longer perceived as a passive experience, but it can be actively experienced. These innovations are making cultural heritage more accessible and engaging for broader audiences, while also preserving the essence of traditional museums in a digital era.

2.4.1 Van Gogh the Immersive Experience

The immersive exhibition Imagine van Gogh[19] was firstly presented in Paris in 2017, and then continued touring around the world. This immersive exhibition shows the most famous pieces of the Dutch artist, but in a totally different way. The visitor is immersed in a new word, where works of art are projected onto the walls, ceilings, and floors of the museum rooms, accompanied by audio narratives or matched music.

These museums exhibitions are perfectly in line with Virtual Museums and with the concept of delivering the art experience in a new and different way, fully engaging the visitors and all its senses. The exhibition is composed by several immersive rooms, where the visitors can sit on chairs and benches and admire the colors and words ok van Gogh. The visitor finds himself surrounded by the colors raging from the famous sky of Starry Night, then in the wheat field with flight of crows, feeling the painter brushstrokes and emotional sensations. The exhibition is accompanied by a Virtual Reality experience, which, through a visor, allows visitors to walk among the works while entering a colorful and lively world and go on a journey through Vincent's canvases, entering his painting in a 360-degress prospective. These are exhibitions that focus on the viewer, no longer on the artwork, concentrating on arousing emotions and engaging the viewer in all his senses. They are therefore easy to enjoy and involve a wider segment of viewers. The educational and playful aspects come together, to create a more engaging experience in which the audience has an active role.

[19] https://vangoghexpo.com/rome/

Figure 14: Van Gogh: The Immersive Experience

Source: https://vangoghexpo.com/rome/

The van Gogh the Immersive Experience won the gold medal for Best Immersive Experience at the Eventex 2023 Awards[20] and was awarded Best Immersive Experience 2021 by USA Today[21], and was also ranked among the 12 best immersive experiences in the world by CNN[22], supporting how these exhibitions are popular between customers.

[20] https://eventex.co/winners2023
[21] https://10best.usatoday.com/awards/travel/best-immersive-art-experience-2021/
[22] https://edition.cnn.com/cnn-underscored/travel/best-immersive-experiences-around-world

Chapter 3 - Experimental Research

3.1 Theoretical Background

The topic of cultural heritage and museums as a dynamic and ever-changing institutions and their role in society has been central for the past decades. Several aspects are taken into consideration when it comes to how to enhance customer experience, as arts and creativity are considered to be essential tools to leverage for social and economic innovation (Hartely, 2005; Santagata, 2009). Culture affects individuals on different levels, such as the cognitive, emotional, and social aspect (Brida et al., 2016; Del Chiappa et al., 2014), but it can also impact community as its whole (Tusa, 2002). Therefore, the importance and the centrality of the cultural heritage sector is undeniable. It became natural for this elaborate to reflect on arts and culture, and how it merges with innovation: questioning the relationships between elements such as novel technologies, considering AI as the most disruptive and customer satisfaction, in the form of positive word-of-mouth, or reflecting on the roles of emotional engagement and personalization in this scenario. This conceptual scenario evolved from the awareness regarding arts ability to interact with individuals on their functional, educational, cognitive meaning; and on the other hand of culture ability to be leader in innovation and change.

Nevertheless, while previous chapters looked at the characteristics of the cultural sector and novel technologies, and how the former can be applied in cultural heritage to result in an enhanced customer experience, this chapter will focus on the experiment of this research. After defining the gap in the literature and the research question, the methodology and the design of the study will be described, then, the results will be presented.

3.1.1 Gap in the Literature

The topic of enhancing cultural heritage experiences has been widely discussed in both past and recent literature. Characterized by a never-ending field of research, cultural heritage has been a favored domain for experimentation with cutting-edge technology (Ardissono et al., 2012), significantly impacting users' experiences (De Benedictis at al., 2021). Museums are forced to adapt to a more marketing-oriented approach, and therefore focus their research on how to improve visitor experience (Kelly, 2004). In this scenario,

understanding the experiential aspect of cultural heritage and applying this knowledge for enhancing museum service experiences is crucial for effective marketing (Chan, 2009).

Several research were used as sources of inspiration for this research to define the conceptual framework and the interested variables.

In the first place, studies as Rossmann et al. (2020) have demonstrated that higher customer satisfaction has a direct effect on positive word-of-mouth, and the direct effect of the implementation of AI (in this study in the form of chatbots) on positive word-of-mouth and intention to reuse.

The relationship between satisfaction of visitor's experiences and positive word-of-mouth was also proved by studies such as Huo and Miller (2007) and Simpson (2000).

Several studies focus on how applications of AI and novel technologies can contribute to a higher customer satisfaction (Gaia et al., 2019; Kim, 2023).

Ferretti at al. (2022), Lee et al. (2024), Pirbazari et al. (2022) all highlight the popularity of immersive interactive virtual tours and virtual experiences in museum, emphasizing the creation of value perceived by customer, and the relative higher satisfaction.

Both research by Falk and Dierking (2016) and Packer and Ballantyne (2016) show how various elements influence visitor experience. This became relevant when looking at findings proving the connection between visitor experience and emotional connection by Light (2017).

Additionally, studies as Carrasco-Santos and Padilla-Meléndez (2016) focus on the role of customer satisfaction in in cultural activities word-of-mouth, showing the activation of emotions in visitors during cultural activities has a positive effect on their satisfaction, thereby positively influencing their word-of-mouth about the museum.

Further studies by Song and Qu (2017) emphasize the mediating role of consumption emotions on the level on customer satisfaction. Additionally, a study by Fabbri et al. (2023) studied how AI tools can be used to offer personalization services, while preserving the museum identity and uniqueness. Another study conducted by Abassi et al. (2023) showed that elements such as personalization, in the scenario of social media content poster by tourism organizations, can influence customers' perceived value of the experience and generate a higher participation in a positive e-word-of-mouth.

As of now, no existing study reflects on the impact of all these variables together on the consumer. The amin of the study is to understand if the presence of Artificial Intelligence in museums will result in a more pleasurable experience for customers, and therefore generate positive word-of-mouth. The study is also questioning if emotional engagement can have a mediating effect on this relationship, and if the use of personalization strategies can moderate the impact of AI-driven experiences on emotional engagement and word of mouth.
The choice of these variables was made because, in this constantly evolving scenario, they are considered to have a higher impact on consumers' experience.

Consequently, this experiment will look at how different *types of experiences* (**presence of AI** versus **physical museums**) may have a significant effect on *consumers' propensity to spread a positive word of mouth* regarding the experience itself.
To test this relationship, it was decided to complete the conceptual framework though the indirect effect represented by the mediating factor concerning perceived involvement, generated by the *type of experience* (**AI museum** versus **physical museum**), and thought the moderation effect concerning the *level of personalization of the experience* (**high** versus **low**).

The definition of the gap and the aim of the study, gives us the possibility to define the research question for this experiment:

"***How does the use of Artificial Intelligence in museum experiences influence Word of Mouth (WoM), and to what extent does emotional engagement mediate this relationship? Additionally, how does the depth of personalization moderate the impact of AI-driven experiences on emotional engagement and on WoM?"***

As a result, the following research hypothesis have been raised:

H1: The experience in a museum with AI influences more positively the propensity to spread a positive WoM than the experience in a physical museum without AI.

