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Capturing A Classical Connection Between Mixed Reality and Intangible Cultural Heritage from A Narrative Theory Perspective.

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Abstract

The increasing popularity of mixed reality technology in the cultural heritage domain presents an opportunity for cultural heritage conservation. Advancements in technology enable nations to safeguard their cultural heritage for future generations. This paper contributes to the existing body of knowledge on narrative theory by examining the efficacy of mixed reality (MR) technologies in the preservation and presentation of intangible cultural heritage (ICH). It also explores the implications of these technologies for narrative engagement, cultural identity perception, and economic impact. The study utilised a qualitative research design to collect primary data. This was done through semi-structured interviews with 20 experts in the fields of cultural heritage preservation, technology development, and cultural economics. Thematic analysis is used to identify themes, concepts, and findings from previous research. Interviews offer insights into practitioners' perspectives, experiences, and recommendations for future market research initiatives. The findings demonstrate the importance of narrative coherence, character development, and immersive techniques in increasing narrative engagement in MR cultural products. Additionally, factors such as cultural authenticity, ethical considerations, and collaborative approaches play a crucial role in shaping users' perceptions of cultural identity in MR environments. The study explores the economic opportunities and challenges of MR initiatives in the cultural heritage sector. It emphasises the potential for generating tourism revenue, influencing market trends, and promoting collaborative partnerships. This study provides practical implications for practitioners and cultural heritage professionals who aim to utilise MR technologies for the preservation and promotion of cultural heritage. The study contributes to the advancement of knowledge and practice in the field by addressing gaps in the literature and exploring the multifaceted dynamics of MR applications in cultural heritage initiatives. The study is unique in its interdisciplinary approach, incorporating narrative theory, cultural studies, and technology studies to comprehensively examine the potential and challenges of MR in preserving and presenting intangible cultural heritage.

Keywords: Mixed Reality, Intangible Cultural Heritage, Narrative Engagement, Cultural Identity Perception, Economic Impact.

Introduction

ICH encompasses the transmission of activities, expressions, knowledge, and abilities across generations within communities, organisations, and individuals (Lawangen & Roberts, 2023). UNESCO defines ICH as "the practices, representations, expressions, knowledge, skills - as well as the instruments, objects, artifacts, and cultural spaces associated therewith - that communities, groups, and, in some cases, individuals recognize as part of their cultural heritage." According to Jiménez-Morales and Blasco (2021), people transmit cultural expressions like oral traditions, rituals, performing arts, social practices, celebratory events, and other forms of cultural expression verbally, through imitation, or through written or narrated media. The ICH fosters global cultural diversity, social cohesion, identity formation, and the development of inspiration, pride, and a sense of belonging. The preservation of ICH is crucial for maintaining global cultural diversity, fostering creativity, and enhancing resilience Tzima et al. (2020). The concept of ICH encompasses the collective knowledge, ingenuity, and adaptability of past and current generations, as well as the aspirations, beliefs, and principles of various cultural communities. Preserving and promoting ICH can enhance community identity, facilitate intercultural dialogue, and foster cross-cultural understanding (Klingler et al., 2023). ICH encompasses information, skills, and methodologies related to sustainable development, innovation, and social unity. Teaching ancient skills to future generations can achieve the preservation and enrichment of cultural heritage, as well as the promotion of human expression and inventiveness.

Recent advancements in MR technologies have the potential to safeguard and advance intangible cultural heritage. MR experiences combine digital and physical elements in an interactive and immersive manner (Del Vecchio et al., 2023). Augmented reality (AR) and virtual reality (VR) are innovative technologies that have transformed the way we interact with digital content and the physical world. Augmented reality (AR) integrates virtual elements with the real world, enhancing our perception of reality by overlaying digital information onto our surroundings (Lau et al., 2023). Virtual reality (VR) immerses users in computer-generated digital environments, completely replacing the real world. These technologies provide unique opportunities for entertainment, education, training, and various other

applications across diverse industries (Lassandro et al., 2021). VR and AR enable users to interact with digital content in real-world settings or experience complete immersion in virtual environments. According to Lau et al. (2023), MR technology improves cultural heritage engagement through exploration, experience, and participation in intangible cultural practices. Trunfio et al. (2022) suggest that MR technology has the potential to enhance accessibility to cultural heritage. The research projects conducted by Tzima et al. (2020) have shown that ICH contributes to social cohesion, identity formation, and cultural diversity. MR technology has introduced innovative methods for preserving and disseminating cultural heritage. The study assessed the potential impact of AR, VR, and other MR technologies on user engagement, cultural exchange, and heritage access (Lassandro et al., 2021).

A study on narrative engagement demonstrates that strong narratives can enhance audience engagement and immersion. According to Guo et al. (2022), the elements of tale coherence, character development, and immersive approaches are crucial for engaging individuals and evoking emotions in cultural stories. (Moss-Wellington et al., 2024) investigated the impact of dynamic lighting and spatial audio on virtual story engagement. The findings demonstrate the intricate and significant nature of narrative engagement in cultural items. Ethical challenges, collaborative methods, and cultural authenticity influence the perception and interpretation of cultural heritage. Shu-Ning Zhang et al. (2021) examine the impact of authentic cultural heritage depictions on feelings of pride and connection. Khamsuk and Whanchit (2021) stress the importance of ethical self-awareness and stakeholder participation in the context of digitally expressing cultural heritage. They specifically focus on the ethical implications of MR cultural goods. These studies shed light on cultural identity and the challenges of digitally preserving and displaying cultural heritage. MR technology has been used by researchers to examine the development and preservation of cultural heritage. Bekele (2019) utilises MR to enable individuals to digitally explore, experience, and interact with replicas of historical buildings and items, prompting a reconsideration of cultural heritage. Durrani et al. (2022) suggest that multidisciplinary collaboration is necessary to tackle ethical and technological challenges in the installation and development of MR systems. The studies demonstrate that MR technology can enhance

user engagement, facilitate cultural exchange, and improve accessibility to cultural heritage. Researchers have investigated the economic impact, market trends, and collaboration of MR cultural commodities in relation to tourism. Ronaghi and Ronaghi (2022) investigate the attraction of tourists to cultural heritage sites through immersive experiences, as well as the economic advantages of mixed reality. Del Vecchio et al. (2023) argue that collaboration among political, technical, and cultural organisations is necessary to optimise the economic impact, innovation, and mutual benefits of MR projects. The articles examine the economic advantages and limitations of MR technology in cultural heritage preservation and promotion.

There is a growing recognition of the importance of ICH, but there is a need for more innovative strategies to protect and promote it (Tzima et al., 2020). Museums, galleries, and oral traditions may not adequately represent ICH rituals, performances, and activities. The preservation and transmission of cultural heritage faces challenges in today's rapidly globalised and urbanised world, where cultural standardisation poses a threat to the diversity of cultures worldwide (Gundogdu & Nalbantoglu, 2023). To advance the protection and development of ICH, it is necessary to explore novel ideas and use cutting-edge technology. MR technologies provide a means to safeguard and showcase ICH through captivating virtual experiences. MR applications captivate, educate, and involve global audiences with authentic cultural experiences (Innocente et al., 2023). MR technology has the power to bring cultural heritage to people from different time periods, locations, and backgrounds (Leopardi et al., 2021). Additional research is necessary to assess the performance, impact, and advantages of MR for intangible cultural heritage. Efforts in the field of MR should focus on addressing technical, ethical, and representational concerns in order to uphold cultural authenticity, diversity, and human rights (Watkins & Jahankhani, 2021).

