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An Investigation into Emotional Engagement of Holography for Museum Display

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ABSTRACT

This study delves into the emotional engagement elicited by displaying holograms in museum settings, offering a comprehensive analysis of visitors’ emotional responses and the technological features that influence them. Utilising a qualitative approach complemented by a TF-IDF analysis, the research gathered data from diverse participants who experienced holographic exhibits. The study revealed a range of emotional responses, with ‘Curiosity’ and ‘Amazement’ being predominant, signifying the ability of the display of holograms to enhance visitor engagement and learning experiences significantly. Key technological aspects of holography, such as display method, colour, and three-dimensionality, were crucial in eliciting strong emotional responses and deepening understanding of the exhibit content. The study also highlighted the long-term impact of these experiences, suggesting that the display of holograms can leave a lasting impression and foster sustained interest in museum visits.

This study enriches the field of museology by shedding light on the emotional dimensions of visitor interactions with holographic technology. The findings reveal the significant potential of holography to deepen visitor engagement, suggesting that, when effectively implemented, the display of holograms can significantly elevate the museum experience. This research highlights the importance of understanding and catering to visitors’ emotional and experiential needs in the evolving landscape of museum exhibit design.

Keywords: Display of holograms, museum engagement, emotional response, visitor experience, exhibit innovation

1. INTRODUCTION

The advent of holographic technology in museum environments has been a harbinger of transformation, not merely in the visual presentation of artefacts but also in its potential for intensifying human sensory engagement\textsuperscript{1}. Since the 20th century, museology literature has continued to underscore the imperative of enhancing visitor experiences\textsuperscript{2}. In this context, holography emerges as a nexus between art and science, catalysing a more interactive, emotionally compelling, and intellectually engaging exhibition milieu.

Previous research has acknowledged the allure of holography in captivating visitor interest and enhancing overall satisfaction. However, the depth of emotional engagement that holography can elicit warrants further exploration. This study aims to illuminate this under-examined facet, utilising qualitative interviews alongside TF-IDF analysis to unravel the emotional intricacies elicited by the display of holograms.
In this context, the work of Barabas and Bove is particularly salient, elucidating a form of passive interactivity inherent in holographic displays. They showcase how holograms respond to the observer’s movements, creating a visual realism and depth perception that is not static but dynamic. This nuanced interaction—a passive yet profoundly immersive experience—allows viewers to perceive changing reflections and discover obscured details as they move, a phenomenon distinct from the active interactivity of touch or voice commands. Such passive interactivity accentuates the unique capabilities of the display of holograms, particularly in their conveyance of depth and realism, which is crucial for dynamic observer engagement and collective viewing experiences.

Building upon the seminal contributions of visionaries like Margaret Benyon, who integrated holography into the art, this research examines the hologram’s ability to challenge and enchant the human senses, offering a viewing experience that is direct, immersive, and emotionally engaging. By enhancing objects’ tangibility and lifelike representation, holography promises to forge a profound connection between the exhibit content and its audience, potentially revolutionising the visitor experience and facilitating deeper comprehension and appreciation of cultural artefacts.

This investigation, therefore, positions itself at the confluence of sensory studies and museology, intent on conducting a qualitative inquiry into the emotional engagement fostered by the display of holograms within the museum context. It aims to dissect the spectrum of emotions these displays evoke, probing the potential of holography to inform and resonate with museumgoers on an emotive level.

2. LITERATURE REVIEW

2.1 Display of holograms and museum visitor experience

Holographic technology in museums represents a significant shift in how visitors interact with and experience exhibits. Early studies, such as those by Barabas and Bove, have demonstrated how holography enhances the visual presentation of artefacts, offering a three-dimensional perspective that changes with the viewer’s movement. This dynamic visual engagement has been noted to augment visitor interest and retention, providing an immersive experience beyond traditional two-dimensional displays. Recent research in this area continues to explore the broader implications of these interactions, particularly regarding visitor satisfaction and educational outcomes.

