

Contemporary Museum Strategies in Employing Digital Art: An Analytical Study on the Preservation and Display of the Digital Image

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General Background: The integration of digital technology has transformed visual arts, giving rise to digital art and redefining museum practices. **Specific Background:** Contemporary museums increasingly adopt digital systems for displaying, documenting, and preserving digital images while incorporating interactive audience experiences. **Knowledge Gap:** Despite widespread adoption, challenges persist regarding long-term preservation, technological obsolescence, and the absence of unified digital management protocols. **Aims:** This study examines museum strategies in digital art display, analyzes preservation methods, and evaluates artist and institutional practices within digital museum contexts. **Results:** Findings reveal diverse display approaches ranging from individual screens to immersive interactive environments that facilitate direct audience engagement. However, insufficient technical expertise and lack of standardized preservation frameworks threaten the sustainability of digital artworks. Additionally, integrating educational technologies with digital exhibitions strengthens audience interaction, while structured digital governance policies support artwork continuity. **Novelty:** The study provides a comprehensive analytical synthesis linking display strategies, preservation challenges, and governance mechanisms within contemporary digital museums. **Implications:** Establishing standardized preservation protocols, strengthening technical training, and integrating educational and technological systems are essential to ensure the long-term sustainability and accessibility of digital art in museum environments.

Highlights:

- Diverse exhibition formats enable direct visitor interaction with digital artworks.
- Absence of unified preservation standards risks media deterioration and data loss.
- Governance policies support continuity and re-exhibition of digital collections

Keywords: Digital Art, Contemporary Museums, Digital Preservation, Interactive Display, Visual Arts

Introduction

In the recent past, the visual arts have witnessed significant changes due to the integration of digital technology in the process of artistic creation and production, leading to the birth of a new form of art referred to as Digital Art. The new form of art has provided the visual arts with the ability to create new forms of visual configurations that cannot be achieved through the application of traditional forms of artistic creation and production (1). As such, the visual artists have been provided with new forms of opportunities to express themselves.

In the process of the visual arts' evolution and changes, the role of the museum has emerged as a contemporary cultural institution whose main objective is to not only safeguard the artistic and historical heritage but also to adopt the use of the latest technological advancements in the presentation and preservation of digital art (2). As such, it has become important to study the role and relationship between the museum and digital art in the context of exhibitions and sustainability due to the vulnerability of digital art to deterioration and disappearance due to the dynamic nature and evolution of digital media technologies.(3)

Research Problem

Despite the fact that digital art is becoming very important and has been incorporated into the museum exhibitions across the world, the mechanisms used by the museum to address the issue of digital art face significant challenges.

Accordingly, the research problem centers on the following main question:

How do contemporary museums approach digital art in terms of display, preservation, and conservation?

Research Objectives

1. To examine the strategies adopted by contemporary museums in exhibiting digital artworks.
2. To analyze methods of preserving the digital image using modern techniques such as fractal systems and interactive technologies.
3. To evaluate the experiences of digital artists in producing artworks that are both exhibit-ready and sustainable within digital museum contexts.

Significance of the Study

The significance of this research lies in addressing a relatively recent issue within the fields of visual arts and museum studies: the integration and safeguarding of digital artworks against obsolescence and loss. Moreover, the study highlights how digital art contributes to redefining the concept of museum display and enhances cultural and cognitive engagement among audiences.

Research Methodology

The study adopts a descriptive-analytical approach through:

1. Reviewing specialized literature related to digital art and its role in museum exhibitions.

2. Conducting a descriptive analysis of works by internationally recognized artists such as John Shier, Nam June Paik, and John Maeda as influential examples of integrating digital media into exhibition spaces.
3. Examining the experiences of contemporary digital museums (such as the Museum of Mathematical Art and the Tokyo Digital Art Museum) to explore mechanisms for preserving digital images and enhancing audience interaction.

The main research questions stemming from the research problem are as follows:

1. How did digital art emerge as an influential direction in museum display?
2. What are the most prominent strategies of contemporary museums in employing digital art?
3. What challenges do museums face in preserving and maintaining digital artworks in the long term?
4. How do the experiences of international artists contribute to shaping a new vision of the role of digital art in the museum?

