

Analysing the effects of adopting interactive multimedia technologies in design exhibitions on visitor behaviour from the perspective of reception aesthetics

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ABSTRACT: With the gradual maturation of multimedia technology, interactive displays have been increasingly employed in arts and creative design exhibitions. However, how multimedia technology can be employed to enhance audience involvement and satisfaction remains unclear. This project explored how reception aesthetics, service quality and playability affect audience perceptions of visiting interactive multimedia exhibitions. Interactive multimedia displays are created to enhance users' experiences, whereas reception aesthetics is a trend of aesthetic theory that is audience-cantered. This project investigated audience receptions of exhibition visits by exploring the connections between interactive multimedia and reception aesthetics. The results showed that both of these factors are closely interrelated and that it is anticipated that the importation of interaction multimedia will enhance audience learning effectiveness in the context of arts and creative design.

INTRODUCTION

Art and design exhibitions generally display items through pictures, descriptions or oral introductions by exhibition guides, all of which are time consuming and laborious. To solve this problem, audio tour systems have been developed to provide customised services. However, such systems are limited to providing an oral introduction and do not provide visitors with diversified services and an interactive experience.

With the robust development and diversified application of multimedia technologies in recent years, exhibitions have begun to feature interactive tours. Tesoriero et al have proposed that mobile devices can be used to enhance tour experiences and the scope of exhibitions. Scholars worldwide have conducted various studies on visitor satisfaction and devised customer satisfaction indices according to their results [1].

Jauss referred to reader response theories, when discussing the aesthetics of reception, emphasising the importance of visitor perceptions after exhibitions [2]. Thus, this study examined whether the introduction of interactive multimedia technologies in art and design exhibitions improved visitor satisfaction with the exhibition items, and investigated the relationships among reception aesthetics and visitor satisfaction and loyalty.

LITERATURE REVIEW

In conventional exhibitions, visitors can only view rather than touch or move items. Thus, such exhibitions attract less attention from visitors than do interactive ones. An exhibition must elicit participation and identification to offer visitors a novel experience. Visitor participation can be divided into active participation and passive participation. Active participation is more ideal than passive participation because advances in multimedia technology have enabled increased interactivity in contemporary exhibitions. The advantages of interactive exhibitions include increased visitor interest and immediate feedback. Such exhibitions are optimal for exhibition programmes emphasising visitor experience and self-oriented interactive devices. Thus, interactive exhibitions offer visitors a comparatively greater sense of participation and selections to increase the level of attractiveness of an exhibition.

Interactive multimedia refer to a digitised combination of at least two types of media, such as text, pictures, animation, static video, dynamic video and audio, on a computer or electronic system that incorporates languages and acoustic effects for interaction. Interactive exhibitions have been applied to various areas. However, they generally are limited to a display of multimedia functions, rather than featuring playable elements to attract visitors. When engaging in interactive exhibitions, visitors are able to operate multimedia components or elements freely by connecting various media forms through a multimedia interface, which can be used to transfer or upload information at any time for immediate interaction with visitors. Hence, *interactive* refers to the ability to allow visitors to engage in reciprocal

interaction with exhibits without necessarily requiring physical contact with the items (e.g. through an audio sensing module). Li and Liew observed that most of the sample participants attended exhibition areas featuring interactive multimedia technologies, suggesting that interaction is key to increasing visitor interest [3].

Guided exhibition tours involving interaction between visitors and virtual reality are critical factors affecting visitor interest. Visitors can use touch screen technologies to search a large-scale exhibition space for the location of exhibition areas they are interested in. When studying art museum visitors, Falk and Dierking found that the actual time spent appreciating artworks ranged between 15 to 40 minutes [4]. Therefore, interactive exhibition technologies enabling location searches will improve the efficiency of visiting an exhibition. In addition, the invention of depth cameras has led to the development of various kinaesthetic interaction technologies and games. Although these games are entertaining, they do not feature a guided tour function through an information display. Therefore, to increase learning effectiveness, this study suggested the adoption of an interactive system that imparts knowledge on the basis of user experience and that employs universal symbols to increase system usability. Moreover, the hardware interface of this system must be easy to understand and operate. Grout proposed that, rather than focusing on creating tangible objects to attract an audience, contemporary artists should create a new relationship (or relative position) between visitors and an art space [5]. Therefore, a successful art and design exhibition requires creating new experiences for visitors and allowing them to view the exhibition content in individual ways by offering an interactive experience.

