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Digitalisation Strategies for Art Museums

Master Thesis
MSc in Management
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Vienna, 10th of July 2018

Affidavit

I hereby confirm that this Master's Thesis represents my own written work and that I have used no sources and aids other than those indicated. All passages quoted from publications or paraphrased from these sources are properly cited and attributed.

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Abstract

Museums play an important role in the Austrian tourism scene and produce revenues that make a sizeable contribution to the national budget. Despite the numbers, museums of art are still far from where they could be with regards to providing truly meaningful experiences to visitors. The notion that museums exist simply to present artworks is outdated and fails to address the networked information paradigm that has become normalised through widespread internet access. Museums need to transition from serving the function of displaying artworks to that of interpreting them. One way museum professionals can begin to address this problem is by taking advantage of digital technologies to build new interpretation practices and boost audience engagement. In the past years, art institutions have begun rapid implementation of digital strategies to up their game and stay competitive among an increasing number of museums, other leisure alternatives, and home-based entertainment options. Nevertheless, this is still a relatively new endeavour and further research is required in order to provide guidance towards the technologies that will effectively contribute to visitor satisfaction and to avoid allocating funds on technology for technology's sake. The question to be answered in this paper is: *How can art museums optimize their digital strategy for different visitor types?* The purpose of the study is to identify prevalent beliefs, affect, and usage intentions towards current and future technologies. The research method follows a two-phased multi-mode approach. The first phase is a non-participant ethnographic study conducted in the Kunsthistorisches Museum in Vienna; the second phase is a cross-sectional self-report study disseminated through Facebook. Key contributions of the thesis include [1] a motivation-based segmentation of museum visitors, [2] a detailed description of beliefs, feelings, and usage intentions of different visitor types towards technology in art museums, and [3] a targeted digital strategy to optimize the museum journey for each visitor type.

Acknowledgements

Firstly, I would like to express my gratitude to my advisor professor, Dr. Astrid Dickinger, for her enthusiasm and guidance. I could not have had a better mentor for my Masters study. Besides my advisor, I would like to thank everyone who participated in the survey for their time and insightful comments. Finally, this thesis would not have been possible without the love and support of my wonderful family and partner.

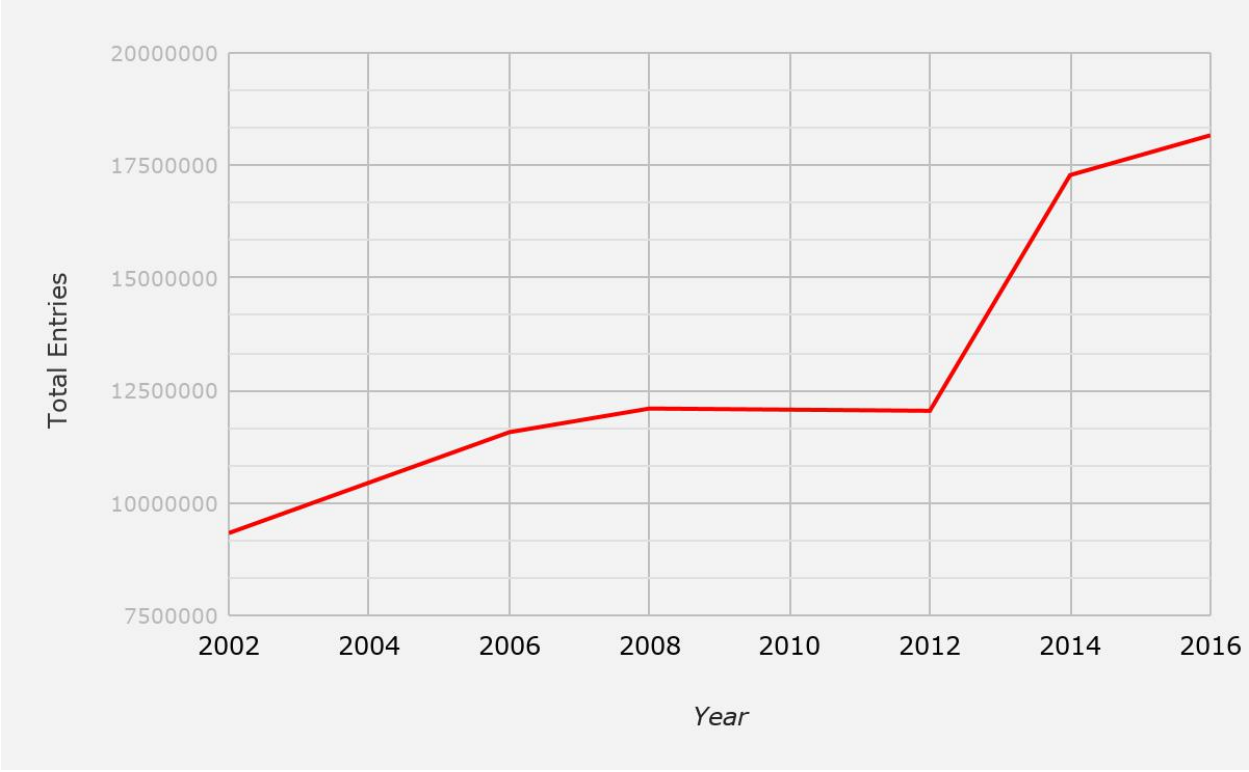
Contents

1.0 Introduction

Museums in Austria

Museums play an important role in the Austrian tourism sector and produce revenues that make a sizeable contribution to the national budget. There are a total of 553 museums across the country, the largest category being art, archeology and history museums which make up 29% of the total, followed by science, technology, and ethnology museums with 13%, and all others constituting 58%. From 2002 to 2016, museum generated revenues from entry fees increased by about 80%. In 2016 alone, € 81.746.515 in revenue from entry fees were generated by museums in Austria (EGMUS, 2016).

Figure 1: **Number of visits to museums in Austria (source: EGMUS)**



Despite the numbers, museums of art are still far from where they could be with regards to providing truly meaningful experiences to visitors. In Austria, about one in four museums are not equipped with a single computer, only 40% make use of computers for visitor information purposes (e.g. in the form of an interactive gallery system), and about 45% of museums do not have an own website (EGMUS, 2016).

The shifting role of museums

The notion that museums exist simply to present artworks is outdated and fails to address the networked information paradigm that has become normalised through widespread internet access. Moreover, museums need to reassess their role as a physical space to combat the rise of online public-access platforms displaying images of artworks in high resolution (e.g. Google Arts & Culture). What is asked for, at present, is that museums serve the function of interpreting art. According to Burton and Scott, *"Information, rather than objects, may be the primary commodity of museums in the future"*(Burton, Scott, 2003).

"Our job is to strike a balance between the artist's wishes and our responsibility as an institution to make the work accessible to the public."
Kathryn Potts, Education Director at the Whitney Museum of American Art, New York

Technology as a tool to release art's latent purpose

Despite their potential, artworks are only able to touch a minority of people with the way they have been presented by museums and galleries so far. On the right are questions and concerns in the minds of most visitors but that are rarely aired out (Gregg, 2010).

One way museum professionals can begin to address this problem is by taking advantage of digital technologies to build new interpretation practices and boost audience engagement. In the past years, art institutions have begun rapid implementation of digital strategies to stay relevant amidst an increasing number of museums, other leisure alternatives, and home-based entertainment options. Nevertheless, this is still a relatively new endeavour and further research is required in order to provide guidance towards the technologies that will effectively contribute to visitor satisfaction and to avoid allocating funds on technology for technology's sake.

I don't know where to start... I don't know what to look at first... Have I looked at this long enough? What does circa mean? How did the artist make this? Why would a museum put this on display? Is this really art?

There is a vast literature pertaining to museum visitor attitudes, motivations, and behaviours and the opportunities for technology implementation across the stages of a museum experience. Concepts, theories, and models to be discussed include those pertaining to motivation, human needs, the human unconscious, attention depletion and restoration, memory, learning, attitude development and measurement, technology acceptance, social cognition, museum experience, visitor

needs and identities, museum fatigue, group influence, self-presence and self-disclosure, gamification, database of intentions, and digital ecosystems.

The question to be answered in this paper is: *How can art museums optimize their digital strategy for different visitor types?* The proposed hypothesis is that general visitor archetypes exist and each requires a tailored digital strategy in order maximise visit satisfaction. The purpose of the study is to identify prevalent beliefs, affect, and usage intentions towards current and future technologies. Research will be market oriented in order to avoid falling for the hype and to focus first and foremost on visitor wants and needs and the means by which they can best be served.

This rest of the paper is presented in four sections; the first section is a literature review of museum history, scientific theories and concepts of consumer behaviour, specific studies on visitor behaviour in museums, the latest trends in museum technologies, and findings of similar studies. Following this is a presentation of the chosen research methodology. Next is a detailing of research findings. The final section contains a discussion of the findings and their implications, the limitations of the study, and suggestions for potential areas for further research in the field. The research method follows a two-phased multi-mode approach. The first phase is a non-participant ethnographic study conducted in the Kunsthistorisches Museum in Vienna; the second phase is a cross-sectional self-report study disseminated through Facebook.

Key contributions of the thesis include [1] a motivation-based segmentation of museum visitors, [2] a detailed description of beliefs, feelings, and usage intentions of different visitor types towards technology in art museums, and [3] a targeted digital strategy to optimize the museum journey for each visitor type.

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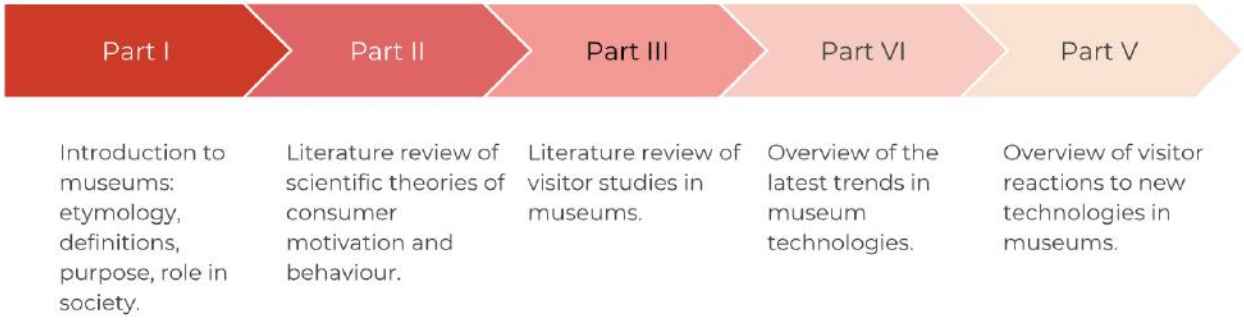
“You’ve got sadness in you, I’ve got sadness in me – and my works of art are places where the two sadnesses can meet, and therefore both of us need to feel less sad.”

— Mark Rothko

Blue, Green, and Brown, Mark Rothko, 1952

2.0 Literature review

Figure 2 : **literature review outline**



2.1 Etymology, purpose, and role in society

Etymology

The term *museum* is derived from the Greek Μουσεῖον (Mouseion) which means "seat of the Muses": these were the goddesses of literature, science, and art in Greek mythology. The mouseion was thereby a place set out exclusively for philosophical meditation, contemplation, study, and the arts (Lewis, 2000).

What are museums?

Definition I

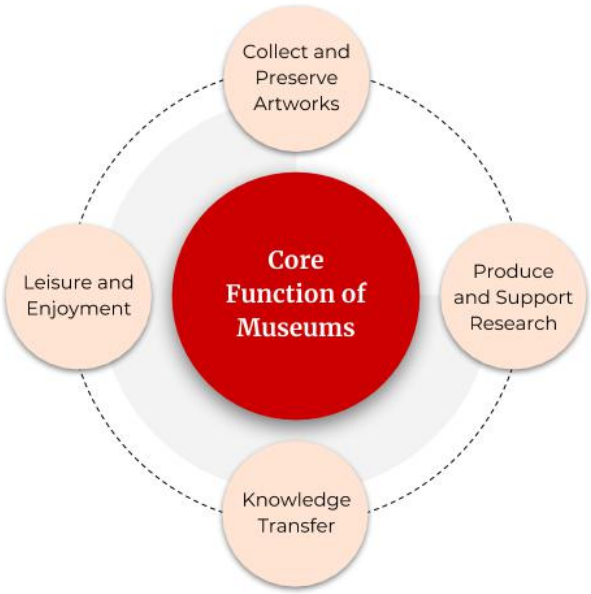
As per the ICOM Statutes of 2007, "*A museum is a non-profit, permanent institution in the service of society and its development, open to the public, which acquires, conserves, researches, communicates and exhibits the tangible and intangible heritage of humanity and its environment for the purposes of education, study and enjoyment"* (ICOM, 2007).

Definition II

According to the Museums Association, *"Museums enable people to explore collections for inspiration, learning and enjoyment. They are institutions that collect, safeguard and make accessible artefacts and specimens, which they hold in trust for society"* (Museums Association, 2008).

Traditional role

Figure 3 : **core functions of museums**



According to the definitions above, museums are designed to serve three key functions. Firstly, the collection and preservation of artworks; although, some form of museums, like the "Kunsthalle", do not actually own any artworks. They instead present constantly rotating exhibitions and offer a more more dynamic and engaging experience but are regarded as less prestigious than museums. The second function served by art museums is research. This is undertaken mostly for the purpose of identifying artworks for acquisition and coming up with new exhibition concepts. Finally, museums largely intend to educate people in an enjoyable way. To fulfill this objective at the most basic level, a museum intends to pass on knowledge on the history of humankind and the environment to its visitors. However, this is a very narrow perspective and a more broader set of outcomes is outlined in the section below (Art Museums and the Public, 2001).

New definitions and roles

Among many scholars and industry professionals, the notion of a museum has developed further than what is conveyed in previous literature. This definition by Encyclopedia Britannica provides a more modern outlook on museums by extending their function further as contributors to local quality of life, tourism attractions, tools

that promote nationalistic and civil pride, and transmitters of ideology. A museum is defined as an *"institution dedicated to preserving and interpreting the primary tangible evidence of humankind and the environment… In the museum the object, in many cases removed in time, place, and circumstance from its original context, communicates itself directly to the viewer in a way not possible through other media. Museums have been founded for a variety of purposes: to serve as recreational facilities, scholarly venues, or educational resources; to contribute to the quality of life of the areas where they are situated; to attract tourism to a region; to promote civic pride or nationalistic endeavour; or even to transmit overtly ideological concepts"* (Lewis, 2014).

Figure 4: **a kiss flash mob on pride day, Albertina Museum, Vienna**

This new definition outlines some of the big trends faced by museums at present. It was posited at the 2016 annual conference of the International Council of Museums held in Milan, Italy; it defines the museum as *'an open to all, ever changing place, in the service of humanity, where curators act as keepers and transmitters of knowledge, culture and values that are shared with co-curators in innovative and inspiring ways, giving them insight into their past and present and informing their future self-development'* (Solery, 2016).

Table 1 : **museums, then and now**

Historically, museums are:	**According to the 2016 ICOM definition, museums are:**
Places of education	Mediators of information and knowledge
Content-oriented	People-oriented
Curator-driven	Market-driven
Fixed time and place	Open access, virtual
Places of exclusion	Places of inclusion

Museum as a restorative environment

Prolonged and intense mental effort can lead to a neuropsychological condition termed directed attention fatigue (DAF). This occurs when the brain's inhibitory system is overworked in the process of suppressing an increasing number of stimuli in order to maintain focus on a particular task. Symptoms of DAF include: false perception or failure to notice external stimuli, restlessness, poor memory, confusion, decreased metacognition, impulsiveness and recklessness, acting out-of-character, poor planning, impaired judgement, irritability, moodiness, and antisocial feelings (Kaplan et al, 1993).

According to the Attention Restoration Theory, DAF can be alleviated by facilitating a restful state during awakeness by means of spending time in a restorative environment (namely wilderness and gardens). In order to qualify as restorative, an environment should be: large enough for persons to feel completely immersed, detached from habitual activities and concerns, fascinating enough to capture attention without requiring direct effort, and aligned with persons' desires. Repeatedly, studies have shown that being immersed in a restorative activity / environment has a positive impact on competence (Kaplan et al, 1993). For example, wilderness hikers performed better on a proofreading task compared to their performance pre-hike as well as the performance of the control group (Hartig, Mang, Evans, 1991).

Literature suggests that museums could also serve as restorative environments (Kaplan et al, 1993). Nevertheless, they may fail to serve as restorative environments for those visitors with less experience. Additionally, visitors may be unable to feel comfortable due to orientation and wayfinding problems.

Feeling Immersed	Immersed in the large selection of awe-inspiring artworks, sublime architecture and spatial design	✓
Removed from Daily Concerns	Content is not directly related to the daily lives of people	✓
Capturing Attention Effortlessly	The ability to appreciate art requires a degree of experience / knowledge	?
Compatible Purpose	Museums are sometimes unsuccessful in serving the needs and motivations of all visitors e.g. inexperienced visitors, children, groups, etc.	?

To sum up, based on the new literature, a museum can have multiple key functions. The outcome varies depending on both the perspective of the visitor and the surrounding political and social context. Aside from the core functions, a museum can also serve as an agent of social change, a safe space for therapy and self-reflection, a restorative environment, a platform for collaboration and ideas exchange, a reinforcer of cultural values and identity, and a key asset for tourism destinations.

2.2 Theories of human motivation, attitude, and behaviour

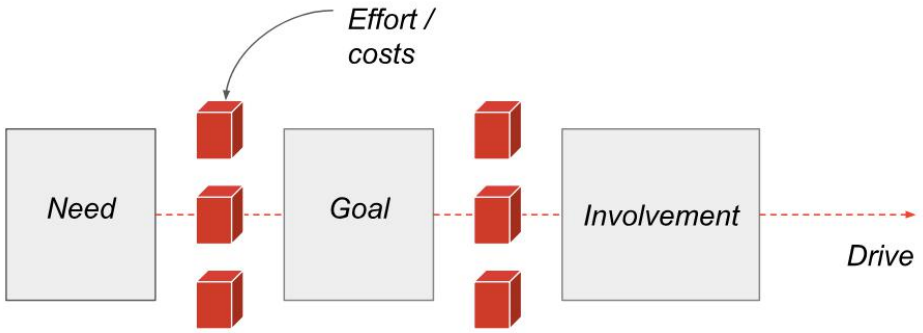
Since museums visitors are first and foremost human beings with lives outside the exhibition, it is useful to begin further up the funnel before diving into visitor studies; this section presents a few powerful and widely accepted theories of human behaviour. Each theory proposes a different set of assumptions about human nature, these are expanded on and applied to explain the basic causes and mechanisms that influence interactions with technology in museums of art.

What is Motivation?

Understanding visitor motivations is a first step towards being able to understand what visitors want and need and why they do what they do at the museum. The origin of the term ‘motivation’ can be traced back to the Latin word ‘movere’ which means ‘to move’. There are many definitions of motivation in the context of consumer behaviour studies (Zoltán Dörnyei, Ema Ushioda, 2001). Motivation can be understood as *“an activation, drive, and/or reason to engage in a certain behaviour and to maintain that behaviour... Motivation determines the direction and the strength or intensity of behaviour”* (Evans et. al, 1996). Motivation can be internal or external and positive or negative. For example a positive, external motivation occurs when a person encounters a crowd gathered around an attractive artwork and

decides to check it out. Alternatively, a positive, internal motivation occurs when a person would like to learn more about Cubism by visiting a Picasso exhibition.

Figure 5 : **the motivational process**



Solomon et al. breakdown motivation into three key dimensions: needs, goals, and drives (shown in the figure above). Motivation is sparked by an unmet **need**, this creates a state of imbalance between the desired state and the current state. This **drives** people to engage in behaviours that will reduce the gap and bring them closer towards their desired end-state or **goal**. **Involvement** is can be defined as the level of importance or interest aroused by pursuing a goal as perceived by the person engaged in the behaviour. In order to pursue a goal, persons need to pay a price. The price of attaining a goal could come in the form of a monetary payment, opportunity cost of pursuing alternatives, and/or time and energy (or **effort**). If the perceived value of the goal is sufficiently higher than the perceived costs, a person will be more likely to pursue that goal (Arnould et. al, 2004).

Motivational Conflicts

In the context of the museum experience, approach-approach conflicts refers to the inner-conflict that occurs in the minds of visitors when they are faced with the choice of two desirable alternatives e.g. the choice between two exhibitions (A and B) if both are of interest to the visior and time is limited. By choosing exhibition A over B, the visitor might experience cognitive dissonance where they feel that they have missed out on the positive attributes of experiencing exhibition B. Museums are responsible for helping visitors eliminate their cognitive dissonance. One approach to doing so could involve creating thematic tours accessible via smartphone around universal themes (e.g. relationships, power, change) featuring artworks from a diversity of artists across centuries (Solomon et al., 2006).

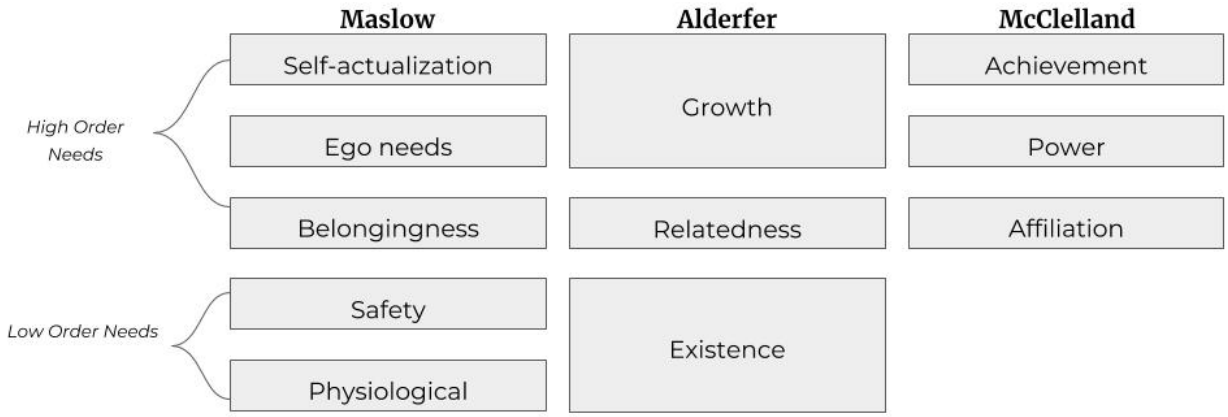
Figure 6 : **[LEFT] Vermeer, *Young Woman with a Water Pitcher* [RIGHT] Matisse, *My Room at The Beau-Rivage*.**

Approach-avoidance conflict occurs when visitors are faced with a choice that has negative associations. For example, a visitor may want to take out their smartphone to look up more information about an artwork while feeling that doing so makes them look less competent. Museums need to reduce discomfort by advertising mobile use as a welcomed part of the museum visit for curious visitors. Museums could also create and promote an online site aggregating all exhibition-related insights in order to reduce time spent on information search (Solomon et al., 2006).

When visitors face a choice between two undesirable alternatives, this is called avoidance-avoidance conflict. This could occur in group visits when members' interests are not aligned and alternatives suggested by one group member are all considered uninteresting to another (Solomon et al., 2006).

Humanistic Need Theories

Figure 7 : **Maslow, Alderfer, and McClleland**



Maslow's Hierarchy of Needs

Abraham Maslow's theory of needs presents five, sequential biogenic and psychogenic levels of human growth, these are: physiological, safety, belongingness, ego needs, and - the peak experience - self-actualisation. His theory follows a set of key assumptions. Firstly, the order of development is fixed, therefore, starting from the bottom, a person must satisfy each level completely in order to proceed upwards to the next level. According to the theory, the museum visit, as a product, could manifest itself different according to different people at different stages of the hierarchy. The museum visit could be a safe place for someone who is feeling overwhelmed, vulnerable, or stressed. The museum could present an opportunity for love and friendship to flourish through mutual experiences. Visiting a prestigious museum could be an activity which reinforces one's ego needs. Finally, a museum could provide a transcendental experience enabling a deep understanding of one's position in the universe and a connection to cultures and civilizations across history (Solomon et al., 2006).

Alderfer's ERG Model

In his ERG model, Alderfer further summarises these five levels to three: existence, relatedness, and growth. He considers physiological and safety needs to fall under existence needs, then comes acceptance and love by others (relatedness), and growth replaces ego needs and self-actualisation as a constant life-long process rather than a definite end point (Solomon et al., 2006).

McClelland's Theory of Acquired Needs

McClelland believed that a person's needs are acquired through their life experience and shaped by the environment and culture that surrounds them. The theory presents three needs: achievement, power and affiliation - each defined below (Solomon et al., 2006).

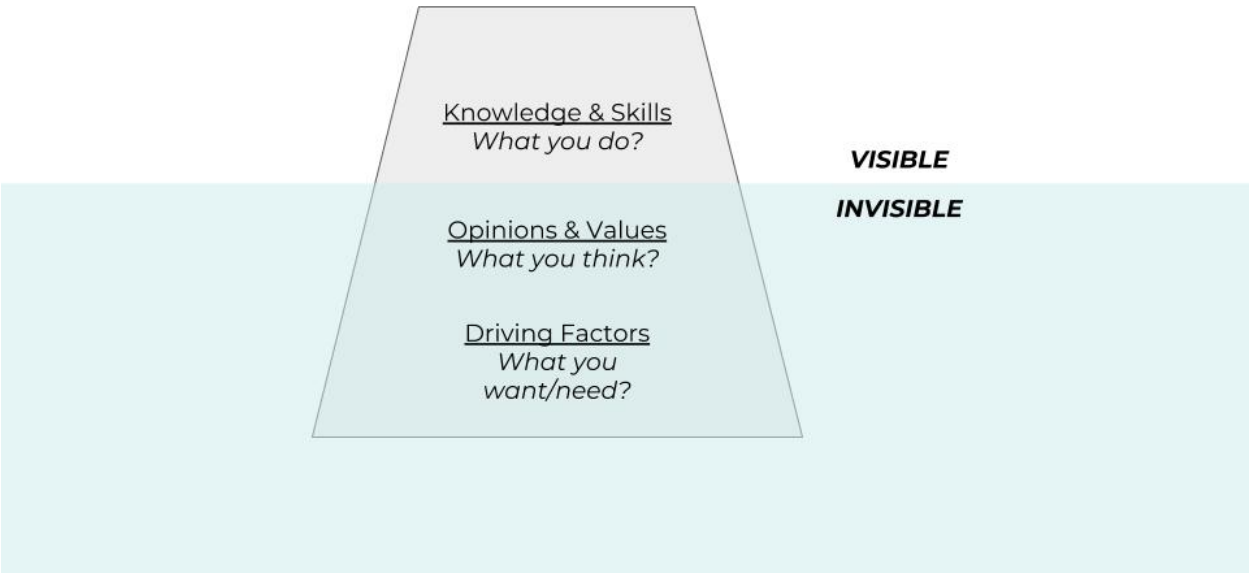
Persons with a high **need for achievement** desire personal accomplishment. They like to engage in activities that enable them to set personal goals and achieve them; they value feedback and recognition for their efforts; they like to purchase products/services that signal success. Within achievement seekers, there are those who are driven by hope for success and others by fear of failure. These behave quite differently. The former are the forward strikers; they take the ball and run with it. They seek challenges and are rewarded by performing well. The latter are the goalkeepers; they are more anxious, risk-averse, and their main reward is the relief that nothing bad happened.

Persons with a high **need for power** desire to exert influence on others and on the environment. They like to be in situations where they can act out leader-follower dynamics and purchase products and experiences that reinforce their high status.

Persons with a high **need for affiliation** desire to be in the company of others. They purchase products and services that facilitate harmonious relationship building. They tend to conform to the wishes of the group and favour collaboration over competition.

He posits everyone possess all three needs at varying levels and that, most often, one is dominant in each person. He found that people who acquire a particular need behave differently from those who have not. Moreover, people's needs and drives are not always evident to themselves, they are deeply psychological and, for this reason, there are obvious difficulties barring museums form being able to fully understand what visitors want and think (Solomon et al., 2006)

Figure 8 : **McClelland's Iceberg Model**



Finally, it is difficult to prove a causal relationship between needs and behaviours. Different persons may behave differently to satisfy the same need. For example, two visitors - John and Peter - both use an interactive touch screen display at the entrance of the museum showcasing exhibitions on a map. John does so to locate the artworks of a particular artist he desires to learn more about. Peter does so because he has no preconception of what he wants to do or see and looks for inspiration. Likewise, the same behaviour can serve to satisfy different needs. In this case, John and Peter both choose to experience the museum without the aid of an audio guide. John does so because he has a high need for power and desires to direct his own visit while Peter does so because he comes with his daughter and desires to spend quality time with her.

Depth Psychology

Freudian Theory

Sigmund Freud presented a set of influential yet controversial assumptions about human behaviour. He claims that *"human behaviour stems from a fundamental conflict between a person's desire to gratify his or her physical needs and the necessity to function as a responsible member of society"* (Solomon et al., 2006). According to Freudian theory, the psyche is constituted from three parts: the *id* (the

egocentric, pleasure-seeking self), the *ego* (the mediator, communicates between the ego and the superego), and the *superego* (the conscience, the self that internalizes society's rules and virtues (Solomon et al., 2006).

Carl Jung's Theory of The Unconscious, 1933

Inspired heavily by Sigmund Freud's concept of id, ego, and superego, Carl Jung presents the personal and the collective unconscious as the fundamental sources of human motivation. The personal unconscious contains all *"previously conscious experiences that have been repressed, forgotten, suppressed, or ignored"* (Arnould et. al, 2004). The collective unconscious is referred to as *"a storehouse of latent memory traces, or archetypes, inherited from the human ancestral past"* (Arnould et. al, 2004). With the archetypes, Jung posits that there is a limited set of ways in which humans react to the world; this is why common symbols and myths are found in different cultures thousands of kilometers apart, dating back centuries e.g. mother nature. By referencing universal myths, symbols, and imagery, museums could communicate with and serve visitors on a level that transcends culture, age, education, etc.

Figure 9 : **screenshot of KHM Stories Mobile App**

Rather than group artworks chronologically, museums could group artworks functionally; for example, a gallery devoted to addressing the agonies of love (Botton, Armstrong, 2016). A number of innovative museums are built around this line of thought, including: The Museum of Broken Relationships based in Zagreb (physical and virtual public space), The Museum of Failure in Sweden, and The Rijksmuseum in Amsterdam which held a temporary exhibit grouping artworks by themes like fortune, politics, love, money, sex, and memory (Tattoli, 2015).

Attitudes and Behaviour

Attitude is a widely popular term that can be defined differently depending on the context. In terms of consumer behaviour, Solomon et al. define attitude as *"a lasting, general evaluation of people (including oneself), objects, advertisements, or issues"* (Solomon et al., 2006). Anything towards which an attitude is held is called *'an attitude object'*.

Schemas and Memory

According to Jean Piaget, as a person grows and tries to make sense their experiences, they construct schemas. A schema is a mental construct that organises collections of beliefs and feelings under one umbrella. By organising external stimuli in this way, people are able to control attention, reconstruct memory, and recognize and recall events to which they had been previously exposed (Bartlett, 1932). Schemata can be categorized into four groups: self, person, role, and event schemata. A **self schema** contains information about one's own personality, appearance, and behaviour. A **person schema** assigns certain traits and behaviours to types of people that often exhibit them. A **role schema** includes information about people and their typical behaviours in specific social situations. An **event schema** (also called a script) includes knowledge about the expected sequence of events in a given situation (Bartlett, 1932).