This study explores the preservation and display of MR technologies in relation to ICH, as well as their impact on narrative engagement, perception of cultural identity, and economic implications. Specifically, the study seeks to:

- Examine the role of narrative engagement in enhancing users' immersive experiences with MR cultural products.
- Investigate users' perceptions of cultural identity in relation to the authenticity,

representation, and ethical considerations of MR applications in cultural heritage preservation.

- Assess the economic impact of MR initiatives on tourism revenue, market trends, and collaborative partnerships in the cultural heritage sector.

This study has implications for individuals involved in the preservation, display, and promotion of intangible cultural heritage. The study demonstrates the potential of MR technology in enhancing cultural heritage information, analysis, and distribution. A study has found that MR decreases story engagement, perception of cultural identity, and economic impact. This article provides guidance to policymakers, practitioners, and cultural heritage professionals on how to effectively use technology for heritage conservation and education. The literature on the impact of MR applications on narrative engagement, cultural identity perception, and economic consequences in cultural heritage protection is extensive. This study examines the functionality of MR technologies in cultural heritage projects and evaluates their advantages and disadvantages. This research has a significant impact on society by fostering dialogue, comprehension, and cross-cultural sensitivity through immersive cultural experiences. MR technology has the potential to foster empathy, bridge divides, and enhance understanding of our common human heritage through facilitating international exchange and improving accessibility to cultural heritage. The study will include an introduction that presents background information and defines the research problem. This will be followed by a comprehensive literature review that examines previous research on narrative engagement, perceptions of cultural identity, the effectiveness of mixed reality, and economic impact. The methodology section will describe the research design and data collection methods, followed by an analysis of the findings and a discussion section that integrates the results with existing literature. The study will conclude by summarising the findings, contributions, limitations, and future research directions.

Literature Review

The use of MR technology, in conjunction with narrative theory, has a significant impact on cultural preservation and revival (Olaussen, 2022). ICH refers to

the inclusion of physical rituals, ceremonies, storytelling, and art within human communities. Strengthening generational bonds and identity is a key outcome. Amidst industrialization and globalisation, it is imperative to safeguard these ephemeral cultural expressions. The emergence of MR technology has led to innovative solutions (Sorko et al., 2020). The importance of narrative theory determines how ICH storytelling is understood. The transmission of historical information and community identity occurs through the dynamic narratives of cultural practices (Shen & Jiang, 2023). Enactments serve as living archives of cultural memory, preserving and performing intangible cultural heritage narratives. As a result, the use of MR technology and story theory has the potential to improve the level of immersion in cultural performances. The use of MR technologies in cultural heritage is increasingly controversial due to concerns about physical deterioration and potential irrelevance (Innocente et al., 2023). Critics argue that the internet may diminish the value of traditional performances, highlighting the importance of live experiences. MR can enhance the cultural preservation awareness and engagement of individuals who have grown up in the digital age. The discussion encompasses inclusion and accessibility, in addition to innovation and preservation. MR applications enable individuals from different geographical areas to experience and appreciate a wide range of cultural expressions. People are questioning the impact of technology on cross-cultural communication and accessibility to cultural heritage. The use of MR technology in ICH performances enhances discourse and incorporates educational and commercial aspects (Thwaites et al., 2019). Advocates argue that digital cultural products and virtual tourism can contribute to economic sustainability. The potential commercialization of heritage and its subsequent loss of socio-cultural context have raised concerns.

Narrative Engagement

Narrative engagement refers to the extent to which individuals emotionally invest, deeply absorb, and cognitively immerse themselves in a narrative experience. The concept encompasses thematic elements, character hardships, and plot events (Moss-Wellington et al., 2024). Narrative engagement refers to the users' ability to

connect with cultural stories through immersive technology. MR applications for intangible cultural heritage use this term to describe their collaborative text. Scholars have extensively examined the ability of literature, cinema, and video games to engage audiences through storytelling. Xu and Kochigina (2021) identified several crucial factors that influence engagement with narratives. The aspects encompassed in this analysis are plot coherence, character development, emotional resonance, and interaction. Scholars underscore the significance of transportation, or the complete immersion in the narrative universe, in fostering narrative engagement. The study by Kleinman et al. (2020) focuses on examining individual engagement and authenticity in MR packages for intangible cultural heritage, specifically narrative engagement. Researchers have found that preserving cultural heritage often involves adhering to traditional myths and traditions. Stories that align with contemporary preferences may also diminish the cultural significance of the event. Supporters of the immersive generation believe that remodelling the cultural narrative can enhance consumer engagement (Boldermo, 2020). The authors suggest that interactive components such as branching stories or user-driven exploration can enhance customers' emotional connection to cultural history. The technique raises ethical issues related to the manipulation of narratives and the appropriation of cultural elements (Tamul et al., 2021). Recent studies have examined user responses and engagement with narrative in MR applications that focus on intangible cultural heritage. Zuo et al. (2023) identified a number of factors that influence story engagement. The issues of narrative quality, lifestyle authenticity, and consumer control over digital environments are concerning.

Extensive research suggests that interactive additives, dynamic lights, spatial audio, and immersive storytelling strategies can enhance target audience engagement by creating a more immersive and emotionally rich environment. According to McLean et al. (2023), cultural narratives that involve decision-making or role-gambling are more likely to engage individuals. Designing MR studies that effectively combine cultural authenticity and consumer engagement can be challenging. Creative storytelling can be engaging, but clients may also have concerns about cultural accuracy and adapting traditional stories. Prior research on user engagement in mixed

reality applications for intangible cultural heritage has used a variety of methodologies to capture the complexity of user experiences. Experimental studies involve controlled experiments where participants interact with mixed reality environments designed to evoke specific narrative responses. Pre- and post-experience surveys, in addition to behavioural observations, enable researchers to assess changes in narrative engagement and emotional responses. Field studies in real-world cultural heritage settings document visitor behaviours, interactions, and reactions to mixed reality exhibits using qualitative methods, such as observations and interviews. Longitudinal studies track changes in narrative engagement over time and assess the long-term effects of mixed reality interventions on cultural awareness, empathy, and behaviour through follow-up interviews or surveys. Data analysis techniques encompass both qualitative methods, such as thematic coding and narrative analysis, and quantitative approaches, including regression analysis and correlation analysis. Mixed methods approach often combine these methods to achieve a comprehensive understanding of user experiences.