Previous studies:

1- Al-Jumah, study aimed to analyze the relationship between technology and heritage, revealing how modern digital anthropology can be used as a tool to understand human behavior towards artifacts. It also explored how technologies can be applied to different aspects of visitor interaction with cultural heritage within the Iraqi Museum. The study explored the humanization of technology, suggesting that technology and digital images serve humanity and preserve its vast history, creating a new, interactive, and internal environment thanks to the sustainability of museum capital. The study concluded that high-quality digitization at the Iraqi Museum has effectively contributed to creating accurate records, protecting the visual identity of artifacts from deterioration or distortion. However, it also highlighted some challenges, including the need to update digital software, maintain equipment, ensure display exclusivity, and train museum staff in "digital anthropology" skills to handle these aspects professionally.

2- Edward M. Corrado's study aimed to provide a theoretical framework and its contribution to cultural institutions (libraries, archives, museums) in protecting digital content from technology. The study focused on building a trust system and establishing digital repositories to ensure the preservation of images and files that are indestructible and indestructible over time. Improving management and technology involves clarifying that digital preservation is not merely a technical task for IT staff, but rather an administrative and planning responsibility that begins from the moment the image is captured. Financial and technical sustainability is ensured by diversifying preservation methods despite the digitization of digital museums. The conclusion is that a digital image without data (source, format, date) is a dead image, a technically dead image; future generations will not be able to access or interpret it. Digital preservation is an ongoing process, not a project completed with the final archiving, and should be an integral part of the museum's core culture.

The artist "John Shier" was born in the United States in 1950. He admired the work of the graphic artist Frank.

He established his own style, and his work was influential, gaining a strong reputation in artistic circles.

His aesthetic message lay in the perception of the graphic achievement, and it was directed to the world through his paintings "Random".



<http://www.National> mathematical art museum.

Artist: John Shier

Title of the work: Random

Date of completion: 2015

Dimensions of the work: 600 cm × 400 cm

Museum of Mathematical Art

Software: Photoshop

Type of technique: Fractal technique

Technical resources: Color printer

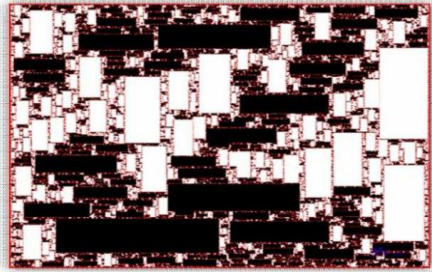
Color model: CMYK / RGB

The artist paid special attention to digital graphics resulting from the nature of the relationship between fractal geometry and fractal technique. The painting, through its expressive power based on diverse color employment, revealed that the structure of the form is based on the introduction of a group of structural elements to generate organic abstract forms. The composition represented in this graphic work appears in an irregular form according to fractal technique with apparent self-similarity; that is, the fractal is not strictly governed by identical self-similarity. The two-dimensional graphic forms appear with sharp edges due to their compositional basis in one-dimensional graphic (vector) form and are somewhat identical. (4)

These fractal forms are characterized by apparent self-similarity rather than identical similarity and are organized through free and varied kinetic rhythm in digital technology.

The aesthetic of the work lies in granting fractals the quality of infinity, as if they are extending beyond the frame of the graphic work, directing the viewer's eye outside the enclosed space, leading to a visual suggestion generated through the process of creating organic fractal forms within space. (5)

The high color contrast translated at the formal level confirms the capability of the Photoshop program in achieving varied color levels within a single graphic work. There is great freedom for the artist in choosing and determining color and formal values, even though there is no direct formal dialogue between the work and the artist. The artist treated digital color in the work using the Sponge tool in Photoshop. (6)



Shier, John. (2011). *Statistical Geometry*. Self-published fractal art picture. Moma.org

Artist: John Shier

Title of the work: Checkerboard

Date of completion: 2015

Dimensions: 480 × 480

Museum of Mathematical Art

Software: Photoshop

Type of technique: Fractal technique

Materials and techniques: Color printer

Color model: RGB

The artist began working on his second painting “Checkerboard” in 1995. It came in a style different from his first work, where he depicted clusters of geometric abstractions in which the artist projected his aesthetic position. It was exhibited in 2011 at the Museum of Mathematical Art.