Moreover, integrating the display of holograms into museum settings has been observed to alter the traditional narrative of exhibitions. Holographic technology enables curators to craft more engaging and interactive stories around artefacts, transforming passive observation into an active learning experience. This enhanced narrative capability of holography is significant in historical and cultural exhibits, where it can breathe life into otherwise static displays and facilitate a deeper connection with the past. What further makes holograms revolutionary for presenting valuable and ancient artefacts is that they offer a more practical and convenient solution than displaying the originals. This allows museum visitors to enjoy and appreciate precious artefacts that might be unseen or lost without holography. Studies have indicated that this capability can lead to a more profound appreciation of cultural heritage, thereby enriching the educational value of museum visits.

These features underscore the evolving role of holographic technology in enhancing museum visitor experiences. As museums adopt and integrate advanced technologies like holography, they transform how artefacts are presented and redefine museum visits’ educational and cultural impact. Future research in this area will likely uncover even more profound implications of holography in museums, particularly regarding visitor engagement, learning outcomes, and cultural education.
2.2 Emotional responses to interactive exhibits

The investigation of emotional responses to interactive exhibits, particularly those utilising holographic technology, is a burgeoning area of interest within the museology. The display of holograms can evoke diverse emotions in museum visitors, from a sense of wonder and curiosity to more profound cognitive and emotional connections with the exhibit content.

Holography offers a unique opportunity to explore relationships between science, technology, art, and visual perception. Fred Unterseher discusses how holography allows viewers to direct their experience, making it unique and personal. Therefore, holographic exhibits’ immersive and lifelike qualities play a pivotal role in this emotional engagement. The ability of holography to present artefacts and narratives in three dimensions allows for a more visceral and engaging visitor experience. This can increase empathy, understanding, and emotional depth in how visitors connect with the content.

2.3 Previous research methodologies and findings

The methodological approach in the prior study, “Investigating the Influence of Holographic Technology on Visitor Perceptions in Museum Displays”, laid a crucial foundation for understanding visitor interactions with the display of holograms. Utilising a structured questionnaire survey, the research engaged 92 participants in a controlled environment, mimicking a museum setting with holographic exhibits. This quantitative approach provided valuable insights into how visitors perceive and interact with the display of holograms, revealing general ease in content perception and a positive response to the interactivity of the displays.

The findings from this survey indicated that the display of holograms could significantly enhance visitor engagement and satisfaction. Most participants reported an increased interest in museum collections after interacting with the display of holograms. These results underscored the potential of holography to offer clear, captivating visual experiences that appeal to visitors, irrespective of their prior exposure to such technology.

However, the study also illuminated areas that necessitated further exploration. While it successfully quantified general visitor reactions and satisfaction levels, the research pointed towards a gap in understanding the depth and nuances of emotional responses elicited by these holographic experiences. The display of holograms influences deeper emotional and cognitive processes in museum visitors beyond the immediate appeal and visual satisfaction. Nevertheless, these aspects needed to be comprehensively explored, signalling the need for a more qualitative approach to capture the subtleties of emotional engagement.

2.4 Introduction to TF-IDF as a data analysis method in qualitative research

Term Frequency-Inverse Document Frequency (TF-IDF) analysis in qualitative research represents an innovative approach to interpreting complex data sets. While traditionally associated with text mining and information retrieval, TF-IDF in qualitative studies offers a sophisticated means to discern patterns and emphasise critical themes emerging from textual data such as interview transcripts.

In qualitative research, the richness of the data lies in the narrative details provided by participants. By transforming qualitative data into a format that allows for analytical visualisation, TF-IDF facilitates a more structured analysis of textual data, highlighting the terms and concepts most salient to the participants’ experiences and emotional responses.
In this study, TF-IDF analysis was employed to examine the interview data collected from participants who have experienced holographic exhibits. The method enabled the research to translate participant narratives into a quantifiable format, identifying the most prominent terms associated with their emotional engagement with the display of holograms. The TF-IDF weight, therefore, became a pivotal tool in determining the significance of specific words and phrases used by participants when describing their experiences.