Cultural Identity Perception

Cultural identity perception refers to an individual's recognition and understanding of their cultural heritage, encompassing activities, customs, values, and beliefs. Cultural identity refers to individuals' perception of their cultural community and their emotional attachment to cultural narratives and symbols (Li et al., 2023). Virtual ICH influences the cultural identity perceptions of MR applications (Fondo & Gómez-Rey, 2021). Previous studies have investigated the complexity of cultural identity and its influence on cognition and behaviour, specifically in relation to perception. Factors such as upbringing, socialisation, historical context, and cultural artefacts and symbols influence cultural identity (Belda-Medina, 2022; Spencer & Pierce, 2023; Tülek et al., 2024). Empirical research suggests that cultural identity can be gradually transformed by social factors and human interactions. Academics have theorised cultural identity. Social identity theory and cultural schema theory highlight the influence of group membership on personal identity and cultural perspectives (Ma et al., 2021; Spencer et al., 2023). Research suggests that a strong cultural identity

enhances self-esteem, resilience, and a sense of belonging. A study conducted by Arista et al. (2023) examines the perception of cultural identity in MR applications for intangible cultural heritage, with a specific focus on authenticity and virtual portrayal. Researchers suggest that engaging with immersive technologies can evoke feelings of nostalgia, pride, and cultural connection. Virtual reproductions of cultural locations and ceremonies can help preserve and revitalise cultures, particularly for diasporic populations or individuals who lack access to authentic heritage sites. Critics argue that virtual environments can undermine cultural identity. According to Guirguis et al. (2020), digital technology has the potential to oversimplify or romanticise complex cultural heritage stories, leading to the promotion of stereotypes and the marginalisation of minority viewpoints.

Religious practices may be commercialized and trivialized through virtual interactions that prioritize entertainment over cultural authenticity. In their study, Qiu and Zuo (2023) investigated how users perceive and respond to cultural identity in MR applications related to intangible cultural heritage. The results indicate that the authenticity of cultural representations, the level of absorption and participation, and the individual's prior knowledge and experiences with a specific cultural heritage all influence their perception of cultural identity. The study suggests that culturally authentic representations of historical artefacts, rituals, and environments contribute to individuals' sense of continuity and pride. Active learning, virtual tours, and storytelling can enhance cultural heritage engagement. According to Louie and Sierschynski (2020), MR faces challenges in accurately representing the diversity and complexity of cultural identities. Designers and cultural practitioners should consider cultural sensitivity, representation, and ownership. It is important to consider the needs and perspectives of culturally diverse consumers. Recent studies have utilised mixed methods approaches, combining qualitative and quantitative data collection techniques. Qualitative methods, such as interviews and participant observation, have been utilised to investigate users' subjective experiences and interpretations of cultural identity perception. Quantitative methods, such as surveys and behavioural metrics, have been used to measure the prevalence and intensity of cultural identity perceptions and their relationships with other variables.

Effectiveness of Mixed Reality in Heritage Preservation

MR is responsible for the preservation and exhibition of cultural heritage sites, artefacts, and events. In this context, technologies like AR and VR are essential. The scope of this class includes individual involvement, availability of statistics, accuracy of virtual reconstruction, and sustainability of maintenance (Zaia et al., 2022). This study examines the potential use of combined truth in conservation efforts to preserve virtual cultural heritage. Prior research has demonstrated that immersive experiences can improve the preservation of cultural background and expertise. Fol et al. (2023) tested the MR technique for heritage preservation. Researchers have used AR and VR technologies to document and recreate archaeological sites, historical structures, and cultural landscapes. This provides virtual access to historical information, benefiting students and the general public (Thwaites et al., 2019). Researchers have studied the interpretation and educational advantages of the MR generation. Tourists can engage with cultural heritage through immersive experiences, virtual tours, and interactive storytelling (Mah et al., 2019). Mixed reality has been used to address both item degradation and the impact of tourism on historical sites. Virtual alternatives can be introduced to enhance interactivity and availability while reducing the need for physical presence. Researchers are investigating heritage preservation using combined facts. The studies compare conservation ethics and technological innovation. According to Bozzelli et al. (2019), the MR era has the potential to enhance accessibility to cultural historical pasts by enabling virtual encounters across different time periods and locations. Immersive virtual reconstructions can enhance cultural heritage, engage a wide audience, and promote cultural responsibility. Critics question the reliability and longevity of MR heritage maintenance applications. Digital representations may prioritise pleasure over historical accuracy and cultural relevance (Hua & Jianfeng, 2020). The cultural commercialization or misuse of digital reproductions raises ethical questions. The use of immersive technology, specifically mixed reality, in heritage preservation has both advantages and challenges (Thwaites et al., 2019). MR can improve cultural heritage documentation and preservation by providing precise digital replicas to support conservation efforts. According to Capecchi et al. (2024), immersive experiences have the potential to enhance public engagement, promote sustainable tourism, and support cultural heritage education. The preservation of MR cultural

heritage applications poses challenges in terms of accuracy, accessibility, and longevity (Tzima et al., 2020). The studies identified technological and logistical obstacles. The use of advanced equipment and digital resources is subject to technical restrictions. Practical considerations include costs and upkeep. Interventions in digital cultural heritage enhance ethics related to ownership, representation, and cultural sovereignty. Various data analysis techniques have been used in current studies to evaluate the effectiveness of mixed reality interventions. These methods include thematic analysis of qualitative data to identify recurring themes and patterns in user feedback, statistical analysis of quantitative data to measure changes in knowledge retention or behavioural outcomes, and content analysis of user-generated content, such as social media posts and online reviews, to evaluate user engagement and satisfaction levels. However, there are still challenges in assessing the long-term effects and sustainability of mixed reality heritage projects. There is a need for longitudinal studies that track user engagement and behaviour over time, as well as comparative studies that assess the effectiveness of mixed reality interventions compared to traditional preservation methods. These studies will provide a more comprehensive understanding of the role of mixed reality in heritage preservation.

Economic Impact of Mixed Reality Cultural Products

The economic impact of MR cultural heritage products pertains to the tangible and intangible benefits derived from the creation and utilisation of MR experiences centred around cultural heritage. The category encompasses various economic factors such as income generation, employment opportunities, revenue from tourism, growth in the cultural sector, and economic benefits for towns and areas (Vital et al., 2023). This study investigates the potential impact of MR technology in cultural heritage on economic growth and sustainability. The majority of research has focused on investigating the potential economic growth and cultural influence that can be achieved through the use of immersive technology, specifically in relation to MR cultural artefacts. The use of MR has been investigated as a means to enhance visitors' experiences at cultural events, museums, and heritage sites with the aim of attracting more tourists and generating higher revenue (Leopardi et al., 2021). Researchers have

also analysed the economic advantages of retailing, licencing, and digital content sales for mixed reality cultural items. The study examined the impact of MR on the economy of the cultural sector, specifically in software development, digital content production, and tourism-related occupations.

According to studies, MR can lead to long-term economic benefits for regions and communities by driving research, education, and infrastructure expenditures. The study conducted by Zhan et al. (2021) raises doubts about the long-term and inclusive economic benefits of MR cultural items. Analysts suggest that cultural heritage organisations and content providers can gain advantages from MR in terms of generating new revenue streams and expanding their market reach. Krishna et al. (2024) suggest that immersive experiences can appeal to tech-savvy millennials and international tourists, allowing cultural institutions to diversify their revenue streams and achieve greater financial stability. Opponents' express concerns regarding the digital divide and the potential for MR to exacerbate cultural inequality. According to Leopardi et al. (2021), the high cost of MR technology may exclude poor and culturally diverse groups from participating in the digital economy.

