Strategies in Time-Based Media Conservation: An Evaluation of Three Institutional Approaches

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1 INTRODUCTION

Time-based media (TBM) is a category of art in which the works rely on the passage of time and often the integration of technology to convey their artistic concepts and narratives[1]. It encompasses various artistic expressions, including video installations, sound art, performance, and interactive digital works. This diverse array of mediums present distinct challenges to institutions responsible for their storage, preservation, and accessibility. The rapid evolution of technology and the inherent fragility of the media formats make the proper management of time-based media art equipment a critical concern. This paper examines three case studies of time-based media artworks from the Guggenheim, Museum of Modern Art, and Smithsonian American Art Museum, evaluating the approaches employed by each institution to address the unique challenges of conserving display equipment for exhibition. By analyzing the outcomes and implications of these approaches, this study aims to contribute to a comprehensive understanding of effective strategies for preserving and presenting time-based media artworks in museum settings.

Many of these time-based media works consist of three essential technical elements: the information carrier, the playback equipment, and the display equipment. For example, a VHS tape—the carrier—is responsible for storing the data, a VHS player—the playback equipment—reads the data, and a CRT video monitor—the display equipment—renders the data in a consumable format for the viewer[2]. In this constructed "dynamic system," each of the components is vulnerable to degradation and technological obsolescence, so parts must eventually be repaired or replaced[3]. While regularly exercising a time-based media work is vital to keeping it and the institutional knowledge of its installation alive, it also introduces loss to the dynamic system by gradually degrading the equipment with each use[4]. Consequently, two fundamental tenets of the museum—preservation and exhibition—are at odds with one another[5].

The active role of a TBM conservator is to strike a delicate balance between these two institutional missions, and to do so they must make decisions that require a certain degree of nuanced, conceptual interpretation. If a piece of equipment fails, should it be replaced with the exact same model as the original or can modern technology be used in its place? If the equipment is updated, what aesthetic or auditory qualities—if any—inherent to the original technology should try to be emulated? If the original hardware is considered invariable—meaning the work's authenticity is reliant on that specific equipment—how does the institution source and preserve the backup equipment that may have become scarce since the artwork's inception? There are never perfect or one-size-fits-all answers to these questions. Technological obsolescence is a common hurdle, and the work becomes more vulnerable to loss as the equipment becomes more invariable and specialized[6]. A conservator must work with other stakeholders such as the artist, curators, collections managers, and fabricators to determine the best strategy for each specific TBM artwork.

Pip Laurenson—the first TBM conservator to be appointed to any institution worldwide in 1996—posits that there are three main strategies to address equipment failure of media artworks[7] (see Appendix A). The first entails replacing technical components with spare parts of the same equipment as it was originally installed. While this strategy preserves the work's conceptual and physical integrity the most, it may not be the most sustainable option due to the necessary stockpiling and upkeep of obsolete, often rare technology. The next strategy involves swapping out failing components with new or modified technologies while maintaining what is considered to be significant to those pieces—like integrating modern components within an original casing or updating the information carrier and playback equipment while preserving the original display equipment. Lastly, a TBM work's significant features can be recreated by substituting the equipment with an inexact alternative that uses the same technology or by emulating quantifiable outputs like dynamic range, resolution, audio levels, and rhythm with mod-

ern technologies, reproducing functionality and behavior through imitation[6].

As Laurenson states in her seminal work, "Authenticity, Change and Loss in the Conservation of Time-Based Media Installations," even identifying a piece's "significant features" or "work-defining properties" is a complicated endeavor, especially when the artist has not provided detailed installation instructions, is not available for interview, or is no longer a reliable source of information and decision-making[3]. The statement of an artist must be contextualized by conservation expertise and the conservation treatments should also consult the artist's original vision[2]. The care of a TBM work is a constant, cyclical, collaborative process that varies based on the piece's unique dynamic system, available technologies, and institutional context. Different institutions may use different conservation approaches based on their resources and needs. Although TBM conservation treatments are complex and nuanced, individual case studies can be evaluated based on the same criteria to determine their efficacy.