3. METHODOLOGY

3.1 Designing the interview process

The interview process was carefully constructed to probe the depth and range of emotional responses from holographic exhibits. The questions were predominantly open-ended, designed to encourage detailed, narrative responses that comprehensively explore participants’ experiences and emotions. Figure 1 shows the questions covered several key thematic areas: Immediate Responses, Emotional Transitions, Emotional Depth, Specificity of Emotion, Long-Term Impact and Advocacy, and Persistence of Emotion.

![Figure 1. Principles of the interview questions.](image-url)

The study rigorously selected participants to ensure comprehensive insights into the emotional resonance provoked by holographic exhibits in museum environments. Targeting frequent museum visitors with firsthand experience in holographic display interaction, the research enlisted 13 individuals with robust arts, design, or museology expertise. The cohort included professionals with extensive field experience and students deeply immersed in relevant academic disciplines. Table 1 delineates the participants’ professional backgrounds and years of experience, showcasing the depth and diversity of expertise brought to the study.
Table 1. Description of interviewed participants.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Years of experience</th>
<th>Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>More than 10 years</td>
<td>National Art Museum of China</td>
</tr>
<tr>
<td>2</td>
<td>More than 10 years</td>
<td>Doctorate in Fine Arts</td>
</tr>
<tr>
<td>3</td>
<td>More than 10 years</td>
<td>Professional From an Internet Company</td>
</tr>
<tr>
<td>4</td>
<td>5 to 10 years</td>
<td>China International Exhibition Agency</td>
</tr>
<tr>
<td>5</td>
<td>5 to 10 years</td>
<td>Doctorate in Design</td>
</tr>
<tr>
<td>6</td>
<td>5 to 10 years</td>
<td>University Lecturer</td>
</tr>
<tr>
<td>7</td>
<td>Less than 5 years</td>
<td>Industrial Design</td>
</tr>
<tr>
<td>8</td>
<td>Less than 5 years</td>
<td>Industrial Design</td>
</tr>
<tr>
<td>9</td>
<td>Less than 5 years</td>
<td>Art Design</td>
</tr>
<tr>
<td>10</td>
<td>Less than 5 years</td>
<td>Art Design</td>
</tr>
<tr>
<td>11</td>
<td>Less than 5 years</td>
<td>Visual Communication</td>
</tr>
<tr>
<td>12</td>
<td>Less than 5 years</td>
<td>Product Design</td>
</tr>
<tr>
<td>13</td>
<td>Less than 5 years</td>
<td>Product Design</td>
</tr>
</tbody>
</table>

3.2 Interview

The interviews were conducted online, an approach necessitated by the diverse locations of the participants and the convenience of digital platforms. The online interviews allowed participants to share their experiences and emotional responses in a comfortable and familiar setting, facilitating open and detailed discussions. Each interview was generally around 40 to 50 minutes. The procedure encompassed participants viewing the holographic image, engaging in the interview discourse, and meticulously transcribing their verbal responses. This structured approach comprehensively captured the participants’ insights while providing a consistent experience across all interviews. To standardise the experience and ensure consistency in data collection, each participant was asked to view the same holographic image (Figure 2). This viewing was supplemented by their recollections of previous encounters with the display of holograms in museum contexts.
3.3 Data Preparation

The preparation phase was pivotal in transforming the raw data into a form amenable to TF-IDF analysis. This involved a series of steps to refine and organise the collected information:

1. Each interview was transcribed verbatim to capture the full breadth of participants’ verbal responses. Transcriptions were meticulously reviewed to ensure accuracy, capturing the nuances of the dialogue.

2. The transcriptions were cleaned to remove extraneous information that did not contribute to the analysis. This included eliminating filler words and off-topic digressions to streamline the content for coding.