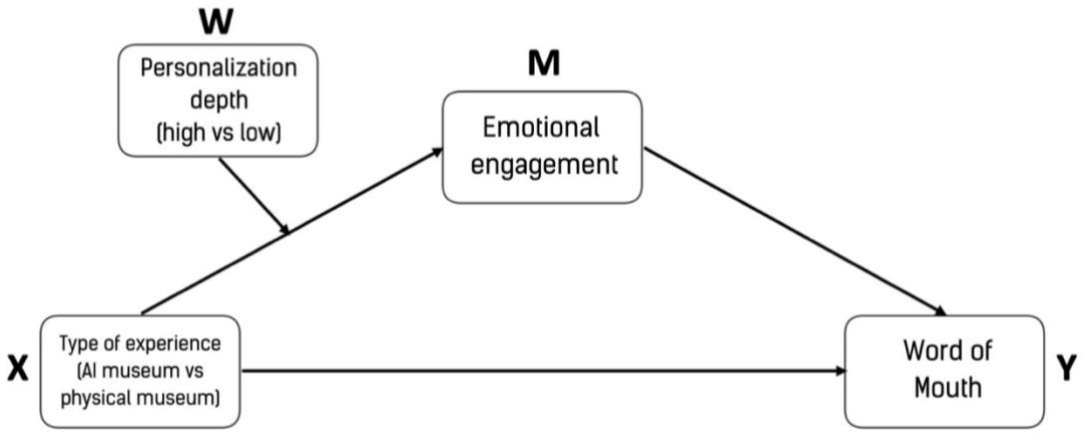
H2 (X-M): The emotional engagement mediates the relationship between the type of experience in a museum (with AI versus physical) and the propensity to spread a positive WoM. In particular, the experience in a museum with AI has a positive effect on emotional engagement rather than the experience in a physical museum without AI.

H3 (M-Y): The emotional engagement mediates the relationship between the type of experience in a museum (with AI versus physical) and the propensity to spread a positive WoM. In particular, a high level of emotional engagement leads to a positive effect on WoM.

H4 (X-W-M): Personalization moderates the relationship between the experience in a museum (with AI versus physical) and emotional engagement. In particular, a high level of personalization related to an experience in an AI museum influences emotional engagement more positively than a low level of personalization.

Following this assumption, it was decided to implement the research model using a mediating factor represented by *perceived involvement*, a moderating factor concerning the *level of personalization of the experience*, an independent variable concerning the *type of experience* and a dependent variable concerting the intention to *spread a positive word of mouth*.

Therefore, for the development of the conceptual framework, Andrew F. Hayes' model 7 was adopted, which appears to be characterized by the presence of an independent variable (X), a dependent variable (Y), a mediator (M) and a moderator (W).



3.2 Methodology

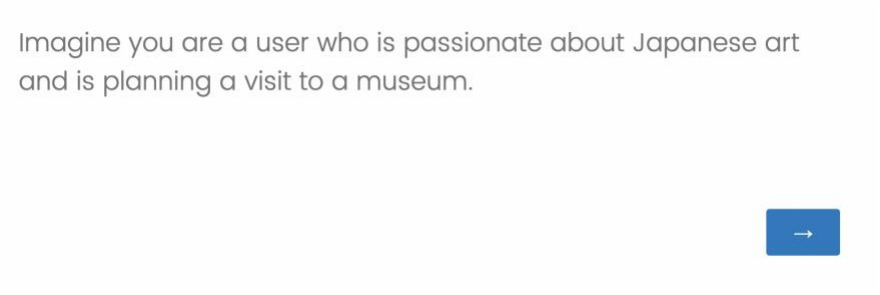
This experimental study is a 2x2 between-subjects causal conclusive research design. The results of the experiment are represented among responses to a questionnaire obtained through an independently administered survey conducted in Italy during September 2024 through the online platform Qualtrics XM. Survey participants were selected by adopting a non-probability sampling methodology. Specifically, it was decided to use a convenience method thereby taking advantage of both the ease and rapidity of access and selection of population elements. In addition, this technique involves no economic cost and is advantageous in terms of high data collection speed and high response rate. Considering the target sample, it was decided to include respondents of all registry ages, collecting data from both female and male individuals, as it was not expected that demographic variables could influence the results of the experimental research in a statistically significant way.

3.2.1 Description of the stimuli

Participants were exposed to a questionnaire featuring 9 questions, of which 7 specific and 2 demographics. To manipulate the independent variable (type of experience: **AI** versus **physical museum**) and the moderator (level of personalization: **high** versus **low**), as this study is a 2x2 research design, 4 different visual stimuli have been created and paired with a description of the experience.

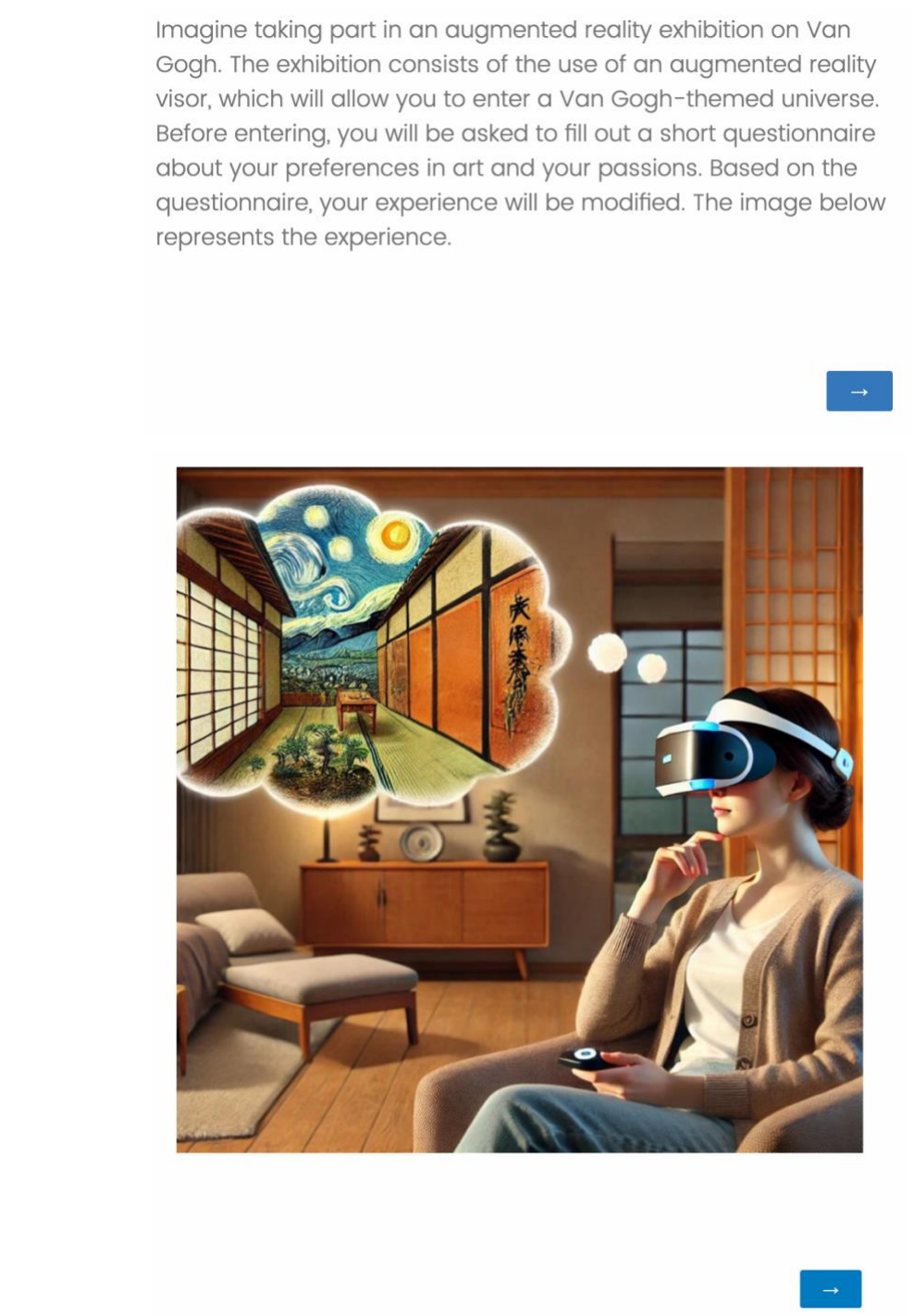
To avoid potential cognitive biases and possible conditioning, all scenarios are represented by mock-ups of experiences. In particular, all visual conjectures were made through the graphical use of ChatGTP.