2 CASE STUDY I: THE GUGGENHEIM'S CONSERVATION OF *RANDOM ACCESS* BY NAM JUNE PAIK

2.1 Description of Conservation Treatments

As recounted in Joanna Phillips' 2010 article, "Shifting Equipment Significance in Time-Based Media Art," Nam June Paik's original 1963 interactive artwork, Random Access, included a cable-extended open-reel audio deck with which visitors were encouraged to trace over an arrangement of ½ in audio tapes—giving them the opportunity to "randomly access" the recorded content of the tape (see Appendix B). This work has three authorized versions, but the Guggenheim's conservation strategies for their version Paik's Random Access differs from those done to other iterations.

The first installation of this piece—labeled the Daniels version after the private collection in which it currently resides—values the portable cassette player as a unique object. Although still in working order, it has been suspended from interactive use since 1998 due to its fragility. Displayed out of the reach of visitors, it has become a non-functioning museum object, emphasizing preservation over interactivity. The second—named the Paik and Saueracker version for the artist and his former assistant who still presents it today—is treated as a conceptual artwork not tied to any specific technical component of significance. In this version, the analog media work is newly fabricated for each installation using different audio decks bought second-hand. This approach emphasizes the flexibility and variability of the artwork, with the devices modified in the name of interactive exhibition.

In contrast to these two previous iterations, the conservation strategy for the Guggenheim Museum's version of *Random Access* focused on retaining the original equipment and preserving its interactive functionality. This approach was decided based on answers to the Variable Media Questionnaire—a tool to record the artist's preservation preferences for mediums facing obsolescence—from Paik's studio representative at the time of the work's acquisition[8]. When the audio deck and extended audio head fell into disrepair, a crucial decision had to be made regarding whether to repair or replace the equipment. The significance of the original equipment was paramount in this conservation approach. The Guggenheim conservation team recognized the importance of maintaining the authenticity and integrity of the artwork, considering both the artist's intentions and the historical context.

The equipment—including the modified 1970s RCA open-reel audio deck and the extended audio head—played a vital role in the artwork's concept and interactivity. By the time the artwork required conservation, however, this period hardware was no longer in production and there were no modern, digital alternatives with the same functionality and tactility available. Consequently, although this technical component began as a variable piece of equipment, it had acquired unique value over time, becoming a precious and integral part of the artwork itself. In the end, repairing the equipment was deemed feasible and desirable to preserve the artwork's interactive nature. However, this decision was not without its difficulties. Finding replacement parts became challenging due to the obsolescence of analog technology. While functioning analog equipment was more readily available a decade before the conservation began, it had become increasingly scarce, making repair and maintenance more complex and time-consuming.

Additionally, the physical dimensions of the equipment were considered essential for the artwork's presentation. The custom-fit acrylic housing, bearing Paik's signature, was specifically designed to accommodate the 1970s audio deck and the 1990s amplifier. Any replacement equipment with different dimensions would have been incompatible with the acrylic construction, potentially compromising the artwork's authenticity and authorship[2].

2.2 Evaluation of Conservation Strategies

Based on Laurenson's three strategies for addressing equipment in TBM artworks, the conservation strategy employed by the Guggenheim Museum for Nam June Paik's *Random Access* aligns closely with Strategy 1: Repairing the original unit or replacing the failed unit with the same kind[6]. The Guggenheim's chosen approach focused on repairing the original equipment and preserving its interactive functionality. This approach

maintained the integrity of the work by preserving the identity of the physical components and ensuring a link to the original meaning of the artwork. By repairing the same equipment or substituting it with the same make or model, this strategy aimed to prevent any loss of the artwork's technical components, intended concept, and functionality.

The case study provides evidence of the original equipment's significance through documentation, including the Variable Media Questionnaire and the artist's studio representative's stipulation for the use of "period equipment" for future recreations[2]. While Phillips admits there are gaps in this original documentation, the conservation treatments were documented to aid with future treatment plans and maintenance.