The forms, with their two colors, were bordered with a red frame, in addition to the latter’s role in highlighting the forms due to the color contrast between it and the neutral colors (black and white). (7)

The drawn work clarifies, according to the geometric abstract context derived essentially from the fusion of natural manifestations within the artist’s inner inclination, that the vertical rectangular forms carry connotations and meanings of pride, elevation, grandeur, and growth. As for the horizontal rectangular forms, they indicate a psychological content that suggests to the viewer stability, balance, and calmness in chromatic abstraction (black and white). Likewise, there is proportion between the two-dimensional form and the relationships among the graphic forms with one another, creating formal and chromatic rhythms that lead to harmony and cohesion. (8)

The artist “Nam June Paik” was born in Korea in 1932. He worked with a range of multimedia forms and is considered the founder of video art. He was interested in performance art and installation art. Through his works, he aimed to present video art in a developed philosophical and conceptual manner by combining abstract art and using parts of television sets and video art components. Paik contributed to creating a media culture that expanded the definitions and languages of art-making. (9)

The artist’s life in art emerged from politics and anti-art movements in the 1950s, 1960s, and 1970s. During this period, he contributed to social and cultural change by combining expressive power and conceptual strength in performance with the technological possibilities associated with the moving image.

Paik realized his artistic ambition through cinematic imagination in avant-garde film and future-oriented approaches, using single-channel video tape methods and sculpture/installation formats. He shaped the electronic moving image into new meanings. (10)



Nam June Paik, “Megatron/Matrix,” 1995, eight-channel (Smithsonian American Art Museum).

The artwork is billboard-sized and contains 215 screens. It integrates multimedia images with audio clips across screens and presents Korean folk rituals. It emphasizes the influence each of us experiences in images directed inward around a single screen. The integration of television devices in his collaborative works with dancers, musicians, and American artists demonstrated the interaction between television and digital art through the fusion of pop art, consumer culture, and national symbols. (11)



Nam June Paik, “Magnet TV,” 1965, television set and magnet, black and white, silent. Whitney Museum of American Art, New York; purchase, with funds from Dieter Rosenkranz, Copyright Nam June Paik Estate. (Robert E. Mates)

He used the magnet and television to express representational and abstract images through recorded and phenomenological techniques, forming a powerful discourse that he maintained across different media. (12)

The artist John Maeda was born in America in 1966. He worked as a technological artistic designer. His work explores the field in which art and technological design are integrated. He currently works as Head of Design and Inclusion in the Computational Design Department at the TeamLab Museum in Tokyo. (13)



Mori Building Digital Art Museum teamLab Borderless, Information: June 21, 2018, Tokyo, Japan.

The displayed scene was digital rather than natural. However, the sea, shawl, flowers, trees, and similar elements are presented with realistic details inspired by ancient Chinese and Japanese art.

The artworks do not remain static; they move as if they have a life of their own. They do not only travel across different screens, but across different rooms and even museums. Some characters stop at one edge of the screen and reappear elsewhere, as in the Tokyo Museum. (14)



Mori Building Digital Art Museum teamLab Borderless, Information: June 21, 2018, Tokyo, Japan.

A person stands near a lamp; it lights up brightly, emitting a color. The light of this lamp becomes the starting point for the viewer and spreads to the two nearest lamps. The light from the two closest lamps transfers the same color to other lamps, one after another, spreading continuously. Thus, the lamp's light responds to human interaction, and as a result it divides into two sections:

First: a single visual line.