3. The cleaned transcripts were then normalised to facilitate computational analysis. This involved standardising the text format, such as correcting for inconsistencies in terminology or abbreviations.

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1 Red jasper intaglio showing Caracalla, eldest son of Septimius Severus, in a youthful portrait. Early 3rd century. A beardless Caracalla such as this appears on coins from AD205-9, representing him as Augustus. The rich texture of his hair follows the late Severan patterned style. The intaglio was found by fieldworker and founder of the Trimontium Trust, Walter Elliot, inside the Trimontium Fort near the north gate. This intaglio is on display at Trimontium Museum, Melrose, Scottish Borders.
4. Finally, the transcripts were formatted into a structured dataset, each interview serving as an individual document within the corpus. This structure allowed for applying the TF-IDF algorithm to quantitatively analyse the significance of terms within the dataset.

3.4 Data analysis method—TF-IDF

In this study, the data analysis was centred around applying the Term Frequency-Inverse Document Frequency (TF-IDF) statistical method, which was utilised to translate qualitative data into an analytically visual format. This method facilitated the quantification and comparison of word significance across the interview data set, effectively highlighting the terms most pertinent to the participants’ emotional responses to the display of holograms.

The TF-IDF weight is a compound metric used in information retrieval and text mining to assess the importance of a word in a document relative to a corpus. The term frequency (TF) component of the weight corresponds to the number of times a word appears in a document, thus gauging its immediate relevance. The inverse document frequency (IDF) component inversely measures the word’s commonality across the entire corpus, providing a balancing effect that elevates the significance of more unique terms.

For each interview, the frequency of specific words was calculated and then adjusted by their respective IDF scores according to the formula:

\[ W_i = \frac{tf_{i,j} \times idf_i}{\text{size}(j)} = \frac{n_{i,j}}{\text{size}(j)} \times \log \frac{|D|}{|j: t_i \in d_j|} \]

By aggregating the results from the 13 participants, the study could discern which terms were most frequently associated with each interview question. This approach pinpointed the participants’ narratives’ predominant themes and emotional descriptors. Once weighted by their TF-IDF scores, the high-frequency words revealed the main points of consensus or divergence among the participants’ experiences and perceptions.

Ultimately, the TF-IDF analysis illuminated the key terms and concepts that stood out in the participants’ discussions about their interactions with the display of holograms. This enabled a focused interpretation of the qualitative data, offering a clear visual representation of the dominant emotional reactions and their relative intensity within the corpus of interviews.

4. RESULTS

4.1 Immediate responses

This segment interrogates the immediacy of the emotional reactions that visitors experience upon their initial encounter with the holographic exhibit. It serves as a pivotal groundwork for comprehending the nature of first impressions and the visceral responses that form the inception of the visitor’s journey through the exhibit. Such initial affective responses are crucial as they establish the baseline from which the entirety of the visitor’s experiential narrative unfolds.

4.1.1 Q1: What were your initial thoughts upon first encountering the holographic exhibit? I invite you to elaborate comprehensively on your first impression.
According to Table 2, the highest TF-IDF weight was assigned to ‘Wonderful’, indicating that a sense of delight and appreciation was the most salient reaction. ‘Realistic’ underscores the authenticity and lifelike quality of the holographic exhibits as a significant factor in initial impressions. Other terms like ‘Curious’ and ‘Surprised’ represent the intrigue and unexpectedness of the experience, while ‘Tranquil’ and ‘Unique’ reflect the calm and novel aspects of the exhibits. Terms such as ‘New Experience’ and ‘Visual Pleasure’ with lower weights suggest additional, albeit less pronounced, elements of the participants’ first encounter with the holography.