Script Theory

According to script theory, *"a script consists of a sequence of goal directed actions that are causally and temporally ordered and includes the relevant people, objects and locations"*. Working to understand visitors' scripts is a key step towards uncovering beliefs about what constitutes a museum visit and getting an inside look into what is required in order to nudge desired behaviours (Erasmus, 2010).

Table 2 : **a basic script for a solo art museum visit**

Scene 1: **Entering**	Walk into the museum, eyes on the ticket booth, walk to ticket booth, stand in line, scan ticket options, choose ticket, approach receptionist, 'I want ticket' to receptionist, visitor gives money to receptionist, receptionist gives ticket to visitor, visitor takes museum map from display, visitor walks away
Scene 2: **Orientating**	Visitor stops and explores the map, visitor chooses exhibition, visitor scans area for signage to the exhibition, visitor makes their way to the chosen exhibition
Scene 3: **Experiencing**	Visitor walks around the exhibition, visitor stops at artworks of interest, visitor observes artworks and reads labels, visitor takes photos of some artworks/labels, visitor has walked through the entire exhibit
Scene 4: **Exiting**	Visitor decides to leave, visitor walks out of the exhibit, visitor makes their way to the exit, visitor walks out of museum

Scripts are written automatically and subconsciously and are stored in a person's long-term memory. In other words, people are often operating under a script without realising they are doing so. This means that museum visitors may choose to follow a familiar course of behaviour that they are comfortable with over experimenting with new concepts and tools. It could be the case that, upon encountering a new piece of technology at the art museum, visitors overlook it due to the fact that it does not have a place in their museum visit script.

Katz's Functional Theory of Attitudes

Daniel Katz (1960) believed that people form attitudes in order to build a repository of information that they believe will come in handy to them in their future. He suggests a list of functions which attitudes exist to serve. If an attitude exists because the attitude object relates to feelings of pleasure or pain than it serves a **utilitarian function**. For example, if a visit to the Louvre left Suzan feeling drained and physically exhausted, she may hold a negative attitude towards the museum. Attitudes can exist in people's minds not because of the object's actual properties but because of the value ascribed with being associated with the object; these serve a **value-expressive function**. For example, if the Kunsthistorisches Museum is positioned as an elite institution, those who want to be considered as such will hold a favourable attitude towards the museum(Solomon et al., 2006).

Figure 10 : **same Artwork Labelled Three Ways , which is best?**

Frank Lobdell
15.April.1962
Oil On Canvas

"A tightly coiled form struggles against the confines of the canvas. Thick paint, hot colors, hard lines, and a gouged surface reinforce the sense of uneasiness. They express the artist's view of the human condition as a struggle for meaning and dignity."

"The horrors of Frank Lobdell's firsthand experiences of World War II affected him deeply. With roughly coiled lines, intense colors, and a scabrous surface, Lobdell seems to be expressing the struggle of humankind, as raw paint strokes metamorphose into gnashing teeth in headless jaws."

(Gregg, 2010)

If an attitude exists to protect one's ego from perceived threats and/or weaknesses, it serves an **ego-defensive function**. For example, a person who is unable to comprehend the meaning of artworks in museums of modern art may hold an unfavourable attitude toward them in order to protect their ego from feeling stupid. Attitude that enable people to structure and make sense of past experiences in order to be able to predict future outcomes serve a **knowledge function**. If a person found the audio guide to be helpful in a museum visit, they may choose to purchase one during their next visit with the expectation that it will add value to their experience as observed previously (Solomon et al., 2006).

ABC Model of Attitudes

The ABC model views attitudes as a product of three inputs, these are: affect (feelings customers have towards an attitude object), behaviour (usage intentions of an attitude object), and cognition (beliefs about an attitude object).

Thinker : Cognitions → Affect → Behaviour

The standard learning process involves the following developments: beliefs towards an attitude object form through the gathering and storing of relevant information (e.g. through marketing communications, observation, word-of-mouth), then feelings towards the object form through an evaluation of the information base, finally a purchase decision is made. This process is time-intensive and requires a high degree of involvement. A museum visitor who engages in this attitude formation process might be a hobbyist, artist, or arts professional who frequently visits art museums. They will need a lot of time and information to engage in critical thinking and come to form an attitude about technologies in art museums (Solomon et al., 2006).

Explorer: Cognition → Behaviour → Affect

The low-involvement learning process involves having a limited knowledge about an attitude object, then making a purchase decision based on this, and finally evaluating feelings towards the object based on the purchase experience. This type of visitor is best reached through simple messages and eye-catching displays. They are not willing to expend much time or energy into whether or not to engage with a piece of museum technology (Solomon et al., 2006).

Feeler : Affect → Behaviour → Cognition

This attitude formation process is highly based on emotional responses and pleasure-driven motivations to attributes of the attitude object. A person driven to

action primarily by the affective component is more likely to engage with artworks that evoke a strong emotional response. They may choose to find out more about them through the use of a technological aid. Likewise, upon seeing another child having fun watching an educational animated video about a exhibit, a mother may take her child to watch that video too in the hopes of eliciting the same excitement in her child (Solomon et al., 2006).

Fischbein's Multi-Attribute Model

According to Fishbein and Ajzen, attitude towards a given behaviour is defined as a person's positive or negative feelings about performing that actual behaviour. As shown by the formula below, **attitude** towards a particular behaviour (A) can be determined by calculating the sum of the product of all **beliefs** about the about consequences of performing a behaviour (bi) and a subjective **evaluation** of the value of those consequences (ei).

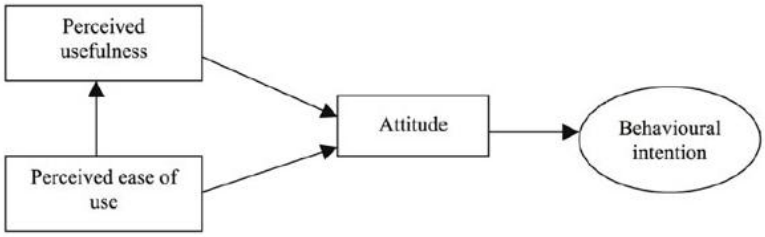
$$A = \sum b_i e_i$$

If a museum aims to be a market leader, it needs to score highest on the attributes which are considered important in the eyes of its target visitors. If, say, a technologically advanced experience is not a priority for its target segment, a museum may not obtain much benefit from investing in digitalization. Moreover, if visitor are not aware of the existing digital tools or the benefits that they can afford, a little informational campaign might be necessary (Fishbein, Ajzen, 1975).

Technology Acceptance Model

The Technology Acceptance Model (TAM) developed by Fred Davis is one of the most popular research models to predict use and acceptance of information systems and technology. Based on Fishbein and Ajzen's Theory of Reasoned Action (1975), TAM suggests that user motivation is predicted by attitude towards using the system which is predicted by two factors: the system's perceived ease of use and the system's perceived usefulness, with perceived ease of use having a direct influence on the perceived usefulness (Davis, 1989).

Figure 11 : **technology acceptance model (TAM)**



Percieved usefulness refers to a user's belief about a system's ability to enhance task performance. Percieved ease of use refers to a user's belief about the amount of physical and mental efforts required to operate a system. People tend to use systems that seem useful to them and easy to use.

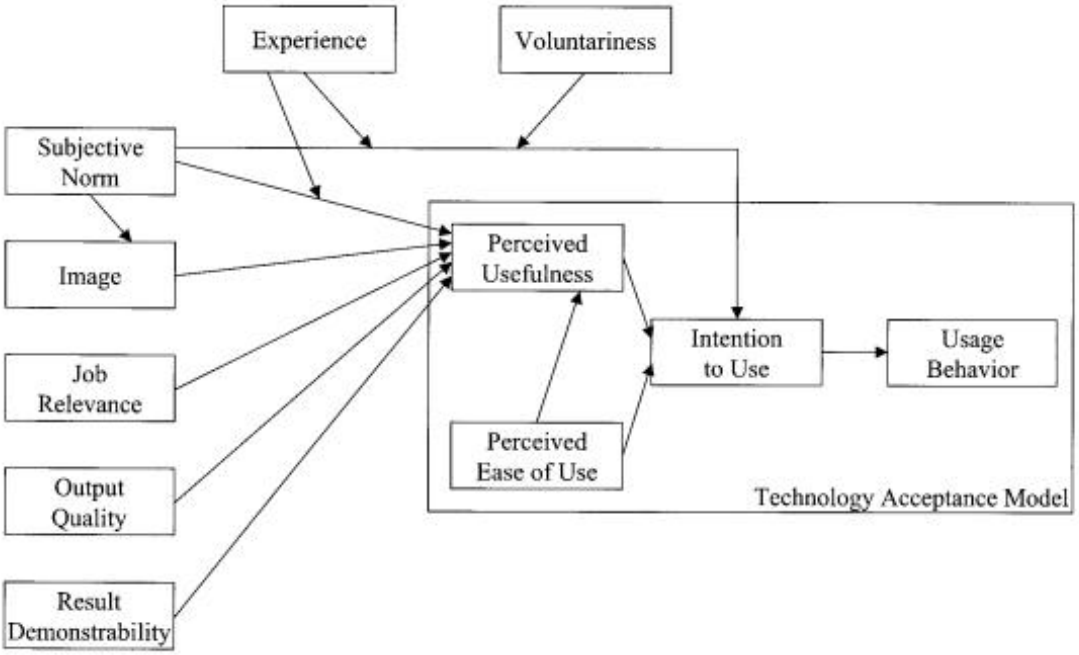
Table 3 : **six item scales developed to measure perceived usefulness and perceived ease of use (Davis, 1989).**

No.	**Perceived usefulness**	**Perceived ease of use**
1	Using this technology would enable me to accomplish tasks more quickly.	Learning to operate this technology would be easy for me.
2	Using this technology would improve my job performance.	I would find it easy to get this technology to do what I want to do.
3	Using this technology would increase my productivity.	My interaction with this technology would be clear and understandable.
4	Using this technology would enhance my effectiveness on the job.	I would find this technology flexible to interact with.
5	Using this technology would make it easier to do my job.	It would be easy for me to become skillful at using this technology.
6	I would find this technology useful in my job.	I would find this technology easy to use.

Venkatesh and Davis's TAM2, 2000

Venkatesh and Davis extended TAM to account for social influence (subhective norm, image, voluntariness), outcome expectancy, and output quality. (Venkatesh, Davis, 2000).

Figure 12 : **technology acceptance model II (TAM2)**



Social Influence

Subjective Norm	Voluntariness	Image

According to Fishbein and Ajzen, subjective norm is defined as a *"person's perception that most people who are important to him think he should or should not perform the behavior in question"* (Fishbein, Ajzen, 1975). A visitor may choose to behave in a certain way in order to comply with the opinions of others who they percieve as important. This effect is strongest when a system is first introduced and knowledge about it is vague. After the first few months, people become more familiar with the system and subjective norm looses its power as a motivating force.

Voluntariness is defined as *"the extent to which potential adopters perceive the adoption decision to be non-mandatory"* (Hartwick and Barki, 1994). According to Hartwick and Barki (1994), subjective norm has an influence on usage intentions in

mandatory settings and not voluntary ones. Moore and Benbasat (1991) define image as *"the degree to which use of an innovation is perceived to enhance one's... status in one's social system"* (Moore, Benbasat, 1991).

Cognitive Determinants

Job relevance	Output quality	Result demonstrability

According to Venkatesh and Davis, job relevance is *"a function of the importance within one's job of the set of tasks the system is capable of supporting"*. Research in human-computer interaction postulates that technology could support two types of goals: higher-level goals and lower-level actions. (Black et al. 1987) In the context of the museum journey, a higher level goal for a mother is creating a fun experience for her children and a lower-level action is moving from painting to painting or reading the labels. Going one step further, output quality is *"how well a system is perceived to perform job relevant tasks"*. Result demonstrability is defined as the *"tangibility of the results of using the innovation"*. (Moore, Benbasat, 1991) This means that if a system effectively supports job relevant tasks, but obscurely, users are unlikely to understand how useful the system really is. Result demonstrability positively correlates with usage intentions and perceived usefulness (Black et al., 1987).

Contrary to the decreasing long-term effect of subjective norm discussed above, Venkatesh and Davis consider expect that people continue to value the match between job goals and a system's ability to effectively support them as a measure for usefulness in the long-term.

Social Influence

As discussed above social influence plays a significant role towards the usage intentions of unfamiliar technologies. Conformity is defined as *"a change in beliefs or actions as a reaction to real or imagined group pressure"* (Solomon et al., 2006). Social pressure operates in two key ways. **Normative social influence** occurs when a person conforms to meet the expectations of others. **Informational social influence** occurs when a person mimics group behaviour in an ambiguous situation (under the assumption that what others do is the correct approach).

Certain factors may increase or decrease the likelihood of behaviour mimicry, these are: *cultural pressures, fear of deviance, commitment, group unanimity,* and *susceptibility to interpersonal influence* (Solomon et al., 2006). Different cultures enforce different degrees of conformity; it might be easier for Americans to tamper with a new technology at the museum given that an individualistic 'Do your own thing' attitude is the social norm compared to Japanese museum goers who may be

more pressured to conform to group values. A person's interpersonal relations may also exert significant pressures, particularly at a younger age. A person will be deterred from using technologies if they believe the act will result in a poor judgement of themselves by their peers (e.g. as incompetent or uncultured).

Albert Bandura's Social Cognitive Theory, 1986

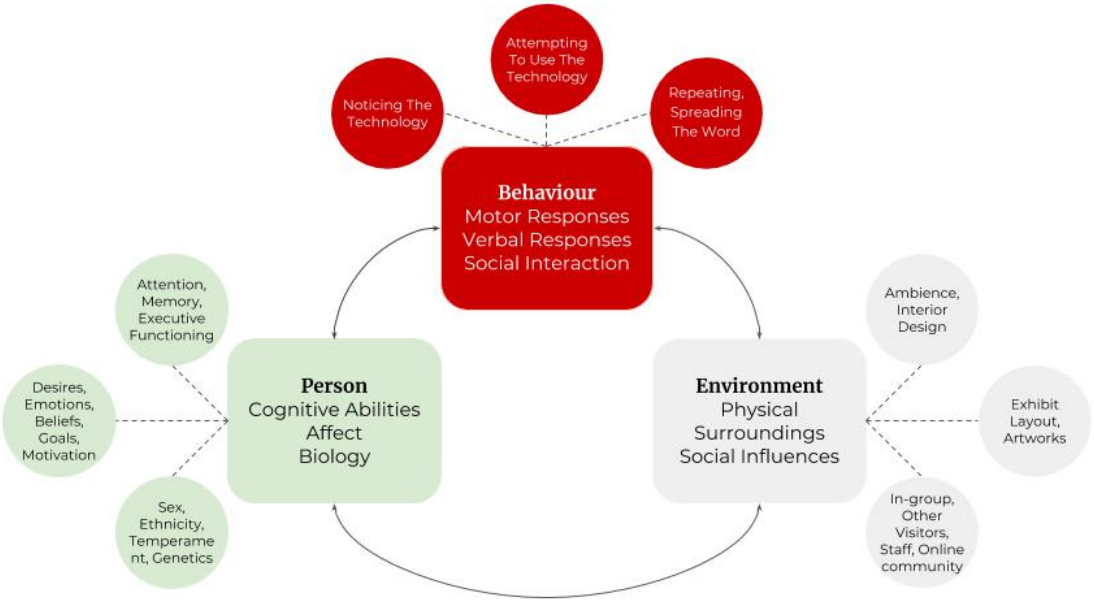
Contrary to previous views - such as those of behaviourism which claimed that learning occurred through conditioning and association, rewards and punishments - Bandura observed that learning can occur as a result of observing and imitating others' behaviours. Nevertheless, SCT integrates concepts from behaviorist, cognitive, and emotional models of human behavior, these concepts will be discussed further in the detailed analyses of the dimensions. According to SCT, a person's motivation and behaviour can be determined by behavioural, personal, and environmental factors; these factors influence each other bidirectionally (Bandura, 1986).

Personal-Behaviour Dimension

Self-efficacy

Self-efficacy refers to the degree to which a person believes they are able to deal with particular cituations. A person with a low self efficacy will try to avoid tasks they percieve to be difficult; a person's level of self-efficacy will impact their use of a particular system depending. In the context of technology use in art museums and taking the person-behaviour dimension as an example, a person's self-efficacy can influence whether or not they choose to engage with a technology new to them. At the same time if, due to social pressures, the person engages successfully with this new technology, their perception of self-efficacy may improve (Bandura, 1993).

Figure 13 : **behavioural, personal, and environmental dimensions of SCT**



Expectancy-value theory

According to expectancy-value theory, a person is motivated when they believe that performing a certain action will produce a desired outcome. The motivating influence of outcome expectancies is thus partly governed by self-beliefs of efficacy and partly by subjective outcome expectations (Bandura, 1994). In the context of an art museum, a visitor who believes that using a touchscreen interface will not provide engaging, educational content about the exhibition has a low subjective task value assigned to this activity and may choose to overlook it. Subjective task value refers to how important, useful, or enjoyable a task is perceived to be; it can be broken down into four dimensions:

1. **Attainment value** is the importance of doing well on the task. A task will have a higher attainment value to the extent that it provides the opportunity to demonstrate aspects of one's actual or ideal self-schema (overall self-perception based on past experiences and/or future self-development goals).
2. **Intrinsic value** is the enjoyment obtained through completing the task.
3. **Utility value** is the contribution that completing a task has towards obtaining current or future goals.

4. **Costs** are negative aspects of engaging in the task, such as performance anxiety, fear of failure, effort needed, time needed, lost opportunities, etc. (Eccles, 1983).

Self-regulation

Bandura (1991) views self-regulation as comprising three processes: self-observation, self-judgment, self-reaction (Bandura, 1991).

Table 4 : **self-regulation**

Self-observation	Self-judgement	Self-reaction
A person sets objectives and monitors their performance	A person compares their performance to the objectives they've set or the performance of others	A person reacts to the comparison in the form of tangible or intangible reinforcement or punishment, these can motivate future performance.

At the start of a museum visit, a person may have a goal to increase their knowledge on a particular topic, say symbolism in the works of Hieronymus Bosch. As they navigate the exhibition, look at the artworks, read labels, and listen to the audioguide, they are simultaneously acquiring information and measuring their actual performance against performance expectations. If they observe that their progress is not meeting their goals - that the desired level of detailed knowledge is not being attained - they may turn to technologies present at the exhibition (e.g. interactive display) as an information tool or otherwise use their own smartphones to search for specific answers. If through this process, goals are attained, a person might proactively set new knowledge goals; museum technologies should be able to provide dynamic systems that enable visitors to obtain more and more detailed information.

Environment-Behaviour Dimensions

Observational Learning

When a person copies the behaviours of a role model or someone with whom they identify, this is called observational learning. Observational learning might involve more than copying behaviours but also values, beliefs, and attitudes.

Table 5: **motivations to engage in modelling behaviour**

Model's qualities	The model is perceived as warm and nurturing (for children). The model possesses a desired quality. The model is in an authoritative position. The model is perceived to be similar e.g. age, sex, and interests. The model is admired or has a higher social status.
(Vicarious) Reinforcement	When you have seen others being rewarded for the behavior in the past. When you have been rewarded for imitating the behavior in the past.
Self-efficacy	When we lack confidence in our own knowledge or abilities.
Situational	When the situation is confusing, ambiguous, or unfamiliar.

Bandura identified three different types of models: a **live model** involves an actual individual acting out a behavior e.g. parent, teacher, peer; a **verbal instructional model** involves an individual providing descriptions and explanations of a behavior; a **symbolic model** involves real or fictional characters acting out behaviors in books, films, television programs, or online media. In the context of technology adoption in museums, a woman visits an art museum with her children in order to provide them with a fun and educational experience. She herself is unfamiliar with the use of QR codes and would not attempt to engage with this technology. However, upon observing another visitor with whom she identifies (e.g. also a mom with children) going through the various steps, she decides to give it a try (Bandura, 1986).

Reinforcement theory

B.F. Skinner's operant conditioning theory is one of the oldest theories explaining human motivation. The theory states that *"an individual's behavior is a function of its consequences"*. Reinforcement theory is a form of operant conditioning and focuses on the environmental factors that contribute to shaping behavior (Skinner, 1966).

Table 6 : **reinforcement theory and self regulation**

Operant Conditioning **Direct Reinforcement**	*Observational Learning* **Vicarious Reinforcement**	*Self-regulation* **Self-reinforcement**
A person is motivated to play a game provided by	A person is motivated to play a game provided by	A person is motivated to play a game provided by

the museum in anticipation of being rewarded bonus points that can be used to gain access to special exhibitions.	the museum because they have observed someone with whom they identify being rewarded for doing so.	the museum because they seek challenges and feel rewarded from winning.

2.3 Visitor studies

The focus of this paper will be on the visitor experience within museums, for this reason, the following section will focus on theories and concepts pertaining to the behaviour, attitudes, motivations, feelings, and beliefs of museum visitors. It is important to obtain a firm grasp of these concepts before going on to discover what visitors want to do with digital technologies in art museums.

Interactive Museum Model, 1992

According to Dierkling and Falk, the museum experience is an *interactive experience* which can be described as a unique combination of three main ingredients: the personal component is what the visitor brings to the experience (psychological make-up, attitudes, motivation, interests, prior knowledge / experience), the physical component is the architecture of the museum, the artworks, the ambience, and so on, and the social component is the influence of accompanying group members and unplanned interactions with other visitors and staff. The *Interactive Experience Model* predicts that at any point within the museum visit, the visitor's experience can be understood by looking at the interplay between these three components. Each component has a different level of impact depending on the visitor's motivation, psychology, and stage in the attention continuum (Dierkling, Falk, 1992).

Four Clusters of Museum Experience, 1999

Pekarik et al. categorize the various possible satisfying museum experiences intro four clusters: object experiences, cognitive experiences, introspective experiences, and social experiences. **Object experiences** are highly focused on seeing the artworks up close and personal, experiencing the awe of their beauty, and indulging in the optical pleasure. **Cognitive experiences** mainly relate to the building up of a new or existing knowledge base. **Introspective experiences** involve an internal emotional process; this includes reflecting, reminiscing, relaxing, imagining other times and cultures, and most ambitiously experiencing a moment of transcendence.

Social experiences involve spending time with loved ones or facilitating to learning or enjoyment of a child (Pekarik et al., 1999).

The study interestingly found, not only a tendency towards certain museums per type but also towards certain exhibitions. For example, an exhibition of Japanese art from the imperial collection had the following distribution (highest to lowest): object experience (54%), cognitive experience (19%), introspective experience(17%), and social experience (10%). An exhibition on the expressions of Hindu devotion, on the other hand, had the following distribution (highest to lowest): cognitive experience (51%), object and introspective experience (23% both), and social experience (4%). Gathering this sort of data, a museum would be able to implement the right digital tools per exhibition to best serve the experience type it offers (Pekarik et al., 1999).

Visitor Needs

John Falk's Identity-Centered Approach to Museum Learning, 2006

Falk's identity-centered approach aims to provide a predictive model of the museum visitor experience. It does so by following the assumption that building and supporting personal identity is the primary driving motivation behind museum visits. In this model, individuals hold multiple situational identities which *"represent responses to the needs and realities of the specific moment and circumstances"* (Falk, 2006). A person's motivations to visit differ from one visit to another; on one day this might be to provide an educaitonal experience for their children and on another it might be to relax and reflect by themselves (Falk, 2006).

The figure below illustrates the causal relationship between identity-related needs, motivation for visiting, behaviour and learning, and perceptions of satisfaction whereby identity influences motivations, which in turn directly influence behavior and learning (Falk, 2006).

Figure 14 : **identity needs and learning outcome**

Aside from identity-related motives, Falk posits that learning outcomes of museum visitors are also explained by visitors' prior knowledge and experience and their social group. He suggests clustering visitors into five types which reflect what the public perceives are the right reasons for visiting museums: the explorer, the facilitator, the professional/hobbyist, the experience seeker, and the spiritual pilgrim.

Explorers visit out of curiosity and the wish to learn something new and to be surprised. They do not care too much about the enjoyment of others in their social group and describe themselves as 'learners', 'discoverers', and 'curious people'.

Facilitators visit to satisfy the needs of someone they care about, often children and sometimes partner or other family member.

Professionalists / hobbyists possess a strong knowledge and interest in the content of the museum and mostly visit to find out more about a specific topic and to enhance their knowledge base within their professions / hobbies.

Experience seekers are often tourists and visit to have "been there, done that". They are driven by others' recommendations and opinions and expect to be entertained.

Spiritual pilgrims visit to reflect and seek refuge in a beautiful and peaceful environment (Falk, 2006).

The Smithsonian's IPOP Model, 2014

According to numerous studies and interviews conducted over a 16 year period on visitors of the Smithsonian museums, Pekarik et al. extrapolated four key dimensions of experience: ideas (concepts, linear thoughts, facts, reasons), people (emotion, human connection, socializing, storytelling), objects (visualizations, aesthetics, craftsmanship, how things work), and physical experiences (activities, appeal to five senses). These results imply that exhibitions that are able to evoke all four interests, will achieve the highest success among visitors. (Pekarik et al., 2014)

Perry's Six Visitor Needs, 1989

One of the prominent, comprehensive works on successful interactive exhibits and visitor learning has been put forth by Perry (1989). She claims that there are two objectives exhibits must achieve in order to be successful: visitors enjoy themselves at the museum and visitors learn something at the museum. Perry refined a model that describes an intrinsically motivated exhibit. This model presents six summary criteria, these are:

Table 7 : **six intrinsic motivations**

Criterion	Visitor's Need	Exhibit's Role
Curiosity	The need to see something new.	The exhibit surprises and intrigues the visitor.
Confidence	The need to boost self-esteem.	The exhibit promotes perceptions of personal competence by providing learning opportunities in a comfortable environment.
Challenge	The need to solve a challenging problem.	The exhibit maintains a balance between success and effort by presenting problems that are easy enough to solve but difficult enough to produce a sense of achievement.
Control	The need to have power and to control their course of action.	The exhibit promotes feelings of self-determination and control by letting visitors wander freely and decide for themselves what to do and see.
Play	The need to have fun.	The exhibit promotes feelings of enjoyment and playfulness.
Communication	The need to interact with other members of the group and the exhibition itself.	The exhibit stimulates meaningful interaction.

(Perry, 1993)

Attention and Perception

Attention refers to *"the extent to which processing activity is devoted to a particular stimulus"* (Solomon, 2009). Generally, there are factors that have proven to direct audiences' attention to to a particular stimuli. **Intensity** can be understood as the sensory impact of a particular stimuli. Less intense stimuli are less likely to attract attention while more intense stimuli are more likely to be noticed. A stimuli can be intense when it differs from its surroundings. When stimuli are larger in size than surroundings, they attract more attention; particular colors (e.g. red and yellow) draw more attention than others (e.g. blue); stimuli at eye level are more likely to be

noticed; and stimuli that appear in unexpected places are more attention grabbing than those which appear in their usual place. **Exposure** is another factor contributing to level of attention; when a stimulus is frequently encountered, viewers become habituated and no longer pay attention. If an element is not considered to be **relevant** to a viewer, it will not attract attention (Solomon, 2009).

Through a series of focus group studies and non-participant observation of visitors, researchers at the department of Interpretation and Research at New York's Museum of Modern Art (MoMA) stumbled upon some interesting insights about visitor attention. In general, visitors only pay attention to artwork labels if they fall within a 50 word count, room labels if they fall within a 150 word count, and introductory texts if they fall within a 300 word count. Visitors spend an average of ten seconds for per artwork - three seconds observing it and seven seconds reading the label. Finally, most visitors begin experiencing fatigue after 45 minutes in the museum (Gregg, 2010).

Museum Fatigue

Museum fatigue refers to the phenomena whereby visitors' level of interest towards the exhibit decreases as time at the exhibit progresses. The concept has been confirmed by studies dating back to the early twentieth century and generalises across demographics and culture (Davey, 2005).

According to Gilman, visitors exert efforts briefly upon entering then resign to viewing artworks *"by a passing glance"* for the rest of the visit. (Gilman, 1916) Melton found that visitor interest decreases as the number of artworks displayed in a single gallery increases. (Melton, 1935) A 1985 study at the Florida State Museum of Natural History detected a more detailed course of events. Visitors interest increases initially to a peak then plateaus for 30 to 45 minutes and finally decreases. Visitors' pace also picks up as time passes: from slow movement to cruising to selective stopping. Serrell found that the duration of visits is approximately 20 minutes regardless of topic and size. (Serrell, 1997) Various studies confirmed that visitors spend more time in exhibits at the beginning of a visit than those at the end even when traffic flow is reversed. (Marcellini, Jenssen, 1988)

Various hypotheses attempt to explain the causes of museum fatigue. Melton proposes that museum fatigue arises when visitors begin feeling physically exhausted. (Melton, 1935) Others propose that humans' limited attention capability causes museum fatigue; because visitors tend to deplete their processing capacity at the beginning, they run out of the resource at some point during the visit (Bitgood, 2013) *Mere-exposure-effect* occurs when repeated exposure to a stimulus decrease the likeness towards it, resulting in *wear out*. (Davey, 2005) Leder confirms the significance of this effect towards preference of artworks. (Leder, 2001). If an exhibit

displays similar artworks, it is more likely that wear out will occur. Bitgood presents a large amount of research positing exhibit design factors as a cause of museum fatigue, these include: *"isolation, size, contrast with setting background, sensory features..., lighting, and line-of-sight placement."* (Davey, 2005; Bitgood, 2002) Some argue that if exhibit factors cause museum fatigue, visitor interest would follow a peak/trough pattern rather than a gradual decrease. (Falk et al., 1985)

Stephen Bitgood's Attention Value Model, 2013

Figure 15 : **three levels of attention**

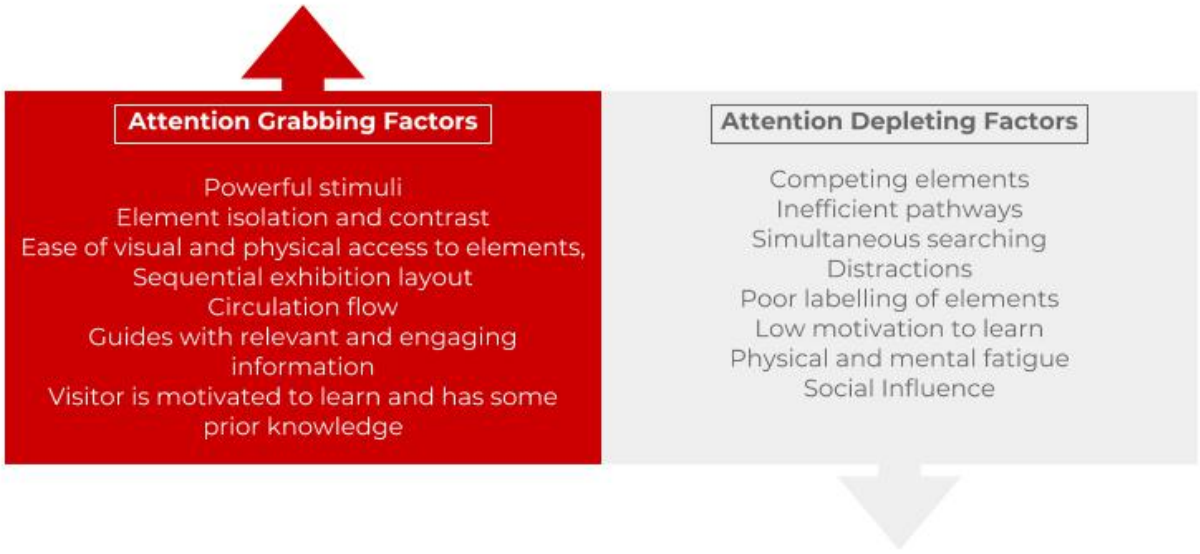
The *Attention Value Model* of museum visitors posits that attention is a three-level continuum, the three levels being: *attention capture*, *focus*, and *engage*. In the capture stage, attention is unfocused, the visitor is aware of a large number of stimuli, and the visitor scan the room for valuable, interesting, or familiar artworks. Once identified, attention moves to the focus stage. Here, the visitor gives brief, shallow attention to the artwork via reading a short description, touching, etc. Distractions can easily occur during this phase and mental effort is low. Engagement involves mental exertion, concentration for a longer period, physical interaction with the artwork, emotional response, personal interpretation (meaning making), discussion with group members, etc. (Bitgood, 2013).