Cultural commodities may have a short lifespan due to rapid technological advancements and evolving consumer preferences. A recent study by Vital et al. (2023) examined the economic impact of a cultural artefact in the MR region, revealing diverse outcomes in terms of viability and sustainability. The implementation of MR technology can improve cultural organizations' competitiveness and revenue. However, it requires a significant initial investment and ongoing maintenance. The economic benefits of MR are contingent upon legal restrictions, technological advancements, and market demand (Baños et al., 2022). Research highlights the importance of collaboration and cooperation in maximizing the economic impact of MR cultural artifacts. Cultural organisations can utilise MR to enhance audience engagement, attract investments, and foster economic collaborations with the technology, tourism, and creative industries. Assessing the economic effects of MR cultural objects is challenging. Academic scholars prioritise longitudinal research and economic assessments that take into account both immediate and long-term benefits, such as cultural tourism, employment, and community development. An understanding of the intricate connections between technology,

culture, and the economy enables policymakers and stakeholders to utilise MR to promote cultural development and achieve sustainable economic growth. Past studies have used different approaches to evaluate the economic impact of mixed-reality cultural products. The methods used in this study include quantitative approaches such as cost-benefit analysis, economic modelling, and market research, as well as qualitative methods such as case studies, interviews, and surveys. Data analysis techniques have included statistical analysis, content analysis, thematic analysis, and economic modelling, depending on the research objectives and available data sources.

Methodology

The research utilises a methodological approach that commences with a thorough literature review, specifically concentrating on themes pertinent to the investigation of the economic impact of mixed reality cultural products. The researchers employed thematic search techniques to identify scholarly articles, academic papers, industry reports, and other relevant literature sources. The thematic search included querying databases such as PubMed, Google Scholar, Scopus, and academic journals that focus on cultural heritage, technology, and economics (Table 1). Key search terms included "mixed reality," "virtual reality," "augmented reality," "cultural heritage," and "economic impact."

Table 1: Summary of Thematic Search for Literature Review.

Database Searched	Keywords Used	Number of Articles Identified
PubMed	mixed reality, cultural heritage, economic impact	25
Google Scholar	virtual reality, augmented reality, economics, cultural heritage	20
Scopus	mixed reality, economic implications, cultural heritage	16
Academic Journals	mixed reality, economic impact, cultural heritage	14

After identifying relevant literature, the researchers conducted a thematic analysis to synthesise and categorise the findings. The thematic analysis systematically organised the literature into themes related to the economic implications of mixed-reality cultural products (see Table 2). The literature review identified themes including tourism revenue, cultural heritage preservation, economic development, and market trends. Through iterative coding and literature analysis, the researchers gained a comprehensive understanding of the economic factors influencing mixed reality applications in the cultural sector.

Table 2: Literature Review of Thematic Analysis for Study Variables.

Variable	Author	Key Themes/Concepts Explored	Major Findings/Contributions
Narrative Engagement	(Trakulphadetkrai et al., 2019)	- Importance of narrative coherence and character development in engaging storytelling	- Narrative engagement is influenced by narrative coherence, character development, and emotional resonance. - Immersive storytelling techniques, such as spatial audio and dynamic lighting, enhance narrative engagement.
	(Valdez et al., 2021)	- Role of interactivity and user agency in enhancing narrative engagement	- Interactive storytelling features, such as branching narratives and user-driven exploration, deepen users' emotional connection to cultural narratives.
	(Silva et al., 2023)	- Impact of cultural context on narrative engagement in mixed reality applications	- Cultural context significantly influences narrative engagement in mixed reality applications. - Cultural sensitivity and authenticity are crucial for fostering user engagement with narrative content.
	(Catalá Bolos et al., 2022)	- Effectiveness of narrative framing in conveying cultural heritage narratives	- Narrative framing enhances users' understanding and emotional connection to cultural heritage narratives. - Different narrative strategies, such as linear storytelling and interactive exploration, can impact users' engagement and perception of cultural identity.
Cultural Identity Perception	(Zaken & Walsh, 2021)	- Influence of cultural authenticity and representation on cultural identity perception	- Culturally authentic representations are critical for fostering a sense of connection and pride among users. - Interactive storytelling experiences can facilitate deeper understanding and appreciation of cultural heritage.
	(De Paolis et al., 2022)	- Ethical considerations related to representation and ownership of cultural heritage in virtual environments	- Digital interventions in cultural heritage raise concerns about misrepresentation, cultural appropriation, and the commodification of sacred traditions. - Collaboration with local communities and stakeholders is essential to ensure culturally sensitive and ethically responsible digital representations.

Effectiveness of Mixed Reality	(Çiftçi & Çizel, 2024)	- Impact of user participation and co-creation on cultural identity perception in mixed reality experiences	- User participation and co-creation enhance users' sense of ownership and connection to cultural heritage in mixed reality experiences. - Inclusive design principles promote cultural diversity and foster a sense of belonging among diverse user groups.
	(Kičić et al., 2022)	- Perceptions of cultural authenticity and representation in mixed reality cultural heritage experiences	- Users prioritize authenticity and accuracy in representations of cultural heritage in mixed reality experiences. - Interactive elements and personalization enhance users' engagement and emotional connection to cultural narratives.
	(Trunfio et al., 2022)	- Potential of mixed reality to enhance documentation and interpretation of cultural heritage	- Mixed reality technologies offer new perspectives on cultural heritage, engaging diverse audiences and fostering cultural appreciation.
	(Zaia et al., 2022)	- Challenges and opportunities in implementing mixed reality applications for heritage preservation	- Mixed reality can complement traditional conservation methods and address challenges associated with heritage preservation. - Technical limitations and ethical considerations must be addressed to ensure the authenticity and sustainability of mixed reality applications in heritage preservation.
	(Del Vecchio et al., 2023)	- Economic impact of mixed reality cultural products on tourism revenue and cultural heritage preservation	- Mixed reality cultural products have the potential to generate significant tourism revenue and support cultural heritage preservation efforts. - Collaborative partnerships between cultural institutions, tech companies, and government agencies are essential for maximizing the economic impact of mixed reality initiatives.
	(Vital et al., 2023)	- Market trends and opportunities in the mixed reality cultural products industry	- Growing demand for mixed reality cultural products presents opportunities for economic growth and innovation in the cultural sector. - Tech companies are investing in mixed reality content creation and distribution platforms to capitalize on emerging market trends.

The study conducted a literature review and then collected primary data by conducting semi-structured interviews with 20 experts

in the fields of cultural heritage preservation, technology development, and cultural economics (Table 3). The selection of interviewees was purposeful, with the goal of including a diverse range of perspectives and expertise related to the research topic. The sample included professionals from academia, industry, government agencies, and cultural institutions, providing diverse perspectives on the research topic. Email invitations were sent to potential participants, providing them with information about the study's objectives and procedures.

Table 3: Profile of Respondents.