4.1.2 Q2: Could you delineate any emotional transitions you experienced during your engagement with the display of holograms?
According to Table 3, ‘Curiosity’ emerged as the term with the highest weight, suggesting that the desire to learn and discover was a dominant emotional transition. ‘Amazement’ follows closely, indicating a sense of wonder and astonishment during the experience. Other terms like ‘Thinking’, ‘Realistic’, and ‘Shocked’ suggest a cognitive processing of the exhibit's lifelike features and an emotional response to its surprising elements. Less weighted terms such as ‘Cognitive Experience’ and ‘Emotional Change’ still contribute to understanding the visitors’ reflective and affective journey through the exhibit.

### 4.2 Emotional depth

The inquiries within this section delve into the profundity and intensity of the emotional experiences elicited by the holographic exhibits. By interrogating which emotions participants perceived as the most salient and assessing whether these emotions augment their comprehension of the exhibit, the questions are designed to elucidate the qualitative aspects of emotional engagement. This exploration is instrumental in understanding the affective responses and their subsequent influence on cognitive interpretation and processing.

#### 4.2.1 Q3: Which emotion did you find most pronounced during your interaction with the exhibit? Would you be so kind as to describe that sensation?
Table 4. Most Pronounced Emotions During Interaction.

According to Table 4, ‘Curiosity’ emerges as the most significant emotion, indicating a strong desire to explore and understand the exhibit. ‘Excitement’ and ‘Amazement’, with equal weights, suggest a sense of thrill and wonder. Other terms like ‘Illusion’ and ‘Emotional Resonance’ point to the depth of the emotional experience, while ‘Thinking’ and ‘Visual Impact’ indicate cognitive engagement and the aesthetic influence of the exhibit.

4.2.2 Q4: Did the intensity of these emotions contribute to a more profound understanding or connection with the content presented?
According to Table 5, ‘Curiosity’ remains the most weighted term, indicating its significant role in enhancing understanding of the exhibit. Terms like ‘Deepen Understanding’ and ‘In-depth’ signify the depth of cognitive processing stimulated by the emotional experience. ‘Historical’ and ‘Amazement’ suggest that the emotional intensity also helped create a sense of presence and connection to historical content. Other terms such as ‘Knowledge’, ‘Resonate’, and ‘Empathy’ reflect the broader cognitive and affective impact of the emotional intensity experienced during the interaction.

4.3 Specificity of emotion

By probing into the specific attributes of the display of holograms that precipitated emotional reactions, these inquiries were instrumental in delineating the particular elements of holographic technology that exert the most substantial impact on viewers. Moreover, they facilitated an exploration into the extent to which holographic exhibits surpass conventional display methodologies in evoking emotional responses, thereby underscoring the distinct advantages of holography in emotional engagement.
4.3.1 Q5: Are you able to identify any particular feature or function of the display of holograms that elicited an emotional response from you?

Table 6. Display of Holograms features Triggering Emotional Responses.

According to Table 6, the terms ‘Display Method’, ‘Color’, and ‘Three-Dimensional’ emerge as the top features with the highest weight, indicating that these aspects of the display of holograms significantly influence the emotional experience. Other elements such as ‘Detail Presentation’, ‘Lighting’, ‘Artistry’, and ‘Space Perception’ also play a crucial role, while features like ‘Tactile Stimulation’, ‘Profundness’, and ‘Immersion’ are identified as well, albeit with lower weights.
4.3.2 Q6: Do you perceive that the holographic exhibit can evoke emotional responses more than traditional displays? Could you explain your rationale?

Table 7. Comparative Emotional Impact of Holographic vs. Traditional Displays.

According to Table 7, the term ‘Evokes Emotional’ has the highest weight, indicating a solid perception among participants that the display of holograms is more effective in eliciting emotional responses than traditional methods. ‘Display Method’ and ‘Visual Effect’ follow, suggesting these aspects are key to the enhanced emotional impact. Other elements like ‘Freshness’, ‘Color’, and ‘Spatial Experience’ also contribute significantly. At the same time, aspects such as ‘Content’ and ‘Real’ further emphasise the unique qualities of the display of holograms in connecting emotionally with viewers.

