The impact of augmented reality on visitor experience and behavioral intentions in cultural sites

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Abstract :

The potential of augmented reality (AR) to transform or enhance cultural experiences is a key topic in contemporary literature (Guttentag, 2010; Tussyadiah and al., 2018). This research aims to analyze the visitor experience at cultural heritage sites through the lens of Mehrabian and Russell's (1974) Stimulus-Organism-Response (S-O-R) model. Focusing on various aspects of the visitor experience in cultural environments, two qualitative studies were conducted: one with AR and cultural heritage experts, and another with visitors to the Bardo National Museum who used the AR application "Bardo Up". Additionally, a quantitative study was carried out at "Klimt: The Immersive Experience" in Madrid. The findings demonstrate that AR can significantly enhance the visitor experience in cultural heritage museums. These results open new avenues for exploring AR's broader impact on cultural heritage and visitor engagement.

Keywords: S-O-R model, augmented reality, visitor experience, cultural heritage

Introduction

The cultural sector faces ongoing challenges in enhancing visitor experiences and valorizing cultural heritage. While the trend toward digitalization is advancing rapidly in other sectors, cultural heritage remains relatively underutilized by new technologies. The literature suggests that digitalization pushes cultural organizations to explore technological innovations to engage visitors and improve their experiences (Tom Dieck & Jung, 2017; Tscheu & Buhalis, 2016). One of the most promising technological innovations in this area is Augmented Reality (AR). AR creates multidimensional environments by overlaying virtual elements onto the real world, transforming visitor experiences and offering new ways of interaction (Guttentag, 2010; Milgram & Kishino, 1994; Tussyadiah and al., 2018). However, despite the growing interest in AR within the cultural heritage sector, its comprehensive impact on cultural organizations, such as museums, and on visitor experiences remains unexplored. This research focuses on the application of AR in museums and cultural sites in Tunisia, specifically at the Bardo National Museum, while also drawing insights from a quantitative study conducted at "Klimt: The Immersive Experience" in Madrid. The primary objective of this study is to examine how AR technology influences visitor experiences. More specifically, this research seeks to answer the following central question: "***How and to what extent do the characteristics of an AR environment affect the visitor experience and behavioral intentions in cultural sites?***" By integrating findings from both the Tunisian context and the quantitative study in Madrid, this research aims to provide a comprehensive understanding of AR's transformative potential for cultural heritage, offering valuable insights for cultural organizations seeking to engage visitors more effectively.

1.Theoretical background and hypothesis

1.1. Augmented reality and visitor experience

AR has become a significant technological tool in enhancing visitor experiences, particularly in cultural settings such as museums. AR provides a mixed experience by combining real-world environments with virtual elements, allowing visitors to interact with both physical and digital spaces in a dynamic and immersive way (Flavian and al., 2017; McLean & Wilson, 2019). In this vein, prior research highlights that the use of AR in museums can improve visitors' cognitive and affective engagement, leading to a more enriching and memorable experience (Jung and al., 2016). To build on this understanding, the Stimulus-Organism-Response (S-O-R) model (Mehrabian & Russell, 1974) serves as the framework for understanding how technological stimuli, such as AR, influence visitor responses. In this context, AR characteristics (augmentation quality, vividness, authenticity) act as the stimulus (S), while the visitor’s cognitive, affective, and sensory experiences serve as the organism (O), leading to behavioral intentions (R) like the intention to revisit or recommend the museum. Furthermore, augmentation quality refers to the ability of AR technology to integrate virtual elements seamlessly with the real environment, enhancing the user experience. Research has demonstrated that high-quality augmentations contribute to more meaningful and engaging visitor experiences by improving interaction with the content presented (Jung and al., 2016). When AR applications display high-quality images, clear information, and seamless integration, users perceive the experience as more enjoyable and realistic. The augmentation influences consumers' affective states and behavioral intentions (Javornik, 2014, 2016), which is why we hypothesize that when visitors use augmented reality technology, the quality of the augmentation influences the affective, cognitive, and sensory dimensions of the

experience: **H1: Augmentation quality positively influences the AR visitor experience (Flavián and al., 2019).**

H1.1: Augmentation quality positively influences the intellectual dimension of the AR visitor experience.

H1.2: Augmentation quality positively influences the affective dimension of the AR visitor experience.

H1.3: Augmentation quality positively influences the sensory dimension of the AR visitor experience.

In addition, authenticity is a crucial element in AR experiences, especially in cultural environments such as museums. Authenticity refers to the degree to which the experience feels genuine and credible. When AR applications offer authentic representations, visitors are more likely to have a deeper connection with the content and find the experience more enriching (Wei and al., 2019, Tussyadiah and al., 2018). In cultural and heritage contexts, perceived authenticity enhances the value of the experience, leading to positive behavioral outcomes. Therefore, we hypothesize: **H2: Authenticity positively influences the AR visitor experience (Tussyadiah and al., 2018).**

H2.1: Authenticity positively influences the intellectual dimension of the AR visitor experience.

H2.2: Authenticity positively influences the affective dimension of the AR visitor experience.

H2.3: Authenticity positively influences the sensory dimension of the AR visitor experience.