In the first place, participants were asked to identity in an user passionate about Japanese art, planning a visit to a museum.

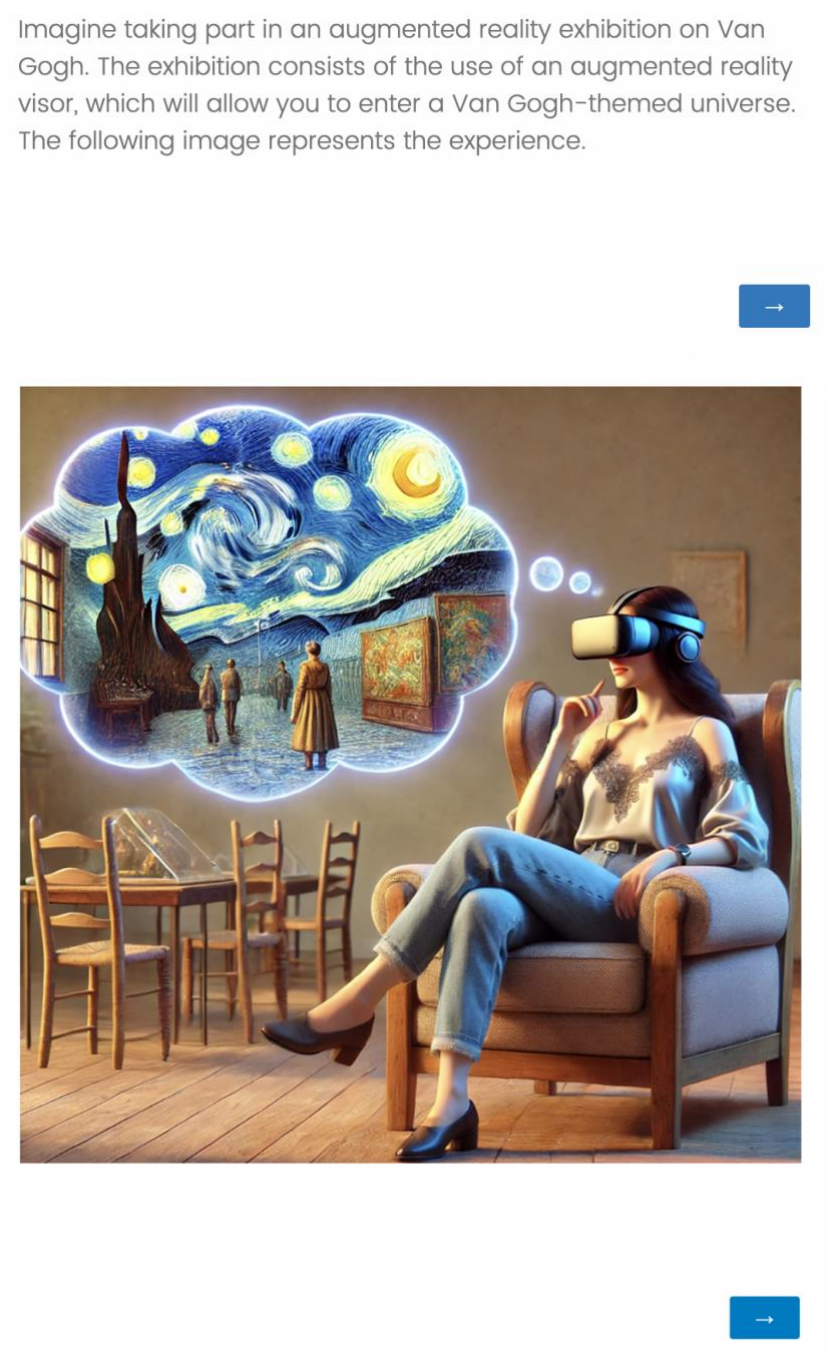


The first scenario featured an image of a **virtual museum displayed through the use of an augmented reality visor**, in which the user interacts with a **Japanese-themed Van Gogh exhibit**.

Therefore, the visual stimulus is represented by the combination of the **presence of AI** and a **high personalization** of the experience.

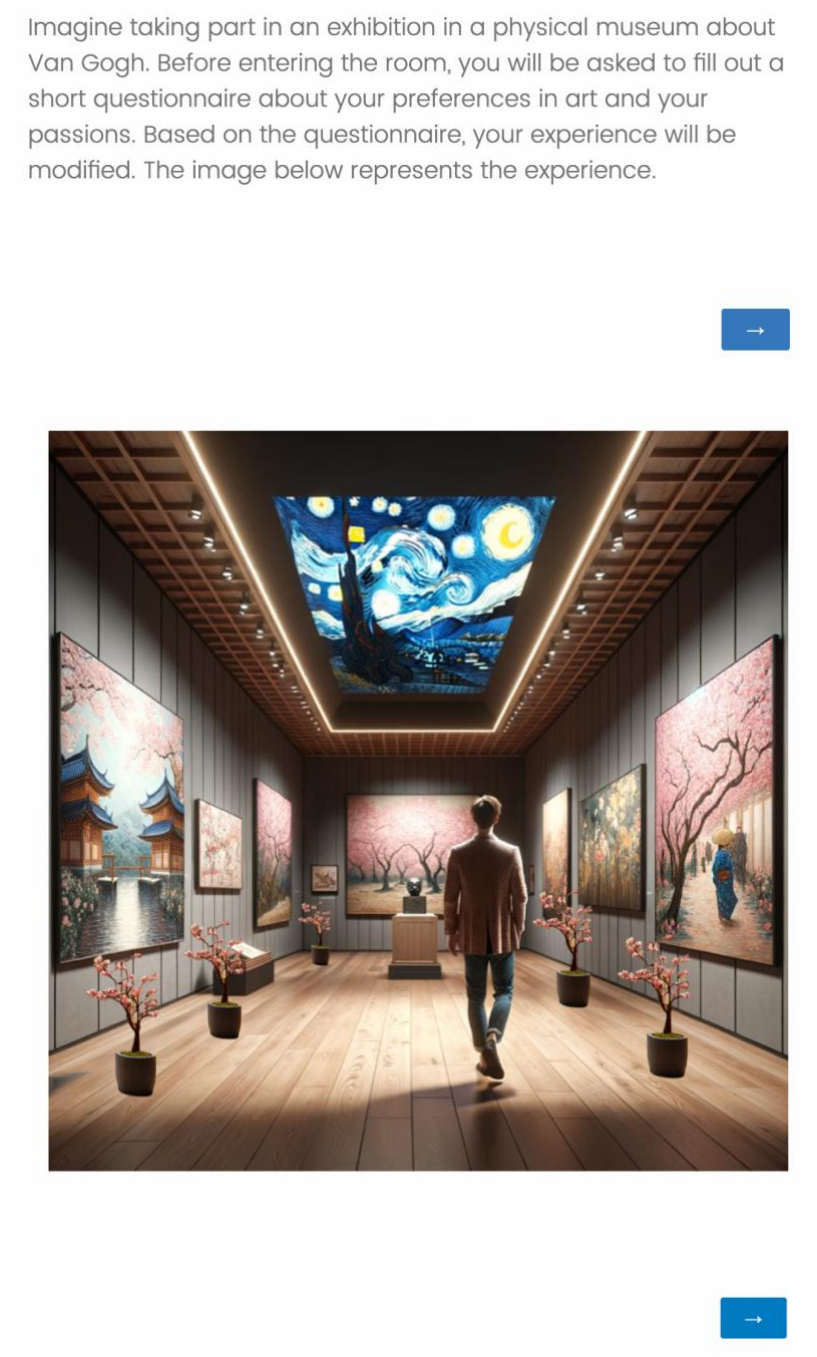


The second scenario featured ad image of a **virtual museum displayed through the use of an augmented reality visor**, in which the user interacts with a **Van Gogh exhibit**. Therefore, the visual stimulus is represented by the combination of the **presence of AI** and a **low personalization** of the experience.