While the chosen strategy emphasizes the importance of the original equipment, challenges arise in terms of equipment availability and long-term sustainability. The obsolescence of analog technology poses difficulties in finding functioning replacement parts for repair or substitution. With a strong link between the specific equipment and the authenticity of the work, more loss is inevitable than if the hardware was variable[6]. Although the conservators were able to repair the piece with minimal substitutions during this treatment, the same may not be true in the future, leaving potential limitations in ensuring the artwork's preservation.

In terms of compatibility and functionality, the conservators stabilized the piece and returned functionality to it through their treatments. In comparison to the Daniels version, which preserved historicity over functionality by removing its interactive element, the Guggenheim's *Random Access* maintains functionality and the original display set-up. However, long-term interactive exhibition may degrade the work-defining equipment and therefore its authenticity.

The approach of repairing the technical components allows for potential reversibility or modification if future technologies or preservation methods become available and the previous repairs are no longer viable. Retaining the original equipment introduces minimal risk to the physical authenticity of the work because it is not a complete re-fabrication that may undermine the properties deemed significant in this work. However, as analog technology becomes increasingly obsolete, it may be challenging to adapt the artwork to emerging standards or formats in the future. Still, the chosen strategy does not result in any significant loss or degradation of the original work. By retaining the original equipment and its modifications made by the artist's hands, the unique authorship, authenticity, and functionality of the artwork are preserved. The visual aesthetics, interactive quality, and audio of the time-based media are maintained as intended by Paik.

3 CAST STUDY II: SAAM'S CONSERVATION OF *FOR SAAM* BY JENNY HOLZER

3.1 Description of Conservation Treatments

The conservation of *For SAAM* by Jenny Holzer—chronicled in depth in Dan Finn's "Museum Authorship and the Conservation of Media Installations: Two Case Studies from the Smithsonian American Art Museum," from 2021—is unique in that it addressed a large-scale, site-specific work commissioned in 2007 specifically for the Smithsonian American Art Museum's lobby (see Appendix B). The cylindrical LED sculpture stands 28 feet tall and features a series of the artist's texts animated by individually programmable LEDs. After approximately ten years of continuous exhibition, *For SAAM* experienced recurring technological failures in solder joints, LED segments, and integrated circuits. SAAM's objects conservator at the time, Hugh Shockey, replaced failed components with spare parts provided by the artist as an acceptable treatment. However, by 2014, replacing LED segments no longer maintained the intended appearance due to uneven aging and color degradation.

In 2015, the accumulation of technical problems led to the consequential institutional decision to undertake a major conservation project. Discussions with the artist and the museum resulted in the decision to completely re-fabricate the artwork. The only physical components that remained from the original piece were the top halo and base. While the overall dimensions remained the same, the original LEDs, LED boards, connections between the LED segments, motherboards, and computer were replaced while maintaining the properties of the work deemed visibly significant by SAAM, the artist, and fabricators. This approach aimed to reduce the amount of maintenance it required, ensure consistency of presentation, and increase energy efficiency.

In addition to addressing the hardware issues, the team considered changing the source of the animated text in the artwork from a generative software to pre-rendered video files. Initially, there was a debate about whether the animation source was a defining property of the artwork. While SAAM agreed to switch to pre-rendered text based on the artist's input and minimal impact on the observable behavior, the original generative method was ultimately maintained due to the inability to reproduce the exact fonts and typefaces. A report was created to document the project's history and serve as a reference for future decisions regarding the artwork's technology.

The new iteration of *For SAAM* addressed most of the technical issues present in the original version. However, one major concern remained, which was how to avoid the mismatched brightness issue that occurred over time in the original LEDs. To address this issue, a

spare lighting system was developed, which ages spare parts at the same rate as the artwork, ensuring that when needed, the spares match the color and brightness of the segments[9].