Moreover, vividness is defined as the technology's ability to create a sensorily rich environment (Steuer, 1992; Lee, 2004, cited in McLean & Wilson, 2019). Prior research has indicated that increased vividness in AR environments enhances cognitive and emotional responses, leading to a more immersive and engaging experience (Flavián and al., 2017; Petrova & Cialdini, 2008). Vivid AR experiences stimulate users' cognitive elaboration and sensory perceptions, helping them form clearer mental images of the content (Li and Duh, 2012). In cultural settings, vividness enhances the overall visitor experience by providing a more realistic and interactive experience. Hence, we propose: **H3: Vividness positively influences the AR visitor experience (Flavián and al., 2017; Petrova & Cialdini, 2008).**

H3.1: Vividness positively influences the intellectual dimension of the AR visitor experience.

H3.2: Vividness positively influences the affective dimension of the AR visitor experience.

H3.3: Vividness positively influences the sensory dimension of the AR visitor experience.

1.2. Visitor experience and behavioral intentions

The visitor experience in AR environments includes intellectual, affective, and sensory dimensions. A positive intellectual experience involves learning and knowledge acquisition, while the affective dimension refers to emotional engagement, and the sensory dimension involves stimulating the visitor’s senses. Previous studies in marketing and AR research have demonstrated that a positive experience in these dimensions leads to favorable behavioral outcomes, such as the intention to reuse AR, revisit cultural sites, and engage in word-of-mouth communication (Brakus and al., 2009; Jung and al., 2016).Thus, we hypothesize the following regarding behavioral outcomes: **H4: The AR visitor experience positively influences the reuse intention (Jung and al., 2016).**

H4.1: The intellectual AR experience positively influences the reuse intention.

H4.2: The affective AR experience positively influences the reuse intention.

H4.3: The sensory AR experience positively influences the reuse intention.

H5: The AR visitor experience positively influences the place revisit intention (Barnes and al., 2014; Brakus and al., 2009; Jung and al., 2016; Belhsen & Sentel, 2016).

H5.1: The intellectual AR experience positively influences the place revisit intention.

H5.2: The affective AR experience positively influences the place revisit intention.

H5.3: The sensory AR experience positively influences the place revisit intention.

H6: The AR visitor experience positively influences the WOM intention (Barnes and al., 2014; Brakus and al., 2009).

H6.1: The intellectual AR experience positively influences the WOM intention.

H6.2: The affective AR experience positively influences the WOM intention.

H6.3: The sensory AR experience positively influences WOM intention.

From these various hypotheses, we try to verify these relations, and we propose the conceptual model of our research (Appendix.1).

2. Research design and methodology

2.1. Presentation of the Study

In recent years, AR has emerged as a transformative technology in various fields, including the cultural sector. This study seeks to explore the implications of AR technology within cultural contexts, focusing on user experiences and behavioral intentions. To achieve a comprehensive understanding of this phenomenon, we adopt a dual methodological approach, encompassing both qualitative and quantitative methodologies. Our research adopts an abductive and hypothetico-deductive approach, reflecting a dual epistemological stance. The abductive approach allowed us to explore and identify emerging patterns and insights from the qualitative data, which informed the subsequent hypotheses tested in the quantitative phase. This combination provides a robust framework for understanding causal relationships between AR characteristics, user experiences, and behavioral intentions. The research process begins with a qualitative exploration in a Tunisian context and transitions to a quantitative phase conducted in Spain. This deliberate choice of contexts was motivated by the specific objectives of each phase and the unique contributions of each setting to the research goals. The qualitative phase was conducted at the Bardo National Museum in Tunisia to explore AR applications in a rich cultural heritage context. The museum offered an environment where AR could significantly enhance visitors' experiences, especially in engaging with ancient artifacts and historical narratives. In contrast, the quantitative phase was conducted during the Klimt exposition in Madrid, a contemporary and highly interactive AR environment. This shift allowed us to test the hypotheses in a context where AR applications were integrated into a modern artistic setting, thereby enabling a broader understanding of AR's impact across different cultural contexts. The study began with a qualitative phase involving semi-structured interviews with eleven AR experts between late 2019 and early 2020. These interviews provided a foundational understanding of the characteristics and potential of AR technology. Building on these insights, we conducted an in-depth qualitative study at the Bardo National Museum in Tunisia in June 2021, involving twenty-six visitors. The aim was to identify AR features that enhanced the museum experience and examine how these experiences influence visitors' behavioral intentions. The findings from these qualitative studies (Appendix 2 and Appendix 3) informed the development of our conceptual model and hypotheses, which were tested in the

quantitative phase. The quantitative study was conducted during the Klimt exposition in Madrid from May to June 2022. This phase involved a structured survey, with a sample designed to capture diverse demographic and psychographic variables. The survey was tailored to validate the causal relationships identified in the qualitative phase and assess the generalizability of the findings.