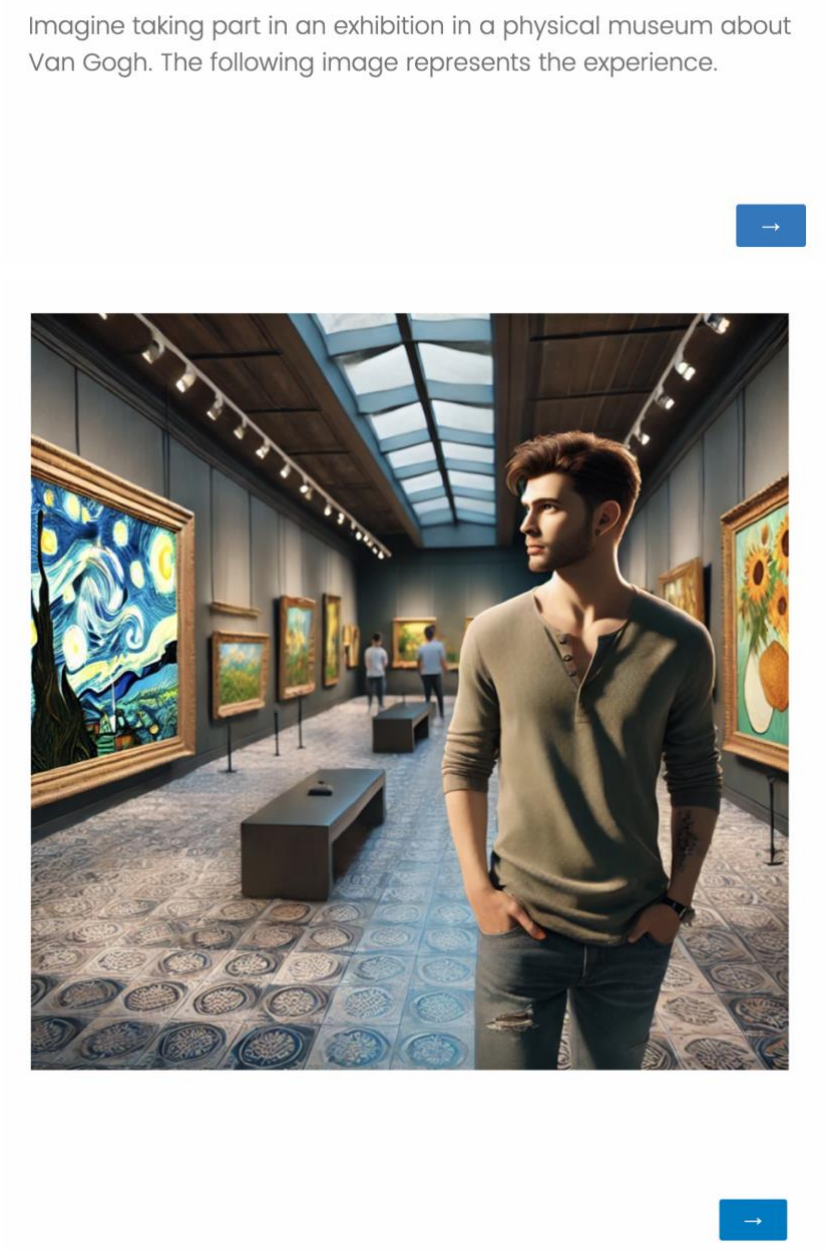
The third scenario featured ad image of a **physical museum**, in which the user interacts with a **Japanese-themed Van Gogh exhibit**.

Therefore, the visual stimulus is represented by the combination of the **absence of AI** and a **high personalization** of the experience.



The fourth scenario featured ad image of a **physical museum**, in which the user interacts with a **Van Gogh exhibit**.

Therefore, the visual stimulus is represented by the combination of the **absence of AI** and a **low personalization** of the experience.



The questionnaire was divided in 4 main parts.
At the beginning of the questionnaire, there is a small introduction featuring an explanation of the academic purpose of the experimental study. Moreover, after mentioning the name of the university, participants were ensured of the anonymity of the survey and informed about the privacy regulations of the data collection.

The second part of the survey featured a randomized block made up of four different scenarios, preceded by a brief introduction in which each respondent was asked to identify with a user who was passionate about Japanese art. Specifically, the randomization process was crucial to assure participants were exposed uniformly to all the stimuli.

The third part of the survey was introduced to respondents after they were exposed to the observation of one of the four scenarios. This block featured 7 questions: 3 related to the mediator (perceived involvement), 3 concerning the dependent variable (WoM), 1 inherent to the attention check, in which respondents were asked what they had visualized in the visual stimuli.
Besides the last question regarding the attention check, consisting of a multiple choice with three options, the other 6 questions were validated by a 7-point Likert scale.
The first scale, related to the mediator **emotional engagement**, derives from the pre-validated scale Chang, C., (2009), and Escalas, M. C. M., & Britton, J. E. (2004). Being Hooked' by Editorial Content. *Journal of Adversiting, 38*(1), 21-33.
The second scale, related to the independent variable **word of mouth**, derives from the pre-validated scale Maxham III, James, G., & Netemeyer, R. G., (2003). Firms Reap What They Sow: the Effects of Shared Values and Perceived Organizational Justice on Customers' Evaluations of Complaint Handling. *Journal of Marketing, 67* (January), 46-62.
Both scales have been readjusted to fulfil the needs of this specific experimental study.

Finally, the fourth and last part of the questionnaire consists in 2 demographic questions, where participants were asked their age and gender.

3.3 Results

3.3.1 Participants and sampling procedure

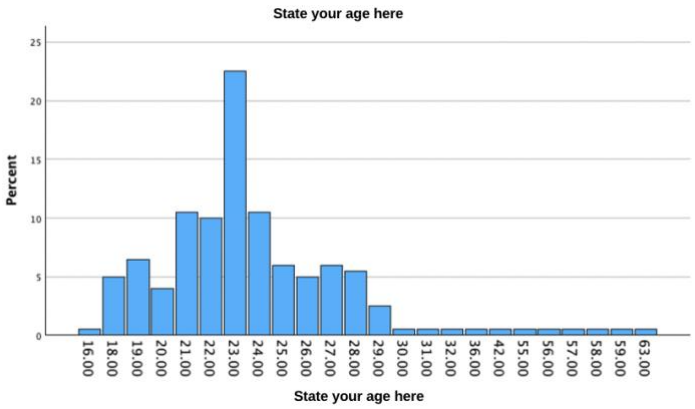
The survey was distributed to 228 individuals of which all respondents fully participated in the experimental study, answering fully and completely all the questions within the questionnaire. Of these 228 answers, 28 individuals did not answer correctly to the attention check question, therefore those responses were initially selected and subsequently discarded from the dataset during the data cleaning procedure.