3.2 Evaluation of Conservation Strategies

This case study represents a large-scale, advanced version of Strategy 2: Making new components or modifying equipment to match the significance of failed equipment[6]. Modern equipment was added to the piece to replace the failing ones, but it was still organized in the same casing with the same dimensions, number of LEDs, and viewing angles. Rather than only recreating the measurable outputs as described in Laurenson's third strategy, the conservators working on *For SAAM* strived to match the physical presence of the failed equipment because the aesthetic qualities were deemed significant by stakeholders.

The intentions of the artist as well as the site-specific context of the TBM artwork were diligently considered by the conservation team. There was a constant, heavily documented dialogue between the artist and SAAM about how the faulty components, technical issues, and the difficulty of maintenance in its pre-conserved state were obscuring the original meaning and function of the piece. To this end, re-fabrication was a valid strategy for the long-term stability of the piece after systematically exploring and rejecting other options. The development of a spare aging system to ensure color and brightness matching of the LED segments also addresses the topic of the work's sustainability. However, the text does not explicitly mention any plans for conservation and repair after this collection of spares is depleted. Considering the incredibly public-facing, immovable nature of *For SAAM* as well as the specific instructions from the artist to update the technology as the originals become obsolete, the museum's decision to value ease of maintenance over complete reversibility is rational. The commitment shown to following the ethics of conservation while fully addressing the technical issues nonetheless takes a significant investment on behalf of the institution regardless of their chosen strategy.

4 CASE STUDY III: MOMA'S CONSERVATION OF *LOVERS* BY TEIJI FURUHASHI

4.1 Description of Conservation Treatments

In Cass Fino-Radin's 2016 article "Art in the Age of Obsolescence: Rescuing an Artwork from Crumbling Technologies," they describe the conservation of Teiji Furuhashi's *Lovers* from start to finish (see Appendix B). The initial phase of the conservation process involved pulling the piece, acquired by the Museum of Modern Art (MoMA) in 1998, from storage. The team of conservators began examining its various components, including documentation, LaserDiscs, 35mm slides, video projectors contained in an 8-foot-tall metal tower, robotics that control the display equipment's movements, control hardware, and software. The artwork—which consists of walking nude figures projected onto the walls from the middle of the room—had not been exhibited since its acquisition, making it necessary to conduct in-depth research to understand its anatomy and functionality.

Based on the research findings, the conservators determined that certain components, such as the original video projectors, needed to be replaced due to their instability and rarity. The process involved selecting suitable replacements that closely matched the original specifications and working closely with Shiro and Yoko Takatani, who had supervised the original technical execution and installation of the artwork before its acquisition in 1998. The aim was to stabilize the artwork using more modern technologies while ensuring reversibility.

In addition to replacing the projectors and after reverse-engineering the original algorithm that controlled how and when the robotics moved the projectors, conservators created a new system to regulate the rhythm, interactivity, and video playback. This program communicated with a microcontroller which transmitted commands to the robotic motors. In other words, new hardware and software were constructed during the conservation treatments to stabilize the work and make it playable for exhibition.

Conservators continued to work on the software to ensure the robotic movements and motion of the figures were synchronized. When they were confident that the timing of each was perfectly reproduced based on the specifications recorded when it was collected by MoMA, the team organized a showing for Shiro Takatani. After documenting his knowledge of the work's lighting, auditory output, and alignment—all identified as information gaps in the original documentation—he explained that Furuhashi intended for the synchronized motion of the figures to be refined with each installation, making the next more accurate, but different, from the last. Following extensive deliberation among conservators and curators, and with the understanding that all modifications would be meticulously recorded and entirely reversible, the team decided to refine the work as the artist envisioned[4].

4.2 Evaluation of Conservation Strategies

The conservation strategy used in the case study exemplifies Strategy 3: Recreating significant features by approximate substitution[6]. The hardware and software were upgraded to more stable, usable technologies, and the work-defining features were emulated using these

new systems. The approach maintained the integrity of the piece; although this iteration was different from the last due to the refinement process, it still holds the authorship of Teiji Furuhashi and honors his intentions.