4.4 Long-term impact

This section is dedicated to examining the display of the hologram experience's prospective influence on visitors’ future engagement patterns. It seeks to ascertain how these experiences might shape subsequent inclinations towards museum visits. It evaluates the likelihood of visitors advocating for the adoption of the display of holograms in museum settings.
The inquiry delves into the potential modifications in visitors’ expectations and attitudes towards museum experiences after interacting with holographic technology.

4.4.1 Q7: How do you foresee this display of holograms experience influencing your future visits to museums or similar exhibitions?

Table 8. Influence of Display of Holograms on Future Museum Visits.

![High-frequency words chart]

<table>
<thead>
<tr>
<th>Term</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will Influence</td>
<td>5.80</td>
</tr>
<tr>
<td>Display Method</td>
<td>5.08</td>
</tr>
<tr>
<td>Artistic Experience</td>
<td>3.63</td>
</tr>
<tr>
<td>Stimulate Interest</td>
<td>2.90</td>
</tr>
<tr>
<td>New Experience</td>
<td>2.90</td>
</tr>
<tr>
<td>Engaging</td>
<td>2.18</td>
</tr>
<tr>
<td>Evoke Memory</td>
<td>1.45</td>
</tr>
<tr>
<td>Increased Interactivity</td>
<td>1.45</td>
</tr>
<tr>
<td>Innovative</td>
<td>0.73</td>
</tr>
<tr>
<td>Unique Technology</td>
<td>0.73</td>
</tr>
<tr>
<td>Exhibit Details</td>
<td>0.73</td>
</tr>
</tbody>
</table>

According to Table 8, the term ‘Will Influence’ with the highest weight indicates a strong belief among participants that displaying holograms will positively affect their future visits. ‘Display Method’ suggests that how holograms are presented is a significant factor in this influence. Other terms like ‘Artistic Experience’, ‘New Experience’, and ‘Stimulate Interest’ point to the fresh and engaging nature of holographic technology, while ‘Engaging’ and ‘Increased Interactivity’ underscore the interactive appeal of these displays.
4.4.2 Q8: Would you advocate for this form of the display of holograms to others? Has it altered your anticipations for museum experiences?

Table 9. Advocacy and Expectations for Display of Holograms.

According to Table 9, the term ‘Innovative’ with the highest weight indicates that participants view the display of holograms as cutting-edge and forward-thinking. ‘Recommend’ suggests a solid willingness to endorse these displays to others. Terms such as ‘Enrich Experience’, ‘Visual Enhancement’, and ‘Art-Tech Fusion’ highlight the perceived benefits of the display of holograms in enhancing the museum-going experience. Other terms like ‘Share Experience’ and ‘Stimulate Exploration’ reflect the desire to communicate these experiences and encourage others to engage with holography.

4.5 Persistence of emotion

This inquiry delves into the enduring nature of the emotional reactions elicited by the display of holograms. It assesses the impact of these sustained emotions on the future inclination to engage with museum exhibitions. The focus is on discerning the extent to which emotional experiences foster lasting memories and continue to motivate subsequent participation in similar cultural settings. This examination is pivotal for understanding the long-term effects of passionate encounters with holographic technology on visitor behaviour and preferences.
4.5.1 Q9: How long do you envisage the persistent emotional response you’ve described? Might it affect your eagerness to visit future museum exhibitions?

Table 10. Persistence of Emotional Responses and Future Visits.