Respondents were reached through an anonymous link generated by the online platform Qualtrics XM and then forwarded via instant messaging techniques and social media networks applications as main distribution channels (WhatsApp, Instagram, and e-mail). The target sample reached by the survey mainly included university students, graduate students, newly hired employees, and experienced workers located in Italy. Therefore, the average age of the respondents was found to be 24.39 years of age, although the age range fluctuated between a minimum of 16 years and a maximum of 63 years of age.

Statistics

State your age here

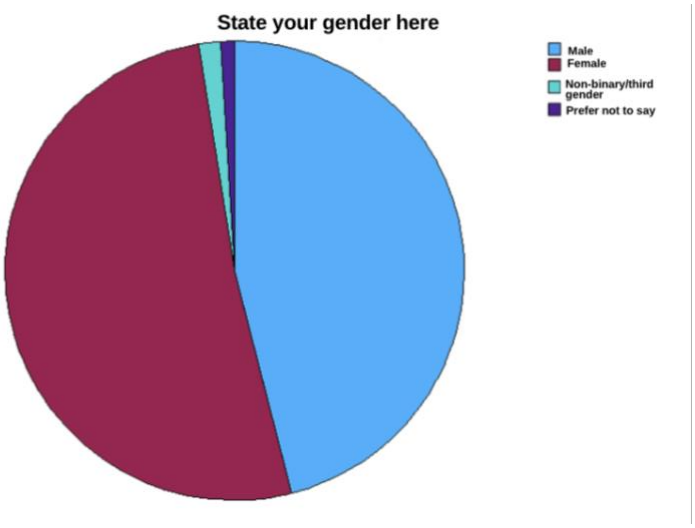
N	Valid	200
	Missing	0
Mean		24.3950
Median		23.0000
Mode		23.00
Std. Deviation		6.80445
Variance		46.300
Range		47.00
Minimum		16.00
Maximum		63.00



Regarding the gender of the respondents, the prevailing gender was found to be female, represented by 51.5% (103/200), while the male gender represented 46,0% (92/200) of all respondents. The remaining 2.5% (5/200) of respondents preferred not to identify with a specific gender or selected the third gender/non-binary option (1.5%; 3/200).

State your gender here

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	92	46.0	46.0	46.0
	Female	103	51.5	51.5	97.5
	Non binary / Third - gender	3	1.5	1.5	99.0
	Prefer not to say	2	1.0	1.0	100.0
	Total	200	100.0	100.0	



3.3.2 Data analysis

All data collected through the questionnaire provided by the survey generated on Qualtrics XM has been exported to the statistical software SPSS (Statistical Package for Social Science) to proceed with the analysis.

Initially, it was decided to perform two exploratory Factor Analyses with the aim to examine and validate all items used in the conceptual model of the experimental research. A Principal component Analysis was executed as an Extraction Method by applying

Varimax as a rotation technique. To determine the number of factors to extract, the total variance explained table was observed. Thus, verifying that, according to Kaiser's rule, the Eigenvalues were greater than 1 and that the cumulative variance percentage was greater than 60%. Additionally, both the Communalities table and the Components Matrix were observed, and all items had an extraction value greater than 0.5 and a loading score greater than 0.3. For this reason, it was decided to retain all items and, thus, to validate them.

After validating both scales, two Reliability tests were conducted to verity the reliability of the scales used. The value for the Cronbach's alpha of both theoretical constructs was observed, assuring it was greater than 60%. For what regards the mediator, results provided a value of 0.862. Regarding the scales used for the dependent variable, a value of 0.913 was recorded. Therefore, both scales were found to be reliable.

Additionally, the KMO test related to the measure of sampling adequacy was performed. Regarding the first scale concerning the mediator, a value of 0.734 was recorded. Regarding the second scale concerning the dependent variable, results provided a value of 0.756. Therefore, in both cases the level of adequacy was found to be more than adequate. Furthermore, Bartlett's test of sphericity was run, which was found to be statistically significant, finding in both cases a p-value equal to 0.001 (p-value $< \alpha =$ 0.05).

Variable Scale	KMO Test	Bartlett Test	Cronbach's Alpha
Emotional Engagement	0.734	p-value = 0.001 $< \alpha =$ 0.05	0.862

Variable Scale	KMO Test	Bartlett Test	Cronbach's Alpha
Word of Mouth	0.756	p-value = 0.001 $< \alpha =$ 0.05	0.913

3.3.3 Results of the hypotheses

After performing Factor Analyses and Reliability Tests, the mail hypotheses of the experimental research's conceptual model were evaluated to determine its statistical significance and, consequently, whether it could be validated or disproven.

H1:

To test the statistical significance of the direct hypothesis (H1), averages were compared by conducting a One-Way ANOVA to test the effect of the independent variable X (type of experience: AI museum versus physical museum) against the dependent variable Y (word of mouth). The independent variable X is of a nominal category nature, and it is separated into two different conditions, coded as 0 (physical museum) and 1 (AI museum), while the dependent variable Y is continuous and metric.

After running the ANOVA and examining the descriptive statistics table, it was observed that respondents in the group subjected to the scenario coded as 0 (100 people) had an average value of 4.7000, whereas the group exposed to the scenario labeled as 1 (100 people) had a mean value of 5.1367. Furthermore, from the ANOVA table, a p-value associated with the F-test of 0.025 was found, which was statistically significant (p-value $< \alpha = 0.05$). As a result, a statistically significant difference between the group means was identifies, thus confirming the effect of X versus Y.

Thus, the direct hypothesis H1 (main effect) is proved.

Descriptives

DV

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
.00	100	4.7000	1.52090	.15209	4.3982	5.0018	1.00	7.00
1.00	100	5.1367	1.20054	.12005	4.8985	5.3749	1.33	7.00
Total	200	4.9183	1.38408	.09787	4.7253	5.1113	1.00	7.00

ANOVA

DV

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9.534	1	9.534	5.079	.025
Within Groups	371.688	198	1.877		
Total	381.222	199			

H2-H3:

To test the statistical significance of the indirect hypothesis (H2-H3), a regression analysis was conducted using model 4 of the SPSS Process Macro extension version 4.2 by Andrew F. Hayes. The aim was to test the mediation effect caused by the mediator M (emotional engagement) against the relationship between the independent variable X (type of experience: AI museum versus physical museum) and the dependent variable Y (word of mouth). To test the success of the mediation effect, it was necessary to distinguish into two different relationships: the first between the independent variable and the mediator (H2) and the second between the mediator and the dependent variable (H3). Specifically, to demonstrate the statistical significance of both hypotheses, a 95% confidence interval was adopted with a α reference value of 5%. In addition, it was necessary to make sure that the extremes of the confidence range (LLCI = Lower Level of Confidence Interval; ULCI = Upper Level of Confidence Interval) for each hypothesis had met the sign concordance (either both positive or both negative), so that no 0 was passed within it. Finally, the coefficients β of the regression analysis of both relationships between the variables were examined to evaluate the sign and magnitude of each effect.

H2:

Regarding the first part of the indirect effect (X-M), though observation of the SPSS output it was possible to note a p-value equal to 0.0006, together with a favorable confidence interval (LLCI = 0.2860; ULCI = 1.0273) and a positive regression coefficient β equal to 0.6567. Therefore, this section of the indirect effect was found to be statistically significant, confirming hypothesis H2.