The case study demonstrates a strong emphasis on research and documentation. The museum team carefully studied and documented the artwork's components, condition, and potential risks. They conducted in-depth research and produced a comprehensive report, providing a solid foundation for subsequent conservation efforts. The team also documented the process of reverse engineering the original software and hardware, ensuring that the knowledge gained was preserved for future reference. This research generated a substantial body of knowledge, providing the conservators with a foundation for creating an informed treatment plan.

Conservators on this project decided to replace the original equipment—at risk of failure and obsolescence—with modern, stable technologies. The strategy of emulation used during this conservation treatment establishes a precedent that the equipment is not work-defining and can be variable based on the needs of the piece, allowing for its adaptation to emerging formats. This means that conservators in the future—if they still deem this approach valid—could emulate this work on contemporary hardware. After the conservation treatments of this case study, all the technical components used to emulate the original work, even though they are not original themselves, conveyed its immersive feel and became part of this authentic iteration. However, future conservators must also consider the vital, active role Shiro Takatani played in communicating *Lovers* unique installation and conservation requirements, and how not being able to consult him or Furuhashi may affect the authenticity of the work if it were to be shown again.

5 CONCLUSION

By carefully considering factors such as institutional needs, artist intentions, equipment availability, and the significance of work-defining features, conservators at the Guggenheim Museum, Museum of Modern Art, and Smithsonian American Art Museum determined the most suitable conservation strategies for their specific pieces, showcasing the nuanced and context-specific approaches required for the stewardship of time-based media artworks. These case studies shed light on the complex nature of TBM conservation, to which the rapid evolution of technology and the fragility of media formats pose significant challenges. The conservators on these projects encountered the ramifications of technological degradation and obsolescence, but each approach varied based on the state of the work, the artist's preference, the museum's parameters, as well their own expertise. While the equipment for Nam June Paik's *Random Access* was determined to be vital to its artistic expression, while the opposite was true for Jenny Holzer's *For SAAM*. Given the artist's preferences that the aesthetic properties be deemed paramount, steps were taken to reconstruct the visual appearance—even if the original hardware had to be sacrificed. Documentation and constant communication between the institution and artist's studio was key in this case as in the conservation of Furuhashi's *Lovers*. Even though the technology was obsolete, the conservators worked with the late artist's collaborator to recreate the alignment, lighting, and sound of the original piece while refining the robotics as the artist would have done.

In each of these institutional examples, understanding the fundamentals of an artwork, considering its various contexts and stakeholders, was key in choosing the most appropriate strategy. To conserve is, ultimately, to interpret; every decision conservators make must align with their informed interpretation of the artwork. With the field of time-based media conservation still in its infancy, these case studies show that there is not a one-size-fits-all approach for these complicated artworks. Treatments that are accepted in this discipline—like complete refabrication—would be unthinkable in, for example, the conservation of paintings. In the future, it will be necessary to reassess the efficacy of the strategies used and possibly consider a different one entirely if prompted by the irreparable degradation of the original invariable equipment or the loss of vital expertise through the death of the artist or their collaborator. However, these three institutional examples represent a current and ongoing paradigm shift in what it means to preserve art, that is, through its use of technology that rapidly degrades and becomes outdated, more ephemeral than traditional mediums. Ultimately, the validity of each conservation strategy lies in its ability to navigate the delicate balance between preservation and exhibition, functionality and historicity, and authenticity and variability. Through continued research, documentation, and adaptive strategies, institutions can successfully navigate the challenges posed by time-based media artworks, ensuring their longevity and accessibility for future generations.

6 EDITOR'S NOTES

This article was peer-reviewed.