At each level of the continuum, a different combination of variables influence attention. The most significant motivator for which draws attention is the *perceived value ratio (pvr)* of the artwork. This is equal to the utility of the artwork (the amount of satisfaction derived from the artwork) divided by the costs (financial, time, physical and mental effort). In order for a visitor to pay attention to an artwork, the benefit to cost ratio must be high enough. In this regard, utility can be maximised by exhibiting more interesting content (increasing benefits) and / or reducing costs by minimizing the time and effort it takes to "consume" artworks.

$$pvr = \frac{utility}{costs}$$

Another influencer of attention is the physical and mental state of the visitor. Lower physical and mental states resulting from stress, lack of sleep, over-exertion leads to low energy level and a decreased likelihood to exert efforts to pay attention to 'high cost' artworks. Distraction can occur at various levels of the attention continuum but is more powerful in the beginning (during capture) than towards the end (during engage). Distraction can be physical (e.g. loud noise, movement, flash of light) or social (visitors obstructing view of artwork). Visitors most often do not return to artworks once a distraction occurs. The pre-visit agenda (length of visit, group members, level of interest in content) plays a role in determining the amount of time spent examining the artworks. The influence of group members (or social influence) can also impact the amount of attention given to artworks and the level, type, and duration of engagement. Finally, other general environmental impacts could facilitate or hinder attentions, these include: architecture of museum building, temperature, ambience, etc. (Bitgood, 2013).

Figure 16 : **attention grabbing and attention depleting elements**



International Art English

International Art English (IAE) refers to a lexically, grammatically, and stylistically distinct language used by and for members of the *art world*, these include: "*artists,*

curators, gallery owners and directors, bloggers, magazine editors and writers, publicists, collectors, advisers, interns, art-history professors, and so on". (Levine, Rule, 1999) A 1999 study collated thousands of exhibition press releases and used language-analysing software to discover the underlying structure and patterns of IAE. Results found that more rather than fewer words are preferred; adjectives are preferred over nouns (global → globality); artworks do not do things but rather *seem* to do things; ordinary words are repurposed in obscure ways e.g. space if used to describe non-spatial things (*"the space of humanity")*; the use of French suffixes -ion, -ity, -ality, and -ization, as opposed to the more common -ness; the use of definite and indefinite articles e.g. "the void" rather than emptiness; words that are en vogue are overused. The authors claim that IAE *"sounds like inexpertly translated French"* tracing its origins back to the seventies with the popularization of French post-structuralist linguistic style through publications such as October - an academic journal that presents contemporary art criticism founded in 1976. Although the objective of using IAE is to approach artists' work in a more sensitive manner and to convey ambiguous concepts, it ultimately succeeds to alienate non-professionals - most people - who cannot understand the industry jargon. (Levine, Rule, 1999)

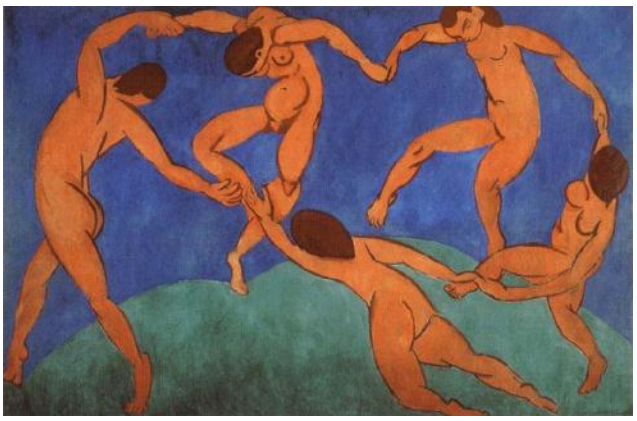
Attentive Viewing

In museological discourse, cultural competence is *"perceptual and cognitive competence, anchored in the dynamics of visual encounters with art... occasionally augmented by other perceptual modalities"*. (Kesner, 2006) One could argue that a certain level of cultural competence is required for the meaningful consumption of an art museum. According to Pierre Bourdieu, visitors' ability to process and understand works of art depends on *"the divergence between the more or less complex and subtle code required by the work and the competence of the individual"* (Bourdieu, 1993). Being able to understand the visual language of an artwork can be seen as a form of visual literacy. Attentive viewing is an indispensable step towards adequately experiencing artworks. Nevertheless, studies find that most museum visitors lack the level of interest required to face the challenge of attentively viewing art objects. (Csikszentmihalyi & Robinson, 1991) Attentive viewing could be motivated by the curious need to understand the specifics of an artwork or to decipher its inner structure and symbolic representations. According to Austrian art historian, Otto Pächt, perception involves "*the triggering of vision that unlocks the formal structure*" (Pächt, 1999). An alternative motivation could also be simply a pleasure in the aesthetic presentation.

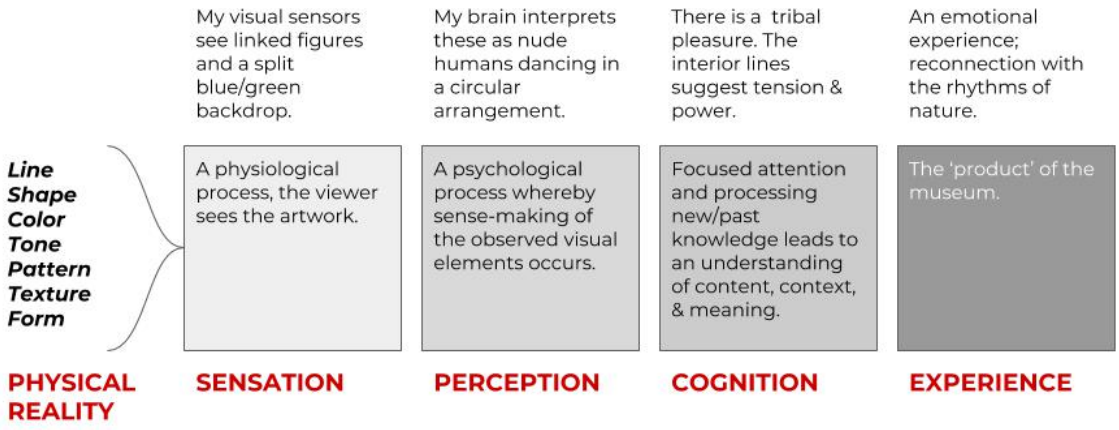
Attentive viewing is increasingly challenging, particularly among millenials, considering the rise of digital media consumption, multi-tasking/multi-screening, and immediate novelty at a click. Younger visitors - who've been exposed to new media technologies since early years - might require a different experience design in order to enjoy art in a meaningful way. Some studies have linked multi-tasking to

negative effects on people's ability to focus attention. Bursts of sensory stimulation provoke the secretion of improper levels of dopamine; this is addicting. When the body is denied the level of stimulation to which it is accustomed, people feel bored. To eliminate feelings of boredom from cropping up, people become more and more impatient in their pursuit of new ways to gratify dopamine cravings. According to Solomon, heavy multi-taskers experience more trouble focusing attention and higher levels of stress compared to those who are allowed to focus on one task at a time (Solomon, 2009).

Figure 17 : **a breakdown of attentive viewing**



Henri Matisse, *The Dance* (1910)



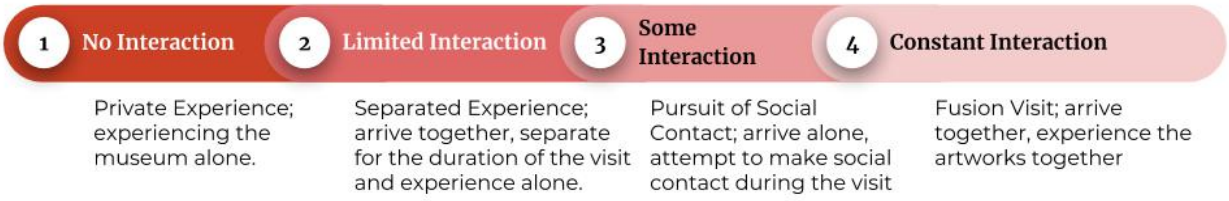
Social Dimension

Stephane Debenedetti's Four Modes of Socially Appropriating the Museum Space, 2003

According to Debenedetti, there is a significant variance between the museum experience of those who visit alone and those who visit accompanied by others. For those who visit with others, the experience involves: a deeper understanding of the meaning of artworks achieved through verbal exchange, a break from the seriousness of museums by means of in group joking and chatting, emotional support to ease anxiety inducing museum elements (lots of people, prestige of the museum, emotional response to artworks), and gratification obtained through explaining artworks to other group members. For those who visit alone, the experience involves: profound and intimate relationship with the artworks resulting from the space for introspection and the absence of interference by others, high cognitive and emotional involvement, autonomy to decide freely the course of the visit, and a sense of ease to experience emotions.

All visitors are located on a spectrum between two irreconcilable poles: conviviality – sharing, exchanging ideas; and introspection – establishing a personal relationship with the artworks. There are four different ways visitors can experience the museum according to their need for interaction with others during the visit, these are: the private experience, the separated experience, the pursuit of social contact, and the fusion visit. (Debenedetti, 2003)

Figure 18 : **four levels of social interaction**



Ingroup Influence

Ingroup influence originate from the number of people within the group, the unique mix of characteristics of each group member, and / or from the combination of these variables. Recent studies have shown significant correlation between such variables and how groups interact with each other and with the museum itself. (Bitgood, 1993).

Regarding groups size, larger groups tend to spend less time at exhibits than smaller groups (Bitgood, et al., 1993). Regarding gender, in a mixed gender group, female adults most often act as caretakers and are less likely to take control of the course of the visit while male adults most often act as leaders. However, when it comes to female-only groups, females are more explorative and autonomous. (Diamond, 1986) Moving on to age, adults are more likely to read labels, stay focused in a text-heavy exhibit, and spend more time at exhibit overall whereas children are more likely to interact with animals and games, move and play with things, and lose attention more quickly in exhibits (especially text-heavy ones). (Diamond, 1986) Moreover, families tend to adopt a cooperative learning strategy throughout the museum visit whereas adult only groups tend to adopt an individualistic learning strategy e.g. reading to themselves (Bitgood, et al., 1993). Both parties tend to modify their behaviour according to whether they are in the presence of members of their age group or those of a different age group. For example, a child's presence increases the time accompanying adults spend at child-preferred exhibits while an adult's presence decreases the amount of roleplaying accompanying children perform. (Wagner, Massey, 1991) When it comes to different age and gender combinations, Cone and Kendall observed that fathers tend to ignore their daughters during museum visits. (Cone & Kendall, 1978).

The Youth Challenge

As of 2016, young people (between 15 to 29 years of age) made about 17.4% of the total population of the European Union. In a world of fast media, young people could benefit greatly from meaningful art museum experiences. Nevertheless, museums and galleries are slow to respond to the needs of the young segment (Eurostat, 2018)

Barriers to Entry

Studies show that young audiences hold unfavourable attitudes towards museums; Bartlett & Kelly (2000) have reported that youth audiences have poor perceptions of museums, which they consider to be boring, moralistic, intimidating, and outdated. According to Prince and Schadla-Hall (1985), *threshold fear* occurs when people are dissuaded from entering a space due to feelings of discomfort. This discomfort might arise as a result of historic perceptions concerning the exclusivity of museums to the affluent upper class. Alternatively, it may arise from architectural elements which make wayfinding difficult or limited artwork labelling which make it frustrating for non-experts to understand artworks, particularity those which require a level of prior knowledge about art history.

A 2003 survey of young people in the Auckland Art Gallery found that when asked *'What kind of people go to art galleries?'*, most responses conveyed galleries as the

business of *'artistic people', 'people who like art', 'cultured people', 'classy people', sophisticated people', and 'arty farty people'*. The study identifies three key areas considered by young people to be areas for improvement: types of art exhibited, advertising, and youth focus. Desired art types include: graffiti, modern art, art that reflects present culture and issues, and more representation of young artists. Suggestions also include more virtual and interactive experiences and events. More advertising, especially targeted towards young people, was another concern of many respondents. Towards attracting new visitors, attention-grabbing displays, freebies, and other incentives were among the popular suggestions (Mason, Mccarthy, 2006).

A meaningful implementation of digital technologies could be a solution for boosting young people's perceptions and designing a more inclusive museum space.

2.4 Applications of digital technologies in art museums

What is digital technology?

Definitions and concepts

Digital technology is an umbrella term for *"any technological device that functions through a binary computational code such as mobile phones, tablets, laptops, computers, etc."* (Santos et al., 2016). Strictly speaking, digital technology is defined as *"the sort of technology – as opposed to analogue technology – based on notation of all signals (e.g., sounds, pictures, data) in uniform 0–1 form. Digital technology includes computing, communication and content"* (Zacher, 2015). Accenture (2013) refers to digitalization as *"the transformative process for turning digitized resources into new sources of revenue, growth and operational results"* (McDonald, 2013).

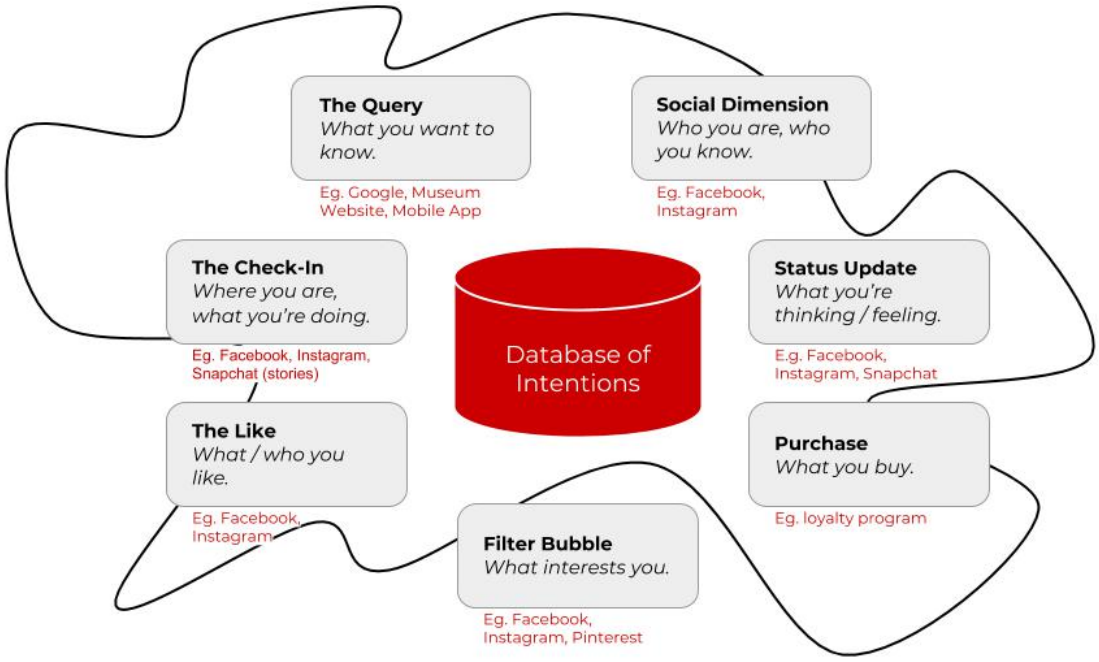
Digital Ecosystems

According to the World Economic Forum (2007), *"a digital ecosystem consists of users, companies, and governments who converge in the space of IT, telecommunications, and media and entertainment industries"*. Similarly, we could understand a **digital museum ecosystem** to consist of technologies that facilitate interactions between the living world - visitors, museums staff, tour guides, and online communities - and the nonliving world - artworks, spaces, devices, and content (Benckendorff, 2014).

Database of Intentions

Inspired by cultural anthropology, John Battelle (2003) introduced the concept of a database of intentions. He defined this as *"the aggregate results of every search ever entered, every result list ever tendered, and every path taken as a result... This information represents, in aggregate form, a placeholder for the intentions of humankind – a massive database of desires, needs, wants, and likes... This artifact can tell us extraordinary things about who we are and what we want as a culture"* (Battelle, 2003)

Figure 19: **adapted from Vilacich and Schneider (2014)**



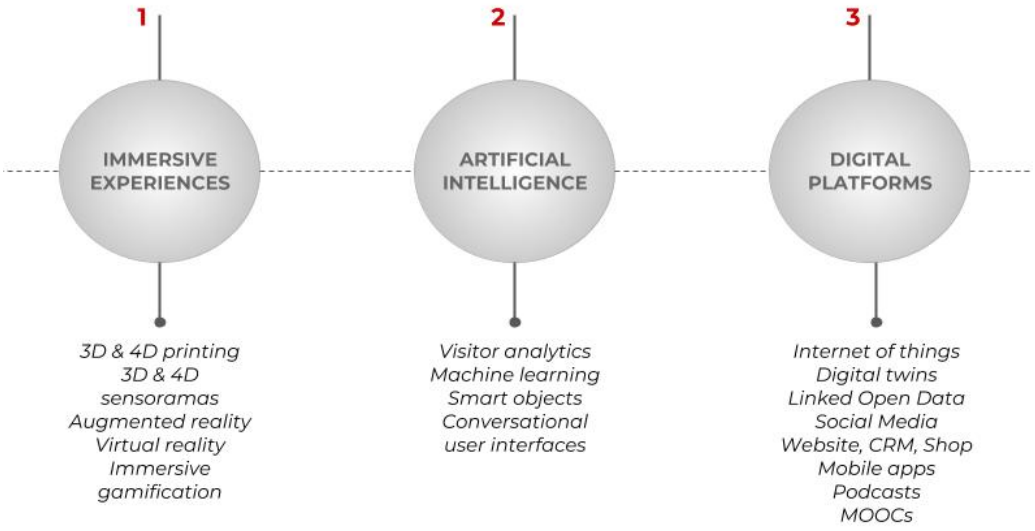
A toolbox of digital technologies for art museums

The 2015 Technology in Museums Report identifies key trends applicable to museums today, these include: Bring Your Own Device (BYOD), Games and Gamification, Location-Based Services (WiFi, Beacon, GPS Technologies), Data Analytics Tools, Makerspaces, Natural User Interfaces, Machine Learning, Internet of Things (IoT), Linked Open Data (LOD), MOOCs, Microcredit, 3D Printing, Virtual Reality, Augmented Reality, Holographic Display, Wearables, Cross-Institutional Collaboration, Co-Creation, Crowdsourcing, Crowdfunding, and Social Media Engagement. (Johnson et al., 2015) At first look, the range of possibilities seems

overwhelming. However, by closely examining - on the one hand - the museum's mission, vision, and exhibitions and - on the other hand - target visitors' journeys and wants and needs, new frontiers of value can be identified for digital tools. McKinsey & Company outlines four key interconnected capabilities required to maintain a constantly evolving digital strategy, these are detailed below (Dorner, Edelman, 2015).

Proactive decision making involves using data analytics tools to obtain insights into visitor behaviours, wants, and needs; building a portfolio of customer preferences and profiles facilitates the curation of personalized experiences. *Contextual interactivity* involves optimising the visitor experience across all communication channels and stages of their museum journey. Pursuing an omni-channel approach means building a seamless visitor journey that transitions smoothly from from online to brick-and-mortar and between devices. *Real-time automation* refers to the automation of customer interactions. When done right, automation (e.g. self-service options) facilitates quick problem solving and service consistency. *Journey-focused innovation* means expanding the visitor journey into new businesses and services thereby opening the door to untapped value streams (Dorner, Edelman, 2015).

Figure 20 : **Gartner's three mega trends for 2017**



(Panetta, 2017)

Mobile Learning

For years, museums around the world have adopted mobile technology to facilitate museum learning. This medium is especially relevant for museums because it

enables users to keep learning resources with them in the pocket, to apply ideas learned previously in different contexts, and ultimately to provide a framework for a lifetime of learning.

Scolari, Aguado, and Feijóo posit the following definition for mobile app; it is *"an interface that connects the users with contents for knowing and tools for doing. The contents could be written texts, images, videos, multimodal and/or interactive."* (Scolari et al, 2012) With regards to the contents, they could be created for different purposes (e.g. advertising, education, games, news), could be intended specifically for mobile use or adapted from a web version, could be original or user-generated, and could be stored in a cloud server or downloaded onto mobile devices. As for tools, these can be any feature that is designed to accomplish a specific task. For example: writing a text, editing a photo, creating a multimedia folder, and so on. Moreover, there exists a hybrid environment which - like many social media platforms - that integrate characteristics of both tools for doing and contents for knowing. (Scolari et al, 2012) Mobile learning can include a broad spectrum of multimedia contents, games, simulations and applications. A selection of cases will be discussed below with regards to their adoption by museums.

Mobile App

The Cleveland Museum of Art introduced an 'ArtLens Wall'; it is a 1.5 by 12 meter MicroTile digital display that shows the museum's permanent collection. The wall shifts to display artworks grouped by categories like material, period, technique, and so on. Visitors can interact with the display by zooming in to specific artworks for more information. Viewers can "favourite" pieces by tapping on the display or via the ArtLens smartphone app. These favorited images are also display on the screen every ten minutes. By enabling Bluetooth, the app can also guide viewers through the museum to their 'favorite' pieces. (Verma, 2018)

The Smartify smartphone app uses image recognition software to scan and identify artworks. Users can save digital copies of scanned artworks and curate folders. Partnering museums can benefit from assessing demographic information about users and gather data on artworks they've favorited. (Lloyd, 2017)

Mobile Website

In a sentence, a mobile website is the mobile-friendly version of a company's website. Instead of building an app from scratch, the Brooklyn Museum implemented a mobile website that is accessible across mobile devices. The website enables visitors to recommend artworks and play a mobile tagging game through a feature called 'Gallery Tag!'. In the game, players (1) select an existing tag or create their own e.g. dog, (2) search the gallery to find artworks that match the tag, and (3)

enter accession numbers to earn points and prizes. The game encourages players to explore the whole premises by awarding more points to those who tag objects on different floors. The tags creates feed into the gallery's online collection to facilitate smarter search. (Bernstein, 2010)

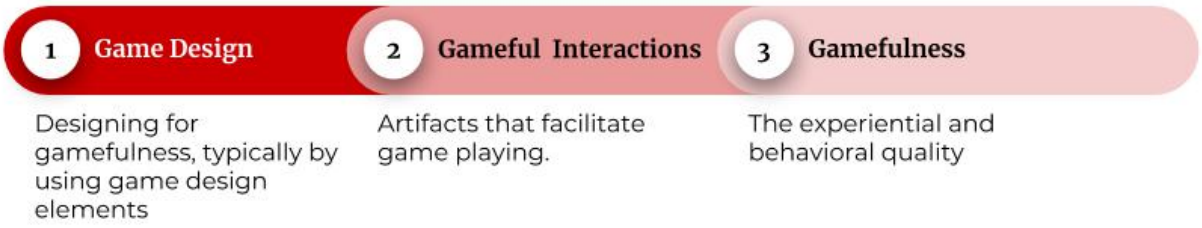
QR Code

In a sentence, QR is an abbreviation for "Quick Response"; it is a barcode that facilitates the storing of URLs and other information which can be accessed within seconds of scanning the code via the camera of a smartphone. The Mattress Factor, an installation art museum in Pittsburgh, has implemented QR codes in their exhibits to communicate textual information in a sustainable effort to reduce the number of paper brochures. In an attempt to add a community voice to the permanent exhibition, the Brooklyn Museum has used QR codes to create a poetry trail throughout the museum using community-generated poems inspired by various artworks in the museum (Bernstein, 2011).

Gamification

Scholars refer to the ludification of culture as a phenomena whereby *"technologies, tropes, references and metaphors, mindsets and practices flowing from games increasingly suffuse society and everyday life, most notably playful identities and playful media practices."* (Montola, 2009). According to Deterding et al, *"Gamification is the use of game design elements in non-game contexts"*. (Deterding et al, 2011) Generally speaking, a game contains a specific set of rules that are put in place to lead players towards achieving certain desired goals and outcomes.

Figure 21 : **three levels of creating a gameful experience**



There are ten Ingredients in every great game, these are (Deterding et al, 2011) :

1. *Self-representation with avatars*
2. *Three-dimensional environments;*

3. *Narrative context;*
4. *Feedback;*
5. *Reputations, ranks, and levels;*
6. *Marketplaces and economies;*
7. *Competition under rules that are explicit and enforced;*
8. *Teams;*
9. *Parallel communication systems that can be easily configured;*
10. *Time pressure*

One upcoming type of gamification is called a pervasive game. A pervasive game is able to surpass spatial, temporal, and/or social dimensions through the use of certain technologies, such as: location-based technology, augmented reality, virtual reality, etc. (Montola, 2009) An in-depth discussion of the role these could play in the context of art museums is presented in the following sections.

Example

The Cleveland Museum of Art installed an ArtLens Studio area, visitors are able to make art using motion sensor technology - using hand and body gestures to draw on a big interactive video screen. Additionally, visitors can compare their eye movement while observing artworks compared to others. Visitors can also experiment with various fun instant photo filters transforming themselves into historical figures. (Verma, 2017)

Augmented Reality

According to Behringer et al., Augmented reality (AR) can be defined as a *"system supplements the real world with virtual (computer-generated) objects that appear to coexist in the same space as the real world"*. Such a system takes place interactively and in real time and presents real and virtual objects together. This is could be made possible by employing combinations of the following enabling technologies: a display (headworn, handheld, or projection) and a location tracking system e.g. GPS. (Behringer et. al, 2001)

Figure 22 : **augmented reality at the Art Gallery of Ontario, Canada (AGO)**

Source: http://business.financialpost.com/technology/gaming/new-reblink-exhibit-at-the-ago-takes-augmented-reality-beyond-video-games

Example

The Andy Warhol Museum implemented AR by enabling users to view Any Warhol's face over select locations in Pittsburgh and New York that are symbolic in the artist's life. By tapping the icon, users are able to access pictures of artworks and content relating to each location. (Hughes, 2017) The Detroit Institute of Arts introduced an interactive, motion-tracking mobile tour that allows users to engage with the museum through augmented reality overlays, 3D animations, videos, photographs, and sounds. For example, users could hold their device up to an Egyptian mummy to reveal an x-ray view of what is inside. (Verma, 2017)

Virtual Reality

"A 'virtual reality' is defined as a real or simulated environment in which a perceiver experiences telepresence... Telepresence is defined as the experience of presence in an environment by means of a communication medium... Presence is defined as the sense of being in an environment." (Steuer, 1993)

A system's ability to create a sense of environmental presence varies across individuals. Two major determinants of telepresence are vividness and interactivity.. Vividness refers to the ability of a technology to produce a sensorially rich mediated environment and interactivity refers to the degree to which users of a medium can influence the form or content of the mediated environment.

Example

The Smithsonian American Art Museum launched the "Renwick Gallery Wonder 360" that allows users to experience the past exhibition in 3D-panoramic view. (Verma, 2017)

Social Media

According to Kaplan and Haenlein (2009), *"social media is a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content."* (Kaplan, Haenlein, 2009)

Media dimension : self-presence theory

The social presence theory states that different media offer different degrees of "social presence" to users; the more acoustic, visual, and physical features a medium has, the richer communication between users. Social presence is also influenced by whether communication is interpersonal (e.g. video call) or mediated (e.g. telephone call) and asynchronous (e.g. e-mail) or synchronous (e.g. live chat)(Kaplan, Haenlein, 2009).

Social dimension : self-disclosure

Self-presentation states that one of the motivations behind social interaction is the desire of persons to control others impressions of them. This is achieved through self-disclosure; this means the conscious or unconscious revelation of personal information that is consistent with the image one wishes to have in the eyes of others. This can occur between already acquainted persons or between strangers (Kaplan, Haenlein, 2009).

Table 8 : **popular social media platforms by self-presence and self-disclosure (Kaplan, Haenlein, 2009)**

Self-presence

Self-disclosure	*Low*	*Medium*	*High*
Low	**Blogs & Microblogs** e.g. Tumblr, Twitter	**Social Networking Platforms** e.g. Facebook, Instagram, Snapchat,	**Virtual Social Worlds** e.g. Second Life

High	**Collaborative Projects** e.g. Wiki-based knowledge sharing tools, Quora, Genius	**Content Communities** e.g. Youtube, Pinterest, Wakelet, Flickr, Slideshare	**Virtual Game Worlds** e.g. World of Warcraft

Social Media Adoption

About 47 % of EU enterprises used at least one type of social media in 2017; compared to 2013, this is an increase of 17%. The four most widely known categories of social media are: (a) social networks (45%), (b) corporate blogs or microblogs (14%), (c) content communities (16%), and (d) wiki-based knowledge-sharing tools (5%). (Eurostat, 2017)

Examples

1. **The Brooklyn Museum** used off the shelf Macbooks and Youtube's built-in video capture feature to enable visitors to upload responses regarding a specific question directly to a Youtube channel setup specifically for the exhibition. The show ran for four months, 482 videos were uploaded, and got a total of 43,386 views in total. (Bernstein, 2008)
2. **The Brooklyn Museum** launch a membership program called '1stfans' to connect members with contemporary artists offline through monthly meetups at the Museum and online access to "The Twitter Art Feed" which featured monthly tweets by the artists. (Bernstein, 2008)

GIFs, memes, and hashtags

A 2016 report released by The Digital Preservation Coalition highlighted the responsibility of research and cultural institutions in the effort towards building up records of 21st century life for future generations. (Rees, 2018) Memes initially began circulating on an image-board website called 4chan; nowadays, memes have become part of millenials' everyday slang. A meme involves the repurposing of online content for posts that relate to daily life issues. (Soto, 2017) The growing popularity of meme humour is undeniable; as of June, 2018, the official Facebook page of *Classic Art Memes* has over 5 million followers.

Figure 23 : Classical Art Memes, Vertumnus by Guiseppe Arcimboldo, 1590–91

Data-Driven Strategy

Gartner, Inc. defines big data as “high-volume, high-velocity and high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making.” (“Gartner IT Glossary, n.d.”)