Second: it merges with the first lamp to become the point of departure. (15)

2- How to Preserve the Digital Image in the Museum

The issue of preserving the digital image in the museum is not easy. It requires safeguarding digital artwork in the contemporary museum and providing tools (multimedia) that help both the artist and the person responsible for managing the artwork feel secure in the short term, not the long term, because there is a significant lack of research that uses modern tools in the digital museum and limited experience in using digital tools, which may lead to their deterioration in the long term. (16) The fractal technique was used in the Museum of Mathematical Art by the artist John Shier.

This technique relies on the use of a mathematical equation and electronic processes that form the fractal operation within the computer, followed by color printing.

(Interaction, participation, programming) not only provide expanded possibilities for art in new media, but also offer valuable insight into the aesthetic applications and social implications of art and technology through conceptual art that used non-traditional art concerned with the idea and content rather than form, through video art and the use of Tilt Brush. (17)

The artist used the concept of the moving time-image at the Smithsonian American Art Museum and at the Whitney Museum of American Art.

By this, he means a primary medium through which artists formulate new strategies and forms for image-making in order to understand them. We therefore need to design historical models and theoretical interpretations that define the moving image as central to our visual culture.

Paik's most innovative dissemination of new media was through laser technology.

He described the installation processes he conducted as a "post-video project," which continued to clarify the moving image through the use of laser energy projected onto screams, cascading water, and smoke-filled sculptures at the beginning of the twenty-first century.

Paik's work demonstrates that cinema and video integrate electronic and digital media into image techniques and new forms of expression, and the end of video and television as we know them signals a transformation in our visual culture. (18)

He placed video images in a wide range of configurations, thereby adding an entirely new dimension to the form of sculpture and the standards of installation art. He transformed the video medium itself through a process that expressed his profound vision of electronic technology and his understanding of how to rebroadcast television "to turn it outward" and make something entirely new. Paik's images were not predetermined or restricted by video techniques or the television system. (19)

He altered the materiality and composition of the electronic image and placed it within space and on the television screen. In this process, he defined a new form of creative expression. His understanding of the power of the moving image began as an intuitive perception of emerging technology, which he exploited and transformed. In addition to collaborating with several technicians such as Shuya Abe, Norman Ballard, and Horst Bauman to create new tools for reshaping the electronic image, Paik also integrated computer technologies and advanced digital techniques into his art to continue reformulating its content, visual vocabulary, and plastic forms. (20)

The Digital Art Museum in Tokyo includes approximately 50 interactive artworks, some of them entirely new, within a vast space of 10,000 square meters divided into five zones. The interactive artworks have no boundaries and remain in a continuous state of flow with people. Visitors enter and explore the works physically by touch and sight, and the artwork interacts with the viewer through touch and the use of Tilt Brush. (21)

Results

1. The study showed variation in digital display strategies, as contemporary museums use different techniques to present digital art, ranging from individual screens to massive

interactive spaces. This allows the audience to interact directly with the artwork and enhances the engaging viewing experience.

2. Long-term digital preservation issues: The lack of technical skills, as well as the absence of unified digital preservation protocols, is another challenge that may result in the loss of digital files or the deterioration of the media.
3. The importance of integrating technology and education: The integration of digital display with educational programs is more effective, as it increases the level of audience engagement with the digital artwork, thus recognizing the cultural and educational importance of the exhibition.
4. The importance of digital governance: The study examined museums that have digital work management and preservation policies, noting that such museums can easily maintain the continuity of the digital artwork for re-exhibition, as opposed to museums that lack such policies.

Recommendations

1. The development of digital preservation protocols by establishing a system to control the preservation of digital artworks, such as the development of several backups and the use of a specific file format.
2. The provision of technical and artistic training to museum staff by training the museum staff on digital preservation techniques and the techniques used in audience interactions through the use of multimedia.
3. The benefit derived from the use of modern technologies in the display of artworks in the museum, such as the use of virtual reality and augmented reality in the museum to enhance the experience of the visitors, as well as the ease of maintenance of the equipment.
4. International exchange of expertise to examine the experiences of leading digital museums worldwide in preservation and display methods to ensure the sustainability of digital works.
5. Conducting continuous research to keep pace with technological and artistic developments through periodic field and analytical studies to update strategies for dealing with digital art.

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