Respondent ID	Position/Expertise	Industry Sector
1	Professor	Education
2	CEO	Technology
3	Curator	Cultural Heritage
4	Policy Analyst	Government
5	Marketing Manager	Tourism
6	Chief Economist	Economics
7	VR Developer	Technology
8	Cultural Heritage Manager	Cultural Heritage
9	Financial Analyst	Finance
10	AR Designer	Technology
11	Archaeologist	Cultural Heritage
12	Community Outreach Officer	Community Development
13	Market Researcher	Marketing
14	Gaming Industry Analyst	Entertainment
15	Tourism Consultant	Tourism
16	Government Policy Advisor	Government
17	VR Content Creator	Media
18	Economic Development Planner	Economics
19	Cultural Anthropologist	Cultural Heritage
20	Investment Strategist	Finance

A semi-structured interview format allowed for flexibility in questioning while maintaining consistency across interviews. A semi-structured interview guide was created using the themes identified in the literature review and thematic analysis. The interview guide contained open-ended questions aimed at obtaining detailed responses from participants about their experiences, insights, and opinions on the economic impact of mixed reality cultural products (Table 4). The interview guide covered topics such as market opportunities, revenue streams, cost-benefit analysis, policy implications, and future prospects for integrating mixed reality in cultural heritage initiatives.

Table 4: Interview Guidelines.

Variable	Interview Guidelines
Narrative Engagement	1. Can you discuss the role of narrative coherence in engaging storytelling experiences? 2. How do you approach character development to enhance narrative engagement? 3. In your opinion, what are the most effective immersive storytelling techniques for enhancing narrative engagement?
Cultural Identity Perception	1. How do you ensure cultural authenticity and representation in virtual environments? 2. Can you discuss any ethical considerations related to digital representations of cultural heritage? 3. How do you address issues of ownership and control when creating digital replicas of cultural artifacts?
Effectiveness of Mixed Reality	1. What are the main challenges and opportunities in implementing mixed reality applications for heritage preservation? 2. How do you assess the effectiveness of mixed reality technologies in documenting and interpreting cultural heritage?
Economic Impact	1. Can you discuss the economic benefits of mixed reality cultural products for tourism revenue and cultural heritage preservation? 2. What market trends and opportunities do you observe in the mixed reality cultural products industry?

The data collected from the semi-structured interviews were analysed using thematic analysis techniques, in addition to the thematic analysis of the literature review. Thematic analysis is the process of identifying patterns, themes, and insights within qualitative data in order to generate meaningful interpretations. The researchers employed a systematic approach to code and analyse the interview transcripts, adhering to the guidelines provided by Braun and Clarke (2006). The analysis process commenced with familiarisation, during which the researchers immersed themselves in the interview transcripts to acquire a comprehensive understanding of the data. Subsequently, initial codes were generated by identifying recurring topics, concepts, and ideas across the transcripts. The codes were categorised into broader themes based on similarities and relationships between codes.

Themes were refined and defined through iterative coding and constant comparison to capture the essence of the participants' responses. The researchers applied best practices in thematic analysis to ensure rigour and reliability in their analysis, drawing on previous studies that used similar methodologies. Studies by Kemp et al. (2023) and Kumar and Mehany (2022) offer valuable guidance on coding and theme development in qualitative data analysis. The researchers aimed to enhance the credibility and trustworthiness of their findings by adhering to established frameworks and principles. The researchers prioritised ethical

considerations during the research process to safeguard the well-being and confidentiality of participants. Before conducting the interviews, the researchers obtained informed consent from all participants, clearly explaining the purpose of the study, the voluntary nature of participation, and the procedures for data collection and analysis. The researchers guaranteed the anonymity of the participants and the confidentiality of their responses. Identifying information was removed from transcripts to ensure privacy. Furthermore, the research team diligently followed ethical guidelines regarding research integrity, respect for diversity, and avoidance of harm. The research team was conscious of power dynamics and potential biases during the interview process. They aimed to establish a supportive and non-threatening environment for participants to openly share their perspectives. The study authors transparently disclosed any potential conflicts of interest or biases and implemented measures to mitigate their impact on the research outcomes.

Findings

This study investigated the impact of mixed reality on the advancement and preservation of cultural heritage across various significant industries. The traits examined in this study were narrative engagement, cultural identity perception, heritage preservation efficacy, and the economic impact of mixed reality cultural products. The data demonstrate the various factors that impact mixed reality technologies in cultural heritage initiatives (Figure 1). By analysing participant thoughts and comparing them to scholarly research, this objective can be achieved. The report provides valuable insights into the challenges and opportunities of this growing sector. The paper investigates narrative coherence, cultural authenticity, and the challenges and potential of implementing mixed reality for economic development and the preservation of cultural heritage. Mixed reality cultural goods' narrative engagement depends on a logical storyline and well-developed characters, according to participants. They underlined the need of immersive, intellectual, and emotional narratives. Response 1 quoted Castañeda-Fernández et al. (2023)'s "Narrative coherence as a determinant of minimal engagement." "An unambiguous and persuasive narrative captivates users and maintains their interest in the experience."

It has been observed by scholars that immersive storytelling techniques, such as spatial audio and dynamic lighting, enhance narrative engagement. These tactics were crucial for creating memorable and immersive story experiences for customers. According to Respondent 2, incorporating immersive elements such as dynamic lighting and spatial audio can enhance narrative engagement by adding emotional significance to the experience. The findings of this study align with previous research on narrative engagement, highlighting the significance of well-developed characters and a cohesive storyline in creating engaging stories. Lee et al. (2022) emphasises the significance of intellectually and emotionally engaging storytelling. Ehemann et al. (2023) found that immersive storytelling tactics enhance audience engagement. The authors illustrate the utilisation of spatial audio and dynamic lights. This study supports the notion that immersive elements and narrative consistency are essential for engaging mixed reality narratives.

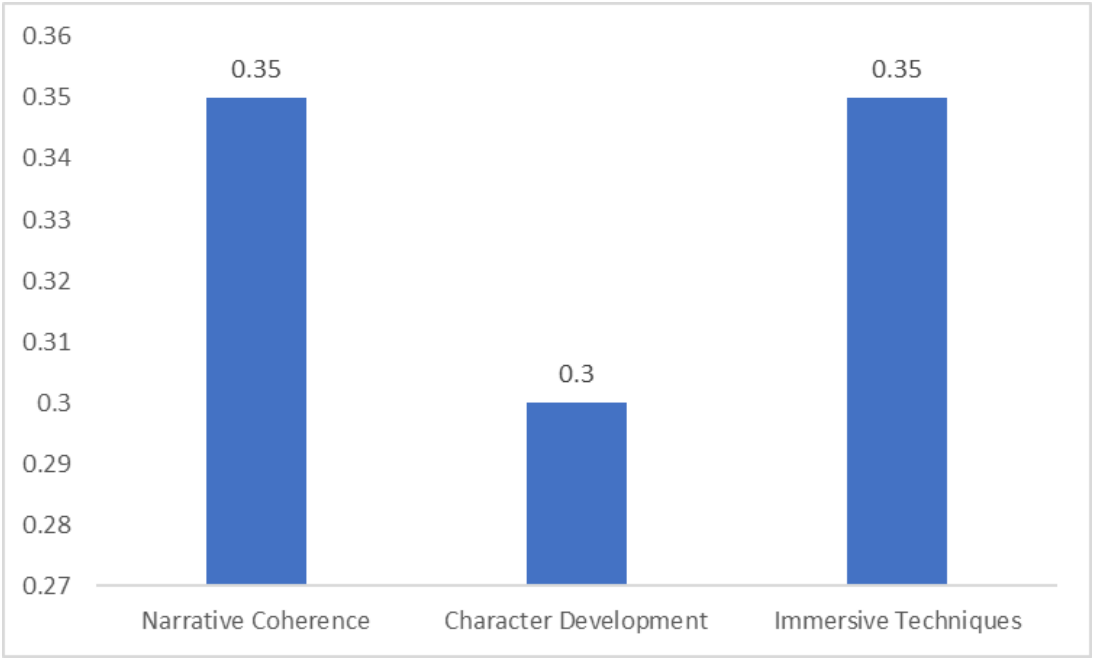

Figure 1: Aspects that Influence Mixed Reality Technologies in Cultural Heritage Initiatives.