Big data is widely characterized by the four Vs: volume, variety, velocity, and veracity. Volume refers to the magnitude of datasets (> 1 terabyte qualifies as big data) (Gandomi, Haider, 2015). Variety refers to a dataset’s structural heterogeneity; data contained must be structured (e.g. tabular data found in spreadsheets) in order to be machine-readable. However, some forms of semi-structured data are also permitted e.g. Extensible Markup Language (XML). (Cukier, 2010) Velocity refers to the rate that data is generated and analyzed e.g. data emanating from mobile devices and mobile apps produces torrents of information about customers, such as location, demographics, and past buying decisions. Veracity refers to the degree of unreliability in some sources of data and the need for tools and analytics to effectively mine and manage tricky data. Another two Vs were identified; variability refers to the fluctuating velocity of big data e.g. seasonality and value refers to the degree to value relative to volume (data in its original form is not value dense.

According to Labrinidis and Jagadish, the overall process of extracting insights from big data can be broken down into five stages.

DATA MANAGEMENT STEPS ↓

1. Acquisition and recording
2. Extractions, cleaning, and annotation
3. Integration, aggregation, and representation

ANALYTICS STEPS ↓

4. Modeling and analysis
5. Interpretation (Labrinidis, Jagadish, 2012)

Some data analytical techniques concerning data that can be collected by museums are discussed below.

Text Analytics

Text analytics is the processing of textual data. Text can be summarized by the extractive method which involved taking out a selection of whole sentences from the original text to create a shorter version. Text can also be summarized by abstraction which uses advanced Natural Language Processing (NLP) techniques to

parse the original text and generate a summary. Question answering (QA) provides answers to questions posed in natural language (e.g. Siri) using information retrieval-based approach, knowledge-based approach, or a hybrid of the two. Sentiment analysis processes opinionated text to determine whether it contains a positive or negative sentiment about a particular product, organisation, individual, events, etc. This can be performed on a document level, a sentence level, or aspect-by-aspect level (Labrinidis, Jagadish, 2012).

Video Analytics

Video analytics involves a variety of techniques that monitor, analyze, and extract information from video streams e.g. from CCTV cameras. Museus can measure foot traffic, movement patterns, dwelling times in various exhibitions areas, and queues. When paired with other customer insights, this can drive decisions to optimise exhibition design and promote certain desired behaviours by visitors(Labrinidis, Jagadish, 2012).

Social Media Analytics

Aside from the text-based analytics discussed above, there are also some techniques pertaining specifically to the realm of social media. Structure-based analytics aim to understand the structure of a social network and to identify the different relationships between users. The former can be modeled through social graphs which represent each user with a node and each link between two users with an edge. This can effectively identify communities and popular users (by number of links). The latter can be modeled through activity networks which represent each actual interaction (e.g. likes and comments) between two nodes with an edge. This is more effective at identifying the strength of relations that users have(Labrinidis, Jagadish, 2012).

Community detection / discovery identifies uses who interact more with each other than with the rest of the network. This facilitates the clustering of users into homogenous groups which can be useful in forecasting behaviours and building recommendation systems. Another tool, social influence analysis, models the influence of certain users and connections within a network. This information is useful in the case of viral marketing and raising brand awareness during the early stages of a product's life cycle. Finally, link prediction aims to predict future interactions between existing users within a network (Labrinidis, Jagadish, 2012).

Example

The Brooklyn Museum set up an exhibition showing the most engaging and controversial artworks based on analytics gathered online via a rating activity; 4,617 participants created 176,394 ratings. The artworks were presented alongside a visualisation and analysis of the data collected e.g. age, gender, experience, location, and so on (Bernstein, n.d.).

2.5 Visitor responses to digitalization and similar studies

How do museums measure success?

There is no unified approach according to which art museums measure success. What is considered as success depends on individual museums' ideology and core mission; success can be, from an economic perspective, revenue and profitability or, from a creating shared value perspective, contribution to social well-being. Anderson (2004) proposes a framework of eleven metrics to measure museum success (listed below). The indicator number one will be the key focus for this study. Industry professionals have proposed a number of ways to measure quality of experience: dwell time (time spent in an exhibit can be measured with GPS signal or RFID tag tracking), satisfaction scores from post-visit questionnaires, and whether the exhibition is requested by other institutions. (Fox, 2006)

1. ***Quality of experience***
2. *Fulfillment of educational mandate*
3. *Institutional reputation*
4. *Management priorities and achievements*
5. *Caliber and diversity of staff*
6. *Standards of governance*
7. *Scope and quality of collection*
8. *Contribution to scholarship*
9. *Contributions to art conservation*
10. *Quality of exhibitions*
11. *Facilities contribution to core mission*

Case studies of successful digitalisation in museums of art

"Influence of New Media Technologie on the Success of Museum Exhibitions"

A 2016 study on new media use for museum exhibitions compares a selection of new media tools based on their suitability in various contexts and for different visitor types. Based off industry experts interviews, the study finds the following digital tools to be highly suitable for use in art museums: portable audio guides, mobile applications, visual information displays, smart objects, augmented reality, online reviews, blogs, museum websites, social media, audio and video, podcasts, and virtual reality. Moderately suitable are: holographic imagery, 3D elements, and messaging services (e.g. WhatsApp). Tools with a low suitability rank are 4D elements and robots. Many tools, though suitable, have yet to be implemented to an effective level by art museums, particularly: mobile applications, smart objects, audio and video, augmented reality, podcasts, blogs, online reviews, and social media. (Widmann, 2016)

The study suggests an optimal list of tools by visitor type according to Falk and Dierking's five visitor identities - shown below. Results show a that most tools are effective for enriching experiences across the board.Nevertheless, some differences exist. More immersive tools are especially effective for the experience seeking type. Conversely, rechargers prefer simpler tools (or less immersive tools). Facilitators don\t benefit from technologies that detract from their ability to socialize with those they accompany (e.g. portable audio guides and virtual reality). (Widmann, 2016)

Table 9 : **digital tools by visitor type**

	Highly suitable	Moderately suitable	Not suitable
Explorers	Portable audio guides, mobile applications, visual information displays, smart objects, audio and video, augmented reality, holographics imagery, 3D elements, 4D elements, robots, online reviews, blogs, podcasts, museum websites, social media, messaging services, virtual reality		
Facilitators	Portable audio guides, mobile applications, visual information displays, smart objects, audio and video, augmented reality, holographics imagery, 3D elements, 4D elements, robots, online		

	reviews, blogs, podcasts, museum websites, social media, messaging services, virtual reality
Professionalists	Portable audio guides, mobile applications, visual information displays, smart objects, audio and video, augmented reality, holographics imagery, 3D elements, 4D elements, robots, online reviews, blogs, podcasts, museum websites, social media, messaging services, virtual reality
Experience seekers	Portable audio guides, mobile applications, visual information displays, smart objects, audio and video, augmented reality, holographics imagery, 3D elements, 4D elements, robots, online reviews, blogs, podcasts, museum websites, social media, messaging services, virtual reality
Recharges	Portable audio guides, mobile applications, visual information displays, smart objects, audio and video, augmented reality, holographics imagery, 3D elements, 4D elements, robots, online reviews, blogs, podcasts, museum websites, social media, messaging services, virtual reality

(Widmann, 2016)

"What Makes a Great Museum Experience and How Can Technology Help?"
The Field Museum in Chicago

A similar study was conducted in 2014 on visitors of the Field Museums in Chicago. Results of the cluster analysis divided visitors into five segments, these were: Curious Activity-Seekers (32%), Contemplative Traditionalists (24%), Social Explorers (18%), Parent Facilitators (16%), and the Disengaged (10%). Out of these segments, all but the contemplative traditionalists were found to embrace technology in the museum experience while the contemplative traditionalists hoped to avoid it. Based on this, Hanko et al. suggested an approach to digitization that would balance out the needs of all visitor types. For the activity-seekers, they suggest implementing mobile app tours to help visitors learn the most out of the museum and digital interactives to provide them with problem-solving challenges. For the contemplative traditionalists, they suggest to ensure that the implemented technology does not interfere with the museum experience of visitors who seek to avoid it and to rely on non-digital and atmospheric tools. For the social explorers, they suggest to implement interactive displays that enable exploration of the museum content, games, and opportunities for social engagement and group meaning-making. Finally or the parent-facilitators, they suggest to install digital display offering games and interactive activities suitable for kids. (Hanko et al., 2014)

The Field Museum study is quite similar to this study in that it aims to answer the same research question, *"What Makes a Great Museum Experience and How Can Technology Help?"* The research was also designed in a similar format, making results quite comparable. Nevertheless, this research was conducted in 2014, lots of technological developments have occurred since then including new technologies and new applications. Additionally, the use of smartphones has become almost ubiquitous and museums have become much more clear on the importance of adopting a digital strategy. Aside from the time variable, the Field Museum is a Natural History Museum located in Chicago. This means that visitor profiles may vary; natural history museum visitors may expect and want different things than art museum visitors. As well, attitudes to technology among Chicago tourists and residents may differ from those of Vienna tourists and residents.

"In the white cube: Museum context enhances the valuation and memory of art."

Museum Stadtgalerie Artothek (MUSA), Vienna, Austria

A study held at the Museum Stadtgalerie Artothek (MUSA) in Vienna compared participants' memory of an art exhibition when viewed in a physical museum versus in an online library, artworks were found to be more enjoyable in real life. Additionally, participants who saw the exhibition in real life had a better recollection of the artworks. These findings support the assumption that encountering art in the physical world is superior to encountering art in an online database with regards to the cognitive and affective benefits and long-term memory retention. (Brieber et al., 2014)

"Playing with Museum Exhibits: Designing Educational Games Mediated by Mobile Technology"

Museum of Solomos and Eminent Zakynthians, Zakynthos, Greece

Researchers of this study designed two education games to be used by young children on mobile devices. The study ran in a historical and cultural museum exhibiting mainly paintings, personal belongings, and original works of historical persons of the region. Games were designed to facilitate interaction between children and the exhibits and enable entertaining education. Findings show an enriched interaction with museum exhibits, added social dimension due to interaction and collaboration between visitors, and an overall more participative museum experience (Yiannoutsou, Nikoleta, et al., 2009).

"Enhancing Museum Victoria's Visitor Journey"
Museum Victoria, Melbourne, Australia

The study measures the effectiveness Museum Victoria's digital communication in directing visitors along three stages of the visitor journey: 'Pre-Visit', 'During the Visit', and 'Post-Visit'. Firstly, the multilingual tour mobile App falls short of fulfilling the goal for which it was originally designed mainly due to lack of visitor awareness surrounding the app's existence reportedly resulting from poor placement and confusing message on signage advertising the app. Secondly, an interactive navigation map is useful only for first-time visitors but fails to provide value for repeat visitors already aware of the museum's layout. Finally, the desire for more content is the number one complaint of visitors regarding the museum's Facebook event pages (Ho Wu, 2016).

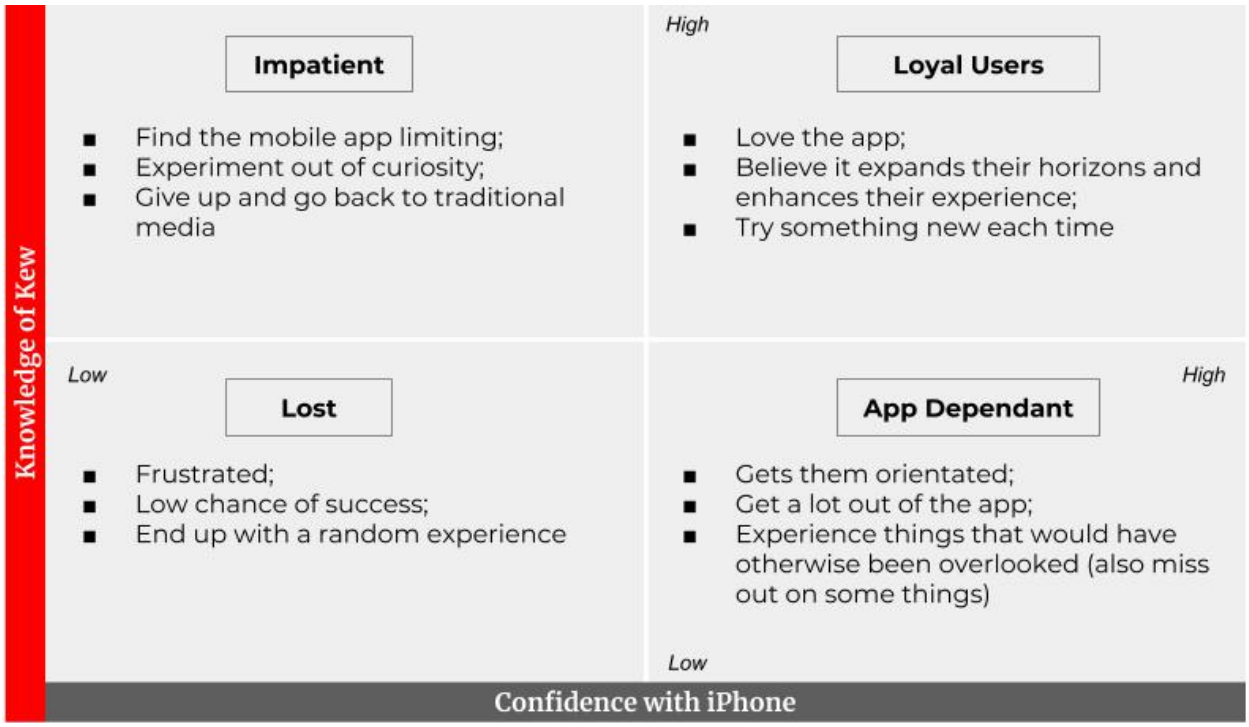
"Museums and Social Media: Modern Methods of Reaching A Wider Audience"
Australian Museum, Sydney, Australia

The Australian Museum tested the effectiveness of using social media to gauge interest in a certain exhibition, 'All About Evil.' This exhibition contained controversial subject matter and the museum created a Facebook group to hear audience feedback and concerns. This Facebook group was utilised to spark conversation between the virtual audience and museum staff. In a matter of three weeks, the group attracted 200 members and a great deal of activity between both the audience and museum staff. Using Facebook proved to be an effective way for the museum to communicate with the public (Marakos, 2014).

"Delightfully Lost: A New Kind of Wayfinding at Kew"
Royal Botanic Gardens, Kew, United Kingdom

In 2010, Kew Gardens (UK) commissioned a study to inform its mobile app development efforts; this included 1,500 visitor-tracking observations, 350 mini-interviews, 200 detailed interviews, and 85 fulfilment maps. Three major visitor segments were extracted based on needs, these are: social spacers (25%), sensualists (20%), and leisure families (19%). The figure below points to the importance of providing a dual experience: one appropriate for confident mobile users and another (simplified version) for less confident users. Overall, the study found that most visitors are motivated to visit Kew for social, emotional, and spiritual reasons. They do not prioritise knowledge acquisition and prespictive navigation. Conversely, they enjoy unguided exploration and serendipity - as they termed it - they want to be *'delightfully lost'* (Waterson, Saunders, 2012).

Figure 24 : **four types of user experience (Waterson and Saunders, 2013)**



"Exploring the potential for social tagging and folksonomy in art museums: proof of concept"

Social tagging refers to *"the collective assignment of keywords to resources"* and folksonomy refers to the subsequent *"assemblage of concepts expressed in such a cooperatively developed system of classification"*. A 2006 study at The Metropolitan Museum of Art explored the potential for social tagging to improve access to museum collections by comparing terms assigned by social tagging to existing museum documentation. Taggers identified content elements not described in formal museum documentation. The benefits are plenty. For one, tags assigned by users could help bridge the semantic gap between professional discourse of curators and popular language of average visitors thereby facilitating social engagement. Secondly, through social tags, museums can better understand the priorities and interests of users of online museum collections. Thirdly, making use of alternative perspectives is a significant departure from traditional values that reflects the move towards inclusion and collaboration. (Trant, 2006)

Figure 25 : **A comparison of the two approaches as shown in study**

Art historian's description :

"Couched in the soft velvety nap of the platinum paper, composed in the languid lines of Art Nouveau, and softly focused, this photograph of New York's Madison Square employs many elements of Pictorialism at its best. However, the dizzying effect of Coburn's aerial view and his fascination with the skyscraper are distinctly and precociously modern. The blend of Pictorialist technique and fresh vision was characteristic of the transitional moment when Alfred Stieglitz, Coburn, Karl Struss, and Paul Strand began to celebrate contemporary urban experience." (The Metropolitan Museum of Art, 2006)

Alvin Langdon Coburn, *The Octopus,* 1912
Source: https://www.metmuseum.org/toah/images/hb/hb_1987.1100.13.jpg

Social tags included : (but not only)

20th century
Abstract
Aerial perspective
Black and white
Cityscape
Geography as art
Landscapes
Madison Square
New York City, octopus
Park
Photography
Winter

3.0 Methodology

3.1 Research questions and hypotheses

What are the different visitor types in art museums?

H0 There is are not homogeneous groups within the data set (H0: r=0).

H1 Homogeneous groups exist within the data set (HA: r<>0).

Do beliefs, feelings, and usage intentions regarding technology in art museums differ by visitor type?

H0 There is no statistically significant relationship between visitor type and beliefs about, affect towards, and intention to use technology in art museums (H0: r=0).

H1 There is a statistically significant relationship between visitor type and beliefs about, affect towards, and intention to use technology in art museums (HA: r<>0).

How can art museums optimize their digital strategy for the different visitor types?

3.2 Methods to be used to test hypotheses

A two-phased , multi-mode approach is employed to identify homogeneous groups within the data set and their corresponding beliefs, affect, and usage intentions towards technology in art museums.

Table 10 : **research design alternatives**

	Phase I : Qualitative	**Phase II: Quantitative**
Research Type	Descriptive research	Correlational research
Data Collection	Sentiment analysis of online reviews of KHM. Non-participant observation at KHM.	Non-experimental design, online self-report study
Data Analysis	Thematic analysis, answers 'what' questions.	K-means cluster analysis, linear regression, cross tabulation

3.3 Data Collection I

Kunsthistorisches Museum Vienna

According to 2014 figures, these are the biggest museums (by number of entries) of the art, archaeology and history category (European Group on Museum Statistics, 2014) :

Schloss Schönbrunn, Vienna	*3,021,000*
Festung Hohensalzburg, Salzburg	*970,000*
Kunsthistorisches Museum and Neue Burg, Vienna	*798,524*
Hofburg, Vienna	*670,000*
Salzburg Museum, Salzburg	*657,000*
Total	*6,116,524*

As shown in the figure above, KHM is a major attraction on a national scale with almost 800,000 entries in 2014. Moreover, it has been one of the few museums in its category to take serious steps towards incorporating new technologies (such as the KHM stories mobile app) into the user experience as well, also putting it at the center stage in marketing campaigns. For these reasons, the Kunsthistorisches Museum is seen as a good candidate for the observational study (Kunsthistorisches Museum Wien, 2018)

Sentiment analysis

Negative sentiments are an important source of insights because they tend to be longer and focus on a smaller number of key issues. Moreover, a negative comment does more harm than an equally positive comment does good. That unevenness means that a museum stands to gain much from addressing the recurring areas of dissatisfaction. As of 2017, the top five consumer and business review websites in the United States are Google My Business, Facebook, Amazon, Yelp, and Tripadvisor. (Abramyk, 2017) Because Amazon centers on e-commerce and Yelp mostly receives US traffic, only reviews from Google My Business, Facebook, and Tripadvisor will be considered for this study.

Reviews chosen for analysis include those that: [1] contain a phrase(s) with negative associations (bad, unpleasant, disappointing, etc.), [2] have scores of 3 stars or below

[3] relate to the experience of moving through the museum and engaging with the artworks, [4] contain constructive criticism, and [5] date back no further than 2016. Reviews disregarded include those that: [1] express only a positive sentiment, [2] contain none or too few words for analysis, [3] contain profanities and/or inappropriate content, or [4] relate to service quality matters such as: staff friendliness, food and beverage, opening hours, etc.

Non-participant observation

The second phase of the qualitative research is an ethnographic study conducted inside the Kunsthistorisches Museum in Vienna. The chosen ethnographic method is naturalistic or "non-participant" observation. This method is appropriate at this stage because it facilitates gathering large amounts of data, identifying patterns, and the emerging of multiple theories and themes backed by real situations. The researcher's role is to come in with a clear mind and observe objectively - maintaining a distance and detachment from subjects. To avoid biasing the data, the researcher ought to refrain from premature attempts at imposing theories and concepts onto the study that may be a poor fit with actual events. One key element of doing this successfully is to pay attention to every detail of what is going on and observing the flow of behaviours as a set series of related events rather than separate instances. Observations are scheduled across ten sessions lasting about three hours each. The final stage of this part of the research is the thematic analysis. This involves looking across all the observations to identify the common events that recur and thereby the main underlying themes - both implicit (latent) and explicit (semantic) themes.

Figure 26 : **step-by-step thematic analysis (Braun, Clarke, 2006)**

What is coding? Coding is the process of categorising and grouping observations in order to be able to summarize, interpret, and analyse a data set.

According to Patton's criteria for judging qualitative research (2002), a thorough thematic analysis is characterised by:

1. **Transparency** : field notes provide a clear account of the procedure used for others to follow.
2. **Validity:** a full, detailed analysis is included for readers to be able to judge and interpret the data themselves.
3. **Reliability:** all observations are analysed, not just those that best fit the assumptions.
4. **Comparability:** findings are compared to those of similar studies.
5. **Reflexiveness:** the limitations of the researcher, the research site, and the research approach are taken into account (Patton, 2002).

3.3 Data Collection II

The second phase of research focuses on confirming and quantifying the preferences, attitudes, behaviours, and motivations uncovered in Phase I and from previous studies and existing literature. This is achieved by means of a cross-sectional self-report study disseminated through Facebook. Although Facebook users tend to be younger and better educated than the general population, the sheer size of the Facebook population means that the underrepresented groups are still fairly large. Snowball sampling is employed to recruit participants, this involves convincing Facebook users to recruit their friends to complete the survey. Recruitment through snowball sampling is low cost option that reaches large sample sizes. To increase shareability, the survey is designed to be as engaging as possible, it is relatively short, and encourages respondents to share with friends. See Appendix for the full survey.

Table 11 : **theoretical bases behind survey questions**

What are the visitor types?		
The survey will answer this question by gathering data on visitors' demographics, motivations, self-reported technology skills, knowledge of artworks, and behaviors. Then, a cluster analysis is run to identify homogeneous groups of visitors. Distinct visitor types have already been posited by Perry (1989) and Falk (2006), as well confirmed in the Field Museum's study.		
Theoretical Base / Purpose	**Question**	**Scale**
Identity-centered approach to museum learning: visitors take on a different identity at the museum based on their objectives for the visit.	What was the purpose of your visit?	List of statements , 1-5 Likert Scale
Do beliefs, feelings, and usage intentions regarding technology in art museums differ by visitor type?		
Cross tabulation is used to assess for differences in beliefs, feelings, and usage intentions (dependent variables) by visitor type (independent variable).		
Theoretical Base / Purpose	**Question**	**Scale**
Beliefs		
Outcome-expectancy is a cognitive motivator whereby the expectation that a given course of behavior will produce certain outcomes.	New technologies would enhance my museum experience.	1-5 Likert Scale
Perceived usefulness, job relevance is "a function of the importance within one's job of the set of tasks the system is capable of supporting"	New technologies serve my needs at the art museum.	1-5 Likert Scale
Perceived ease of use is defined as the degree to which an individual believes that using a particular system would be free of physical and mental effort. **Perceived value ratio (PVR)** is	It takes too much time to grasp how to use new technologies to make them worth the effort.	1-5 Likert Scale

equal to the utility of the technology divided by the costs.		
Affect		
Theory of reasoned action, attitude towards a given behaviour is defined as a person's positive or negative feelings about performing that actual behaviour.	I am pleased to come across technologies during my visits.	1-5 Likert Scale
Self-efficacy, relating to individual's perception of their ability to use the new technologies.	I feel anxious when interacting with a new technology for the first time.	1-5 Likert Scale
Self-efficacy, relating to individual's perception of their ability to make sense of the artworks independently.	Using technology makes me feel less accomplished in my ability to understand and connect with the artworks.	1-5 Likert Scale
Social influence, the image factor refers the degree to which use of an innovation is perceived to enhance one's... status in one's social system	I feel like using new technologies at the art museum makes me look worse among others.	1-5 Likert Scale
Usage Intentions		
x	Of the different kinds of digital technologies listed below, which would you be most excited to use?	Checklist

3.4 Limitations of the chosen methods

Sentiment Analysis

Demographics	Fake reviews	Incentives

The people who post reviews online are not demographically representative. As a result, information on these sites is skewed in ways that are neither fully understood nor accounted for. Different people have different preferences; one visitor may negatively rate a museum for being outdated while another may enjoy a nostalgic experience. 57% of reviews on Tripadvisor are written by US citizens, reviews might be biased in favour of overrepresented cultures (Abramyk, 2018).

There is also the issue of fake reviews posted by museums to boost their rating or by competitors as malicious attacks. A museum could play the system by posting reviews using fake accounts or outsourcing fake reviews on platforms like Fiverr. Reviews tend to be written by those who have had an either extremely unpleasant or an extremely pleasant experience; an “okay” experience provides weak motivation to spend time writing a review. Finally, a person’s museum experience can be influenced by a variety of indirect factors (e.g. having a bad day) - one visitor’s experience at one point in time does not capture the whole picture.

Observation

Observer bias	Internal validity	External validity

The exact answers cannot be collected by observation alone. In an observational study, the observer comes to the table with conscious or unconscious prejudices about the group and situations being studied. Confirmation bias can take place during observation whereby information that conforms to prior beliefs is sought out and information that does not is dismissed. Confirmation bias then extends into analysis, where memory bias enhances or impairs recall to support hypotheses. Confounding is a mixing or blurring of effects that can occur when the researcher attempts to relate an observed behaviour to a cause, but actually measures the effect of a third factor - a confounding variable.

Most of the social phenomenon is abstract in nature. For example, beliefs, affect, feelings, and emotions. Such dimensions are not open to our senses and cannot be quantified by observational techniques. Since observation deals only with what is

shown, lack of insight into visitors' inner processes leads to missing out on nuanced data. This method cannot identify causality or reliably predict outcomes. In other words, it lacks the internal validity to make a definitive statement of fact.

It is always better to have more observations as the basis of generalization. It is an unavoidable criticism that a theory which passes this single case study test requires specific prior conditions and therefore actually has little explanatory range; these conditions may be clearly identified through repeat large-N studies.

Self-report study

Sampling error	Respondent bias	Oversimplification

The downsides of the snowball sampling method are that the first participants influence the composition of the whole sample; Facebook friends are likely to have much in common. Also, people that have many Facebook friends are more likely to be sampled. Furthermore, since respondents self-select their participation in the study, only those that are interested in the topic will respond. This subset of the population may not give an accurate representation of the whole.

Self-report studies rely on the assumption that respondents are able to understand and accurately convey their beliefs and feelings and to recall previous events. However, respondents are also vulnerable to a number of cognitive biases. The framing effect, for example, refers to influencing responses by whether a survey answer or question is presented as a loss or gain. People are more risk averse when a question or answer is framed as a gain. Negative statements might get more extreme ranks compared to positive ones. Habituation bias occurs when respondents provide the same answers to questions that seem similar. Misinterpretation of questions and instructions could occur even when a questionairre is perfectly worded due to differences in culture and values.

One general limitation attributed to survey research is the oversimplification of social reality. By framing issues into multiple-choice questions and preconceived categories. Cross-sectional surveys can sometimes present a static image of an interactive and dynamic process in reality. In other words, respondents attitudes may change with time as technologies become better integrated into museum experiences and social norms adjust to accommodate for this; what is true for someone today may no longer be so a year from now.

4.0 Results

4.1 Observational study

4.1.1 Storyline

The purpose of this step is to observe the behaviour of visitors as they navigate the museum space and interact with the exhibits and with one another in order to gain a deeper understanding of real visitor behaviour and to uncover preferences, attitudes, behaviours, and motivations that may be hard to articulate. Though the researcher enters the museum with a clear mindset, the following questions serve as the framework for observations: (photos of the site and field notes are in the appendix).

- “What does the site look like? Smell like? Feel like? How is it set up physically?
- How does our background influence the way we experience events and process new information?
- How do visitors of art museum interact and communicate with the exhibit and with one another?
- What factors influence the level of engagement and the communication climate?
- Are there elements that are psychologically or physiologically distracting? How do these affect visitor behaviour?
- Is technology implemented by the museums? Is technology being used by visitors? If so, how does it impact the behaviour and interactions of visitors?”

Figure 27 : **a sense of the Kunsthistorisches Museum**

Photography by Stern distributed under a CC BY-SA 3.0 license.

Instagram post by KHM on June 21, 2018

The Kunsthistorisches Museum needs no introduction amongst Austrians and art history lovers. However, for those who do not fall in these categories, below is a description that hopefully captures the essence of the institution.

The structure (seen above) was built between 1871 and 1891. Today, it is one of the most highly regarded museum buildings of the nineteenth century. Topped with a sixty meter high octagonal dome, the building exudes a sense of imperial grandiose. Inside, a blend of Neo-Baroque decorative elements, marble, stucco, gold-leaf, and murals lend the museum an exuberant, ornate, and festive character. While it mainly features ancient antiquities and classical paintings, the museum remixes works of art through a number of excitingly new exhibitions. The *Shape of Time* exhibition, for instance, incorporates a selection of more contemporary artworks into the Picture Gallery as *"stepping stones to lead us from the point at which our own collections end to the point at which we stand today"* (The Shape of Time, 2018). Because of its content and the base ticket price (€ 15.00 for adults, € 11.00 discounted price for adults, seniors, students, and groups), KHM mainly attracts members of the art community, upper class tourists, and seniors.

As mentioned before, KHM is one of the few museums in Austria actively working on digitalisation. The KHM Stories mobile app, for example, offers eight different interactive tours on big themes like Love or Magic. The are are offered in German, English, Turkish and Serbo-Croatian. Users can access hidden secrets and see the reverse of an artwork, its interior, and X-ray images (App KHM Stories, 2018). The museum also harnesses the power of social media and online content. As of June 2018, the official KHM has 72.6k Facebook followers, 35.6k Instagram followers, and about 1.5 million views on Youtube.