2.2. Sampling and Data Collection

In the context of quantitative study, our data collection took place during the Klimt exposition at the Madrid Artes Digitales (MAD), which opened on March 4, 2022, showcasing works inspired by Klimt. The data was collected from a total of 290 respondents, of which only 267 were retained. The results indicate that most respondents identified as female (70.6%), while 26.4% identified as male, and 3% preferred not to answer the gender question. There was a varied distribution in terms of age, with a notable concentration among respondents aged 25 to 34 years (30.9%) and a smaller proportion among those under 18 years (3.7%). Additionally, most visitors were from Spain (75.8%), while 24.2% came from other countries, including Mexico, the United States, the United Kingdom, Germany, France, Argentina, and Brazil. A summary of sample characteristics is presented in Appendix 4.

2.3. Measures

To measure the variables of augmented reality experience, we employ established instruments from literature. The quality of augmentation was assessed using the scale by Hinsch and al. (2020), characterized by a Cronbach's alpha exceeding 0.80, ensuring reliable measurement. For authenticity, we adapted four items from the scale developed by Kim, Lee, and Jung (2020), achieving a Cronbach's alpha close to 0.90. Vividness was measured using three items from Wu and Lai (2022) on a 7-point Likert scale, with a Cronbach's alpha of 0.826. The intention to reuse AR applications was measured with a scale adapted from Kourouthanassis and al. (2015) and Chung and al. (2015), showing excellent reliability with Cronbach’s alpha of 0.975. Additionally, word-of-mouth intention was assessed using items from Stylidis and Quintero (2022) and Nguyen-Phuoc and al. (2022). Finally, the intention to revisit was measured with an adaptation of the scale from Ballester, Ruiz, and Rubio (2021), demonstrating Cronbach’s alpha of 0.893. The use of existing measurement scales guarantees a certain level of objectivity and allows for greater generalization in research findings. The various scales used in this research are presented in Appendix 5.

3- Data analysis and Results

Following the data collection phase, a purification of the measurement scales was executed using SPSS.20 software, employing exploratory factor analysis (EFA) via principal component analysis (PCA). This methodological approach allows for the identification of underlying relationships between observed variables, ensuring that the constructs are accurately represented. To assess the internal consistency of the measurement scales, we employed Cronbach’s Alpha, a widely accepted metric for reliability analysis. In total, 30 items measuring 9 constructs were meticulously evaluated and retained for this preliminary analysis. The results of the EFA indicated that the constructs exhibited a satisfactory level of internal coherence, as outlined in Appendix 6. Specifically, the explained variance percentages and Cronbach’s Alpha values suggest that the scales are not only reliable but also capable of capturing the intended dimensions of the constructs effectively. This level of reliability enhances the validity of our findings and supports the robustness of the measures used. Consequently, all items were retained for further analysis, laying a solid

foundation for subsequent research phases. To test our research hypothesis, we chose to use the Partial Least Squares (PLS) method, a structural modeling technique suitable for analyzing complex models (Cassel and al., 2000). We utilized Smart PLS 4.0 software, which allows for modeling a latent construct using formative or reflective indicators. All the results are presented in Appendix 7 and Appendix 8.

4. Discussion and conclusion

The results of this research confirm that AR experiences in cultural destinations have a positive impact on visitors' intention to share their experience, particularly through word-of-mouth, thereby enhancing the promotion of these sites. By incorporating affective, intellectual, and sensory dimensions, AR stimulates visitors' engagement and their willingness to share, validating the importance of designing immersive and comprehensive experiences. Moreover, it has been shown that authentic and engaging augmented experiences not only encourage visitors to return but also to reuse AR applications, highlighting the need to develop reliable and user-friendly AR infrastructure. The study also emphasizes AR's contribution to the sustainability of cultural tourism by enriching visitors' experiences while promoting heritage preservation. Additionally, AR increases visitors' engagement with cultural products, notably through well-designed presentations that stimulate interest and facilitate the understanding of heritage. Finally, the results support the idea that AR represents a genuine innovation for cultural products, paving the way for new business models and potential revenue streams for museums and cultural sites.