<table>
<thead>
<tr>
<th>High-frequency words</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticipation</td>
<td>7.38</td>
</tr>
<tr>
<td>Long-term Impact</td>
<td>5.11</td>
</tr>
<tr>
<td>Short-term Impact</td>
<td>1.70</td>
</tr>
<tr>
<td>Enjoyable Experience</td>
<td>1.70</td>
</tr>
<tr>
<td>Freshness</td>
<td>1.70</td>
</tr>
<tr>
<td>Deepen Memory</td>
<td>1.70</td>
</tr>
<tr>
<td>Shocking</td>
<td>1.14</td>
</tr>
<tr>
<td>Influence Behavior</td>
<td>1.14</td>
</tr>
<tr>
<td>Enhanced Interactivity</td>
<td>1.14</td>
</tr>
<tr>
<td>Eye-Catching</td>
<td>1.14</td>
</tr>
<tr>
<td>Emotional Surge</td>
<td>1.14</td>
</tr>
<tr>
<td>Emotional Engagement</td>
<td>0.57</td>
</tr>
<tr>
<td>Feature Exhibition</td>
<td>0.57</td>
</tr>
<tr>
<td>Sensory Enhancement</td>
<td>0.57</td>
</tr>
<tr>
<td>Attract</td>
<td>0.57</td>
</tr>
</tbody>
</table>

According to Table 10, ‘Anticipation’ emerges as the most significant term, suggesting that the emotional experience with the holographic exhibit significantly drives future interest in museum visits. ‘Long-term Impact’ indicates a belief that these experiences will have enduring effects. Other terms such as ‘Deepen Memory’ and ‘Enjoyable Experience’ denote that the emotional resonance of the exhibit not only enhances recall but also contributes to the overall enjoyment. Lesser-weighted terms like ‘Sensory Enhancement’ and ‘Emotional Engagement’ still shape the visitor’s future expectations and eagerness for similar experiences.

5. DISCUSSION AND CONCLUSION

5.1 Discussion of Findings

The results from the study provide compelling insights into the emotional engagement elicited by the display of holograms in museum settings. The data revealed a range of emotions, from curiosity and amazement to a profound sense of
engagement and anticipation for future visits. Notably, ‘Curiosity’ emerged consistently as a dominant emotional response, indicating that the display of holograms significantly piqued visitor interest and inspired a desire to explore and learn.

The findings also underscore the importance of specific features of holographic technology, such as display method, colour, and three-dimensionality, in enhancing the visitor experience. These elements were repeatedly cited as key factors in eliciting solid emotional reactions and deepening the understanding of the exhibit content. Furthermore, the study highlighted the potential of the display of holograms to create more engaging, memorable, and interactive experiences compared to traditional exhibits.

The long-term impact of these experiences is particularly noteworthy. As indicated by the participants, the anticipation and eagerness for future museum visits suggest that the display of holograms can leave a lasting impression on visitors. This has significant implications for museums considering incorporating such technology to attract visitors and foster a sustained interest in museum-going.

5.2 Limitations

One notable limitation is the potential for a novelty effect. The high frequency of terms like ‘Innovative’ and ‘New Experience’ might indicate that their novelty partially influences the emotional impact of the display of holograms. As this technology becomes more common, the initial wonder and excitement may diminish, suggesting the need for continuous innovation and evolution in displaying holograms to sustain visitor interest.

While the study’s results underscore the emotional impact of the display of holograms, the aspects of interactivity and immersion warrant a closer examination. The data revealed terms such as ‘Increased Interactivity’, ‘Engaging’, ‘Immersive’, and ‘Interactive’, which suggest that these features are integral to the holographic experience. However, their relatively lower TF-IDF weights than terms like ‘Curiosity’ and ‘Amazement’ might indicate that the current level of interactivity and immersion could be further enhanced.

The positive reception of interactivity, reflected in mentions of ‘Increased Interactivity’ and ‘Engaging’, points to its importance in modern museum experiences. It fosters active participation and deepens visitor engagement, suggesting a potential area for further development to create more dynamic and memorable experiences.

Likewise, terms associated with immersion, though present, indicate a need for more profound immersive elements. As immersion can significantly enhance the emotional impact of an exhibit by creating a sense of presence and connection, future implementations of holographic technology should focus on deepening this aspect.

**REFERENCE**