The researcher

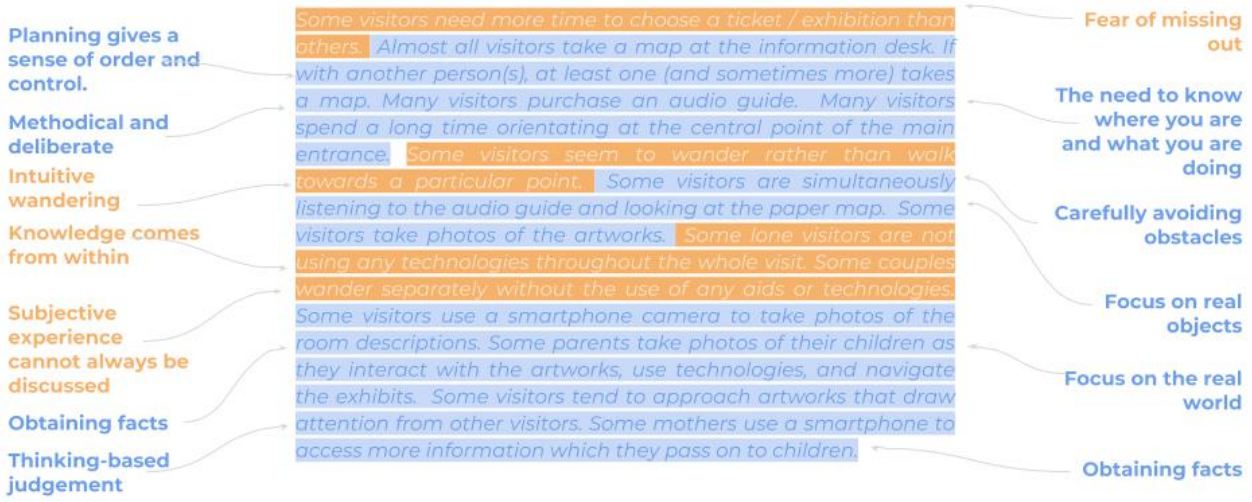
Harry Mckenzie, 2017

As in any observational study, the researcher necessarily comes to the experiment with conscious and unconscious prior knowledge and subjective feelings about the phenomena under study. For this reason, a brief about the researcher follows. The researcher is 23 years old and female. Her educational background includes a BBA in Tourism and Hospitality Management and a MSc in Management (in progress). Her interests are in behavioural economics, empathic design, and emerging tech tools. She believes that, although there will always be aspects of reality that remain hidden beneath the surface, logic and scientific methods can sometimes be used to answer questions about underlying mechanisms that bring about the observable regularities. She believes that art has the power to support and encourage growth and that, with the help of digital technologies, museums can present artworks in a way that achieves this goal.

4.1.2 Data analysis

Six themes were identified via the observational study sessions, these are: [1] objective truth and subjective experience, [2] agentic and communal orientation, and [3] activity and passivity. Each is discussed below. .

Figure 28 : **Objective truth and subjective experience,** some field notes visualised

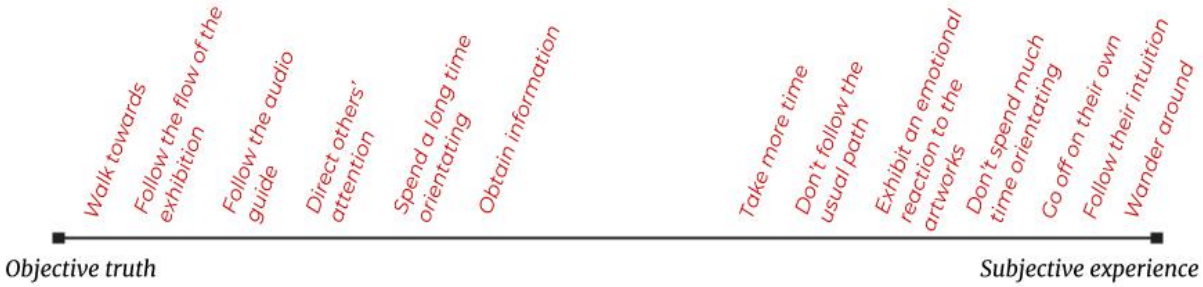


Legend Objective truth | Subjective experience

Visitors seeking objective truth exhibit different behaviour than those who seek subjective experience. They follow a structured route, usually guided by an audio guide, map, or the exhibit's designed flow. These visitors often carry a map along with them throughout the visit and check frequently to see where they are and where they are going. They have a desire for a sense of control, order, and predictability. They make decisions quickly, whether this be which artworks to pay attention to or which exhibits to check out first. They seek specific information; they will read labels and room descriptions and search for more online.

Visitors seeking subjective experience prefer to keep their options open and wander around the museum without keeping to a particular imposed structure. They have difficulty making choices, for example when purchasing a ticket or choosing which exhibit to see first. They are curious and also seek to expand their knowledge through reading labels or listening to audio guide, however unlike objective truth seekers, they often wait behind after a recording stops - looking deeply into the artworks. Ofcourse, persons do not strictly fall in either category, objectivity inclined visitors may have subjective experiences and subjectivity inclined persons may want to obtain factual information. Nevertheless, a general tendency is observed.

Figure 29 : **objective truth and subjective experience**



Agency and communion

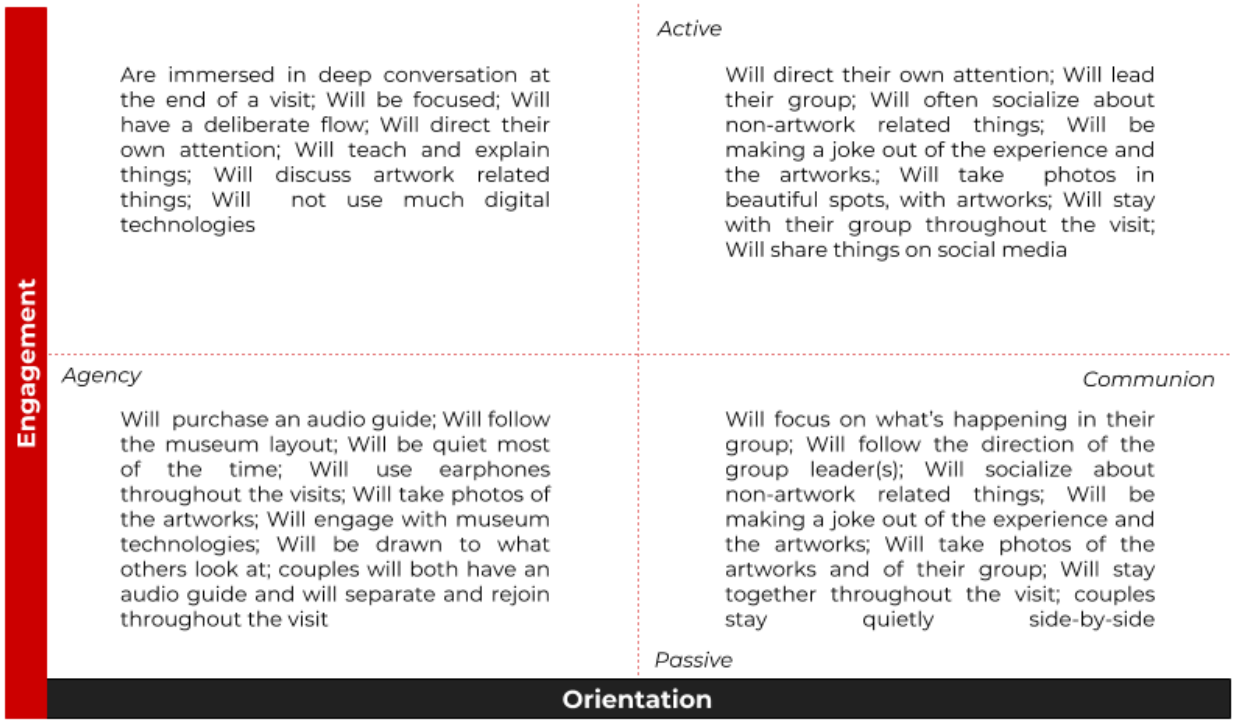
Agentic visitors are those who seek goal-attainment through their museum visit be reinforcing qualities, such as: intelligence, competence or persistence. Agentic visitors tend to be task-oriented, individualistic, and intellectually-driven. Communal visitors are those who seek to maintain social relationships through their museum visit. Communal visitors tend to be group-oriented, social, and warm with those they accompany.

Activity and passivity

Regarding learning

Some visitors seem to receive information about artworks passively. Passive visitors seem to go through two learning processes when encountering artworks, perception and comprehension. Other visitors seem to be actively involved (cognitively or emotionally) with the artworks; they try to make sense of the messages within them and to relate (consciously or unconsciously). Active visitors seem to go through most or all the stages of learning: perception, comprehension, interpretation, evaluation, and response. Because most what process of engaging with artworks occurs in the minds of visitors, from the perspective of an outsider looking in, whether or not a person is learning (critical thinking vs. blank stare) is difficult to determine. Nevertheless, some behavioural cues are observed, these are shown in the figure below.

Figure 30 : **visitor behaviour at different levels of engagement and orientation**



Regarding socialising

Similar as with the learning processes, some visitors socialise actively and others passively. Active persons often direct the visit of their group and draw attention to what they see is worth looking at, their eye is drawn quickly to things to which they are interested, and their movements are more deliberate. Passive persons are more flexible; they let others direct them and exhibit more apathy towards the experience.

Figure 31 : **use of technologies**

- Audio guide only
- Audio guide and map
- KHM Stories app
- Smartphone only
- Smartphone and map
- Digital camera only
- Digital camera and map

- A tour on the mobile app.
- Taking photos in beautiful spots of the museum.
- Some visitors take photos of the artworks either with their smartphones or with a digital camera
- Some visitors take photos of the room descriptions.
- Some visitors edit photos they have taken at the museum while still inside.
- Teenagers take a social media break on the sofas.
- Some teenage girls use smartphones to take selfies with the sculptures and artworks.
- Some mothers use a smartphone to access more information which they pass on to children.
- Younger children will have an audio guide hung around their necks but will not engage with it whatsoever.
- Some parents take photos of their children as they interact with the artworks, use technologies, and navigate the exhibits.

Note : friend groups/pairs consisting of teenagers only tend to not use any museum technologies. Also, older visitors tend to take the map only.

4.2 Sentiment analysis

Three states that ruin visits

Feeling overwhelmed , how should I direct my attention amongst all this?

A visitor is overwhelmed when they feel as though they are given more than is needed or desired. Out of 37 reviews, **11 mentions** refer to the the large size of the museum itself and its collections with a negative sentiment e.g. 'too much' or 'overload'.

Feeling lost , what does all this mean to me?

Visitors can feel lost as a result of a lack of direction (resulting from e.g. poor exhibition flow) or a lack of meaning (resulting from inadequate information communication about artworks, artists, context, etc. Out of 37 reviews, **13 mentions** refer to being frustrated with or irritated by not sufficiently informative labelling and audio guide content and seemingly random exhibition layout.

Feeling bored, why is this art?

When visitors lack interest in the exhibition content, they grow weary and restless. Out of 37 reviews, **16 mentions** use words like uninteresting, unamusing, uninspiring, dull, or repetitive to describe their museum experience.

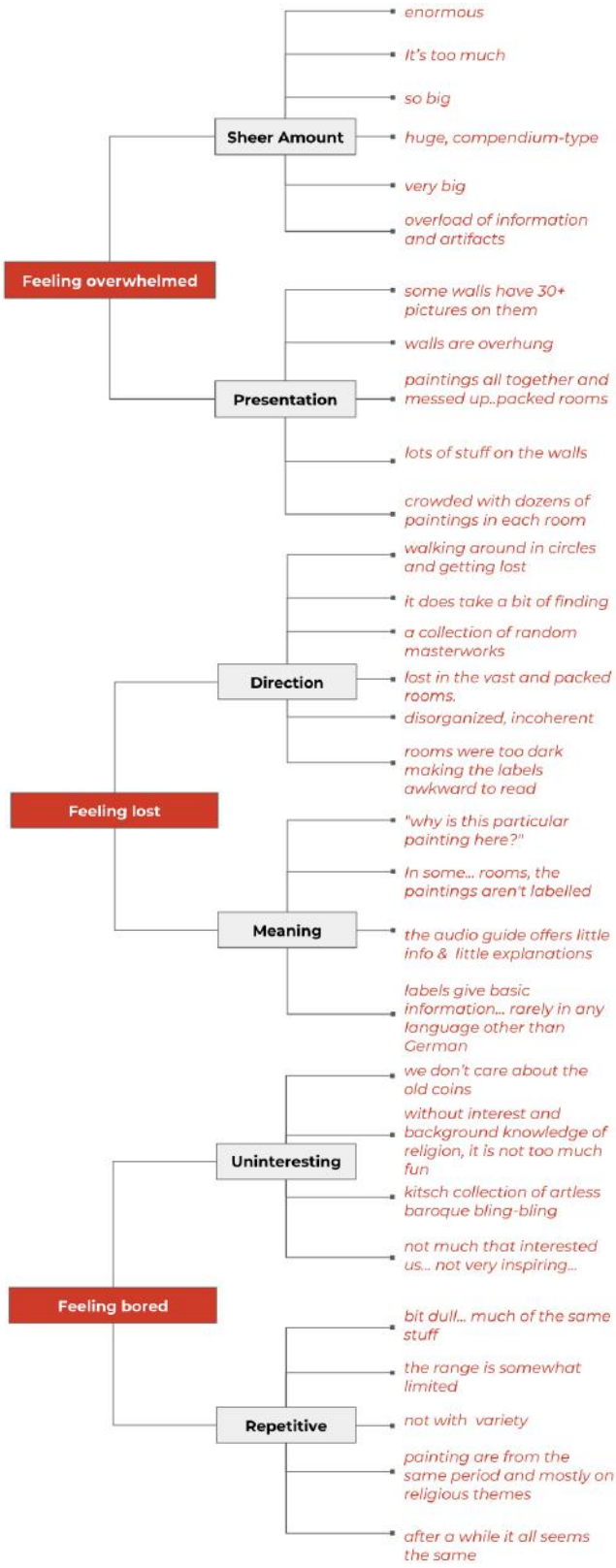


Figure 32 : three states that ruin visits

4.3 Online survey

4.3.1 Data Preparation

A classification of the technologies studied

Old technologies

Museum website
Museum guide
Videos and animations
QR codes providing additional information

Immersive technologies

3D videos or interactives
Holographic imagery
Virtual reality simulations
Immersive games

Educational technologies

Museum app (or other mobile app designed for use in art museums)
Multimedia tours using smartphone GPS locators to give real time information
A tool that lets users identify artworks with a smartphone/tablet camera.
An open source, online archive of all the artworks in the possession of a museum.

Social technologies

Selfie-friendly setups
An online story-gathering interface that lets users annotate and react to artworks.
An online interface that lets users collect artworks into folders and share them with others.
An online interface that lets users design tours into folders and share them with others.

Interactive technologies

Interactive, touchscreen displays
Games playable via smartphone or tablet

Personalisation technologies

A personalised handheld tour ready for you when you arrive.

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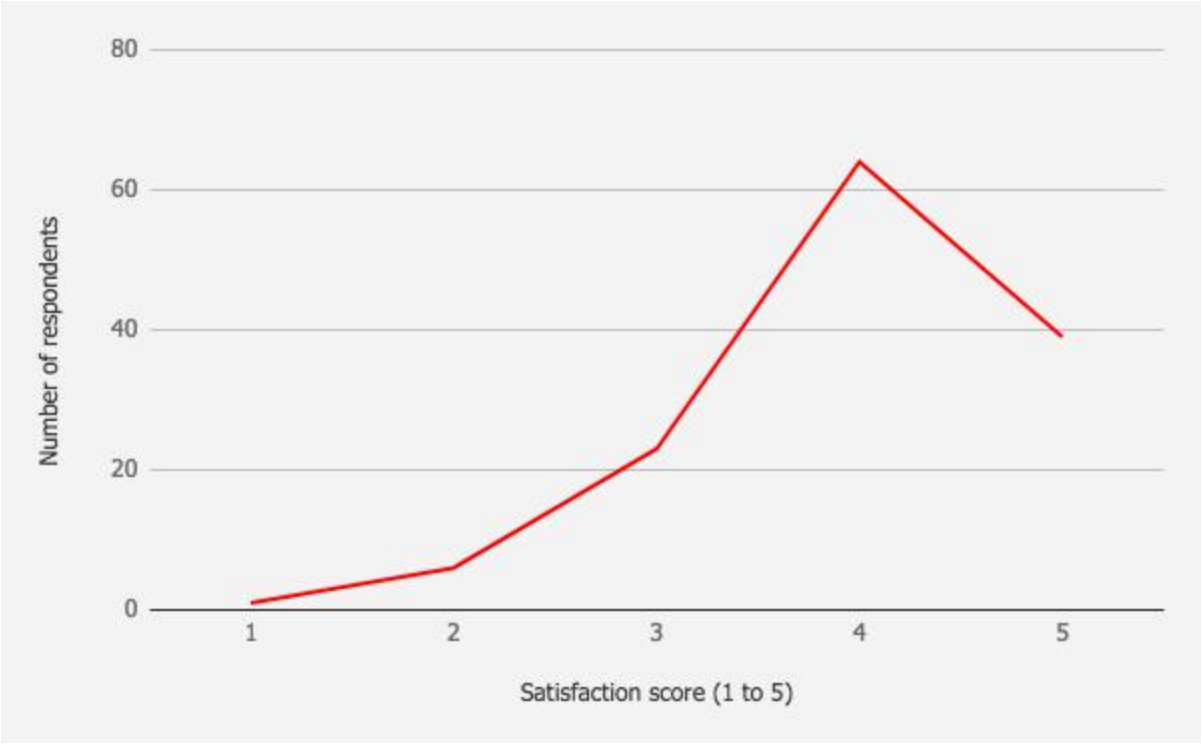
4.3.2 Data Analysis

Satisfaction distribution

Overall, 29% of respondents are very satisfied with their previous museum visit, 48% are somewhat satisfied , 17% are neither satisfied nor dissatisfied, 4% are somewhat dissatisfied, and only one respondent considers their previous museum experience to be very unsatisfying.

Figure 33 : **satisfaction distribution**



*very satisfied is equal to 5 and very dissatisfied is equal to 1.

Linear regression, factors helping or hindering satisfaction (see output in appendix)

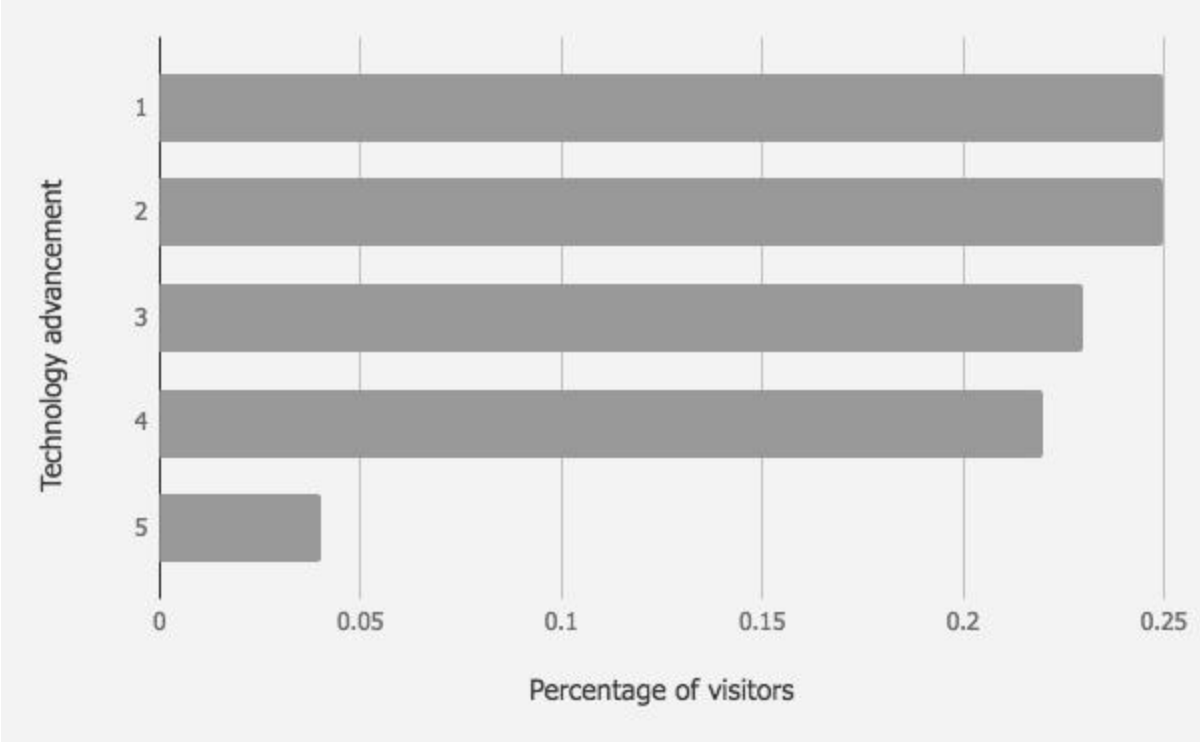
The adjusted R^2 of the model is 0.36, that means that the linear regression explains 36% of the variance in the data. The regression has a significance value of 0.000, this means that the model can predict satisfaction and that there is a linear relationship between the x and y variables. Among the variables in the model, the following are significant predictors (p-value below 0.05): **innovative** (p-value = 0.003), **boring**

(p-value = 0.007), **engaging** (p-value = 0.027), and **nostalgic** (p-value = 0.009). Given the scores on significant predictors, satisfaction can be computed by:

3.02 + (0.21 x innovation) – (0.17 x boring) + (0.16 x engaging) + (0.13 x nostalgic) = Satisfaction

Innovation, engagement, and nostalgia increase satisfaction while boredom decreases it. By order of most to least powerful, predictors are: [1] innovative, [2] boring, [3] nostalgic, and [4] engaging.

Technology advancement of museum visits



*very technologically advanced is equal to 5 and very technologically behind is equal to 1.

Linear regression, effects of advanced technologies on visitors' experience

The adjusted R^2 of the model is 0.35, that means that the linear regression explains 35% of the variance in the data. The regression has a significance value of 0.000, this means that the model can predict technology advancement and that there is a linear relationship between the x and y variables. Among the variables in the model, the following are significant predictors (p-value below 0.05): **innovative** (p-value = 0.000), **boring** (p-value = 0.023), and **engaging** (p-value = 0.008). There is a linear

relationship between level of technology advancement and innovation, engagement, and boredom. By order of most to least powerful, predictors are: [1] innovative, [2] engaging, and [3] boring.

Cluster analysis, visitor types

Cluster analysis is an exploratory test that identifies homogeneous groups within a data set. A selection of key motivations for visiting an art museum are used as the grouping variables, these are:

- I went to enhance my **knowledge** base within my profession/hobby.
- I went to **discover** new things and learn a little bit about a variety of topics.
- I went to **reflect** in a beautiful and peaceful environment.
- I went to look for fresh **memes**.
- I went to take nice **photos** that I can later share.
- I went to spend time **with someone** who wanted to visit the museum.
- I went to provide my **children** with a fun / educational experience.
- I went to **check it** off my 'places to see'.
- I went to see the **best of** what the museum has to offer.
- I was driven by the **recommendations** of others.

The values in the figure below range between 1 to 5 with 1 indicating strong disagreement with the statement and 5 indicating strong agreement with the statement. ▉ = 1 likert point; ▉ = strong predictor of cluster membership; ▉ = weaker predictor of cluster membership

Table 12 : **motivation scores per cluster**

Motivation	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Knowledge	▉▉	▉▉▉	▉▉▉▉	▉▉
Discover	▉▉▉	▉▉▉▉	▉▉▉▉	▉▉▉▉
Memes	▉▉	▉	▉▉▉	▉
Reflect	▉▉	▉▉▉	▉▉▉▉	▉▉▉
Best of	▉▉	▉▉▉▉	▉▉▉▉	▉▉▉▉
Photos	▉▉	▉	▉▉	▉▉▉▉
Children	▉	▉	▉▉▉	▉▉
Accompany	▉▉▉▉	▉	▉▉▉	▉▉▉▉
Checklist	▉	▉▉	▉▉▉▉	▉▉▉

Recommendations	▮▮	▮▮	▮▮▮▮	▮▮▮▮
Share of respondents	16%	29%	25%	30%

All motivational factors are significant predictors of cluster membership(sig. value = 0) . From strongest to weakest, they are: accompany (42), best of (35), recommendation (28), photos (27), memes (26), knowledge (19), children (17), discover (14), check it (13), and reflect (11).

Cluster 1 ranks 'spending time with someone who wanted to visit the museum' as the primary motivation for visiting; this is also the only highly scored motivation by this group and is the strongest predictor of cluster membership. All other motivations were given a negative or neutral score. For this reason, we can say this group regards most aspects of the museum experience with some degree of apathy while focusing on relating to whomever they accompany. **This cluster is best described as the passive communal type.**

Cluster 2 ranks 'seeing the best of what the museum has to offer', ' 'enhance knowledge base within a profession/hobby, and 'discovering new things and learning a little bit about a variety of topics' highly. The ANOVA table (in the appendix) shows that the 'discover' factor is a comparatively weaker predictor of cluster membership, for this reason, it is not used to define any particular cluster. 'Knowledge' and 'best of' can give a clear picture of visitors belonging to cluster 2. They wish to acquire knowledge about specific things and are highly focused on the content of the museum - the artworks. They do not rank highly social activities and others' opinions. **This cluster is best described as the passive agentic type.**

Cluster 3 shows some similarities to cluster 2; they seek knowledge (to an even larger degree) and to see the best of what the museum has to offer. However, they score motivations higher across the board; they are more enthusiastic about the experience and are more active - taking photos. **This cluster is best described as the active agentic type.**

Like cluster 1, cluster 4 is socially oriented; they rank 'spending time with someone who wanted to visit the museum' highly and are driven to visit by the recommendations of others. However, they are more engaged with the experience. They care about seeing the best of what the museum has to offer and like to take photos during the visit. They also rank motivational factors more highly across the board compared to their apathetic counterparts. For these reasons, **cluster 4 is best described as the active communal type.**

Overall, active visitors make 55% of the total and passive visitors make 45% of the total. Communal make for 46% and agentic make for 54%. The smallest group are

passive communals. Passive agentic and active communal both make up about 30% each.

Figure 24 : **share of each dimension**

Age

There are significant age differences between clusters (p-value = 0.000). Minors (20 or younger) and mature visitors (40 or older) tend to be agency oriented while respondents in their 20s and 30s tend to be communally oriented.

Figure 35 : **age make up of respondents and per cluster**

17 or younger	Active agentic
18 o 20	Active agentic (or passive communal)
20 to 29	Active communal (or passive agentic)
30 to 39	Active communal
40 to 49	Active agentic
50 to 59	Passive agentic
60 or older	Not enough data to determine.

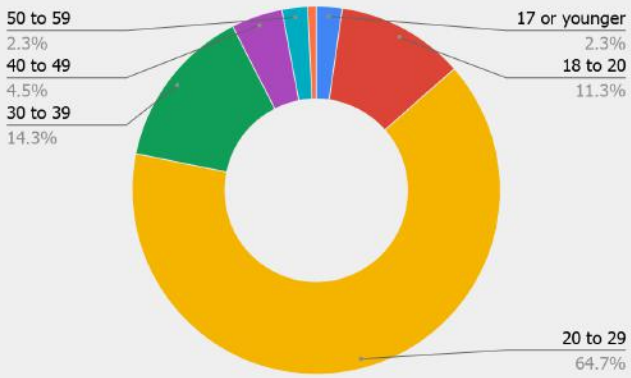
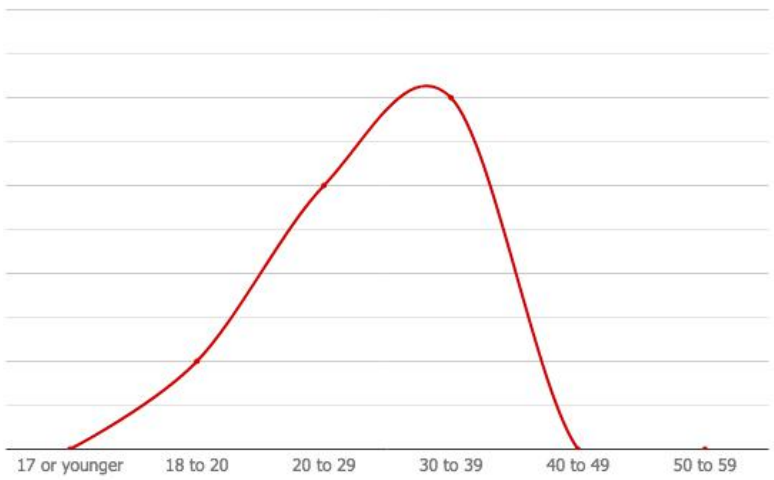


Figure 36 : **from agentic to communal and back to agentic across a lifetime**



Familiarity with artworks and artists

40% of respondents are unfamiliar with museum content before visiting, 29% are neither familiar nor unfamiliar, and 32% are familiar to some degree with the museum content. There are no significant differences detected between visitor types.

Accompanied and unaccompanied visits

Most respondents visit the art museum alone (20%), with a friend or friends (27%), with a partner (16%), or with other members of the family (20%).

Table 13 : **group make up per cluster**

	Alone	Friend(s)	Partner	Tour	Guest(s)	Children	Family	A date	Total
PC	4	**7**	1	1	**2**	0	5	**1**	21
PA	**15**	10	5	**5**	**1**	0	2	0	38
AA	**7**	6	**6**	**3**	0	0	**7**	**3**	32
AC	0	**12**	**9**	2	0	**4**	**13**	0	40
Total	**26**	**35**	**21**	**11**	**3**	**4**	**27**	**4**	131

More than it should be - Less than it should be - Matches ratio

Out-of- town includes with out-of-town guest(s) and with a partner and with out-of-town guest(s). With a friend(s) includes with a friend(s), with a friend(s) and with out-of-town guest(s), and with partner and a friend(s). In group tour includes in group tour and with friend(s) in a group tour. With other family member(s) includes with other family member(s), with other family member(s) and a date, and with other family member(s) and a friend/ out-of-town guest (s). With children includes with partner and children, with children only, with other family member(s), children, and friends, and with other family members, children, and out of town guests. By myself and with a friend(s) is disregarded (hence 131 respondents)

Passive communals are with friends, with out-of-town guests, and one a date. The persons they go with are not so closely related as with active communals. The largest proportion of passive communals visit with friends. Passive agentics are alone, with an out-of-town guest, or with an organised group tour. They are mostly alone. Active agentics are alone, with their partner, with an organised group tour, with other members of the family, or on a date. They like to accompany others but prefer adult visitors who would not detract from their learning goals. (Kids could be above 18 years old) The largest proportion of active agentics are alone, with a partner, or with family. Active communals are socially oriented and sometimes come in large groups including young children. The largest proportion of Active communals visit with family, friends, and/or a partner.

Cross tabulation, attitudes, affect, and intentions

It takes too much time to grasp how to use new technologies to make them worth the effort.

67% of visitors do not agree that it takes too much time to learn how to use new technologies for it to be worth the effort, 17% are neutral towards the statement, and 17% agree with the statement. There are significant differences between groups regarding attitude towards new technologies (p-value = 0.001). Agentic visitors make for the majority of those that agree with the statement - especially active agentics.

Key point

Active agentics are the most sceptical towards the ease of use and usefulness of new technologies. They believe that it takes too much time to grasp how to use them for it to be worth the effort.

New technologies enhanced my museum experience.

26% of respondents disagree that new technologies have a positive impact, 23% neither agree nor disagree, and 51% agree. There are significant differences between

groups regarding the belief that new technologies enhance the museum experience (p-value = 0.05).

Key point

Passive communals tend to disagree that their experience was enhanced by new technologies.

New technologies served my needs at the art museum.