4.1. Theoretical and practical implications

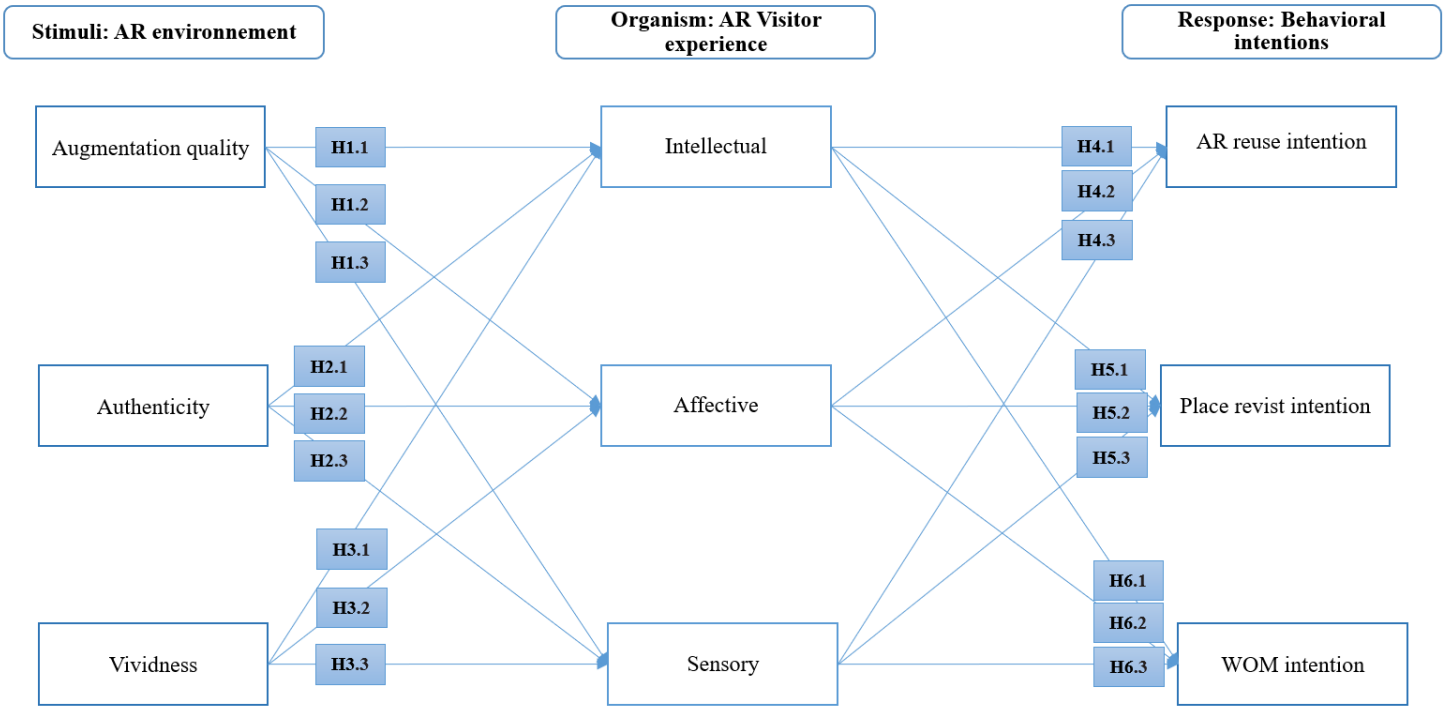
This research extends previous studies on the application of AR in cultural sites, specifically focusing on visitor experience and its influence on behavioral intentions such as AR reuse, revisits, and WOM. By integrating physical cultural elements with AR, the study demonstrates how museums, as cultural venues, enhance cognitive capacities and provide immersive experiences for visitors (He and al., 2018; Jung & tom Dieck, 2017). Using S-O-R model, the study offers a novel framework for exploring visitor responses to AR environments in cultural contexts. The findings confirm that the intellectual, affective, and sensory dimensions of visitor experiences play a key role in shaping positive behavioral outcomes. This work contributes to the academic discourse on AR's role in preserving cultural heritage while delivering educational and entertaining experiences, enriching knowledge sharing for diverse audiences (Bekele and al., 2018; tom Dieck & Jung, 2017). This research offers also valuable managerial insights into leveraging augmented reality (AR) to enhance visitor experiences in cultural sites, providing a competitive edge. It identifies key experiential components, highlighting how AR's functional characteristics—such as vividness, augmentation quality, and authenticity—improve visitor engagement and create value. Museum managers can utilize these findings to justify investments in AR technologies, enhancing interactivity and attractiveness. Furthermore, AR offers opportunities for marketing by enriching user experiences, making cultural sites more competitive and appealing (Jung and al., 2015). However, its financial implications remain uncertain, especially for smaller enterprises (Chung and al., 2015). The study also underscores the importance of continuous evaluation of emerging AR solutions to optimize visitor satisfaction and explores the potential for new business models in museums through immersive experiences. AR implementation presents a shift towards interactive and co-created cultural experiences, offering museum visitors active roles in exploring historical and cultural values.

4.2. Future research directions

Our research can be replicated in other contexts, such as furniture, cosmetics, the fashion industry, entertainment, and so on. Therefore, other characteristics of augmented reality can be investigated, particularly interactivity. Additionally, moderating factors could be explored in future research, such as the moderating role of expertise in augmented reality or the degree of involvement in the technological field.

Appendix:

Appendix1. Research Model



Appendix2. Results of the qualitative study with experts

Themes	Sub-themes	Verbatim quotations
Obstacles and challenges	**Absence of a marketing strategy**	"***l'Agence de Mise en Valeur du Patrimoine et de Promotion Culturelle'*** fait normalement le marketing, mais pour le moment, c'est très, très faible comme effort**,** on s'est mis d'accord pour préparer l'affiche, nous avons fourni une vidéo promotionnelle, mais ça n'a pas été diffusée." **CEO 3DWave**
	Technical issues	"Nous ne disposons pas d'un aspect technique, je veux dire du Wifi dans le musée" **Project manager « musée pour tous »**
	Low attendance for some museums	"Le problème ici c'est que Sfax n'a pas beaucoup de visiteurs…" **Project manager « musée pour tous »**
Value creation for the museum	***Economic value***	
	Attract new audiences	"Notre objectif est de susciter l'intérêt du public qui n'était pas intéressé par une visite auparavant… » **CEO Hirsor.IAR**
	Increase visitor numbers	"Notre objectif est d'aller découvrir notre pays ou bien d'encourager les touristes à visiter cet endroit." **Développer at the AMVPPC**
	Diversify museum products	"Ainsi, il y a un côté de diversification des produits actuels du musée, mais aussi un côté éducatif." **Curator at the Bardo Museum**
	Historical and cultural value	
	Showcase cultural heritages as they existed in the past	"Dans le sens que le touriste visualise des statues cassées ou incomplètes en marbre blanc dans son état brut, alors qu'à la base, ce n'est pas le cas. Nous présentons comment les statues étaient et la reconstitution faite n'est pas au hasard, mais plutôt à travers des études assistées par des scientifiques." **Project manager « musée pour tous »** « Une application mobile qui recrée les sites via la réalité augmentée pour offrir au visiteur une immersion pour savoir comment étaient les sites avant. » **CEO Hirsor.IAR**
	Fostering interest in history	"Nous voulons que nos expériences soient présentes dans les musées et les sites archéologiques et même dans les écoles pour

Value creation for visitors		encourager les enfants à apprendre leur histoire, pour que nous résolvions le problème de l'identité, et aussi les encourager à être ouvert aux autres cultures. » **Managing director of DCX** "Aujourd'hui ce qu'on veut faire c'est redonner vie aux ports puniques et de créer un nouveau type de sentiment chez les visiteurs culturels » **CEO Hirsor.IAR**
	Valorizing world heritage sites	"C'est de valoriser le patrimoine, surtout le patrimoine mondial qu'on a en Tunisie" **CEO 3D Wave**
	Experientiel value	
	Cultural mediation experience for people with reduced mobility (the visually impaired)	**"***Musée pour tous*, son objectif global est l'accès des non-voyants à la culture, les non-voyants sont 22.000 en Tunisie. Si je peux en avoir 1000 qui entrent dans les 2 musées. C'est très bien comme résultat" **Project manager « musée pour tous »**
	New and engaging experience	"Donc, là, l'utilisation des nouvelles technologies dans ce secteur offre une nouvelle façon de présenter le patrimoine plus attractif." **CEO 3D Wave**
	Gamification	**"**Le jeu en AR est une chasse au trésor qui incite les gens à jouer plutôt pour découvrir la ville de Sfax via l'application en AR' ***Serious Game***'." **CEO 3D Wave**
	Storytelling	"Si vous le présentez avec le bon storytelling, pour arriver à toucher les sentiments et pour améliorer le sens de l'interaction avec l'expérience, elle peut attirer énormément de monde. » **Managing director of DCX**
	Educational value	
	Translation of historical materials	"Les statues sont peintes avec ses couleurs d'origine ce qui permet aux visiteurs de mieux comprendre comment les romains ou les anciens les visualisant à leur époque" **Project manager « musée pour tous »** "Donc avec un simple marqueur et une reconstitution 3D dans le téléphone, tu touches le mur et tu verras une section qui montre les couches superposées." **Project manager « musée pour tous »**

	Facilitate information memorization	"…même la mémorisation du public qui visite le musée est renforcée, il y a une grande différence entre la visualisation d'une statue nue et la visualisation avec la réalité augmentée." **CEO 3D Wave**
	Engaging and interactive learning experience	"Le plus valu pour nous, c'est de donner le cours d'histoire que l'on apprend à l'école, et qui peut être ennuyeux pour certains, on essaie de le donner d'une manière plus pédagogique et plus ludique pour amener les jeunes à apprendre et leur laisser une belle image de l'histoire. » **Managing director of DCX**
The importance of AR in the economy	**Market growth**	"C'est un marché qui fait 50% de développement chaque année. Donc oui bien sûr, c'est un marché très porteur et non seulement dans le domaine culturel ou dans le tourisme' **Managing director of DCX** « Si on pense et on imagine, on peut l'appliquer dans tous les domaines. » **Project manager « musée pour tous »**
	Enhance cultural tourism	"Avec les nouvelles technologies, du storytelling, avec une approche immersive et interactive, on peut développer le tourisme culturel et créer toute une économie… » **Managing director of DCX**
	Boost the country's GDP	"Ce type de produits est généralement vendu au pays visant à augmenter leur PIB, pour développer les recettes et l'intérêt pour ses activités culturelles et touristiques » **CEO HirsorIAR**

Appendix 3. Results of the qualitative study with museum visitors

Themes	Sub-themes	Verbatim quotations
Application features	**Augmentation quality**	"C'est une expérience tellement réelle" **M-37-Embassy officer- United States of America** "On se croyait dans la réalité en fin de compte quand on voit tout ça, c'est génial !" **F-69 ans-Retired-France** "Cette application qui m'a fait sentir que les statues sont vivantes et existent vraiment" **M-50- Political area- Lithuania**
	Ease of use	"C'est simple à utiliser, ce n'est pas compliqué" **F-40-Professor- Saoudi Arabia**