Outcome variable:

Model	coefficient	se	t	p	LLCI	ULCI
Constant	4.6300	0.1329	34.8361	0.0000	4.3679	4.8921
IV: Type of experience	0.6567	0.1880	3.4936	0.0006	0.2860	1.0273

H3:

Regarding the second part of the indirect effect (M-Y), the SPSS output revealed a p-value of 0.0006, a favorable confidence interval (LLCI = 0.7037; ULCI = 0.8878) and a positive regression coefficient β equal to 0.7957. Thus, this portion of the indirect effect was found to be statistically significant, supporting hypothesis H3.

Outcome variable:

Model	coefficient	se	t	p	LLCI	ULCI
Constant	1.0157	0.2332	4.3565	0.0000	0.5559	1.4756
IV: Type of experience	-0.0859	0.1272	-0.6748	0.5006	-0.3368	0.1651
MED: Emotional Engagement	0.7957	0.0467	17.0419	0.0000	0.7037	0.8878

H4:

To investigate the statistical significance of the moderation hypothesis (H4), a Two-Way ANOVA was performed to analyze the combined interaction effect of the independent variable X (type of experience: AI museum versus physical museum) and the moderating variable W (personalization depth: high versus low) on the mediating variable M (emotional engagement). Both the independent variable X and the moderator W are nominal categorical variables, each divided into two conditions, coded as 0 (physical museum, low personalization depth) and 1 (AI museum, high personalization depth), while the mediator M has continuous metric nature.

After conducting the ANOVA and reviewing the descriptive statistics table, it was observed that the group of respondents assigned to the condition coded 0,0 (49 individuals) had a mean value of 4.5034. The participants in the condition labeled 0,1 (51 participants) had an average value of 4.7516, those exposed to the stimulus coded 1,0 (51 individuals) had an average value of 5.2157, and the individuals exposed to the scenario labeled as 1,1 (49 people) expressed an average value of 5.3605.

Considering the between-subjects effects test table, a p-value related to the adjusted model of 0.005 emerged, which was statistically significant (p-value < $\alpha = 0.05$). Next, all effects of the independent variables (IV, MOD, IV*MOD) toward the mediating variable (MED) were observed and examined to define their statistical significance, and thus their relative success.

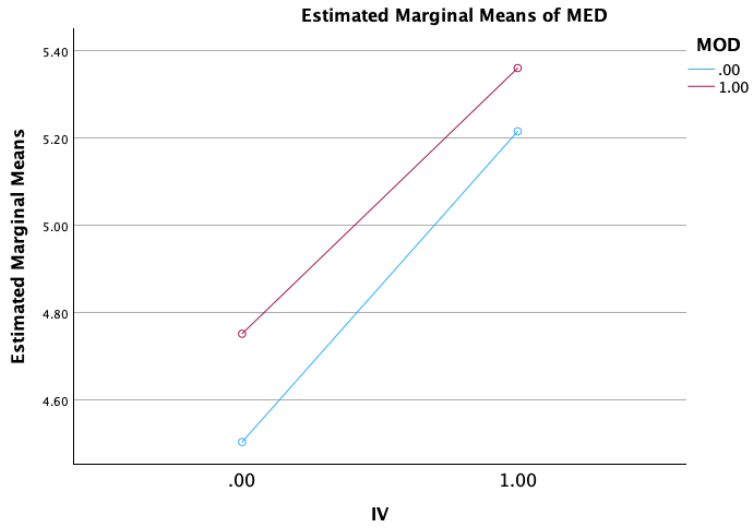
Regarding the first direct effect between X and M, a p-value of 0.001 emerged. Therefore, there the X is significant on M (p-value < $\alpha = 0.05$).

Regarding the second direct effect between W and M, a p-value of 0.298 emerged. Therefore, W is not significant on M (p-value > $\alpha = 0.05$).

Relative to the joint interaction effect between X and W toward M, a p-value of 0.784 emerged. Therefore, the interaction between X (type of experience) and W (personalization depth) towards M (emotional engagement). This means that W (personalization depth) does not significantly moderate the effect of X (type of experience) on M (emotional engagement).

There is not statistically significant difference between the group averages, and the joint interaction effect between X and W toward M is not confirmed. The analysis indicated that the X (type of experience) has a significant effect on M (emotional engagement), but W (personalization depth) does not affect either directly or through interaction with X (type of experience).

Thus, the H4 moderation hypothesis (interaction effect) is not proved.



Descriptive Statistics

Dependent Variable: MED

IV	MOD	Mean	Std. Deviation	N
.00	.00	4.5034	1.30902	49
	1.00	4.7516	1.65710	51
	Total	4.6300	1.49439	100
1.00	.00	5.2157	1.19596	51
	1.00	5.3605	1.08619	49
	Total	5.2867	1.14005	100
Total	.00	4.8667	1.29663	100
	1.00	5.0500	1.43264	100
	Total	4.9583	1.36599	200

Tests of Between-Subjects Effects

Dependent Variable: MED

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	23.625[a]	3	7.875	4.439	.005
Intercept	4914.022	1	4914.022	2770.099	<.001
IV	21.811	1	21.811	12.295	<.001
MOD	1.931	1	1.931	1.088	.298
IV * MOD	.134	1	.134	.075	.784
Error	347.695	196	1.774		
Total	5288.333	200			
Corrected Total	371.319	199			

a. R Squared = .064 (Adjusted R Squared = .049)

Chapter 4 – General Discussions

4.1 Theoretical Contributions

This experimental study contributes to existing literature on customer marketing in cultural heritage by providing evidence of the impact of the use of AI in cultural heritage in AI-based museums, compared to physical museums, on customer satisfaction, measured in the form of the intention to spread positive word-of-mouth. Specifically, this study confirms that the use of AI affects customers' attitude towards the experience. These findings add to previous literature exploring how the emotional engagement perceived by the visitors mediates the relationship between the type of experience and the propensity to spread a positive word-of-mouth, in a positive way. Lastly, this study proves that the depth of personalization does not act as a moderating variable between the experience in a museum and emotional engagement.

Results provide evidence showing elements of support for the first three hypothesis, while the fourth and last hypothesis is not supported.

The findings of this study contribute to the present body of literature on customer marketing in cultural heritage and the positive effects of implementing new technologies in this field. First, it contributes to the understanding of how implementation of novel technologies, in particular AI-based technologies, affect customer enjoyment of the experience. Though the identification of the moderating function of emotional engagement, this study offers insights into the need for customer to be involved also from the emotional sphere, how AI-based technologies can enhance this, and how this can result in the intention to recommend, paving the way for further research in the field. The study also looks at the non-significant effect of personalization depth as a mediator, indicating that in AI-based experiences in museum higher personalization does not lead to higher emotional engagement. Therefore, personalization depth may have an impact on other aspects and may be more relevant in different when considering different scenarios.

These results provide useful insights on how experience marketing factors to implement in cultural heritage in order to create higher value for the customers.

This study confirmed existing theories by De Benedictis at al., (2021) about the enhancing role of AI-based technologies in cultural heritage experiences, and supports the studies

by Vesci et al. (2020) and Carrasco-Santos & Padilla-Meléndez (2016), looking at the relationship between museum experience and word-of-mouth. This research also supports the study by Rossmann et al. (2020) on the direct effect of customer satisfaction on the willingness to share a positive word-of-mouth, and the direct effect of AI-based technologies on positive word-of-mouth. Additionally, the connection between visitor experience and emotional engagement supports previous literature by Light (2017). Lastly, even though the body of literature supporting the relevance of personalization in enhanced customer experience is broad, this research does not contribute supporting the moderation effect of personalization depth regarding the type of experience, with AI or physical, and the emotional engagement.