The participants emphasised the importance of digital cultural authenticity and representation in shaping perceptions of cultural identity. The promotion of authentic cultural heritage representation fosters a sense of connection and ownership among customers (Figure 2). Respondent 3 emphasised the importance of cultural authenticity in creating user-resonant and meaningful experiences. Trust and

certainty are encouraged. Scholars have identified ethical dilemmas related to digital cultural heritage representations, such as issues of ownership and control. Respondent 4 emphasised the significance of ethical issues related to ownership and control in digital cultural copying, citing the work of Makris et al. (2021). Collaborative initiatives with neighbouring communities promote culturally sensitive representations. The aforementioned results highlight the significance of addressing ethical concerns and engaging with stakeholders in order to create genuine and conscientious digital representations of cultural heritage. When it comes to perceiving cultural identity, prior studies have provided evidence in favor of promoting cultural authenticity and representation in digital environments. Pace and Bohland (2020) suggest that sharing cultural heritage fosters consumer connection and satisfaction. The study by Wibawa et al. (2024) investigates the ethical aspects of ownership and control in digital representations of cultural heritage. The study highlights the significance of stakeholder collaboration in producing precise digital representations of cultural heritage and addressing ethical concerns.

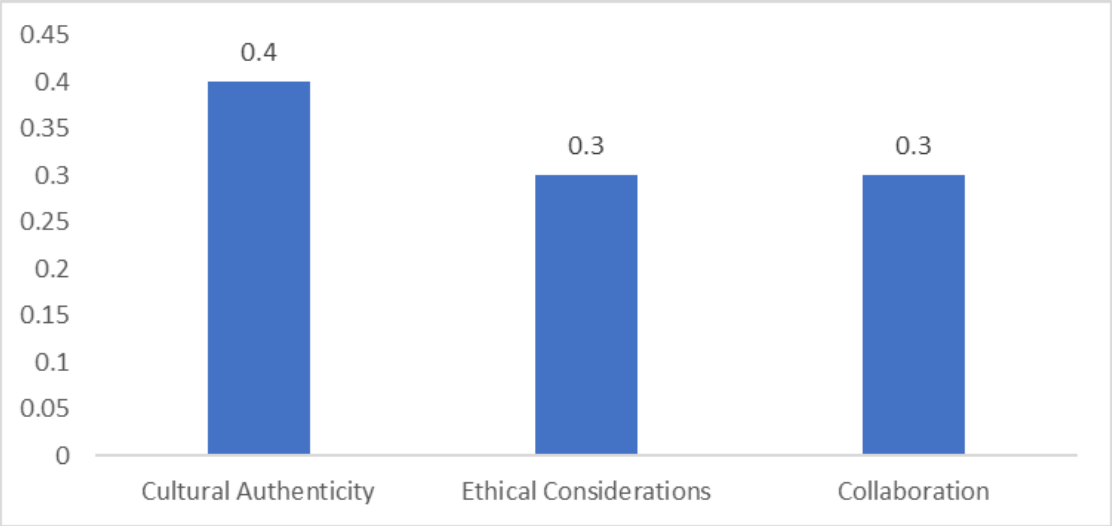

Figure 2: Aspects that Influence Digital Cultural Authenticity in Cultural Heritage Initiatives.

The participants examined the effectiveness of mixed reality in cultural heritage preservation and identified both challenges and opportunities. Mixed-reality technology has the potential to provide novel perspectives and engage a diverse range of individuals in the preservation of cultural heritage (Figure 3). Respondent 5 suggests that mixed reality has the potential to offer immersive experiences that

enhance our understanding of cultural heritage. In order to fully capitalise on their benefits, it is necessary to address both technological and ethical obstacles. Experts suggest that government agencies, technical companies, cultural groups, and collaborative coalitions can enhance the economic impact of mixed reality. Respondent 6 emphasised that the economic impact of mixed reality activities is contingent upon teamwork. Resource and skill consolidation is facilitated for long-term, significant projects. Our stance aligns with previous research on the advantages of mixed reality for heritage preservation. This study investigates the challenges and opportunities of mixed reality applications in cultural heritage initiatives. Flavián et al. (2019) demonstrate the potential of mixed reality technology in engaging a wide audience and providing fresh perspectives on cultural heritage preservation. Collaborative collaborations enhance the economic impact of mixed reality activities (Zhang & Zhang, 2021). The study indicates that we need to address ethical and technological challenges prior to using mixed reality for heritage preservation.

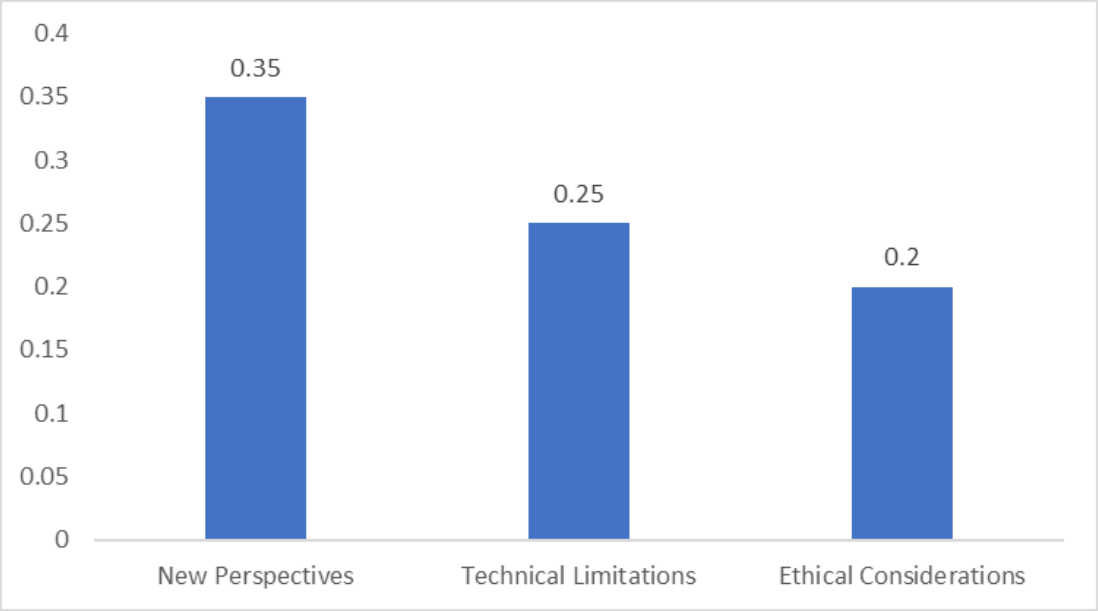

Figure 3: Aspects that Influence the Efficiency of Mixed Reality in Cultural Heritage Initiatives.