		"Cette application semble facile et simple" **M-37- Embassy officer - United States of America** "C'est facile à utiliser" **F-51- Doctor- Spain** "C'est très intuitif, c'est facile et ça permettre de voir l'art d'une autre manière" **F-26 ans- Nurse- Belgium** "C'est intuitif, se comprend facilement…, et peut être plus facile d'accès pour les jeunes que prendre un guide ou un audio guide" **F-26- Nurse- Belgium** "C'est plus facile et ça facilite la visite au musée" **F-28- Responsible - Maroc**
	Utility	"C'est très utile pour les gens qui visitent le musée pour améliorer l'expérience ici au Bardo" **M-40- University administration- United States of America** "…donc c'est tellement utile pour faire comprendre aux gens comment c'était avant" **F-41- Archaeologist - United States of America** "Cela semble extrêmement utile, elle élimine le besoin d'un guide et tout autre chose de ce genre…, on peut s'y fier comme si c'est un expert" **F-25 ans- Banker -India** "Bon c'est mieux de lire les informations sur votre téléphone, plus claire et mieux que se pencher et lire les petites notices en bas des statues, déjà la moitié des informations sont effacés" **F-25- Veterinarian - Tunisia** "C'est peut-être plus difficile d'avoir accès aux informations, il faut aller lire les pancartes qui sont parfois basses, écrites en petit, là au moins on a les informations plus rapidement, c'est plus pratique, c'est un plus je pense" **M-32-Professor- France**
	Vividness	"…donc ce n'est pas juste le statut de marbre ou quelque chose sans vie, ça donne de la vie, des couleurs et ça bouge" **F-40-Professor- Saudi Arabia** "Elle apporte ces statues à la vie" **M-37 ans- Agent in the Embassy - United States of America**
	Authenticity	"Cette application est juste là pour ajouter plus au musée, donc c'est exceptionnel" **F-41- Archaeologist - United States of America** "La capacité de reconstruire, tout de suite, les objets est quelque chose que je n'ai jamais vu avant" **F-41- Archaeologist - United States of America** "La capacité de réunir le virtuel et la réalité, cela les rassemble tous les deux, alors je le trouve… c'est

		original" **F-41- Archaeologist - United States of America** "c'est très profond pour le musée, je n'ai pas vu une telle chose pareille avant" **M-37- Embassy officer - United States of America** "C'était une bonne expérience c'est génial!" **F-29- Architect - China** "Je trouve que cette expérience est originale" **M-20-Student – Tunisia** "C'est vraiment innovant ; c'est très intelligent, je ne l'ai vu nulle part ailleurs donc c'est unique et semble facile à utiliser." **F-37- Lawyer - Australia**
Dimensions of the experience	**Cognitive**	"C'est très intéressant comment vous pouvez apprendre d'une manière plus informative que le musée peut vous donner" **F-41- Archaeologist- United States of America** "Elle vous permet de reconstruire les idées d'une manière plus complète que vous ne pouvez pas le faire toute seule" **F-41- Archaeologist- United States of America** "Montrer à quoi il ressemblait, comme version restaurée qui est intéressante, l'information est agréable" **M-29-PhD student - United States of America** "Il y a beaucoup plus de contextes et d'informations dans l'application" **M-29-PhD student- United States of America** "…Avec l'application, vous pouvez apprendre l'histoire lorsque vous touchez l'écran, elle vous montre l'histoire de chaque statue, et vous permet également de voir l'image réelle avec les parties manquantes du corps" **F-34- Manager- Spain** "ça permette de voir l'art et les sculptures sous un nouveau jour de rendre la simulation et la connaissance plus facile" **F-26- Nurse - Belguim** "L'application elle est très bien parce que on peut s'imaginer en voyant les statues comme ça, bah ça ne nous parle pas trop la plupart en leurs enlever la tête" **F-65- Retired - France** "C'est bon d'avoir la réalité augmentée parce que ça stimule l'imagination en plus on voit les statues comment elles étaient dans la réalité" **F-34- Lawyer - Italy**
	Affective	"…donc j'aime beaucoup ça" **F-40-Professor- Saudi Arabia**

		"…un lien émotionnel avec tout ce que je vois ici" **M-37- Embassy officer - United States of America** "C'est une expérience passionnante" **F-35- Dentist- Tunisia** "Une très bonne idée, j'aime bien, parce qu'une telle application aide les gens qui cherchent les détails et qui sont passionnés par l'histoire, télécharger cette application, leur permettre de voir les statues en entier comment ils étaient à l'origine" **M-20-Student– Tunisia** "J'ai la 3D pour visualiser les images. C'est la chose que j'aime le plus" **F-40-Professor- Saoudi Arabia**
	Sensory	"Comme je vous l'ai dit ceci a capturé mes yeux, ça me fait absorber l'image complète" **F-40- Professor- Saoudi Arabia** "J'ai la 3D pour visualiser les images. C'est la chose que j'aime le plus" **F-40- Professor- Saoudi Arabia** "Elle te fait voir les choses mieux avec une voix plus moderne du coup avec les couleurs tu fais plus attentions aux choses" **F-22- Student- Italy** "Cette application est bonne mais surtout pour les jeunes, très visuelle, orientationelle, elle a également des couleurs par exemple" **F-51-Doctor- Spain** "Vous obtenez beaucoup plus d'informations et vous pouvez visualiser beaucoup mieux" **M-50- Political area- Lithuania** "C'est très visuel" **F-26- Nurse - Belguim** "Être capable de voir les vraies couleurs, les couleurs d'origine et de remplacer les pièces qui manquaient. Je pense que c'est vraiment intéressant" **F-37- Lawyer - Australia**
Cultural involvement		"En tant qu'archéologue, j'étudie ce domaine et j'ai entendu dire que c'est un excellent musée à visiter, alors je suis heureuse d'être ici, c'est fantastique !" **F-41- Archaeologist - United States of America** "Personnellement, je suis une passionnée de mosaïques" **F-65- Retired - France** "Je m'intéresse à l'architecture des musées, et je souhaite découvrir ce musée car il a plusieurs cultures et en tant qu'architecte d'intérieur, je suis tellement intéressé par cette beauté" **F-29- Architect- China**