The success of an exhibition is determined by various factors. Sometimes a single element captures the attention of a considerable number of visitors, and sometimes the attraction may be the peripheral equipment. Therefore, a detailed assessment is required to identify the critical factors affecting visitor interest. Bitgood et al proposed three primary factors that influence visitor behaviour: 1) exhibition design influences: exhibition content and quality. The attracting power, holding power and instructional power of an exhibition can be utilised to increase visitor learning effectiveness; 2) visitor influences: visitors generally arrange visiting schedules and select exhibitions depending on personal experience and interests; and 3) environmental influences: exhibition space is considered a social environment. Therefore, clear and predictable visitor behaviour patterns (e.g. visitor experience, knowledge and interests) can be generated by studying this environment [6].

Oliver and DeSarbo defined consumer satisfaction as a gap between expectations and disconfirmation [7]. When consumer expectations are equal to their disconfirmation, consumer satisfaction is maintained. Perceived performance exceeding consumer expectations leads to positive disconfirmation and, thereby substantially increases consumer satisfaction. Perceived performance falling short of consumer expectations leads to negative disconfirmation and, therefore, considerably reduces consumer satisfaction. Depending on personal experience, customisation needs, and word of mouth, visitors have certain expectations of exhibition services. However, exhibition management has different perceptions of visitor expectations, resulting in five gaps in service quality discrepancy between:

1. visitor expectations and management perceptions;
2. management perceptions toward service quality and service standards;
3. service quality specifications and service delivery;
4. service delivery and external communication;
5. visitor perceptions of the services received and expected.

Gaps 1-4 concern internal organisational problems, whereas Gap 5 reflects differences between visitor expectations and the actual experience. Therefore, this study examined visitor satisfaction toward the adoption of interactive multimedia technologies in cultural and creative exhibitions by analysing service quality from the perspective of visitors.

Because most people are attracted by aesthetic pleasure, products and services satisfying this need are valuable. The core value of aesthetic economics in the cultural and creative industry lies in an emphasis on the supply-demand relationship in the circuit of culture. Thus, commercial activities integrating aesthetic life experience with industry activities can be used to achieve aesthetic economics, which infuses material experience with spiritual qualities. To create this self-fulfilling experience, aesthetic economics has been used to provide services and products satisfying both material and spiritual needs and generating positive viewing experiences.

Reception aesthetics, also referred to as reception theory or reception and effects studies, was developed on the basis of the author-reader relationship at the University of Konstanz in Germany by Jauss and Iser, who emphasised that aesthetics studies must focus on reader reception, reader response, the reading process, aesthetic experience and reception effects, and delve into the interactions among authors, works and readers. They proposed that works are no longer created only by authors, but are mutually created by the authors and readers [8]. Readers are the most crucial elements in literary works, because the meaning of a literary work is not created by the author who wrote the text, but by an audience participating in the process of reading [9].

Iser proposed slightly different concepts for reception aesthetics [10]. From the perspective of phenomenology, he described the process of reading as one in which readers attempt to grasp the text [10]. Therefore, the text is no longer interpreted only by the author, but also by the reader because a text is open to recreated meaning and reinterpretation. This study adopted theories of reception aesthetics, which are audience-oriented, to further understand

the relevance of multimedia technologies, and the impact of interactive multimedia technologies on service quality and visitor satisfaction.

METHODOLOGY

This study adopted a questionnaire survey method to collect data for statistical analysis. Questionnaires were distributed to visitors who had attended interactive multimedia exhibitions of art and design to examine their degree of satisfaction.

This study employed interactive multimedia technologies in an exhibition, designed a set of questionnaires, distributed them to visitors, and collected data for statistical analysis, which was used to examine the effects of interactive multimedia technologies on the overall exhibition structure and to generate conclusions and suggestions. By adopting a research framework, which involved dimensions of guided tour personnel, visitors, physical equipment and reception aesthetics, Sie proposed a total of seven hypotheses (H1-H7) to discuss the relationship between visitor satisfaction and loyalty and their individual effects, revealing that, in addition to the dimension of reception aesthetics, interactivity was a major factor affecting in-depth exchange between visitors and exhibits, leading to varied opinions on the exhibits and, therefore, a statistically insignificant correlation between the dimensions of reception aesthetics and visitors [11].