The study focused on analysing the economic impact of mixed reality cultural items on tourism and heritage preservation. The mixed-reality cultural products industry requires platforms for content development and immersive experiences (Figure 4). According to Respondent 7, mixed-reality cultural items have the potential

to generate substantial tourism revenue by providing immersive experiences at cultural heritage sites. Vital et al. (2023) identified industry professionals' focus on market trends and opportunities in the cultural products of mixed reality. Respondent eight emphasised the importance of immersive experiences and content creation platforms in the mixed reality cultural products industry. IT companies are investing in these platforms to leverage market trends. This analysis provides further support for previous economic studies on mixed-reality cultural goods. This study focuses on tourism and the protection of cultural heritage. Tzima et al. (2020) investigate the economic advantages of mixed-reality cultural products and provide immersive experiences to attract tourists to cultural heritage sites. The study demonstrates the economic benefits of mixed-reality cultural items. Strategic content development and technological investments are necessary to take advantage of emerging market trends.

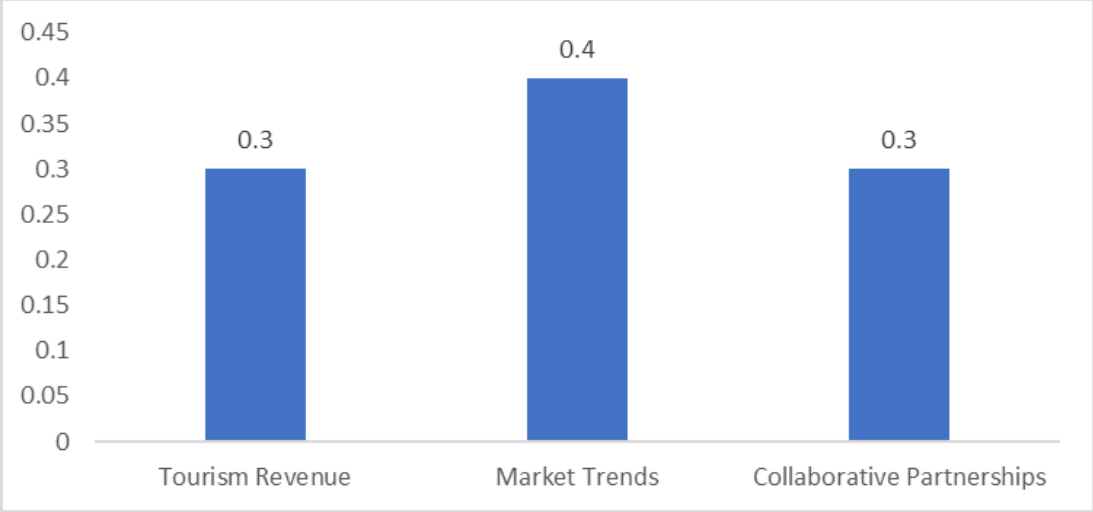

Figure 4: Aspects that Influence Economic Effects of Mixed Reality in Cultural Heritage Initiatives.

Discussion

The discussion section examines the findings and existing research to identify the various factors that influence the use of MR technology for cultural heritage advancement and preservation. This section discusses narrative engagement, cultural identity perception, and the economic implications, problems, potential, and efficacy of mixed reality, based on the study's findings. Future cultural heritage initiatives may utilise Mr. This debate compares the results of a study to previous ones. The text emphasises the study's distinctive contributions and provides practical

recommendations for cultural heritage policymakers, practitioners, and academics. Narrative engagement is crucial for achieving immersion, emotional impact, and a fulfilling experience in mixed reality (MR). The study demonstrated that narrative engagement in MR cultural products is enhanced by story coherence, character development, and immersive methods. Silva et al. (2023) emphasises the importance of narrative coherence, which is the primary focus of their study. The narrative captivates viewers by providing an immersive experience that offers both progress and purpose. Respondents' ratings of story coherence highlight the importance of this factor in audience engagement and cultural narrative exchanges. Engaging with a story also necessitates the development of cultural items and characters in MR. This study supports the findings of Catalá Bolos et al. (2022) that well-developed characters establish emotional connections with consumers. By imbuing characters with depth, complexity, and relatability, MR experiences have the potential to elicit empathy, curiosity, and commitment from users, thereby enhancing their engagement with the narrative. Based on the comments, immersive techniques such as spatial audio and dynamic illumination effectively captivate audiences in the narrative. Spatial audio has the potential to create an immersive experience for listeners. Dynamic lighting enhances visual storytelling by influencing mood, creating suspense, and establishing atmosphere.

In market research, consumers' perception of cultural identity influences their interaction with cultural goods. The study highlights the importance of ethical considerations, collaborative approaches, and cultural authenticity in enhancing cultural heritage awareness and emotional connection. The participants emphasised the importance of cultural authenticity in virtual settings, as noted by Kičić et al. (2022). Authentic representations of cultural heritage foster a sense of pride and inclusivity among customers, while also safeguarding and promoting various cultural narratives. The incorporation of cultural sensitivity, authenticity, and integrity in cultural commodities within the field of market research can enhance cultural education, awareness, and enjoyment. Ethical considerations play a vital role in shaping cultural identity within the context of MR. This study is consistent with the findings of Çiftçi et al. (2024) regarding the ethical implications of digital cultural

heritage representations. Challenges related to ownership, control, and representation underscore the importance of stakeholder involvement and ethical self-awareness in the development of cultural products in the field of market research. Collaboration among local communities, indigenous peoples, and other stakeholders is necessary to ensure that MR experiences are culturally sensitive, inclusive, and respectful. MR may address ethical dilemmas, offer novel viewpoints, and surpass technical constraints, while also safeguarding cultural heritage. The research examines the advantages and disadvantages of utilising MR technology in cultural heritage initiatives. Zaia et al. (2022) discovered that MR technology provides novel insights into cultural heritage, initially accepted by participants. MR exhibits captivate visitors through interactive narratives, historical reenactments, and archaeological reconstructions. This would offer students distinct viewpoints and understandings of heritage interpretation. The respondents expressed appreciation for MR's ability to accurately recreate architectural wonders, historical environments, and cultural treasures. This functionality enables users to actively engage, acquire knowledge, and discover in novel ways. The study examined the ethical and technological challenges associated with using MR applications for heritage preservation. Data privacy, software interoperability, and device compatibility have impeded the design and execution of MR experiences. The significance of ethical involvement and stakeholder participation in mixed reality cultural product production is highlighted by issues related to intellectual property rights, cultural appropriation, and misrepresentation.