32% of respondents disagree that new technologies have a positive impact, 28% neither agree nor disagree, and 40% agree. There are significant differences between groups regarding the belief that new technologies serve museum needs (p-value = 0.03). Passive agentics and active communals tend to disagree that new technologies serve their museum needs. Passive communals tend to neither agree nor disagree. Active agentics tend to agree that new technologies serve their museum needs.

Key points

Passive agentics are the visitor group that least believes new technologies serve their needs at the art museum.

Feeling confident using new technologies

The majority of respondents (87%) feel confident in their ability to use new technologies. There are no significant differences detected between visitor types.

Feeling pleased to see new technologies during the visit

30% of respondents do not feel pleased to see new technologies during a museum visit, 30% are neither pleased nor displeased, and 40% are pleased. There are no significant differences detected between visitor types.

Using technology made me feel less accomplished in my ability to understand and connect with the artworks.

70% of respondents do not feel that using new technologies reduced their sense of accomplishment in understanding and connecting with the artworks. There are no significant differences detected between visitor types. Agentic visitors tend to form the majority of those who do feel less accomplished.

Key point

Agentic visitors get a sense of achievement from being able to understand things on their own. Using technologies makes them feel reliant on outside help thereby reducing their sense of accomplishment.

I felt like using new technologies at the art museum makes me look worse among others.

75% of respondents do not feel that using new technologies at the art museum reflects negatively on their image in front of others. There are no significant differences detected between visitor types. Active agentic visitors are most likely to feel some uncertainties regarding the way their use of new technologies is perceived by others.

Key point

Active agentics sometimes feel negatively represented. This could be due to the combination of their need for personal achievement and their propensity to sometimes visit with others. Using technologies to understand artworks may make them feel stupid in front of their peers.

I felt anxious when interacting with a new technology for the first time.

76% of respondents do not feel anxious when interacting with a new technology for the first time. Passive communals are the least anxious when interacting with new technologies for the first time, followed by passive agentics and active communals. Active agentics are the group which feels the most anxiety.

Key point

There are several reasons why active agentics may feel anxious interacting with new technologies: [1] a proportion of active agentics feel as though using technologies makes them look and feel stupid and [2] a proportion of active agentics struggle to grasp new technologies (it takes too much time and effort).

Table 14 : **technologies used in the last visit by cluster,** number of visitors

Technology options	PC	PA	AA	AC	Total
None	4	12	2	2	20
Audio guide	4	9	12	13	38
Museum app	2	0	6	4	12
Take photos	13	16	23	28	80
Look up something on the internet	7	14	11	23	55
Sharing on social media and/or messaging apps.	6	4	9	14	33
Collect/share artworks I liked on social media	0	2	5	5	12
Videos	4	4	7	9	24
Interactive, touchscreen displays	4	6	9	12	31
Interactive museum game	2	0	4	2	8
VR or AR tools	0	0	2	1	3
Share of respondents per cluster (%)	16	29	25	30	-

More than it should be - Less than it should be - Matches ratio

Usage behaviour differs between the visitor types. Passive visitors use less technologies during a museum visit than active visitors. Active communals use the most technologies, followed by active agentics, followed by passive communals, and finally passive agentics who use the least technologies.

Table 15 : **technologies that seem exciting by cluster,** number of visitors

Technology options	1	2	3	4	Total
None	1	1	0	0	2
Museum **website**	3	6	9	10	28
Museum **guide**	4	16	18	16	54
Videos and animations	10	13	14	20	57
Interactive, **touchscreen** displays	14	21	17	27	79
Games playable via smartphone or tablet	2	5	7	5	21
Museum **app**	5	7	12	14	38
QR codes providing additional information	4	7	9	11	31
3D videos or interactives	9	10	11	19	49
Holographic imagery	9	16	10	20	55
Virtual reality simulations	12	17	14	24	67
Immersive games	6	3	5	8	22
Multimedia tours using smartphone GPS locators	8	10	9	15	42
A tool that lets users **identify artworks** with a camera	7	9	10	18	44
Selfie-friendly setups	3	3	4	3	13
A **personalised** handheld tour upon arrival	3	9	6	17	35
An online **story-gathering** interface that lets users annotate and react to artworks.	2	5	7	8	22
An online interface that lets users **collect artworks** into folders and share them with others.	2	5	8	4	19
An online interface that lets users **design tours** into folders and share them with others.	1	3	4	6	14
An **open source**, online archive of all the artworks in the possession of a museum.	4	6	10	16	36
Share of respondents per cluster (%)	16	29	25	30	728

More than it should be - Less than it should be - Matches ratio

The most popular technology options among respondents are:

1. Interactive, touchscreen display
2. Virtual reality simulations
3. Videos and animations
4. Holographic imagery
5. Museum guide
6. 3D videos and interactive
7. A tool that lets users identify artworks with a camera
8. Multimedia tours using GPS.

The order of visitor types by excitement towards the new technology options presented are: [1] active communals, [2] active agentics, [3] passive communals, and [4] passive agentics. Only 2 respondents mark that they would not be excited to see any of the suggested technologies; 1 passive communal and 1 passive agentic. The figure below displays technology options preferences according to the four visitor dimensions.

Table 16 : **passive and active technologies**

Passive technologies	*Active technologies*
Holographic imagery	*Website* *Museum app* *QR codes* *An online story-gathering interface that lets users annotate and react to artworks.* *An online interface that lets users design tours into folders and share them with others.* *An open source, online archive of all the artworks in the possession of a museum.*
Agentic technologies	*Communal technologies*
Audio guide	*Videos and animations* *Interactive, touchscreen displays* *3D videos or interactives* *Virtual reality simulations* *Immersive games* *Multimedia tours using GPS* *A tool that lets users identify artworks*

Written responses

The technology is static

“Labels were very limited. Information online was hard to find. Need for more dynamic information about artworks instead of hearing the same old thing from museum audio guide.”
- Female (20 to 29)

“I downloaded the KHM app but I didn't have a lot of time that time. For my need (just seeing one special exhibition) it wasn't flexible enough.”
- Female (20 to 29)

--

The technology is fussy

“In general technologies in museums these days are not yet well developed and need improvement for them to be beneficial to visitors.”
- Female (20 to 29)

“Touch screens that don't work properly so you have to push several times and give up dissatisfied... Guide app only in German. To remember artists’ and artworks’ names I always take picture of infocard, would be nice if picture was automatically labeled with this info when taking picture of artwork.”
- Female (20 to 29)

“Audio Guide at London Tower didn’t sync when it was trying to find your location. Very unsatisfying and ultimately useless as the audio didn’t describe what you were seeing."
- Female (30 to 39)

--

The technology is not accessible

“I do not have a data plan and therefore require local, preferably free museum wifi to take advantage of any online/downloadable content in the museum.”
- Female (20 to 29)

--

The technology is distracting

"It is fun, but it distracts me from the real beauty of artworks."
- Female (20 to 29)

"... looking at the app all the time feels like you're not engaging with the artworks themselves at the time of the visit."
- Female (17 or younger)

"Time consuming search for information."
- Female (30 to 39)

5.0 Discussion

5.1 Technology and satisfaction

Technologically advanced museums correlate with more satisfying experiences. The implementation of technologies corresponds to a number of satisfying factors. Visits that are ranked as technologically advanced also tend to be ranked as innovative; satisfied respondents tend to rate their museum experience as innovative. Visits that are ranked as technologically advanced also tend to be ranked as engaging; engagement is a source of visitor dissatisfaction.

On boredom

The sentiment analysis of online reviews identified boredom as a key cause of dissatisfaction. This happens when the exhibition fails to grab visitors' attention or when the journey is too monotonous and slow. Cross tabulation between satisfaction and boredom also shows a relationship between them. Moreover, technologies alone do not seem to alleviate this problem. A technologically advanced museum can still be boring.

Written survey response :

"... Need for more dynamic information about artworks instead of hearing the same old thing from museum audio guide."
- Anonymous, 2018

Tripadvisor review of the Kunsthistorisches Museum Vienna :

"Bit dull to be honest. Too much of the same stuff. Bored the kids to death. The natural history museum is a much better trip."
- Anonymous, 2017

To solve this problem, technologies need be implemented in a way that combats boredom by equipping visitors to progress easily through exhibits, to understand each artwork's uniqueness and newness, to discover underlying themes and stories, and to relate emotionally.

Figure 38 : **on feeling lost and overwhelmed**

Johan Zoffany
The Tribuna of the Uffizi, 1772-8
The Royal Collection, Windsor

In his book, *The Paradox of Choice – Why More Is Less,* American psychologist Barry Schwartz argues that doing away with consumer choices can significantly reduce shoppers' anxiety (Schwartz, 2004). The same can be said for museum visitors; more utility can be achieved by limiting the number of artworks being presented at a time. The sentiment analysis of online reviews identifies feeling overwhelmed and lost as key causes of dissatisfaction. This happens when visitors feel buried down beneath the sheer immensity of the museum and its collections; a feeling of wandering aimlessly ensues.

Tripadvisor review of the Kunsthistorisches Museum Vienna :

"It's a very large museum with a wide variety of paintings. Sometimes I wondered, looking at yet another room with lots of stuff on the walls, 'why is this particular painting here?'"
- Anonymous, 2017

To solve this problem, museums need to do a better job of directing visitors' gaze in a meaningful way. Most museums organise artworks chronologically or by medium, below are the collections as arranged in KHM. This has little utility for museum visitors. However, a number of digital solutions can be employed to group artworks into collections that can actually help visitors decide where they want to go and what they want to see - discussed in the upcoming subchapter (5.1.1).

- Egyptian and Near Eastern Collection
- Collection of Greek and Roman Antiquities
- Picture Gallery
- Kunstkammer Wien (in English : Cabinet of Curiosities Vienna)
- Coin Collection
- The Library

Figure 39 : **on nostalgia**

Doug Bloodworth
Batman v Superman and m&m

In the context of this topic, nostalgia refers to *"a yearning for the return of past circumstances, events, etc"* (Collins English Dictionary, 2012). There is a tendency for highly satisfied visitors to rate their museum experience as nostalgic. Larger studies have confirmed the positive psychological impacts of feeling nostalgic. It has been shown to decrease levels of loneliness, boredom, and anxiety and to increase hope for the future, feelings of being loved, feelings that life is worth living, feelings of belonging and affiliation, and generosity towards others.

Nostalgia can be induced by: listening to hit songs from previous years, singing along to a favorite song from one's past, artworks that bring about existential angst (defence mechanism), and cold rooms or cold weather. How often one feels nostalgic varies across a lifetime, the young and elderly tend to nostalgize more than

middle-aged adults. It serves a consoling function during periods of transition. (Tierney, 2013)

On Innovation

Figure 40 : **number of mentions of the word 'innovation' in English from 1800 to 2013.**

(Google Ngram Viewer, 2013)

Innovation has grown to become somewhat of a buzz word over the past decades; it derives from the Latin *in* meaning 'into' and *novare* meaning 'make new'. Both technologically advanced and satisfactory experiences tend to be positively related to innovation. Firstly, museums should eliminate old-fashioned and arcane language from labels and audio tours. Secondly, museums should innovate using digital technologies. By mediating and enriching visitors' encounters with artworks, museums can infuse insights by transforming the old to the new in the eyes of visitors or by highlighting truths and philosophies behind artworks that are useful in present day.

5.2 Suggestions for a technology enhanced journey

Where am I? - Where am I going? - What should I see? - What have I still not seen? - How much am I missing? - How long will this take? - Where can I rest?

Guiding questions

Observing and interpreting artworks is not a straightforward business for most visitors. Museums need to step in to guide the viewing process. One way this can be

done is through presenting a set of guiding questions to visitors via the labels, audio guide, museum app, or other interface. These questions can hint at underlying philosophies and subliminal messages. There can include nostalgia inducing ones e.g. *when was the last time you experienced a beautiful landscape ?*

Figure 41 : **how these questions might look like**

Diego Velázquez, Las Meninas (1656)

Experiential, location-based audio tours

At present, visitors are responsible for choosing which artworks to stop and learn about. For experienced viewers, this might be useful. However, leaving the decision up to those who are unfamiliar with artworks and artists is useless. A seemingly uninteresting artwork may have a special story behind it. A GPS-enabled guided tour can enable an experience full of spontaneous discoveries. Tours can be categorised by universal and timeless themes, trending topics and current events, or by the special narrator. Narrators might include influencers, philosophers, artists, politicians, comedians, writers, historians, sociologists, psychologists, etc. They would co-create the tours and infuse their own thoughts about the artists and reactions to the artworks. Tours should be narrated in the tone of a knowledgeable friend rather than the classical, actor-like voice. Artspeak should be completely eliminated from guides (and all communications) to bridge the gap between experts and tourists or beginners and to make the art world more relatable. Resourced need to be allocated towards translating tours into the languages of key visitor demographics and

sourcing narrators from all over the world. Another great idea for groups would be to include an audio sync feature.

Podcasts

Podcasts are an excellent way to provide visitors with a frequent stream of in-depth conversations. More familiar visitors might be interested in going in-depth into a smaller selection of artworks rather than getting a general overview of many. A narrator would invite weekly interviewees to engage in a informative and casual conversation about specific topics, artworks, or artists. The narrator should take on the persona of an average visitor, asking questions and making observations they might do. The narrator should also translate any artspeak by the interviewee. Podcasts can be uploaded on iTunes, Youtube, Spotify, Google Play, TuneIn, and/or Soundcloud.

Animated storytime

Headphones plugged in is not for everyone, especially communal types. Curators and volunteers could select a special artwork for an intimate storytime experience. They can be personal or presented using animated video with audio sound bites, music, and sound effects. Animations should ideally appeal to both adults and children.

Personalisation

Museums can target visitors with personalised tours by employing a simple recommender system. Data collection could involve asking visitors to choose favourite artworks, artists, or art periods from a given list similar to that used by Netflix on new customer profiles. A short quiz (e.g. 3 questions) could also be a means to the same end. Either option could be completed via a museum website, mobile app, audio guide, or interactive touchscreen.

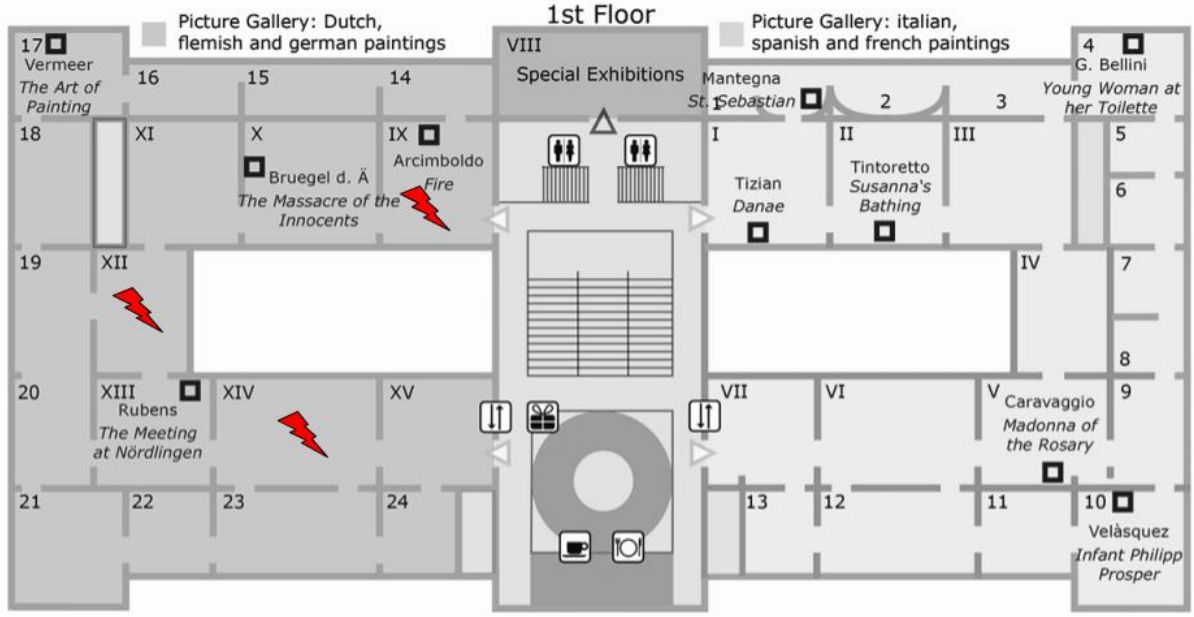
Questions could be:

1. What is your motivation to visit?
2. How familiar are you with the artworks / artists?
3. Who are you with?

Personalised tours could be built by visitors themselves using guided search. This would involve identifying all artworks exhibited in the museum that match a searched keyword via a museum website, mobile app, multimedia guide, or interactive touchscreen. Visitors can then follow a suggested path around the museum to view these artworks. For example, a visitor might search “anger” and all

artworks tagged with the term appear marked on the digital floor plan. Artwork tags could be crowdsourced (see next page) or completed in house by museum curators. Tours could be saveable and shareable with others on social media.

Figure 42 : **KHM floor plan with anger tags**



Source :http://beyondarts.at/guides/en/kunsthistorisches-museum-vienna/kunsthistorisches-museum-vienna.html
* these do not represent actual anger related artworks at the museum, the illustration is just for show.

Augmented Reality

Many exciting augmented reality applications for art museums emerge today. In Vienna, *Artivive* (implemented by Albertina Museum) layers digital animations on top of artworks. These show the process leading up to the realisation of artworks and are visible by holding a smartphone or tablet up to them.

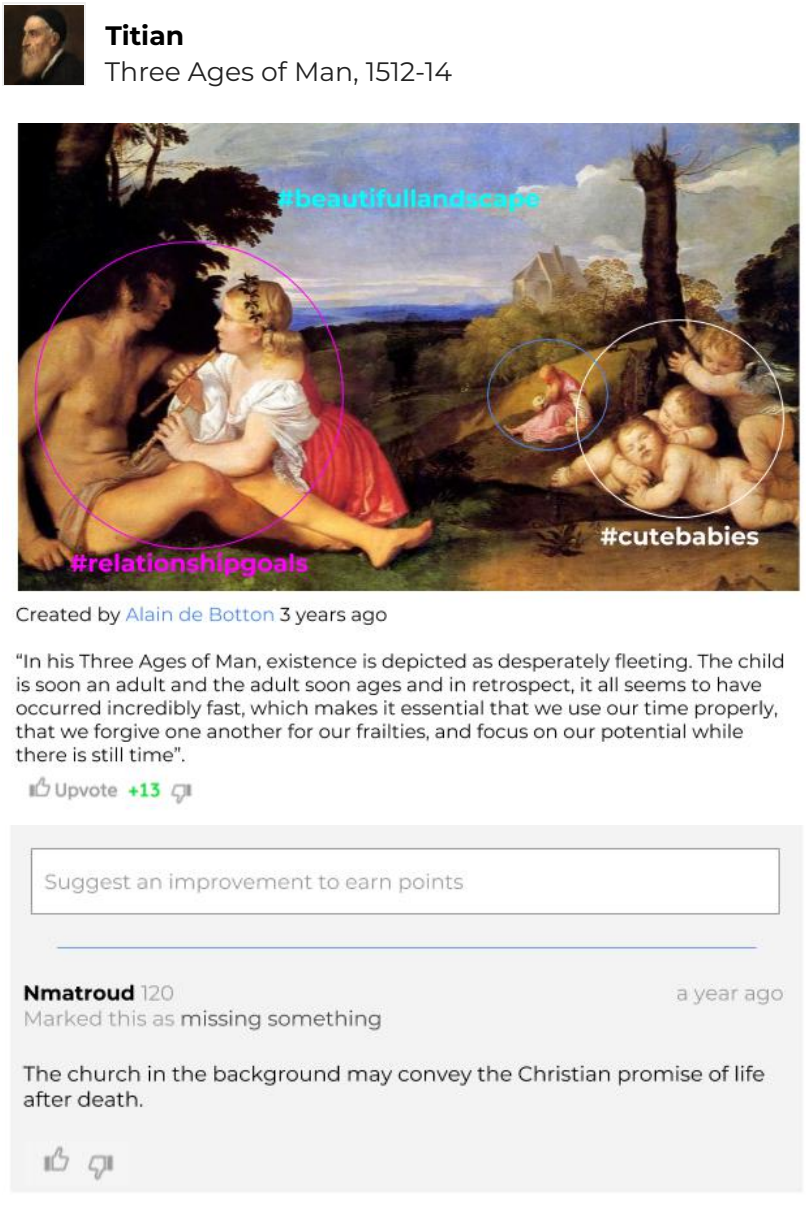
Immersiveness

Museums could create an immersive experience using digital art 'installations'. These should not compete with or distract from artworks. On the contrary, they should enable visitors to flow smoothly through the exhibition and feel a sense of calm and connection and spontaneity. Exhibition floors could be illuminated with flowing and intermingling waves of light - going in various directions, highlighting certain points - as though visitors are carried slowly by a current of water or air.

User generated content

Site or function that allows users to provide annotations and interpretations of artworks. Social tagging, users can tag parts of artworks using keywords. By clicking on a tag, users can access annotations providing additional details and context about the tagged element of the artwork. Tags provided by the artists or by museum moderators are distinguishable e.g. by colour. An 'Art Map' using (e.g. Google Maps) displays locations and landmarks relating to or appearing in artworks. The site is interactive, users can comment on each others comments and annotations. Users earn points for publishing quality text; these are obtained by receiving upvotes from other users or through being chosen by museum moderators. Top comments are credited and included as part of labels, guides, podcasts, etc. Tags are searchable, users can identify where in the museum artworks under a specific tag are located on a digital map with GPS.

Figure 43 : **an illustration of how such a platform may look like**



Open source online discovery

Museums can facilitate online discovery by designing an own online discovery interface (e.g. Rijksstudio by Rijksmuseum) or by building a profile on sites like Pinterest. Users could 'like' artworks, build thematic folders containing whole artworks or cropped parts, download high resolution images of artworks for inspiration or reuse, and follow other's profiles or folders. A nice added feature would be to enable camera recognition to identify artworks while at the museum so that they could be directly 'liked', added to a folder, download, etc.

Figure 44 : **screenshot of a selection of boards made by the Getty Museum on Pinterest dated 08.07.2018.**

J. Paul Getty Museum
Los Angeles

The following section provides an overview of the visitor types, motivations, characteristics, and technology related beliefs, affect, and behaviours.

Four visitor types :	Passive Communals	Passive Agentics	Active Agentics	Active Communals

5.3 Passives

5.3.1 Passive Communals

Motivation

I went to spend time **with someone** who wanted to visit the museum.

Characteristics

1. 16% of total respondents, minority group.
2. There is a tendency for passive communals to be between **ages 18 to 20.**
3. A large proportion of passive communals **visit with friends**, with a tendency towards acquaintances.

Beliefs and affect

Passive communals do not believe that new technologies enhance their experience at the museum; they are not particularly pleased to see new technologies during a visit.

Technology use and intentions

Passive communal visitors use technology to a moderate degree. Their most preferred way to engage with technologies while at the museum is through sharing parts of their experience on social media and/or messaging apps. They also like to take photos for later sharing and watch informative videos.

The most popular technologies among passive communals are: videos and animations, interactive touchscreen displays, 3D videos or interactives, holographic imagery, virtual reality simulations, immersive games, multimedia tours using smartphone GPS locators, and selfie-friendly setups.

5.3.2 Passive Agentics

Motivation

I went to see the **best of** what the museum has to offer.

Characteristics

1. 29% of total respondents, they are the second largest group.
2. There is a tendency for passive agentics to be between the ages of **20 to 29** or **50 to 59**.
3. Passive agentics mostly visit **alone**.

Beliefs and affect

Passive agentics are the visitor type least pleased to see new technologies at the museum; they do not believe that new technologies serve their needs at the art museum and somewhat believe that it takes too much time to grasp how to use new technologies for it to be worthwhile.

Technology use and intentions

Passive agentics use the least amount of technologies during a museum visit. When they do, they will use an interactive touchscreen display to find out more information and know where to direct their attention. They prefer easily accessible information tools that do not require them to make any downloads, play any games, or put on any gadgets.

The only popular technologies among passive agentics are the museum guide and holographic imagery.

5.4 Actives

5.4.1 Active Agentics

Motivation

I went to enhance my **knowledge** base within my profession/hobby.

Characteristics

1. 25% of total respondents are active agentics.
2. There is a tendency for active agentics to be **20 to younger** or **between 40 to 49**.
3. Active agentics tend to **visit alone or with people to whom they are very close** e.g. their partner or other family member(s) - mainly adults.

Beliefs and affect

Active agentics believe that new technologies serve their needs at the art museum. They are the most pleased to see new technologies at the museum. However, they also believe that it takes too much time to grasp how to use new technologies for it to be worth the effort.

Agentic visitors get a sense of achievement from being able to understand things on their own. Using technologies makes them feel reliant on outside help thereby reducing their sense of accomplishment.Active agentics sometimes feel negatively represented. This could be due to the combination of their need for personal achievement and their propensity to sometimes visit with others. Using technologies to understand artworks may make them feel stupid in front of their peers.

Active agentics are the group which feels the most anxiety when interacting with a new technology for the first time. There are several reasons why active agentics may feel anxious interacting with new technologies: [1] a proportion of active agentics feel as though using technologies makes them look and feel stupid and [2] a proportion of active agentics struggle to grasp new technologies (it takes too much time and effort).

Technology use and intentions

Active agentic visitors use technologies to a considerably high degree. Their tastes range across the board from the traditional audio guide to VR and HR tools. They are less likely to share parts of their experience on social media websites and messaging apps. They like to use technologies to learn and to immerse themselves with the artworks. They prefer to use power of the mind over looking up answers online. .They do not watch videos as much; they do not wish to sit passively watching something. They seek an experience that is both educational and co-created.

The most popular technologies among active agentics are: the museum website, the museum guide, games playable via smartphone or tablet, museum app, QR codes providing additional information, selfie-friendly setups, an online story-gathering interface that lets users annotate and react to artworks, an online interface that lets users collect and share artworks, an online interface that lets users design and share

tours, and an open source archive of all the artworks in the possession of the museum. They are the only group which prefers the online interface that lets users collect and share artworks option.

5.4.2 Active Communals

Motivations

I went to spend time **with someone** who wanted to visit the museum and see the **best of** what the museum has to offer.

Characteristics

1. 30% of total respondents are active communals.
2. There is a tendency for active communals to be **20-39**.
3. Active communals tend to **visit with family, close friends, children** under 18 years, and/or their partner.

Beliefs and affect

Active communal somewhat disagree that new technologies served their needs at the art museum. Active communals are neither pleased not displeased to come across new technologies at the museum.

Technology use and intentions

Active communals make the largest share of the museum visitors. Despite their low perception of technology usefulness, active communals are the heaviest technology users. They use traditional educational tools (e.g. audio guide) and new ones (museum apps); they take photos and share their experiences on social media; they are curious and want to discover more by searching online and making use of interactive touchscreen displays. However, just as important as discovery is for them, so are the people they accompany. They do not want to completely disengage from their group.

This visitor type is the most excited about new technologies. The most popular technologies among them are: the museum website, videos and animations, interactive touchscreen displays, a museum app, QR codes providing additional information, 3D videos or interactives, holographic imagery, virtual reality simulations, immersive games, multimedia tours using smartphone GPS locators, a tool that lets users identify artworks with a camera, a personalised handheld tour

upon arrival, an online interface that lets users annotate and react to artworks, an online interface that lets users design and share tours, and an open source archive of all the artworks in the possession of a museum.

5.5 Four targeted digital strategies

The following section provides an overview of ...

Passive communals - break the ice with an easygoing promenade.

Do not overwhelm this type, keep things light and give general information and fun facts. Give them something to look at together with videos, VR simulations, and interactive touchscreens. Make it shareable by integrating with social media.

Passive agentics - a relaxed quest for discovery.

Provide easy-to-use, educational tools - museum guide and holographic imagery. Replace fussy and repetitive audio guides with weekly in-depth podcasts and/or experiential tours.

Active agentics - a participative learning experience.

Active agentics have mixed feelings about new technologies, they would like to use them but they would also like to maintain their power of mind. Facilitate feelings of achievement with challenging games and co-creation via crowdsourced annotations and tours . Enable continuous learning by providing educational tools on site and open source online discovery e.g. pinterest.

Active communals - a fusion visit with active learning and constant interaction.

Similar to passive communals, this visitor type like to experience the museum together. Give them something to look at together with videos, AR and VR simulations, and interactive touchscreens. Because they also like to actively interact with the exhibits, give them something to do together with immersive games and multimedia tours using GPS & audio sync feature. Similar to active agentics, they like to co-create their experience, enable this with crowdsourced annotations and tours and personalisation.

6.0 Conclusion

Summary

Art museums are starting to address their shifting role in society - from mediators of artworks to mediators of information. Implementing a digital strategy has become a 'must' to continue to producing meaningful experiences for visitors. Doing this effectively involves having a combined understanding of the strengths and limitations of various technology solutions and visitor needs; the latter was the focus of this paper. Based on the sentiment analysis of online reviews, three states of dissatisfaction were identified: being overwhelmed, being lost, and being bored. Based on the observational study at Kunsthistorisches Museum Vienna and the Facebook disseminated survey of 133 respondents, four visitor types were identified: passive communals, passive agentics, active agentics, and active communals. These differ in their orientation (towards 'things' versus towards 'people') and their level of engagement (high activity versus low activity). Each type is distinct with regards to their motivation to visit, demographics, familiarity with artworks, visiting group make up, and level technology use and usage intentions.

Deduction

The issue of feeling overwhelmed could be tackled by reducing choice via personalisation. Feeling lost could be tackled by providing direction via guiding questions and experiential tours or giving meaning via in-depth podcasts and crowdsourced annotations and reactions. Feeling bored could be tackled by breaking the monotony with immersive, AR, and VR features and drawing attention to unlikely places using online discovery and user generated content. Museums could build four targeted digital strategies to directly serve each visitor type. These are:

Passive communals : break the ice with an easygoing promenade.

Passive agentics : a relaxed quest for discovery.

Active agentics : a participative learning experience.

Active communals : a fusion visit with active learning and constant interaction.

Predictions

By implementing some of these suggestions, a museum will generate buzz and will emerge as a market leader in the move passed 'art for art's sake'. For the general population, interest in visiting art museums will rise as more and more people experience and share meaningful visits. Looking forward, digitalisation could put a visit to the art museum on par in popularity with watching a movie at a theater or listening to music at a concert venue.

Limitations and suggestions for future research

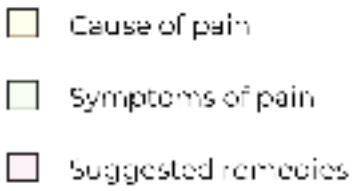
This paper addresses the multitude of technology tools in broad brushstrokes; more focused research is needed on the exact usefulness and applications of each tool as it progresses down the technology lifecycle. Research focused on which technologies are best suited to address visitor needs, another perspective would be to assess the technologies that best suit different museums and exhibitions. There are many limitations to gathering data by survey and observation; further experimental studies could give rise to practical knowledge and best practices. Finally, more research is needed on the downsides and dangers of implementing technologies on the art viewing experience. Perhaps other educational platforms and institutions should play a bigger role in teaching people to understand art.