To solve this problem, Chiu [12] conducted follow-up research on the correlation between interactive design and visitor reception, employing the same research framework used by Sie [11] and incorporating the dimension of interactivity, and generated an eighth hypothesis (H8) to examine whether a positive correlation existed between interactivity and reception aesthetics and whether enhanced interactivity increased the degree of receptivity among visitors in the dimension of reception aesthetics (Table 1).

Table 1: Description of H1-H8 Sie [11] and Chiu [12].

Hypotheses
H1: whether reception aesthetics and visitors are positively correlated
H2: whether guided tour personnel and visitor satisfaction are positively correlated
H3: whether visitors and visitor satisfaction are positively correlated
H4: whether physical equipment and visitor satisfaction are positively correlated
H5: whether overall exhibition experience and visitor satisfaction are positively correlated
H6: whether playability and visitor satisfaction are positively correlated
H7: whether visitor satisfaction and loyalty are positively correlated
H8: whether interactivity and reception aesthetics are positively correlated

By adopting interactive multimedia technologies in an exhibition (Figure 1), this study examined the relationship between visitor satisfaction and loyalty and their individual effects by adding the dimension of interactive multimedia to the other six dimensions (reception aesthetics, guided tour personnel, visitors, overall exhibition experience, physical equipment and playability). This study modified the research framework adopted by Chiu [12] by replacing the interactive design dimension with the interactive multimedia dimension to examine whether the adoption of multimedia guided tour technologies could increase interactivity and visitor satisfaction. If a positive correlation is indicated between these two dimensions, the results of the present study can confirm that the adoption of interactive multimedia technologies can increase visitor-exhibit interactivity and visitor satisfaction.

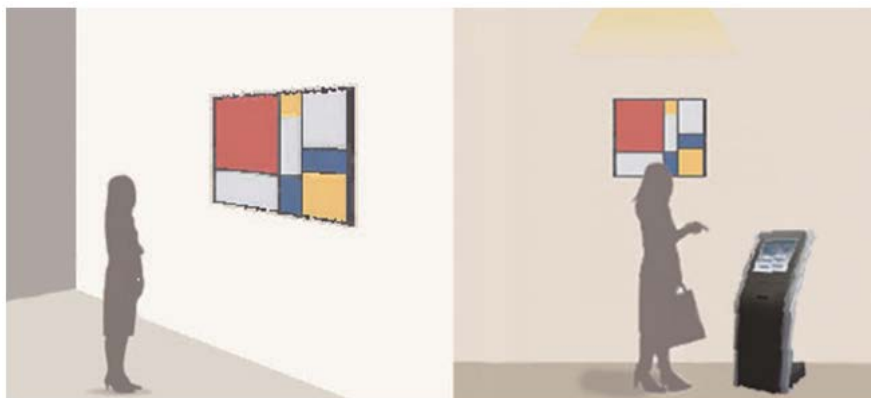


Figure 1: Schematic of differences between the adoption and non-adoption of interactive multimedia technologies.

The questionnaires designed for use in the present study were modified from those used by Sie [11] according to the dimensions employed in the present study. After the initial questionnaire draft was completed, this study invited two professional exhibition curators to offer suggestions on each dimension and corresponding questionnaire items,

and modified the questionnaires accordingly to increase questionnaire quality. The official questionnaires were then distributed to a total of 61 subjects who had attended interactive multimedia exhibitions of art and design (Table 2).

Table 2: Applied dimensions and corresponding questionnaire items.