Collaboration with cultural institutions, local communities, and stakeholders can help create culturally aware, inclusive, and respectful mixed reality experiences. The potential of cultural commodities to generate tourism revenue, influence market trends, and promote collaboration determines their economic impact. The report examines the economic opportunities and challenges associated with MR technology in the context of cultural heritage. Participants initially hypothesized that MR cultural goods could potentially generate significant tourism revenue by providing immersive experiences at cultural heritage sites. This analysis supports the economic benefits research in the current tourism market (Del Vecchio et al., 2023). Interactive and immersive MR cultural artefacts can enhance visitor engagement and enjoyment. Visitors have the potential to

extend their stay and increase their spending on goods, tickets, and services. The study highlights the impact of MR cultural artefacts on customer decisions and market trends. The survey participants expressed the need for platforms that facilitate content creation and immersive experiences for mixed reality cultural products. The industry advancements discussed encompass interactive narrative experiences, virtual heritage tours, and AR art installations. The advancements and investments in technology and content production can assist MR practitioners in leading a rapidly evolving sector. The respondents expressed the belief that government, technical, and cultural institutions should collaborate to maximise the economic impact of MR. The study's findings back up Vital et al. (2023) call for interdisciplinary collaboration to tackle the technological and economic constraints of MR. The integration of networks, resources, and information can enhance innovation, synergy, and the economic benefits of MR for all stakeholders.

Conclusion

This study investigated the advantages, disadvantages, and outcomes of using MR apps for cultural heritage preservation and promotion. This study examines the impact of cultural heritage on the adoption of MR technology in programs, considering various aspects. The key goals of this project are to assess the efficacy of MR, measure story engagement, evaluate cultural identity perception, and analyse economic impact. Story consistency, character development, and immersive tactics enhance narrative engagement. The study emphasises the influence of ethical concerns, cooperative strategies, and cultural authenticity on the formation of impressions. The report highlights the potential of MR to increase tourist income, shape market trends, provide new cultural heritage sites, and foster innovative partnerships. The creation and deployment of MR cultural goods necessitates careful consideration of technological, ethical, and representational limitations. In order to fully harness the revolutionary potential of MR technologies for the advancement and preservation of cultural heritage, it is essential for practitioners, policymakers, researchers, and other stakeholders to engage in innovation and collaboration. Technology, multidisciplinary approaches, and various groups facilitate immersive and inclusive cultural events. Meetings can facilitate global dialogue, foster social

cohesion, and elicit personal emotions. In order to maintain cultural authenticity, diversity, and human rights in mixed reality environments, it is necessary to address technological, ethical, and representational challenges through collective and transparent efforts.

Implications of the Study

The research has an impact on individuals involved in the development, implementation, and evaluation of MR applications for cultural heritage preservation and promotion. This study can aid practitioners and developers in creating immersive cultural experiences that emphasise character development, narrative coherence, and immersion. Practitioners of MR can utilize dynamic illumination, spatial audio, and other immersive elements to engage audiences and encourage involvement in cultural heritage. The paper emphasises the ethical and technological limitations of producing and implementing cultural commodities in the context of MR. The study's conclusions may address software interoperability, hardware compatibility, data protection, and ethics. The implementation of ethical and technically sound MR experiences would yield positive outcomes. Facilitating collaboration among cultural institutions, local communities, and other stakeholders can help ensure that MR experiences are comprehensive, culturally sensitive, and respectful of diverse cultural narratives. This report has the potential to assist policymakers and funding agencies in formulating and executing cultural heritage MR strategies. Policymakers can promote entrepreneurship and innovation in the MR industry by investing in technology infrastructure, content platforms, and collaboration. Government support can expedite the evaluation, advancement, and exploration of MR applications for cultural heritage protection and dissemination. This can enhance the community, economy, and job market.

Theoretical Implications

This study improves our understanding of narrative engagement, perception of cultural identity, efficacy of mixed reality, and economic impact on cultural heritage conservation and promotion. This study examines the impact of story coherence,

character development, and immersive strategies on audience engagement with cultural goods in mixed reality, contributing to narrative theory. The study examines the impact of immersive components, such as dynamic lighting and spatial audio, on narrative engagement in virtual world immersive storytelling theory. This study highlights the importance of collaborative techniques, ethical considerations, and cultural authenticity in influencing users' experiences and perceptions of mixed reality cultural products. It contributes to our knowledge of cultural identity. The study explores the ethical concerns related to cultural heritage production and consumption in mixed reality environments, focusing on intellectual property rights, misrepresentation, and cultural appropriation. This study identifies the technical and ethical challenges that impede the preservation of cultural heritage in mixed realities. This study enhances our understanding of the ethical and technological limitations associated with the development and implementation of mixed reality applications for the preservation and promotion of cultural heritage. The topics of interoperability, device compatibility, and data privacy are addressed. The report emphasizes MR's ability to generate tourism revenue, influence market trends, and establish new alliances, all of which contribute to the economic impact of cultural goods in mixed reality. This study examines market trends, collaborative partnerships, and economic potential to enhance our theoretical comprehension of the economic dynamics of the cultural heritage MR industry.

Limitations and Future Direction

Despite its helpful insights, we must acknowledge the study's limitations. This study investigates specific characteristics associated with story engagement, cultural identity, mixed reality effectiveness, and economic impact. However, the generalizability of these conclusions to unexplored circumstances or variables remains uncertain. Further research can be conducted on additional aspects and features of mixed reality applications in the context of cultural heritage preservation and dissemination. Enhancing comprehension of the phenomenon would be beneficial. Prejudices or personal viewpoints may influence the study's outcomes due to the use of qualitative data from expert interviews. Qualitative research provides in-depth

insights into people's opinions. To improve future research, we recommend using quantitative or mixed methods approaches to substantiate these findings. The study's limitations in terms of features and sample size may restrict its applicability and accuracy. The sample may not fully represent the perspectives and experiences of all participants due to the significant number of mixed reality and cultural heritage specialists and practitioners. To enhance the representation and understanding of the topic, future research could employ a larger sample size. The ability of cross-sectional studies to establish causation or identify long-term trends in the relationships between variables is limited. This study explores the use of mixed-reality applications for cultural heritage preservation and marketing. Longitudinal or experimental designs may be useful for future studies because they allow us to track changes over time and evaluate the direct impact of technological advances or therapies.

This study suggests that further research can explore the complexity of mixed-reality applications in cultural heritage conservation and promotion. Further research could investigate the potential impact of emerging technologies, such as augmented reality (AR), virtual reality (VR), and extended reality (XR), on user engagement and interactions with cultural heritage. Studying the potential and constraints of technology could lead researchers to uncover novel approaches and design concepts for captivating cultural experiences. User-generated content and participatory design may influence future research on mixed-reality cultural products. Researchers can harness the expertise and creativity of users by involving them as collaborators and co-creators. This approach allows for the development of inclusive and culturally aware experiences that align with the users' values, beliefs, and interests. Future studies could investigate the potential for ML and AI algorithms to personalise mixed reality experiences. AI-driven recommendations and adaptive content delivery systems enable scholars to personalise content and interactions. Accommodations can be made for their preferences, learning styles, and cultural backgrounds. User engagement and enjoyment of mixed reality cultural offerings increase. The impact of mixed reality applications on educational outcomes, cognitive processes, and behaviour related to cultural heritage preservation requires further investigation. Researchers can find out how well magnetic resonance (MR) treatments work at improving educational goals, critical thinking, and helpful behaviour by using experimental designs,

long-term studies, and quantitative assessments. Future research could investigate the ways in which mixed reality applications empower communities, promote cultural diversity, and preserve and advance cultural heritage. Researchers can engage a diverse range of individuals in the creation, execution, and assessment of MR initiatives that tackle the requirements, preferences, and concerns of marginalized communities and underrepresented populations through community-based co-design techniques and participatory action research.

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