7.0 Appendix

7.1 Thematic analysis of online reviews

Sentiment Analysis

Legend



Tripadvisor 4.5 7,986 reviews

Not our cup of tea
"*The architecture and interior of the building is breathtaking and worth visiting. But for us, we found the museum rather boring, we don't care about old coins and stuffs. Also we found ourselves walking around in circles and getting lost. If we do this again, we would just spend the whole time looking at and enjoying the paintings though! They also had stairs to look at the ceiling details closer which was amazing. The natural history museum is much more entertaining.*" (JJCC_10, February 2018)

Terrible organisation, beautiful artifacts and buildings
"*...the displays are rarely brought together to give you anything more than a basic idea of the piece. Displays are also rarely in any language other than German making the audio guide mandatory.*" (Alex W, October 2017)

Gloomy
"*The rooms were too dark and the labels awkward to read, because of the (lack of) lighting. I left after visiting three rooms.*" (Debby B, July 2017)

Ok for very old art
"*Bit dull to be honest. Too much of the same stuff. Bored the kids to death. The natural history museum is a much better trip.*" (alexh2009, July 2017)

Pretty good general art museum
"*It's a very large museum with a wide variety of paintings. Sometimes I wondered, looking at yet another room with lots of stuff on the walls, "why is this particular painting here?"*" (Daniel L, May 2017)

Some Spectacular Art
"...You will have to get the audio tour box because most exhibits have German-only descriptions. That was frustrating.,," (J-H-Carp, May 2017)

Dark, Overpowering and Underwhelming
"...Collectively though it is just a collection of random masterworks, and even with the audio tour is too overwhelmed to make sense of it all. I left almost mentally disturbed, and light deprived, and was happy to be out the door, back in the rain. Don't miss if you are a traditionalist, for true inspiration you might consider other venues." (Michael D, April, 2017)

Nice but not for all
"It is a nice museum. With paintings from famous artists. Too many paintings. But if this kind of artist isn't in your interest, just skip it" (Vagdesto, February 2017)

Note to the reader: It would have been a 4, possibly 5 stars, if I had the time to visit it all.
"...I've spent most of my time visiting the Egyptian and Near Eastern collection, the collection of Greek and Roman Antiquities and the collection of Sculpture and Decorative Arts....not quite impressive as those in other major museums in Europe... the picture gallery was full of great masters. I've had the chance to see the "Tower of Babel" and "Infanta Margarita Teresa in a blue dress". Unfortunately, there was no time to see Arcimboldo, Raphael, and "The art of painting" by Vermeer which has a great story behind it. So please, if you lack time, and paintings interest you of course, start with the picture gallery. Also, the cupola was quite beautiful." (Sofia_M_D83, January 2017)

Not my favorite museum, but if you like portraits this is the place for you
"If you love historical pictures vs modern then be sure to hit this museum. I found it fort of boring, but the building itself was beautiful and the entrance is breathtaking." (missycard, January 2017)

Not for every taste (even if you like museums)
"*From the reviews and talking to locals, most people would rate this museum as #1 in Vienna. I thought a bit overrated: paintings were pretty much sacred art, greek/roman and coin collections did not amuse me. If you have time for one museum only and are more into paintings, I would suggest Belvedere."* (44ase, January 2017)

Very interesting but some exhibitions are only in German..
"When I visited the Kunsthistorisches Museum in Vienna I was rather disappointed to find that many exhibitions were only in German.The ticket is 15 euros and it is like they force you to take an audio guide.Totally unacceptable for a big museum in Vienna. On the other hand,the museum's building inside is magnificent and there are many work of arts worth seeing." (Elen Z, October 31, 2016)

Art for Arts Sake
"You have to go as it is considered one of the main attractions but many of the pictures are a bit 'churchy'. There are Brueghels and other classics but it does take a bit of finding. Don't bother with the audio guide and the floor plan is a bit 'unhelpful'. Best try and get one of the main guide books which documents which pictures you can find in which salle." (ajm549, October 2016)

Overwhelming!
"No, it's not really an "average" collection, but I just don't love huge compendium-type museums, and this one was so crowded with dozens of massive paintings in each room that it literally would take weeks to wade through it properly. We cheated and used Rick Steves' tour and therefore hit the "high" points, but that was all one could truly internalize in a short visit." (CapeTravellers. September 2016)

OK if you like really old paintings.
"We spent a pleasant 2 hours in the museum and I would say go if you are close. I would not make a special trip; the collection is huge, but the range is somewhat limited..." (Randy S, September 2016)

Not very inspiring
"Nothing much here that interested us, but the walk to it from our hotel was lovely. Dark inside, no really famous paintings etc to see. A bit disappointed." (Linda D, September 2016)

Good but very big
"If your into an overload of information and alot of artifacts. .this is your place I found there was too much to take in. But there are many beautiful pieces there." (photobugger2015, September, 2016)

history of european art
"*interested collection but not with a variety, The building is great and the interior breathtaking. friendly stuff, needs to make more interesting curations*" (August, 2016)

Disappointed
"...In each exhibition, there was not a huge amount of English translations. Only a handful. There were many beautiful items but we didn't get to learn much about them. I'm sure it would have made the place come alive..." (jennyk0, August 2016)

Beautiful paintings
"*We had an afternoon to visit this museum, and it was not sufficient. The realistic paintings of the Baroque era were very good, with mostly religious themes. The other features were not that interesting to us, such as the statuettes of the Green and Roman period, or the coin collections."* (vic10101, July 2016)

Not my favorite museum visit.
"*The walls are overhung and the descriptions of the paintings are on rails situated a few feet from the paintings rather than on the wall next to them. It made for a less than pleasant viewing experience for me. However, they do have some fantastic pieces in their permanent collection."* (sunshine3, July 2016)

Quiet peaceful museum
"Loved that there weren't huge crowds at the museum so we had enough time and space to browse. The audio guide was very confusing though and not that easy to use and match up with the exhibits." (rini9, June 2016)

Most of the paintings look the same after a while.
"This is a nice museum, but most of the painting are from the same period and mostly on religious themes so after a while it all seems the same. The only highlight was the Carravaggio paintings. The Egyptian collection is nice, but not a scratch on the British Museum or Louvre." (Longboat999, June 2016)

Meh
I was sort of disappointed by this place, perhaps because the National Gallery in London (my favourite) is both free and much better. It was €15 to get in and the collections are not that impressive. In some of the rooms, the paintings aren't labelled, so it isn't obvious who did them or what they're called, which is very annoying. I'm sure the audioguide would have helped, but I didn't need quite that level of detail about everything. The building itself is absolutely beautiful though, both inside and out and the cafe (though busy) looked incredible. If you do want to go, book online in advance just in case the queues are bad; the ticket is valid for one entry on any day. They have a cloakroom and lockers for your bags, located just to the left of the ticket control. (May 2016)

Good building, good museum, not worth it
"The building itself is phenomenal. The museum is really good too. But it's too much in the midst of all else in Vienna. If you live in Vienna, it's probably amazing." (Dave11us, May 2016)

A typical capital city museum
"There are many beautiful museums in Vienna but while interesting this would not rate in my top list. The galleries are massively overcrowded - some walls have 30 plus pictures on them and it is difficult to appreciate them well. Contrast to the Belvedere where the may be 5 to a wall. Other galleries such as the Egyptian ones are also overcrowded. Sometimes less is more." (bluevcone, May 2016)

Superb Paintings, Poor and Disorganized otherwise
"There are two sides to this museum. First, the paintings collections: No questions asked, one of the finest around (the only one I can think that is better or at least comparable is the London National Gallery). They were presented in a coherent, well-organized manner. On the other hand, everything else about the museum is appallingly bad. The half-floor gets the award of the most disorganized, incoherent assortment of items I have ever seen. Roman-Greek artifacts (of very questionable importance), displayed in close proximity to the most kitsch collection of artless baroque bling-bling (sorry about the colloquialism, but it's the only word I can think of that remotely describes how aesthetically offensive it was). Oh, and the signs were ONLY in German! Apparently not even the museum curators believe anyone would care to know more about those atrocious items. Entrance fee: 15 euros (14 if you have the Vienna Card). Very, very expensive. The National Gallery in London is free; The Athens Acropolis Museum (truly a breathtaking collection of true art) is 5 or so euros. All in all, the paintings collection is worth it, but barely." (MySweetShadow, February 2016)

Very big and tiring. Everything is packed in there.
"Mummies, ancient greek and roman, kitsch baroque artefacts, hundreds of paintings all together and messed up. Some items are really interesting but cannot be seen since they are lost in the vast and packed rooms. Better get a good travel guide book and see some

items recommended by the book. Otherwise you will just spare half a day." (Manos1710, January 2016)

Google My Business

"...Without interest and background knowledge of religion, it is not too much fun" (Ra s, 2018)

"You can do without the guide... overall, little info little explanations" (Stengeline D, 2018)

"We could not understand what we see in some room description was given only German." (Nilay Ertem, 2017)

"... a lot of objects did not have English translations which was a bit of a let down...." (Johan Hugg, 2016)

"Super great museum, especially how the architecture of the rooms fits the different eras of the time. Unfortunately, the museum is so big that it is simply impossible to see it under one day." (Stefan, 2017)

"A unique experience, a mysterious trip to history. Could be great if they created more stories to grab you back to those times." (Osman Yikiin, 2018)

"...The biggest issue I had with the museum was the lighting on the paintings, this was terrible and gave a lot of reflections on them which made it harder to see them." (Nick Van Gilst, 2018)

Facebook

"The last time I was in there I saw an advertisement for a SmartPhone App called "KMH Stories". It allows the user to download multiple animated guided tours of the exhibits in the Museum. It is a real blast to watch one of those animations and then wander around the Museum like a little child looking for lost and stolen treasures." (Stephen Scotti, January 2018)

"Enormous and enormously boring." (Justina Sabova, August 2017)

Finding recurring issues

Source of pain	Symptoms of pain	Suggested remedies
We don't care about old coins	Walking around in circles and getting lost	If we do this again, we would spend the whole time looking at the paintings

Displays give basic information... rarely in any language other than German		
The audio guide seems mandatory	Terrible organisation	
Rooms were too dark making the labels awkward to read	Gloomy	
“Bit dull... much of the same stuff...	Bored the kids to death.	
Room with lots of stuff on the walls...	*"why is this particular painting here?"*	
Most exhibits have German-only descriptions.	frustrating	...You will have to get the audio tour box
Dark, seemingly random masterworks	Overpowering and Underwhelming, too overwhelmed to make sense of it all. I left almost mentally disturbed, and light deprived.	A place for traditionalists
Too many paintings		
Unimpressive antiquities , sculpture, and decorative arts....		
Poor time management	Spent too much time in antiquities and not enough in the seemingly better picture gallery.	If you lack time, and paintings interest you of course, start with the picture gallery.
	Boring	
Not amused by coin collection and greek/roman collection	Overrated	Belvedere better for paintings.
Exhibitions online in German, It seems they force you to use the audio guide	Disappointed, unacceptable	
Art for art’s sake, unhelpful audio guide	it does take a bit of finding	Buy guide book
Huge, compendium-type,	Overwhelming, take weeks	Rick steves tour

crowded with dozens of paintings in each room	to wade through it properly	
The range is somewhat limited		
Dark inside, not much that interested us	Not very inspiring, disappointed	
Very big, overload of information and artifacts	Too much to take in	
Not with variety		Needs to make more interesting curations
Not a huge amount of English translations	Disappointed, we didn't learn much	Having English translations would have made the place come alive
Not that interesting, Greek/Roman period and coin collection, an afternoon is not sufficient time		Rather see beautiful paintings
Walls are overhung and the descriptions of the paintings are on rails situated a few feet from the paintings rather than on the wall next to them.	Less than pleasant viewing experience	
The audio guide was very confusing and not that easy to use and match up with the exhibits		
Painting are from the same period and mostly on religious themes	After a while it all seems the same	
In some of the rooms, the paintings aren't labelled,	Disappointed, very annoying	I'm sure the audioguide would have helped, but I didn't need quite that level of detail about everything.
It's too much (as a tourist)	Not worth it	
Some walls have 30 plus pictures on them	It is difficult to appreciate them well.	Sometimes less is more.
The half-floor gets the award of the most disorganized, incoherent assortment of	Roman-Greek artifacts of very questionable importance), kitsch	

items I have ever seen, signs were ONLY in German!	collection of artless baroque bling-bling	
Very big, hundred of paintings all together and messed up...lost in the vast and packed rooms		Get a good travel guide book
..Without interest and background knowledge of religion, it is not too much fun		
“You can do without the guide... overall, little info little explanations”		
Room descriptions only in German	We could not understand what we see	
a lot of objects did not have English translations	A bit of a let down	
So big	impossible to see it under one day.	
		Could be great if they created more stories to grab you back to those times
lighting gave a lot of reflections on the paintings	made it harder to see them	
Enormous	Enormously boring	

7.2 Thematic analysis of observational study at KHM

	Observations	Code	Theme
1	Some visitors have a yearly pass.	Repeat visiting.	Order.
2	Some visitors need more time to choose a ticket / exhibition than others.	Decision conflict.	FOMO.
3	Almost all visitors take a map at the information desk.	Need to know what’s next.	Security/ Safety, Order.
4	If with another person(s), at least one (and sometimes more) takes a map.	Group dynamics.	Action vs. apathy, authority

5	Many visitors purchase an audio guide.	Desire for detailed information.	Quest for knowledge/ power of mind vs. authority
6	Many visitors spend a long time orientating at the central point of the main entrance.	Grappling with the unknown	FOMO.
7	Many younger visitors use earphones throughout the visit.	Sound bubble, privacy.	Peace, comfort zone. order
8	Some visitors seem to wander rather than walk towards a particular point.	Confronting the unknown.	Exploration, chaos.
9	Some visitors are immersed in deep conversation as they descend the main staircase at the end of a visit.	Connecting ideas.	Relating, bringing about change.
10	Some visitors seem to socialize about non-artwork related things.	Connecting people.	Relating, maintaining internal/community order.
11	Some visitors (mostly teens and early twenties) are making a joke out of the experience and the artworks.	Connecting people.	Relating, maintaining internal/community order.
12	Some visitors spend a long time taking photos in beautiful spots of the museum e.g. in front of the sculpture of Theseus slaying the centaur by Antonio Canova.	Coming in contact with rare and beautiful things.	Power(social media influence), pride
13	Some visitors are simultaneously listening to the audio guide and looking at the paper map.	Need for control over situations and learning.	Safety/security and quest for knowledge.
14	Some visitors only take their smartphones along.	Confronting the unknown.	Exploration.
15	Some visitors take a map and their smartphones along.	Need for control over situations.	Safety/security
16	Some visitors take a digital camera and map along.	Need for control over situations. Coming in contact with rare and beautiful things.	Preservation of beauty, safety/security
17	Some visitors take photos of the artworks with their smartphones.	Coming in contact with rare and beautiful things.	Preservation of beauty

18	Some visitors bring a digital camera to take photos of the artworks.	Coming in contact with rare and beautiful things.	Preservation of beauty
19	Some couples both have an audio guide. They separate and rejoin constantly throughout the visit.	Connecting ideas.	Relating, bringing about change.
20	Some couples and friends groups throughout the visit.	Connecting ideas/people.	Power of mind, bringing about change/ maintaining harmony
21	Some couples stay side-by-side throughout the whole visit.	Connecting people.	Love, harmony.
22	Some lone visitors are not using any technologies throughout the whole visit.	Confronting the unknown.	Exploration, freedom, power of the mind
23	Elderly visitors tend to take the map only.	Confronting the unknown.	Power of the mind.
24	Elderly couples are more immersed in conversation about the artworks than other visitors.	Connecting ideas.	Relating, bringing about change.
25	Friend groups/pairs consisting of teenagers do not use any museum technologies.	Connecting people.	Relating, maintaining internal/community order.
26	Some couples are physically inseparable throughout the whole visit.	Connecting people.	Love, harmony.
27	Some couples wander separately without the use of any aids or technologies.	Separating people.	Power of the mind, exploration, freedom
28	Some visitors use a smartphone camera to take photos of the room descriptions.	Learning	Quest for knowledge, authority
29	An organised group (possibly school trip) of teens uses social media during the visit. They appear to be especially fatigued. Some browse social media whilst seated at the margins of the exhibit.	Teen disengagement.	Action vs. apathy, peer pressure
30	Some teenage girls use a smartphone to take selfies with the sculptures and artworks.	Relating to heritage., rare and beautiful things.	Power (social media attention), ego, humour

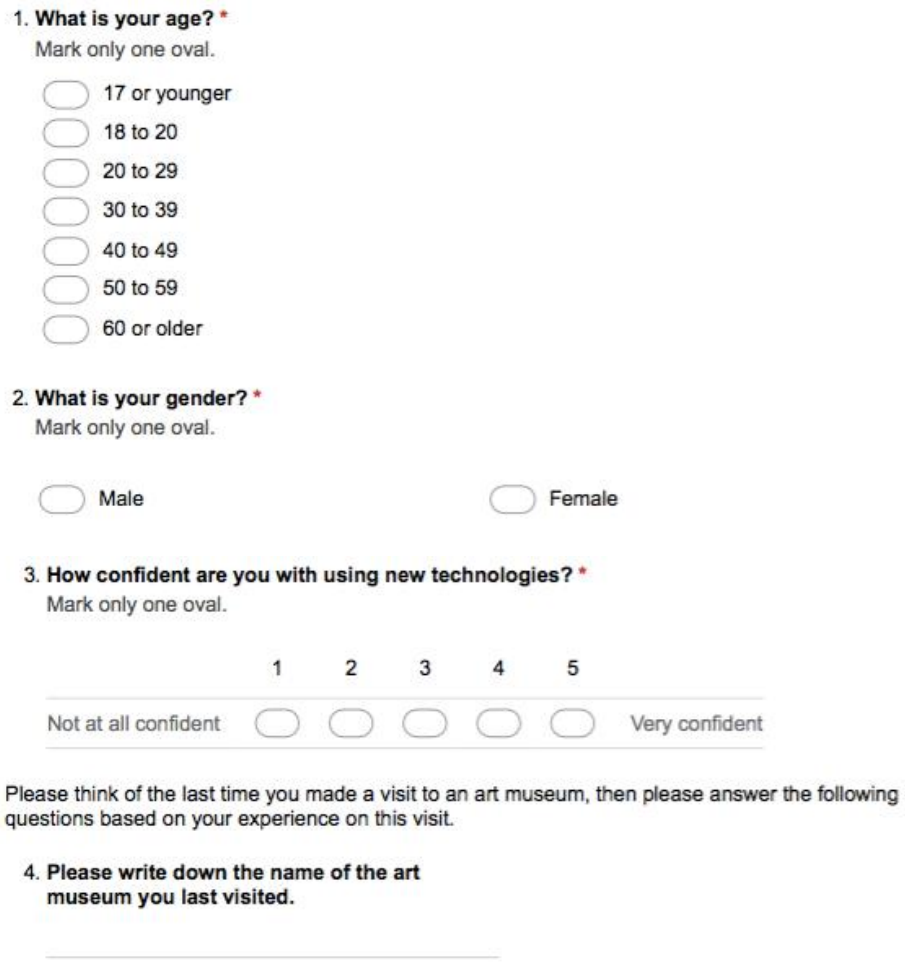
31	Some parents take photos of their children as they interact with the artworks, use technologies, and navigate the exhibits.	Parent-child relationships	Preservation of beauty, harmony, love
32	Some visitors tend to follow what others see. If a particular artwork draws intense attention by a visitor, another visitor will be drawn to it.	Social learning	Quest for knowledge, exploration
33	Some mothers show stress that children might knock something over or cause troubles.	Need for control over situations	Fear
34	Some mothers use a smartphone to access more information which they pass on to children.	Parent-child relationships	Power to educate, quest for knowledge
35	Some children have an audio guide hung around their necks but do not engage with it whatsoever.	Parent-child relationships	Separation, peace of mind, apathy
36	Some visitors edit photos they have taken at the museum while still inside.	Need to share immediately.	Seizing the moment.

7.3 Field notes from observation sessions at KHM

Some visitors are immersed in deep conversation as they descend the main staircase at the end of a visit. Some visitors seem to socialize about non-artwork related things.
Some visitors (mostly teens and early twenties) are making a joke out of the experience and the artworks. Many visitors purchase an audio guide. Many younger visitors use earphones throughout the visit. Some visitors spend a long time taking photos in beautiful spots of the museum e.g. in front of the sculpture of Theseus slaying the centaur by Antonio Canova. Some visitors are simultaneously listening to the audio guide and looking at the paper map. Some visitors take photos of the artworks. Some couples both have an audio guide, they separate and rejoin constantly throughout the visit. Some couples stay side-by-side throughout the whole visit without much communication. Elderly couples are more immersed in conversation about the artworks than other visitors. Friend groups/pairs consisting of teenagers do not use any museum technologies. Some couples are physically inseparable throughout the whole visit. Some visitors use a smartphone camera to take photos of the room descriptions. An organised group (possibly school trip) of teens uses social media during the visit. They appear to be especially fatigued. Some browse social media whilst seated at the margins of the exhibit. Some teenage girls use a smartphone to take selfies with the sculptures and artworks. Some parents take photos of their children as they interact with the artworks, use technologies, and navigate the exhibits. Some visitors tend to approach artworks that draw attention from other visitors. Some mothers show stress that children might knock something over or cause troubles. Some mothers use a smartphone to

access more information which they pass on to children. Some visitors edit photos they have taken at the museum while still inside.

7.4 Survey Questionnaire



1. **What is your age?** *
   Mark only one oval.
   - 17 or younger
   - 18 to 20
   - 20 to 29
   - 30 to 39
   - 40 to 49
   - 50 to 59
   - 60 or older

2. **What is your gender?** *
   Mark only one oval.
   - Male
   - Female

3. **How confident are you with using new technologies?** *
   Mark only one oval.

	1	2	3	4	5	
Not at all confident						Very confident

Please think of the last time you made a visit to an art museum, then please answer the following questions based on your experience on this visit.

4. **Please write down the name of the art museum you last visited.**

5. **How familiar were you with the artworks/artists before visiting?** *
Mark only one oval.

	1	2	3	4	5	
Not at all familiar	◯	◯	◯	◯	◯	Extremely familiar

6. **With whom did you make the museum visit?** *
Check all that apply.

- [ ] With a spouse/partner or significant other
- [ ] With another family member(s)
- [ ] With child(ren) under 18 years old
- [ ] With a friend(s)
- [ ] With a date
- [ ] By myself
- [ ] With an out-of-town guest(s)
- [ ] With an organised group e.g. tour

7. **How satisfied were you with your visit?** *
Mark only one oval.

	1	2	3	4	5	
Very dissatisfied	◯	◯	◯	◯	◯	Very satisfied

How would you describe that visit?

8. **Innovative** *
Mark only one oval.

	1	2	3	4	5	
Does not describe that visit at all	◯	◯	◯	◯	◯	Describes that visit very well

9. **Outdated** *
Mark only one oval.

	1	2	3	4	5	
Does not describe that visit at all	◯	◯	◯	◯	◯	Describes that visit very well

10. **Boring** *
Mark only one oval.

	1	2	3	4	5	
Does not describe that visit at all	◯	◯	◯	◯	◯	Describes that visit very well

11. **Engaging** *
Mark only one oval.

	1	2	3	4	5	
Does not describe that visit at all	◯	◯	◯	◯	◯	Describes that visit very well

12. **Nostalgic** *
Mark only one oval.

	1	2	3	4	5	
Does not describe that visit at all	◯	◯	◯	◯	◯	Describes that visit very well

13. **Technologically advanced** *
Mark only one oval.

	1	2	3	4	5	
Does not describe that visit at all	◯	◯	◯	◯	◯	Describes that visit very well

What was the purpose of your visit?

14. **I went to enhance my knowledge base within my profession/hobby.** *
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

15. **I went to discover new things and learn a little bit about a variety of topics.** *
Mark only one oval.

	1	2	3	4	5	
Strongly diagree	◯	◯	◯	◯	◯	Strongly agree

16. **I went to reflect in a beautiful and peaceful environment.** *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

17. **I went to look for fresh memes.** *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

18. **I went to take nice photos that I can later share.** *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly disagree

19. **I went to spend time with someone who wanted to visit the museum.** *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

20. **I went to provide my children with a fun / educational experience.** *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

21. **I went to check it off my 'places to see'.** *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

22. **I went to see the best of what the museum has to offer.** *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

23. **I was driven by the recommendations of others.**
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

24. **Which of the following describes ways in which you engaged with technology during your previous art museum visit?** *
Check all that apply.

- [ ] I used the museum's audioguide to find out more information and know where to direct my attention.
- [ ] I downloaded a museum app to find out more information and know where to direct my attention.
- [ ] I used my camera/ smartphone/ or tablet to take photos during the visit.
- [ ] I used my smartphone/tablet to look up a question or topic of interest during the visit
- [ ] I used my smartphone/tablet to share parts of my experience on social media and/or messaging apps.
- [ ] I used a social media platform (e.g. Pinterest) to collect/share artworks I liked.
- [ ] I watched videos featuring an overview of current exhibitions or insights into a particular topic within an exhibit.
- [ ] I used interactive, touchscreen displays to find out more information and know where to direct my attention.
- [ ] I used a digital device or interface to play an interactive game provided by the museum.
- [ ] I used VR or AR tools to experience a simulated or augmented environment during my last visit.
- [ ] I did not engage with any technology during my last visit.

The following pairs of statements describe ways you might have felt about technology in your previous visit.

25. **New technologies enhanced my museum experience.** *
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

26. **I was pleased to come across technologies during my visit.** *
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

27. **New technologies served my needs at the art museum.** *
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

28. **It takes too much time to grasp how to use new technologies to make them worth the effort.** *
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

29. **I felt like using new technologies at the art museum makes me look worse among others.** *
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

30. **I felt anxious when interacting with a new technology for the first time.** *
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

31. **Using technology made me feel less accomplished in my ability to understand and connect with the artworks.** *
Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

32. **Of the different kinds of digital technologies listed below, which would you be most excited to use?** *

Check all that apply.

- [ ] Museum website
- [ ] Museum guide
- [ ] Videos and animations
- [ ] Interactive, touchscreen displays
- [ ] Games playable via smartphone or tablet
- [ ] Museum app (or other mobile app designed for use in art museums)
- [ ] QR codes providing additional information
- [ ] 3-D videos or interactives
- [ ] Holographic imagery
- [ ] Virtual reality simulations
- [ ] Immersive games
- [ ] Multimedia tours using smartphone GPS locators to give real time information
- [ ] A tool that lets users identify artworks with a smartphone/tablet camera.
- [ ] Selfie-friendly setups
- [ ] A personalised handheld tour ready for you when you arrive.
- [ ] An online story-gathering interface that lets users annotate and react to artworks.
- [ ] An online interface that lets users collect artworks into folders and share them with others.
- [ ] An online interface that lets users design tours into folders and share them with others.
- [ ] An open source, online archive of all the artworks in the possession of a museum.
- [ ] None

If any, please list any previous difficulties you experienced using technology to further your experience at art museums.

E.g. I wanted more information about certain artworks but did not want to distract from the experience through an online search right there and then.

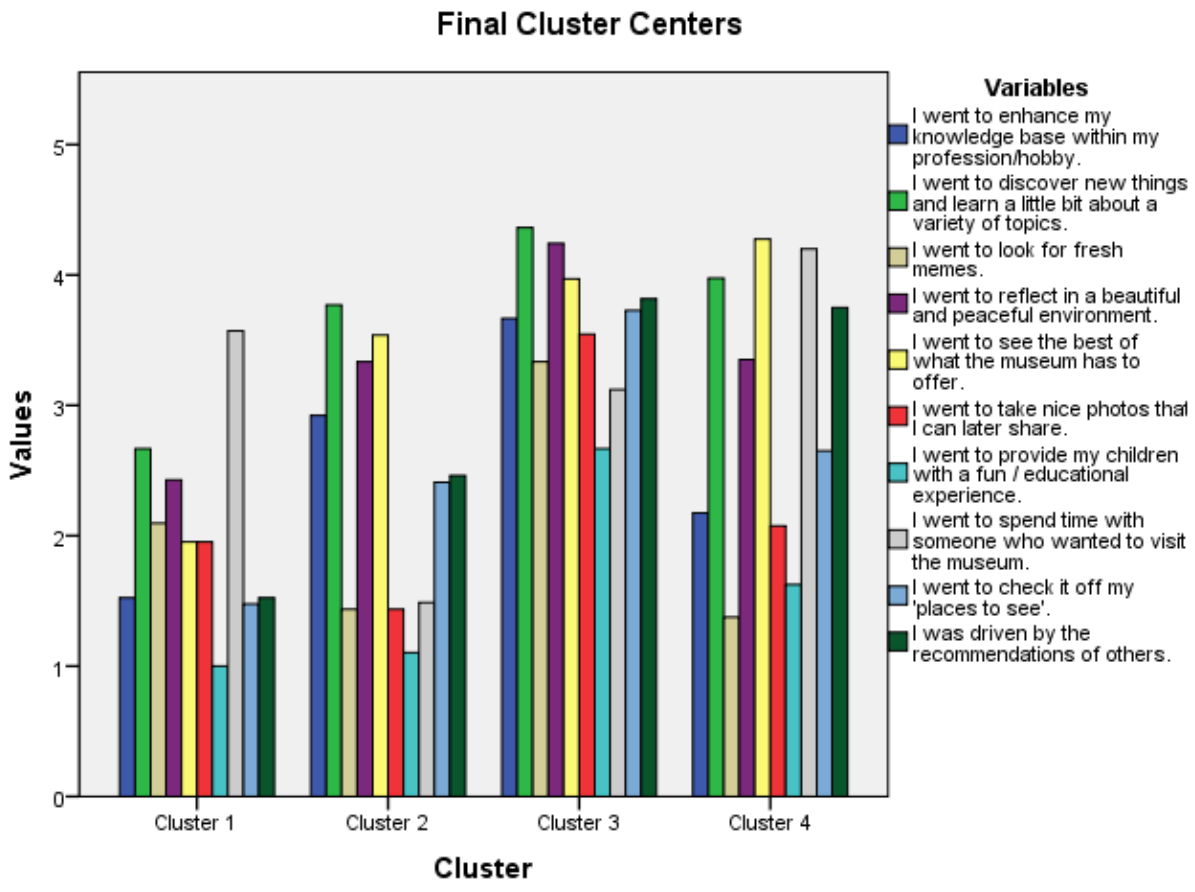
33.

7.5 SPSS Output

K-Means Cluster Analysis

	Clusters			
	1	**2**	**3**	**4**
Knowledge	2	3	4	2
Discover	3	4	4	4
Memes	2	1	3	1
Reflect	2	3	4	3
Best of	2	4	4	4
Photos	2	1	2	4
Children	1	1	3	2
Accompany	4	1	3	4
Checklist	1	2	4	3
Recommendation	2	2	4	4

Cluster 1: **Accompany**	Passive Social
Cluster 2: Discover, **Best of**	Passive Agentic
Cluster 3: **Knowledge,** discover, reflect, **best of,** checklist, **recommendations**	Active Agentic
Cluster 4: Discover, best of, **photos, accompany, recommendations**	Active Social


Final Cluster Centers
Values
5
4
3
2
1
0
Cluster 1
Cluster 2
Cluster 3
Cluster 4
Cluster
Variables
I went to enhance my knowledge base within my profession/hobby.
I went to discover new things and learn a little bit about a variety of topics.
I went to look for fresh memes.
I went to reflect in a beautiful and peaceful environment.
I went to see the best of what the museum has to offer.
I went to take nice photos that I can later share.
I went to provide my children with a fun / educational experience.
I went to spend time with someone who wanted to visit the museum.
I went to check it off my 'places to see'.
I was driven by the recommendations of others.