Dimension	Item
Reception aesthetics	1. The exhibits evoked my life experiences or personal emotions. 2. I have seen similar exhibits, but this exhibition still involved novel experiences. 3. The exhibits were similar to those in other exhibitions, but I perceived them as being different in certain ways.
Guided tour personnel	4. Guided tour personnel immediately responded to my questions. 5. Guided tour personnel always provided assistance to visitors. 6. Guided tour personnel were polite. 7. Guided tour personnel possessed adequate professional knowledge for my questions. 8. Guided tour personnel had friendly work attitudes.
Visitors	9. I liked interacting with the exhibits. 10. I had positive interactions with other visitors during my visit. 11. Interactions between other visitors and exhibits increased my interest in the exhibits.
Overall exhibition experience	12. The exhibits were presented smoothly. 13. I had a positive experience in operating the interactive interface in the exhibition. 14. When interacting with the exhibits, I was immediately assisted when I encountered problems. 15. The exhibition had a smooth traffic flow.
Physical equipment	16. The interior design of the exhibition was attractive. 17. The resolution quality of the exhibits was satisfactory. 18. The quality of surround sound effects for the exhibits was adequate.
Playability	19. The exhibits were strongly interactive. 20. The interface for exhibits responded consistently to my commands. 21. The exhibits gave me certain levels of feedback through the interface. 22. The exhibits increased my interest in operating them again.
Visitors' satisfaction	23. The overall exhibition experience conformed to my expectations. 24. The services provided by guided tour personnel conformed to my expectations. 25. The interactivity of the overall exhibitions conformed to my expectations.
Loyalty	26. I am willing to revisit the exhibition. 27. I am willing to visit other projects by the same exhibition team. 28. I am willing to recommend the exhibition to my friends.
Interactive multimedia	29. Interactive multimedia guided tours can increase my willingness to attend exhibitions. 30. Interactive multimedia guided tours can increase my satisfaction after visiting an exhibition. 31. I have more curiosity toward conventional static exhibitions than interactive multimedia ones. 32. Interactive multimedia exhibitions are necessary in every museum.

EXPERIMENT RESULTS AND ANALYSIS

This study collected a total of 61 returned questionnaires, all of which were valid. The response rate was 100%. An analysis indicated a reliability of more than 0.65 in all dimensions, including reception aesthetics, guided tour personnel, visitors, physical equipment, overall exhibition experience, playability, visitor satisfaction, loyalty and interactive multimedia. Therefore, each dimension exhibited adequate reliability (Table 3).

Table 3: Reliability analysis of dimensions.

Dimension	Cronbach's α	Number of items
Reception aesthetics	0.720	3
Guided tour personnel	0.901	5
Visitors	0.792	3
Overall exhibition experience	0.810	4
Physical equipment	0.828	3
Playability	0.880	4
Visitor satisfaction	0.867	3
Loyalty	0.823	3
Interactive multimedia	0.697	4

Modifying the seven hypotheses (H1-H7) proposed by Sie [11] and adopting interactive multimedia technologies, this study generated an eighth hypothesis (H8); namely, whether interactivity and reception aesthetics are positively correlated (Figure 2). The Pearson's correlation coefficient of H1 (whether reception aesthetics and visitors are positively correlated) was 0.608, a moderate correlation.

This study expected to increase the level of interactivity by adopting interactive multimedia technologies and, thereby examine whether the adoption generated positive outcomes. Moreover, H2-H6 were hypotheses involving the dimensions of guided tour personnel, visitors, overall exhibition experience, physical equipment and playability, to determine if they yielded positive correlations. The Pearson's correlation coefficients of H2-H6 were 0.800, 0.671, 0.731, 0.763, and 0.811, respectively. Except for H3, which exhibited a moderate correlation, the other hypotheses indicated statistically significant high positive correlations. Therefore, the results of the present study confirmed, as previous studies did, that the quality of each dimension positively affected visitor satisfaction, showing that a high quality exhibition must eliminate potential problems concerning these dimensions.