		"Je suis intéressé par l'histoire de la Tunisie, j'adore l'histoire" **M-40- University administration- United States of America**
Behavioral intentions		**Positive behavioral intentions**
	Use intention of the application	"Je vais essayer cette application dans mes futurs visites" **F-23-Student- Tunisia** "Je vais l'utiliser si je reviendrai" **F-37-Diplomat- United States of America** "Je veux surement télécharger cette application et l'utiliser dans ma visite prochaine au Bardo" **F-69- Retired - France** "J'espère que cette application se propage à l'échelle internationale et je peux la trouver dans l'Apple store ou Google Play pour que Je puisse la télécharger." **F-40-Professor- Saudi arabia**
	WOM intentions	"Je recommanderais a tous mes collègues et amis quand ils viennent ils doivent connaître cette application" **M-37- Embassy officer - United States of America** "Je veux en parler à mes sœurs" **F-40-Professor- Saudi arabia**
		Negative behavioral intentions
	Non-purchase decision	"Pour avoir des informations oui mais pas pour acheter" **F-51-Doctor- Spain** "Non, je ne vois pas pourquoi je l'utiliserais pour acheter des choses**" F-37- lawyer- Australia** "Bah je ne fais pas beaucoup d'achat je vous avoue par application ou même par internet, je préfère sortir le contact dans une boutique" **M-32- Professor- France**

Appendix4. Sample Characteristics

Characteristics		**Frequency (N=269)**	**Percentage**
Gender	Female	190	70.6%
	Male	71	26.4%
	Preferred not to answer	8	3%
Age	Under 18 years	10	3.7%
	25-34 years	83	30.9%
	35-54 years	176	65.4%
Nationality	Spain	204	75.8%
	Other countries	65	24.2%

Appendix5. Scales of mesures

Construct	**Item**	
Augmentation quality (Hinsch and al., 2020)	- It seemed to you that the Klimt paintings projected in AR were there. - You had the impression that the characters in the AR projection moved from the projection into the room. - The elements augmented by the projection appeared very realistic.	
Authenticity (Kim, Lee, and Jung, 2020)	- The visit to the AR "Klimt" exposition allowed me to have authentic experiences. - The visit to the AR "Klimt" exposition allowed me to have real experiences. - The visit to the AR "Klimt" exposition allowed me to have exceptional experiences. - The visit to the AR "Klimt" exposition allowed me to have unique experiences.	
Vividness (Wu and Lai, 2021)	- When I visited the Klimt exposition, I found that the works of Klimt presented through the AR projection were very vivid. - When I visited... the AR projection were very rich. - When I visited... the AR projection were very detailed.	
Visitor experience Brakus and al. (2009) and Leopardi and al. (2020) and Kim, Lee, and Jung (2020)	**Intellectual**	- I demonstrated great creativity when I discovered this AR exposition. - This exposition made me dream. - This exposition stimulated my imagination.

	Affective	- This exposition evoked feelings and emotions. - I felt strong emotions during this exposition. - This is an emotional exposition.
	Sensory	- This AR exposition made a strong impression on my visual sense or other senses. - I find this AR exposition interesting from a sensory perspective. - This AR exposition appeals to my senses.
AR reuse intention **Kourouthanassis and al. (2015) Chung and al. (2015)**	- I would like to use AR technologies in the future. - I intend to use AR technologies in the future. - I plan to use AR technologies frequently in the future. - I intend to invest my time and money in AR technologies in the future.	
WOM intention Stylidiset Quintero (2022) and Nguyen-Phuoc and al. (2022)	- I would tell others positive things about the Klimt exposition. - I would recommend others to try the Klimt exposition. - I would write positive reviews about the Klimt exposition on social media.	
Place revisit intention Ballester, Ruiz and Rubio (2021)	- I would like to revisit MAD soon. - I am considering visiting MAD again. - I would visit MAD more frequently. - I would recommend MAD to my family or friends.	