Even though this study does not provide support for the moderating role of personalization depth in this conceptual framework, this study suggests further research to focus on this theme and to understand the role of personalization in cultural heritage experiences.

4.2 Managerial Implications

Regarding managerial implications, this study emphasizes the need for cultural heritage entities to create an enhanced customer experience to generate a higher willingness to recommend. The study suggests that cultural heritage managers invest resources into integrating novel technologies in their offer, offering visitors new ways to interact with the cultural scenario, that can both be complementary to existing ones or replace traditional methods. As the study suggests, the implementation of AI-based techniques can result into higher willingness to recommend, implementing the affluence to the experience or museum, and therefore bring higher revenues. In order to fully exploit this possibility, it is important to consider other aspects that can contribute to creating the most valuable experience for visitors.

Over the past decades the cultural sector experienced radical changes, evolving from the traditional perception of the museum as a place for just displaying art pieces. In fact, the museum, and the art itself transcended from this traditional view, evolving in a more dynamic, engaging, interactive experience. This happened when arts and culture became central in the development of cities and became an economic tool (Hartley, 2005;

Santagata, 2009a). So, since cultural heritage entered the field of entertainment, it became natural to experiment new ways for users to experience it. Several elements were taken into consideration to reach the best experience possible for customers, and this study results in several managerial implications.

The first managerial implication regards the importance to apply AI-based technologies in cultural heritage, as this allows visitors to have an innovative, more engaging, more interactive experience that can contribute to increase customer satisfaction. In particular, it is fundamental to experiment and to adapt to new technological trends and provide innovative ways to interact with arts and culture. Users are not resistant to these possibilities; in fact, they strongly appreciate it and are fascinated by new horizons. Hence, in order to achieve positive word-of-mouth, cultural heritage managers can invest in innovative AI-based experiences for their users.

The second managerial implication regards the mediating role of emotional engagement. Results provide evidence supporting the idea that the experience in a museum with AI has a positive effect on emotional engagement, and a high level of emotional engagement leads to an increasing willingness to recommend. For this reason, culture heritage managers aiming to create the ultimate experience, should consider prioritizing techniques to create emotional engagement for the visitors. Both the literature reviewed, and the result of the study underscores the importance of designing engaging and evocative experiences through emotional design, with AI facilitating immersive experiences. In fact, AI-based technologies can be used to create several stimuli for the visitors, going far beyond the visual stimuli. Thanks to immersive experiences, VR and so on, visual, auditory, sound stimuli can be used to generate higher emotional engagement, and therefore higher willingness to recommend that will result in higher affluence to the experience.

These theorical and managerial implications consist in a guide to develop more effective marketing strategies, focusing on the experience of the visitor and novel technologies, to reach successful long-term results.

4.3 Limitations and further research

Regardless of its contributions, this study has some limitations. In the first place, this study took part in Italy. These two factors result into the research only be relevant in the Italian context, as it is based on preferences of Italians' consumers. Utilizing one single country is not enough to provide empirical evidence for the findings. Future research should be conducted in more countries to evaluate broader consumers' preferences, leading to the possibility to extend the findings on a global market. Additionally, the findings' ability to be adopted extensively may be impacted by the sample's reduced size. In fact, although 200 respondents actively took part to the research, this sample might not be large enough to provide reliable and definitive findings. Additionally, other aspects regarding the sample selected, such as gender and age, can impact the trustworthiness of the results. In fact, the survey was conducted with no age restriction, resulting in participant ages ranged between 16 years and 63 years of age, with an average age of 24.39 years. AI and new technologies are expected to be more appreciated by younger generations (Gen Z and Millennials), who are more inclined to change and to new experiences. Further research should focus on targeting a younger generation, more inclined to implementation of new technologies in traditional experiences, such as art and culture. Also, two different questionnaires might be administered to two different age gaps, in order to understand different attitudes and perceptions. Another limitation regards the gender of the sample. In fact, the survey was administrated to all genders without distinction, even though data show that women are more inclined to take part to art related experiences, as the data from the Wilkening Consulting + American Alliance of Museums[23] annual report of 2023 show (70% of women visited museums against 30% of men). Further research should either focus on an only female sample, or different studies might be conducted regarding gender. Further limitations include the choice to use a quantitative methos of research, characterized by time efficiency but lacking the possibility to offer deep insights. Further research might focus on qualitative methods, conducting in depth interviews and focus groups, in order to take into accounts aspects such as tone of voice, body language, and fully explore customers' preferences. An important limitation regards the use of visual stimuli created with ChatGTP, unable to

[23] https://cthumanities.org/wp-content/uploads/2024/01/Connecticut-ALL-Museums-2023-Annual-Survey-of-Museum-Goers.pdf

describe the complexity of the situation. This might impact the accuracy of participants answers. Further research might focus either on creating more complex and more adequate stimulus, or conducting this research with qualitative methods, being therefore able to better frame the stimulus and better understand participants opinions.
Taking into consideration the traditional research method used, in this field innovative methos might be used to provide significative insights on this research. Further research should focus on innovative methods, implementing neuroscience marketing techniques. In fact, eye tracking and Galvanic Skin Response GRS can be employed to measure audience engagement and fully understand the ability of AI to enhance emotional responses and user engagement. Additionally, this experimental research might not fully represent the complexity of real-world customer satisfaction situations when several aspects simultaneously affect consumer's experiences. Further research might focus on other variables, in order to investigate different roles and influences by significant variables..

In conclusion, this study reveals the significant impact of AI-based experiences on consumer satisfaction measured in the form of the intention to share positive word-of-mouth, which emotional engagement as a crucial mediator. The results provide relevant theoretical and managerial insights, paving the way for innovative strategies in the cultural heritage field.

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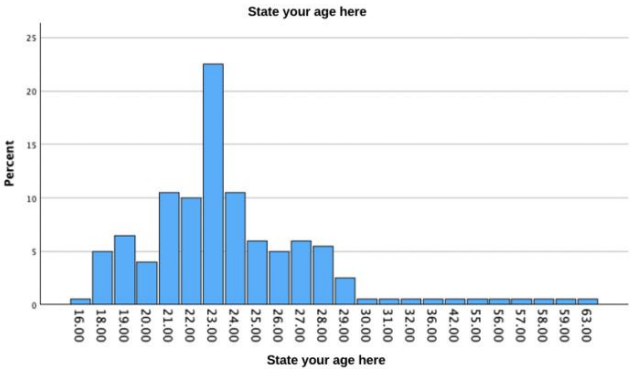
Appendices

Appendix A – Descriptive statistics: Age

Statistics

State your age here

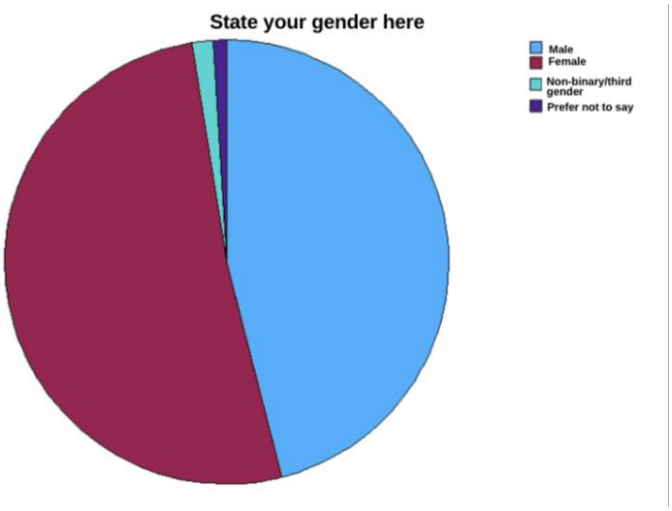
N	Valid	200
	Missing	0
Mean		24.3950
Median		23.0000
Mode		23.00
Std. Deviation		6.80445
Variance		46.300
Range		47.00
Minimum		16.00
Maximum		63.00