ANOVA

	Cluster		Error			
	Mean Square	df	Mean Square	df	F	Sig.
I went to enhance my knowledge base within my profession/hobby.	24.220	3	1.280	129	18.922	.000
I went to discover new things and learn a little bit about a variety of topics.	12.905	3	.947	129	13.623	.000
I went to look for fresh memes.	28.962	3	1.102	129	26.290	.000
I went to reflect in a beautiful and peaceful environment.	14.484	3	1.310	129	11.058	.000
I went to see the best of what the museum has to offer.	26.618	3	.757	129	35.186	.000
I went to take nice photos that I can later share.	28.092	3	1.050	129	26.744	.000
I went to provide my children with a fun / educational experience.	18.216	3	1.088	129	16.749	.000
I went to spend time with someone who wanted to visit the museum.	51.337	3	1.231	129	41.703	.000
I went to check it off my 'places to see'.	23.152	3	1.739	129	13.314	.000
I was driven by the recommendations of others.	33.824	3	1.204	129	28.089	.000

The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

Number of Cases in each Cluster

Cluster	1	21.000
	2	39.000
	3	33.000
	4	40.000
Valid		133.000
Missing		.000

Linear regression

Regression for Satisfaction SIGNIFICANT

Model Summary (How satisfied were you with your visit?)

R	R Square	Adjusted R Square	Std. Error of the Estimate
.63	.39	.36	.68

ANOVA (How satisfied were you with your visit?)

	Sum of Squares	df	Mean Square	F	Sig.
Regression	37.29	6	6.21	13.57	.000
Residual	57.70	126	.46		
Total	94.99	132			

Coefficients (How satisfied were you with your visit?)

	Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	3.02	.33	.00	9.16	.000	2.37	3.67
Innovative	.21	.07	.28	2.98	.003	.07	.35
experience_outdated	-.09	.06	-.12	-1.52	.131	-.21	.03
Boring	-.17	.06	-.22	-2.76	.007	-.29	-.05
experience_engaging	.16	.07	.19	2.23	.027	.02	.30
Nostalgic	.13	.05	.20	2.65	.009	.03	.23
Technologically advanced	-.02	.06	-.04	-.40	.690	-.15	.10

Regression for Technologically Advanced SIGNIFICANT

Model Summary (Technologically advanced)

R	R Square	Adjusted R Square	Std. Error of the Estimate
.61	.38	.35	.98

ANOVA (Technologically advanced)

	Sum of Squares	df	Mean Square	F	Sig.
Regression	73.33	5	14.67	15.36	.000
Residual	121.24	127	.95		
Total	194.57	132			

Coefficients (Technologically advanced)

	Unstandardized Coefficients		Standardized Coefficients			95% Confidence Interval for B	
	B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	-.82	.47	.00	-1.74	.084	-1.75	.11
Innovative	.52	.09	.50	5.83	.000	.34	.70
experience_outdated	.09	.09	.08	1.05	.296	-.08	.26
Boring	.20	.09	.18	2.30	.023	.03	.36
experience_engaging	.27	.10	.23	2.69	.008	.07	.47
Nostalgic	.05	.07	.05	.71	.481	-.09	.19

Cross tabulation

Age per cluster SIGNIFICANT

Summary.

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Cluster Number of Case * age_ordinal	133	100.0%	0	0.0%	133	100.0%

Cluster Number of Case * age_ordinal [total %].

	age_ordinal							
Cluster Number of Case	17 or younger	18 to 20	20 to 29	30 to 39	40 to 49	50 to 59	60 or older	Total
1	.00%	3.01%	10.53%	2.26%	.00%	.00%	.00%	15.79%
2	.00%	1.50%	22.56%	3.76%	.00%	1.50%	.00%	29.32%
3	2.26%	6.77%	7.52%	3.01%	3.76%	.75%	.75%	24.81%
4	.00%	.00%	24.06%	5.26%	.75%	.00%	.00%	30.08%
Total	2.26%	11.28%	64.66%	14.29%	4.51%	2.26%	.75%	100.00%

Chi-square tests.

Statistic	*Value*	*df*	*Asymp. Sig. (2-tailed)*
Pearson Chi-Square	49.64	18	.000
Likelihood Ratio	53.08	18	.000
Linear-by-Linear Association	.67	1	.415
N of Valid Cases	133		

Gender per cluster NOT SIGNIFICANT

Summary.

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Cluster Number of Case * What is your gender?	133	100.0%	0	0.0%	133	100.0%

Cluster Number of Case * What is your gender? [total %].

	What is your gender?		
Cluster Number of Case	Female	Male	Total
1	9.77%	6.02%	15.79%
2	18.05%	11.28%	29.32%
3	14.29%	10.53%	24.81%
4	21.80%	8.27%	30.08%
Total	63.91%	36.09%	100.00%

Chi-square tests.

Statistic	*Value*	*df*	*Asymp. Sig. (2-tailed)*
Pearson Chi-Square	1.99	3	.575
Likelihood Ratio	2.03	3	.567
Linear-by-Linear Association	.77	1	.379
N of Valid Cases	133		

Familiarity per cluster NOT SIGNIFICANT

Summary.

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Cluster Number of Case * How familiar were you with the artworks/artists before visiting?	133	100.0%	0	0.0%	133	100.0%

Cluster Number of Case * How familiar were you with the artworks/artists before visiting? [total %].

	How familiar were you with the artworks/artists before visiting?					
Cluster Number of Case	1	2	3	4	5	Total
1	6.02%	3.76%	2.26%	3.01%	.75%	15.79%
2	5.26%	5.26%	8.27%	7.52%	3.01%	29.32%
3	1.50%	3.76%	8.27%	9.02%	2.26%	24.81%
4	6.77%	7.52%	9.77%	5.26%	.75%	30.08%
Total	19.55%	20.30%	28.57%	24.81%	6.77%	100.00%

Chi-square tests.

Statistic	*Value*	*df*	*Asymp. Sig. (2-tailed)*
Pearson Chi-Square	15.17	12	.232
Likelihood Ratio	15.96	12	.193
Linear-by-Linear Association	.13	1	.718
N of Valid Cases	133		

It takes too much time to grasp how to use new technologies to make them worth the effort. SIGNIFICANT

Summary.

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Cluster Number of Case * It takes too much time to grasp how to use new technologies to make them worth the effort.	133	100.0%	0	0.0%	133	100.0%

Cluster Number of Case * It takes too much time to grasp how to use new technologies to make them worth the effort. [total %].

	It takes too much time to grasp how to use new technologies to make them worth the effort.					
Cluster Number of Case	1	2	3	4	5	Total
1	9.77%	3.76%	1.50%	.00%	.75%	15.79%
2	12.78%	7.52%	3.76%	4.51%	.75%	29.32%
3	5.26%	3.01%	6.77%	6.77%	3.01%	24.81%
4	12.78%	11.28%	5.26%	.75%	.00%	30.08%
Total	40.60%	25.56%	17.29%	12.03%	4.51%	100.00%

Chi-square tests.

Statistic	*Value*	*df*	*Asymp. Sig. (2-tailed)*
Pearson Chi-Square	31.85	12	.001
Likelihood Ratio	35.13	12	.000
Linear-by-Linear Association	.54	1	.463
N of Valid Cases	133		

New technologies enhanced my museum experience. SIGNIFICANT

Summary.

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Cluster Number of Case * New technologies enhanced my museum experience.	133	100.0%	0	0.0%	133	100.0%

Cluster Number of Case * New technologies enhanced my museum experience. [total %].

	New technologies enhanced my museum experience.					
Cluster Number of Case	1	2	3	4	5	Total
1	3.76%	3.01%	4.51%	3.01%	1.50%	15.79%
2	3.76%	4.51%	9.02%	7.52%	4.51%	29.32%
3	2.26%	.75%	3.01%	16.54%	2.26%	24.81%
4	3.01%	5.26%	6.02%	11.28%	4.51%	30.08%
Total	12.78%	13.53%	22.56%	38.35%	12.78%	100.00%

Chi-square tests.

Statistic	*Value*	*df*	*Asymp. Sig. (2-tailed)*
Pearson Chi-Square	21.01	12	.050
Likelihood Ratio	21.46	12	.044
Linear-by-Linear Association	3.54	1	.060
N of Valid Cases	133		

New technologies served my needs at the art museum. SIGNIFICANT

Summary.

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Cluster Number of Case * New technologies served my needs at the art museum.	133	100.0%	0	0.0%	133	100.0%

Cluster Number of Case * New technologies served my needs at the art museum. [total %].

	New technologies served my needs at the art museum.					
Cluster Number of Case	1	2	3	4	5	Total
1	3.01%	1.50%	6.02%	4.51%	.75%	15.79%
2	6.77%	2.26%	9.02%	7.52%	3.76%	29.32%
3	2.26%	1.50%	7.52%	9.02%	4.51%	24.81%
4	3.76%	10.53%	6.02%	8.27%	1.50%	30.08%
Total	15.79%	15.79%	28.57%	29.32%	10.53%	100.00%

Chi-square tests.

Statistic	*Value*	*df*	*Asymp. Sig. (2-tailed)*
Pearson Chi-Square	22.57	12	.032
Likelihood Ratio	21.38	12	.045
Linear-by-Linear Association	.03	1	.855
N of Valid Cases	133		

How confident are you with using new technologies? NOT SIGNIFICANT

Summary.

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Cluster Number of Case * How confident are you with using new technologies?	133	100.0%	0	0.0%	133	100.0%

Cluster Number of Case * How confident are you with using new technologies? [total %].

	How confident are you with using new technologies?				
Cluster Number of Case	2	3	4	5	Total
1	.00%	1.50%	8.27%	6.02%	15.79%
2	.75%	3.76%	15.79%	9.02%	29.32%
3	.75%	3.01%	8.27%	12.78%	24.81%
4	1.50%	1.50%	12.03%	15.04%	30.08%
Total	3.01%	9.77%	44.36%	42.86%	100.00%

Chi-square tests.

Statistic	*Value*	*df*	*Asymp. Sig. (2-tailed)*
Pearson Chi-Square	7.34	9	.602
Likelihood Ratio	8.16	9	.518
Linear-by-Linear Association	.75	1	.385
N of Valid Cases	133		

I was pleased to come across technologies during my visit. NOT SIGNIFICANT

Summary.

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Cluster Number of Case * I was pleased to come across technologies during my visit.	133	100.0%	0	0.0%	133	100.0%

Cluster Number of Case * I was pleased to come across technologies during my visit. [total %].

	I was pleased to come across technologies during my visit.					
Cluster Number of Case	1	2	3	4	5	Total
1	3.01%	3.01%	4.51%	3.76%	1.50%	15.79%
2	6.02%	5.26%	8.27%	4.51%	5.26%	29.32%
3	.75%	3.76%	5.26%	9.77%	5.26%	24.81%
4	3.01%	5.26%	11.28%	6.02%	4.51%	30.08%
Total	12.78%	17.29%	29.32%	24.06%	16.54%	100.00%

Chi-square tests.

Statistic	*Value*	*df*	*Asymp. Sig. (2-tailed)*
Pearson Chi-Square	12.86	12	.379
Likelihood Ratio	13.37	12	.343
Linear-by-Linear Association	1.66	1	.197
N of Valid Cases	133		

Using technology made me feel less accomplished in my ability to understand and connect with the artworks. NOT SIGNIFICANT

Summary.

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent

I felt using technologies at the art museum makes me look worse among others. NOT SIGNIFICANT

Summary.

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Cluster Number of Case * I felt like using new technologies at the art museum makes me look worse among others.	133	100.0%	0	0.0%	133	100.0%

Cluster Number of Case * I felt like using new technologies at the art museum makes me look worse among others. [total %].

	I felt like using new technologies at the art museum makes me look worse among others.					
Cluster Number of Case	1	2	3	4	5	Total
1	10.53%	.75%	3.76%	.75%	.00%	15.79%
2	13.53%	9.02%	4.51%	1.50%	.75%	29.32%
3	9.02%	6.02%	4.51%	3.76%	1.50%	24.81%
4	20.30%	6.02%	3.01%	.75%	.00%	30.08%
Total	53.38%	21.80%	15.79%	6.77%	2.26%	100.00%

Chi-square tests.

Statistic	*Value*	*df*	*Asymp. Sig. (2-tailed)*
Pearson Chi-Square	18.87	12	.092
Likelihood Ratio	20.28	12	.062
Linear-by-Linear Association	.48	1	.488
N of Valid Cases	133		

8.0 References

"About." *FAQs | Museums Association*, www.museumsassociation.org/about/frequently-asked-questions.

Abramyk , Heidi A. "Top 10 Review Sites for More Customer and Business Reviews." Vendasta Blog, 24 May 2018, www.vendasta.com/blog/top-10-customer-review-websites.

Amir Gandomi, Murtaza Haider, Beyond the hype: Big data concepts, methods, and analytics, International Journal of Information Management, Volume 35, Issue 2,
2015, Pages 137-144, ISSN 0268-4012, https://doi.org/10.1016/j.ijinfomgt.2014.10.007.

Rule, Alix, and David Levine. "Triple Canopy – International Art English by Alix Rule & David Levine." Triple Canopy, www.canopycanopycanopy.com/contents/international_art_english.

"App KHM Stories." Kunsthistorisches Museum, www.khm.at/en/learn/kunstvermittlung/app-khm-stories/.

Arnould, E.J., Price, L. and Zinkhan, G.M. (2002) Consumers. McGraw-Hill, Boston.

ART MUSEUMS AND THE PUBLIC. 2001, ART MUSEUMS AND THE PUBLIC.

Skinner, B. F. Science and Human Behaviour. The Free Press, 1966.

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1991). Social cognitive theory of self-regulation. Organizational Behavior and Human Decision Processes, 50, 248-287.

Bandura, A. (1993). Perceived self-efficacy in cognitive developement and functioning. Educational Psychologist, 28, 117-148.

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), Encyclopedia of human behavior (Vol. 4, pp. 71-81). New York: Academic Press. (Reprinted in H. Friedman [Ed.], Encyclopedia of mental health. San Diego: Academic Press, 1998).

Bartlett, F. C. (1932). Remembering: A study in experimental and social psychology. New York, NY, US: Cambridge University Press.

Bartlett, A. & Kelly, L. (2000). Youth audiences: Research summary. Australian
Museum Audience Research Centre. Retrieved Apr 1, 2005 from
www.amonline.net.au

Battelle, John. "John Battelle's Search Blog The Database of Intentions." John Battelle's Search Blog, 13 Nov. 2003, battellemedia.com/archives/2003/11/the_database_of_intentions.

Behringer, Reinhold. “Recent Advances in Augmented Reality.” Academia.edu, www.academia.edu/5005705/Recent_Advances_in_Augmented_Reality.

Benckendorff, Pierre J., et al. Tourism Information Technology. CABI, 2014.

Bernstein, Shelley. “Gallery Tag!” Brooklyn Museum: Isabella D'Este, www.brooklynmuseum.org/community/blogosphere/2010/03/25/gallery-tag/.

Bernstein, Shelley. “ALL POSTS BY SHELLEY BERNSTEIN.” Brooklyn Museum: Isabella D'Este, www.brooklynmuseum.org/community/blogosphere/author/shelley/

Bitgood, Steve. “An Attention-Value Model of Museum Visitors.” 2013, doi:10.4324/9781315433455.

Bitgood, Steve. (1993). Social Influences on the Visitor Museum Experience. *VISITOR BEHAVIOR*, 8(3), 4-5. Retrieved February 22, 2018, from https://www.researchgate.net/profile/Stephen_Bitgood/publication/254930510_Social_Influences_on_the_Visitor_Museum_Experience/links/0deec53b4575fb01be000000/Social-Influences-on-the-Visitor-Museum-Experience.pdf.

Bitgood, Steve., Kitazawa, C., Cavender, A. , & Nettles, K. (1993). *A study of social influence*. Poster presented at the 1993 Visitor Studies Conference, Albuquerque, NM.

Bitgood, Steve. (2002). Environmental psychology in museums, zoos, and other exhibition centers. In R. Bechtel & A. Churchman (Eds.), Handbook of environmental psychology (p. 461– 480). John Wiley & Sons.

Black, J. B., D. S. Kay, E. M. Soloway. 1987. Goal and plan knowledge representations: From stories to text editors and programs. J. M. Carroll, ed. Interfacing Thought. The MIT Press, Cambridge, MA. 36–60

Botton, Alain De, and John Armstrong. *Art as therapy*. Phaidon Press Limited, 2016.

Bourdieu, Pierre (1993). Outline of a sociological theory of art perception. In Bourdieu (Ed.), The field of cultural production. New York: Columbia University Press.

Braun, Virginia; Victoria Clarke (2006). "Using thematic analysis in psychology". Qualitative Research in Psychology. 3 (2): 93

Brieber, David, et al. “In the white cube: Museum context enhances the valuation and memory of art.” *Acta Psychologica*, vol. 154, 3 Dec. 2014, pp. 36–42., doi:10.1016/j.actpsy.2014.11.004.

Burton, Christine, and Carol Scott. “Museums: Challengesfor the 21st Century.” International Journal of Arts Management, vol. 5, no. 2, 2003, pp. 56–68., opus.lib.uts.edu.au/bitstream/10453/6473/1/2003000710.pdf.

Collins English Dictionary - Complete & Unabridged 2012 Digital Edition © William Collins Sons & Co. Ltd. 1979, 1986 © HarperCollins. Publishers 1998, 2000, 2003, 2005, 2006, 2007, 2009, 2012. http://www.dictionary.com/browse/nostalgia

Cone, C., & Kendall,K. (1978). Space, time and family interaction: Visitor behavior at the Science Museum of Minnesota. Curator, 21, 245-258.

Csikszentmihalyi, Mihaly, & Robinson, Rick (1991). The art of seeing. An interpretation of the aesthetic encounter. Malibu: J. Paul Getty Museum and the Getty Center for Education in Arts.

Cukier K., The Economist, Data, data everywhere: A special report on managing information, 2010, February 25, Retrieved from http://www.economist.com/node/15557443.

Davis, F. D. 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quart. 13 319–339.

Davey, Gareth. "What Is Museum Fatigue?" Visitor Studies Today, vol. 8, no. 3, 2005, pp. 17–21.

Debenedetti, S. (2003). Investigating the Role of Companions in the Art Museum Experience. *International Journal of Arts Management, 5*(3), 52-63. Retrieved February 21, 2018, from https://www.researchgate.net/profile/Stephane_Debenedetti/publication/41220233_Investigating_the_Role_of_Companions_in_the_Art_Museum_Experience/links/54006efd0cf24c81027decfd.pdf.

Deterding, Sebastian, et al. "From Game Design Elements to Gamefulness: Defining Gamification." Gamification Research Network, 23 Apr. 2012, gamification-research.org/2012/04/defining-gamification/.

Diamond, J. (1986). The behavior of family groups in science museums. Curator, 29(2), 139-154.

Dierkling , Lynn, and John Falk. Redefining the Museum Experience, 1992, www.informalscience.org/sites/default/files/VSA-a0a5b9-a_5730.pdf.

Dörner, Karel, and David Edelman, July 2015, "What 'Digital' Really Means." McKinsey & Company, www.mckinsey.com/industries/high-tech/our-insights/what-digital-really-means.

Dörnyei Zoltán, and Ema Ushioda. Teaching and Researching: Motivation. Taylor and Francis, 2013.

Eccles, J. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), Achievement and achievement motives: Psychological and sociological approaches (pp. 75-146). San Francisco, CA: W. H. Freeman.

Egmus. " Complete Data." European Group of Museum Statistics, 2016, www.egmus.eu/nc/en/statistics/complete_data/z/0/.

Erasmus, Ac, et al. "The Potential of Using Script Theory in Consumer Behaviour Research." *Journal of Family Ecology and Consumer Sciences /Tydskrif Vir Gesinsekologie En Verbruikerswetenskappe*, vol. 30, no. 1, 2010, doi:10.4314/jfecs.v30i1.52819.

European Group on Museum Statistics , 2014, Date accessed: 23.October.2017

Eurostat, 2018, http://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Children_and_young_people_in_the_population,_EU-28,_1_January_1996,_2006_and_2016_BYIE18.png#filelinks

Evans, M.J., Moutinho, L. and van Raaij, W.F. (1996) Applied Consumer Behaviour. Addison-Wesley: Harlow, UK. ISBN 9780201565010

Falk, J., Koran, J., Dierking, L., & Dreblow, L. (1985). Predicting Visitor Behaviour, Curator, 28(4), 249–257.

Falk, John H. “An Identity-Centered Approach to Understanding Museum Learning.” *Curator: The Museum Journal*, vol. 49, no. 2, 2006, pp. 151–166., doi:10.1111/j.2151-6952.2006.tb00209.x.

Fishbein, M., I. Ajzen. 1975. Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research. Addison-Wesley, Reading, MA

Fox, Heath. “Beyond the Bottom Line: Evaluating Art Museums with the Balanced Scorecard.” 2006, citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.615.5506&rep=rep1&type=pdf.

Gilman, B. (1916). Museum Fatigue. Scientific Monthly, 12, 67–74.

Gregg, Gail. “'Your Labels Make Me Feel Stupid' -.” *ARTnews*, 7 Sept. 2011, www.artnews.com/2010/07/01/your-labels-make-me-feel-stupid/.

Hanko, Karlene, et al. November, 2014.

Hartig, T., Mang, M., & Evans, G. W. (1991). Restorative Effects of Natural Environment Experiences. *Environment and Behavior, 23*(1), 3-26. doi:10.1177/0013916591231001

Hartwick, J., H. Barki. 1994. Explaining the role of user participation in information system use. Management Sci. 40 440–465

Ho Wu, Jonathan, et al. Enhancing Museum Victoria's Visitor Journey. 2016, Enhancing Museum Victoria's Visitor Journey, www.wpi.edu/academics/undergraduate.

Johnson, L., Adams Becker, S., Estrada, V., and Freeman, A. (2015). NMC Horizon Report: 2015 Museum Edition. Austin, Texas: The New Media Consortium.

Kaplan, S., Bardwell, L. V., & Slakter, D. B. (1993). The Museum as a Restorative Environment. *Environment and Behavior, 25*(6), 725-742. doi:10.1177/0013916593256004

Kesner, L. “The Role of Cognitive Competence in the Art Museum Experience.” Museum Management and Curatorship, vol. 21, no. 1, 2006, pp. 4–19., doi:10.1016/j.musmancur.2005.09.007.

Kunsthistorisches Museum Wien, 2018, http://tourism.khm.at/fileadmin/content/TOURISMUS/sprachen2018/KHM__info_en_2018.pdf

Labrinidis, Alexandros & Jagadish, H.V.. (2012). Challenges and opportunities with big data. Proceedings of the VLDB Endowment. 5. 2032-2033. 10.14778/2367502.2367572.

Leder, H. (2001). Determinants of preference. When do we like what we know? Empirical Studies of the Arts, 19, 201-211.

Lewis, Geoffrey D. “Museum CULTURAL INSTITUTION.” *Encyclopaedia Britannica*, www.britannica.com/topic/museum-cultural-institution.

Lewis, Geoffrey D. “History of museums.” *Encyclopædia Britannica*, Encyclopædia Britannica, inc., 25 Sept. 2000, www.britannica.com/topic/history-of-museums-398827.

Lloyd, Peter. “Smartify Uses Facial Recognition Software to Identify Art.” Daily Mail Online, Associated Newspapers, 6 Mar. 2017, www.dailymail.co.uk/sciencetech/article-4278194/New-app-uses-facial-recognition-software-identify-art.html.

Pacht, Otto (1999). The practice of art history. Reflections on method. London: Harvey Miller Publishers (tr. C. Wood).

Marakos, Panteleimon. “MUSEUMS AND SOCIAL MEDIA: MODERN METHODS OF REACHING A WIDER AUDIENCE.” Mediterranean Archaeology and Archaeometry, vol. 4, 2014, pp. 74–81., maajournal.com/Issues/2014/Vol14-4/Full9.pdf.

Mason, David D.m., and Conal Mccarthy. “‘The Feeling of Exclusion’: Young Peoples’ Perceptions of Art Galleries.” Museum Management and Curatorship, vol. 21, no. 1, 2006, pp. 20–31., doi:10.1080/09647770600402101.

Marcellini, D., & Jenssen, T. (1988). Visitor behaviour in the National Zoo’s Reptile House. Zoo Biology, 7, 329–338.

Melton, A. (1935). Problems of installation in Museums of Art. New Series, No 14. American Association of Museums.

McDonald, Mark. Defining Digital, Technology’s Current Tower of Babel. 9 Aug. 2013, www.accenture.com/us-en/blogs/blogs-defining-digital-technologys-tower-babel.

MONTOLA, MARKUS. PERVASIVE GAMES: Theory and Design. CRC PRESS, 2009.

Moore, G. C., I. Benbasat. 1991. Development of an instrument to measure the perceptions of adopting an information technology innovation. Inform. Systems Res. 2 192–222

“Museum Definition.” *Copyright © Icom* 2010-2017, www.icom.museum/the-vision/museum-definition/.

Museums Association. Code of Ethics for Museums. Code of Ethics for Museums, Museums Association, 2008, www.museumsassociation.org/asset_arena/7/17/15717/v0_master.pdf.

Panetta, Kasey. “Top Trends in the Gartner Hype Cycle for Emerging Technologies, 2017.” Hype Cycle Research Methodology | Gartner Inc., Gartner, Inc., 12 Oct. 2017, www.gartner.com/smarterwithgartner/top-trends-in-the-gartner-hype-cycle-for-emerging-technologies-2017/.

Patton, Michael Quinn. Qualitative Research & Evaluation Methods. illustrated, reprint ed., SAGE, 2002.

Pekarik, A. J., Schreiber, J. B., Hanemann, N., Richmond, K. and Mogel, B. (2014), IPOP: A Theory of Experience Preference. Curator, 57: 5–27. doi:10.1111/cura.12048 http://onlinelibrary.wiley.com/doi/10.1111/cura.12048/full

Pekarik, Andrew J., et al. “Exploring Satisfying Experiences in Museums.” Curator: The Museum Journal, vol. 42, no. 2, 1999, pp. 152–173., doi:10.1111/j.2151-6952.1999.tb01137.x.

Perry, Deborah L. “Beyond Cognition and Affect: The Anatomy of a Museum Visit.” *Visitor Studies*, vol. 6, no. 1, 1993, pp. 43–47., doi:10.1080/10645793094444676.

Rees, Arran. “What Does It Meme? When Social Media Becomes Part of the Museum Collection.” Medium, Augmenting Humanity, 21 Feb. 2018, medium.com/mcnx-london/what-does-it-meme-when-social-media-becomes-part-of-the-museum-collection-1f10d18fb095.

Santos et. al, Handbook of Research on Media Literacy in the Digital Age, 2016

Schwartz, Barry. The Paradox of Choice: Why More Is Less. Harper Perennial, 2004.

Scolari, Carlos Alberto, et al. “Mobile Media: Towards a Definition and Taxonomy of Contents and Applications.” International Journal of Online Engineering (IJOE), Apr. 2012, www.online-journals.org/i-jim/article/view/1880.

Serrell, B. (1997). Paying attention: The duration and allocation of visitors’ time in museum exhibitions, 40, 108–125

Solery, Claire. “Let's rewrite the definition of Museums!” We Are Museums, 7 July 2016, www.wearemuseums.com/lets-rewrite-the-definition-of-museums/.

Solomon, M., Bamossy, G. J., Askegaard, S., & Hogg, M. K. (2006). Consumer Behaviour: A European Perspective (3rd Edition). London: Prentice Hall.

Soto, Kenny. “The Importance of Memes & Meme Culture In Millennial Marketing.” Medium, Augmenting Humanity, 27 Jan. 2017, medium.com/@KennySoto/the-importance-of-memes-meme-culture-in-millennial-marketing-62f2c350f152.

Steuer, Jonathan. “Defining Virtual Reality: Dimensions Determining Telepresence.” Freshwater Biology, Wiley/Blackwell (10.1111), 7 Feb. 2006, onlinelibrary.wiley.com/doi/10.1111/j.1460-2466.1992.tb00812.x/abstract.

Tattoli, Chantel. “Alain de Botton's Guide to the Works in Amsterdam's Rijksmuseum.” *Architectural Digest*, 16 Sept. 2015, www.architecturaldigest.com/story/alain-de-botton-john-armstrong-rijksmuseum-amsterdam.

“The Shape of Time 2018.” *2018*, theshapeoftime.khm.at/en/.

Tierney, John. “What Is Nostalgia Good For? Quite a Bit, Research Shows.” The New York Times, The New York Times, 8 July 2013, www.nytimes.com/2013/07/09/science/what-is-nostalgia-good-for-quite-a-bit-research-shows.html.

Trant, J. (2006). Exploring the potential for social tagging and folksonomy in art museums: Proof of concept. The New Review of Hypermedia and Multimedia. 12. 83-105. 10.1080/13614560600802940.

“Users of the World, Unite! The Challenges and Opportunities of Social Media.” Egyptian Journal of Medical Human Genetics, Elsevier, 13 Oct. 2009, www.sciencedirect.com/science/article/pii/S0007681309001232.

Venkatesh, Viswanath & Davis, Fred. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. Management Science. 46. 186-204. 10.1287/mnsc.46.2.186.11926.

Verma, Pragati. “Dell TechnologiesVoice: How Technology Is Transforming The Museum Experience.” Forbes, Forbes Magazine, 17 Jan. 2018, www.forbes.com/sites/delltechnologies/2018/01/17/how-technology-is-transforming-the-museum-experience/#76dde7311302.

Valacich, Joseph S., and Christoph Schneider. Information Systems Today Managing in the Digital World. Pearson, 2014.

Widmann, Sofia. “Influence of New Media Technologies on the Success of Museum Exhibitions.” MODUL University Vienna, 2016, www.modul.ac.at/index.php?eID=dumpFile&t=f&f=9390&token=594903e9fa6d61a87ea954d33cd4410ef904d4b2.

Wagner, K., & Massey, C. (1991). The Treehouse visitor research project. In S. Bitgood, A. Benefield, & D. Patterson, Visitor studies: Theory, research, and practice, volume 3. Jacksonville, AL: Center for Social Design. Pp. 270-277.

Waterson, N, Saunders, M.: Delightfully lost: A new kind of wayfinding at Kew. In: Museums and the Web 2012: The International Conference for Culture and Heritage On-line, San Diego, USA, Archives and Museums Informatics (2012)

Yiannoutsou, Nikoleta, et al. “‘Playing with’ Museum Exhibits: Designing Educational Games Mediated by Mobile Technology .” 3 June 2009, sites.psu.edu/wp-content/uploads/sites/107/2010/04/Resource-4.pdf.

Zacher, Encyclopedia of Information Science and Technology, Third Edition, 2015