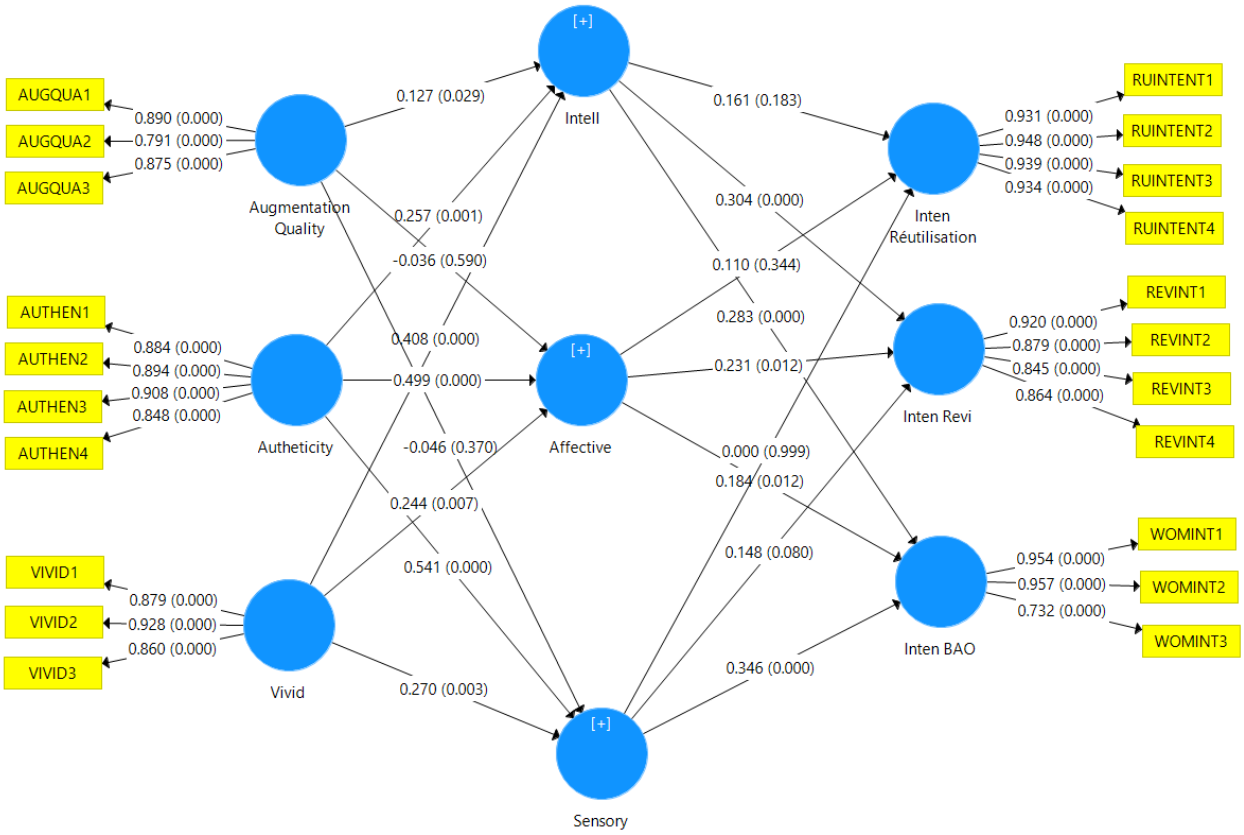
Appendix6. Exploratory factor analysis

Construct		**Explained Variance (%)**	**Cronbach's Alpha**	**KMO**
Augmentation quality		73.037	0.815	0.693
Vividness		79.154	0.868	0.703
Authenticity		78.068	0.906	0.809
Visitor experience	**Intellectual**	79.249	0.869	0.717
	Affective	85.501	0.915	0.752
	Sensory	89.827	0.941	0.748
AR reuse intention		88.001	0.955	0.830
WOM intention		78.808	0.860	0.632
Place revisit intention		77.118	0.893	0.759

Appendix7. Summary of hypotheses testing results

Hypothesis of research	**Std Bet**	**T-Value**	**P-Value**	**Results**
Affective ->WOM Inten	0,184	2,533	0,012	Supported
Affective ->Inten Revi	0,231	2,512	0,012	Supported
Affective ->Inten Reuse	0,110	0,948	0,344	Rejected
Augmentation Quality -> Affective	-0,036	0,539	0,590	Rejected
Augmentation Quality ->Intell	0,127	2,196	0,029	Supported
Augmentation Quality ->Sensory	-0,046	0,897	0,370	Rejected
Autheticity -> Affective	0,499	6,030	0,000	Supported
Autheticity ->Intell	0,257	3,375	0,001	Supported
Autheticity ->Sensory	0,541	6,784	0,000	Supported
Intell ->Inten WOM	0,283	3,658	0,000	Supported
Intell ->Inten Revi	0,304	3,514	0,000	Supported
Intell ->Inten Reuse	0,161	1,332	0,183	Rejected
Sensory ->Inten WOM	0,346	4,795	0,000	Supported
Sensory ->Inten Revi	0,148	1,752	0,080	Rejected
Sensory ->Inten Reuse	0,000	0,002	0,999	Rejected
Vivid -> Affective	0,244	2,686	0,007	Supported
Vivid ->Intell	0,408	5,542	0,000	Supported
Vivid ->Sensory	0,270	2,957	0,003	Supported

Appendix8. Result of the confirmatory factor analysis of the overall conceptual model



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