Appendix B – Descriptive statistics: Gender

State your gender here

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	92	46.0	46.0	46.0
	Female	103	51.5	51.5	97.5
	Non binary / Third - gender	3	1.5	1.5	99.0
	Prefer not to say	2	1.0	1.0	100.0
	Total	200	100.0	100.0	



Appendix C – Factor Analysis: Mediator

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.352	78.393	78.393	2.352	78.393	78.393
2	.353	11.768	90.161			
3	.295	9.839	100.000			

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
State your indicate on a scale of 1 (completely disagree) to 7 (completely agree) to what extent you agree or disagree with the following statements. - 1. The experience of which I have just read the description and viewed the preview caught my attention.	1.000	.804
State your indicate on a scale of 1 (completely disagree) to 7 (completely agree) to what extent you agree or disagree with the following statements. - 2. I would like to have an experience like the one I have just read the description of and previewed.	1.000	.782
State your indicate on a scale of 1 (completely disagree) to 7 (completely agree) to what extent you agree or disagree with the following statements. - 3. I was able to identify with the experience of which I just read the description and saw the preview.	1.000	.766

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component 1
State your indicate on a scale of 1 (completely disagree) to 7 (completely agree) to what extent you agree or disagree with the following statements. - 1. The experience of which I have just read the description and viewed the preview caught my attention.	.897
State your indicate on a scale of 1 (completely disagree) to 7 (completely agree) to what extent you agree or disagree with the following statements. - 2. I would like to have an experience like the one I have just read the description of and previewed.	.884
State your indicate on a scale of 1 (completely disagree) to 7 (completely agree) to what extent you agree or disagree with the following statements. - 3. I was able to identify with the experience of which I just read the description and saw the preview.	.875

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.734
Bartlett's Test of Sphericity	Approx. Chi-Square	277.264
	df	3
	Sig.	<.001

Appendix D – Reliability test: Mediator

Case Processing Summary

		N	%
Cases	Valid	200	100.0
	Excluded[a]	0	.0
	Total	200	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.862	.862	3

Appendix E – Factor Analysis: Dependent Variable

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.555	85.177	85.177	2.555	85.177	85.177
2	.250	8.343	93.520			
3	.194	6.480	100.000			

Extraction Method: Principal Component Analysis.

Communalities

	Initial	Extraction
State your indicate on a scale of 1 (completely disagree) to 7 (completely agree) to what extent you agree or disagree with the following statements. - 1. I am inclined to spread positive word of mouth about the experience I have just read the description of and previewed.	1.000	.833
State your indicate on a scale of 1 (completely disagree) to 7 (completely agree) to what extent you agree or disagree with the following statements. - 2. I would recommend the experience I have just read the description of and previewed to my friends.	1.000	.855
State your indicate on a scale of 1 (completely disagree) to 7 (completely agree) to what extent you agree or disagree with the following statements. - 3. If my friends wanted to visit a museum, I would tell them to try the experience I just read the description of and previewed.	1.000	.868

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component 1
State your indicate on a scale of 1 (completely disagree) to 7 (completely agree) to what extent you agree or disagree with the following statements. - 1. I am inclined to spread positive word of mouth about the experience I have just read the description of and previewed.	.913
State your indicate on a scale of 1 (completely disagree) to 7 (completely agree) to what extent you agree or disagree with the following statements. - 2. I would recommend the experience I have just read the description of and previewed to my friends.	.924
State your indicate on a scale of 1 (completely disagree) to 7 (completely agree) to what extent you agree or disagree with the following statements. - 3. If my friends wanted to visit a museum, I would tell them to try the experience I just read the description of and previewed.	.932

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.756
Bartlett's Test of Sphericity	Approx. Chi-Square	411.048
	df	3
	Sig.	<.001

Appendix F – Reliability test: Dependent Variable

Case Processing Summary

		N	%
Cases	Valid	200	100.0
	Excluded[a]	0	.0
	Total	200	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.913	.913	3

Appendix G – One-Way ANOVA

Descriptives

DV

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
.00	100	4.7000	1.52090	.15209	4.3982	5.0018	1.00	7.00
1.00	100	5.1367	1.20054	.12005	4.8985	5.3749	1.33	7.00
Total	200	4.9183	1.38408	.09787	4.7253	5.1113	1.00	7.00

ANOVA

DV

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9.534	1	9.534	5.079	.025
Within Groups	371.688	198	1.877		
Total	381.222	199			

Appendix H – Regression analysis model 4

```
Run MATRIX procedure:

*************** PROCESS Procedure for SPSS Version 4.2 beta ***************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************
Model  : 4
    Y  : DV
    X  : IV
    M  : MED

Sample
Size:  200

**************************************************************************
OUTCOME VARIABLE:
 MED

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .2410      .0581     1.7665    12.2055     1.0000   198.0000      .0006

Model
              coeff         se          t          p       LLCI       ULCI
constant     4.6300      .1329    34.8361      .0000     4.3679     4.8921
IV            .6567      .1880     3.4936      .0006      .2860     1.0273

**************************************************************************
OUTCOME VARIABLE:
 DV

Model Summary
          R       R-sq        MSE          F        df1        df2          p
      .7784      .6059      .7625   151.4653     2.0000   197.0000      .0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     1.0157      .2332     4.3565      .0000      .5559     1.4756
IV           -.0859      .1272     -.6748      .5006     -.3368      .1651
MED           .7957      .0467    17.0419      .0000      .7037      .8878


****************** DIRECT AND INDIRECT EFFECTS OF X ON Y ******************

Direct effect of X on Y
     Effect         se          t          p       LLCI       ULCI
     -.0859      .1272     -.6748      .5006     -.3368      .1651

Indirect effect(s) of X on Y:
        Effect     BootSE   BootLLCI   BootULCI
MED      .5225      .1595      .2059      .8475

************************ ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

Number of bootstrap samples for percentile bootstrap confidence intervals:
  5000

------ END MATRIX -----
```

Appendix I – Two-Way ANOVA

Between-Subjects Factors

		N
IV	.00	100
	1.00	100
MOD	.00	100
	1.00	100

Descriptive Statistics

Dependent Variable: MED

IV	MOD	Mean	Std. Deviation	N
.00	.00	4.5034	1.30902	49
	1.00	4.7516	1.65710	51
	Total	4.6300	1.49439	100
1.00	.00	5.2157	1.19596	51
	1.00	5.3605	1.08619	49
	Total	5.2867	1.14005	100
Total	.00	4.8667	1.29663	100
	1.00	5.0500	1.43264	100
	Total	4.9583	1.36599	200

Tests of Between-Subjects Effects

Dependent Variable: MED

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	23.625[a]	3	7.875	4.439	.005
Intercept	4914.022	1	4914.022	2770.099	<.001
IV	21.811	1	21.811	12.295	<.001
MOD	1.931	1	1.931	1.088	.298
IV * MOD	.134	1	.134	.075	.784
Error	347.695	196	1.774		
Total	5288.333	200			
Corrected Total	371.319	199			

a. R Squared = .064 (Adjusted R Squared = .049)