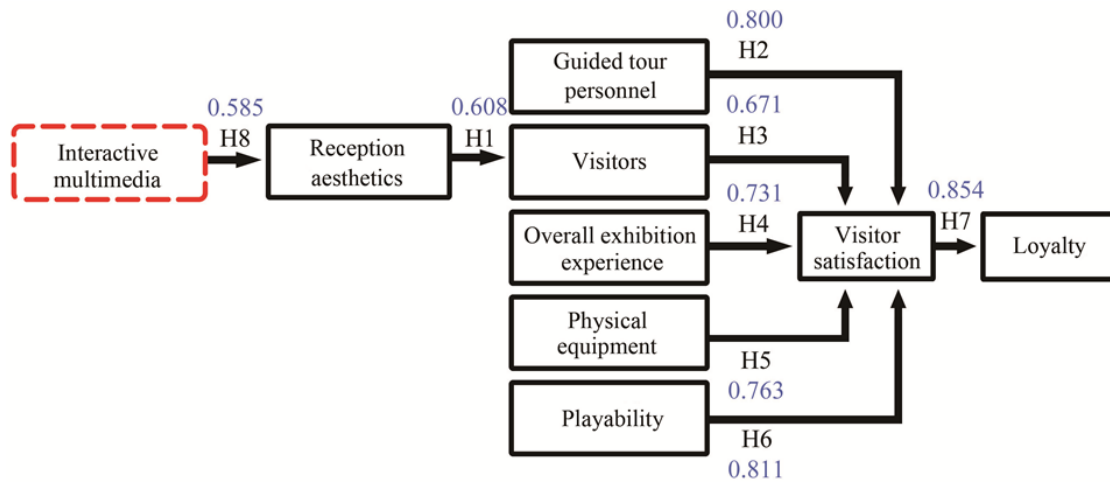


Figure 2: Pearson's correlation coefficients of H1-H8.

The Pearson's correlation coefficient of H7 (whether visitor satisfaction and loyalty are positively correlated) was 0.854, a statistically significant high positive correlation. Thus, this study suggested, as did previous ones, that higher visitor satisfaction levels resulted in increased willingness to revisit the exhibition.

The Pearson's correlation coefficient of H8 (whether interactivity and reception aesthetics are positively correlated) was 0.585, a statistically significant moderate positive correlation, confirming that the adoption of interactive theories and design in exhibits did increase visitor satisfaction toward the reception aesthetics dimension. The dimensions of interactive multimedia and reception aesthetics exhibited a statistically significant moderate correlation, implying that the adoption of interactive multimedia technologies in exhibitions increased visitor-exhibit interactivity and visitor satisfaction.

By examining the aforementioned eight hypotheses and data analysis results in this study, it was possible to deduce the relationships among H1-H8. Visitor satisfaction exhibited the most direct influence on loyalty. According to the degree of influence, dimensions affecting visitor satisfaction are listed from high to low as follows: playability, guided tour personnel, physical equipment, overall exhibition experience and visitors. In addition, the adoption of interactive multimedia technologies increased not only the positive relationship with reception aesthetics, but also the positive relationship between reception aesthetics and visitors, between visitors and visitor satisfaction, and between visitor satisfaction and loyalty.

The results of the Pearson's correlation coefficient analysis showed that the dimensions of interactive multimedia and reception aesthetics exhibited a statistically significant positive correlation, indicating that the adoption of interactive multimedia technologies considerably enhanced value transmission between exhibits and visitors.

CONCLUSIONS

The results of this study indicated that the dimensions of reception aesthetics and visitors exhibited a statistically significant high positive correlation, and confirmed that art and design exhibitions required interaction with visitors. Only effective visitor interaction could achieve value transmission. Moreover, the analysis results illustrated that a statistically significant high correlation existed between the dimensions of guided tour personnel and visitor satisfaction, suggesting that the professional knowledge and work attitude of guided tour personnel affected visitor satisfaction.

In addition, this study observed a statistically significant high correlation between the dimensions of overall exhibition experience and visitor satisfaction and between the dimensions of physical equipment and visitor satisfaction, indicating that background facilities used in art and design exhibitions affected visitor satisfaction. Furthermore, a statistically significant high correlation existed between the dimensions of playability and visitor satisfaction and between the

dimensions of visitor satisfaction and loyalty, suggesting that higher satisfaction led to increased willingness to revisit the exhibition.

This study examined whether the adoption of interactive multimedia in art and design exhibitions could increase interactivity and visitor satisfaction. The analysis results showed a moderate correlation between the dimensions of interactive multimedia and reception aesthetics, implying that the adoption of interactive multimedia technologies were helpful in enhancing visitor-exhibit interactivity and visitor satisfaction.

The study results illustrated that an interactive exhibition where exhibits were presented in an intimate arrangement and with increased usability for a quick understanding and easy interaction can increase the degree of receptivity among visitors. Therefore, to increase visitor satisfaction, an easy-to-use interactive interface can be adopted in art and design exhibitions.

Follow-up studies must incorporate more survey respondents to further understand visitor satisfaction toward art and design exhibitions and to explore the satisfaction of visitors from various backgrounds and ages toward interactive multimedia exhibitions. Analysing a broader base of respondents and diversified dimensions will lead to more valuable results.

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