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Appendix A

List of Strategies for the Conservation of Display Equipment from Pip Laurenson's "The Management of Display Equipment in Time-Based Media Installations" (2004)

1. Acquiring spares to repair the original unit or substituting the failed unit with the same make or model. This maintains the integrity of the work on all counts except for any work explicitly designed to be ephemeral. This strategy is the closest to traditional conservation practice in that it preserves the link to the meaning of the work by preserving the identity of the physical components. Success is easy to evaluate – if the same equipment is used then (if all other conditions for installation are adhered to) no loss will occur. This strategy is only an option for the time spares are available.
2. Making new components or modifying another piece of equipment to match what was considered significant about the failed equipment. For example, putting a modern mechanism into an original casing. When considering this strategy one should bear in mind the risk of undermining the spirit of the work if the technology is intended to be transparent and uncontrived.
3. Recreating significant features by inexact substitution perhaps by an item of equipment using the same technology or producing the best match of measurable outputs (quantifiable in terms of dynamic range, resolution, brightness etc.).

Appendix B

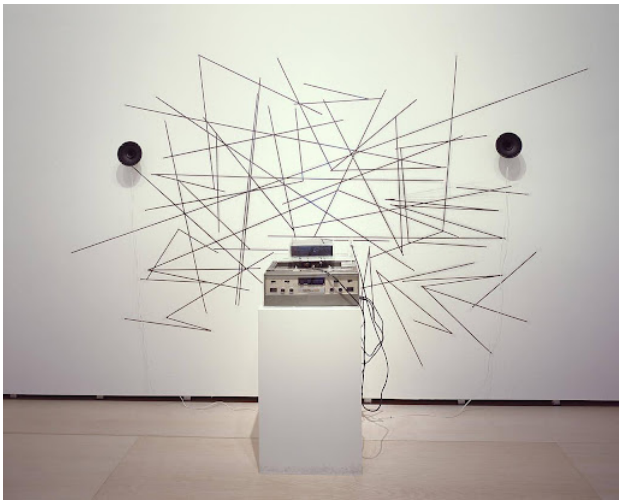

Figure 1. Nam June Paik, *Random Access*, 1963 (2000 version), strips of audiotape, open-reel audio deck, extended playback head, and speakers, dimensions vary with installation, Solomon R. Guggenheim Museum, https://www.guggenheim.org/artwork/9536.

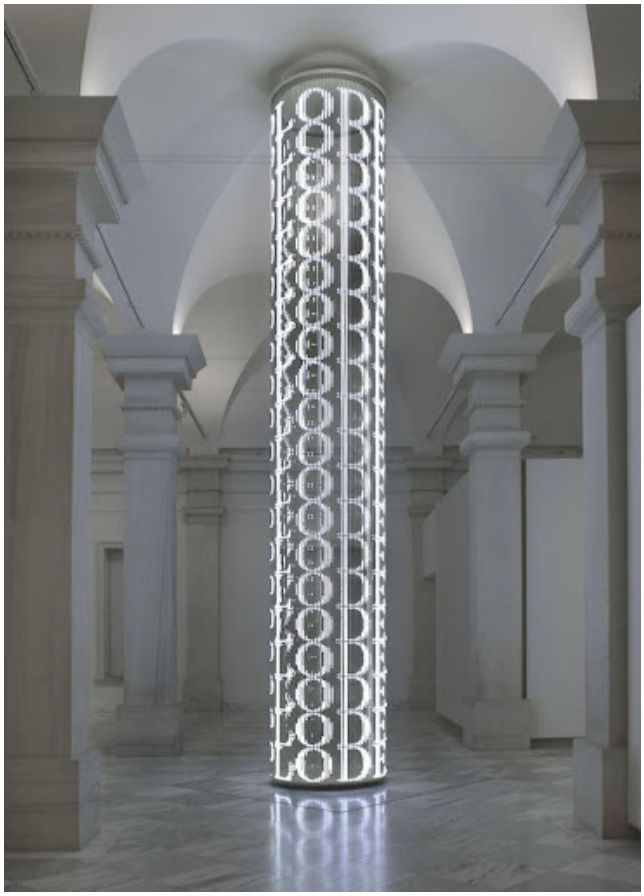

Figure 2. Jenny Holzer, *For SAAM*, 2007, electronic LED array with white diodes, 336″ x 48″, Smithsonian American Art Museum, https://americanart.si.edu/artwork/saam-76771.

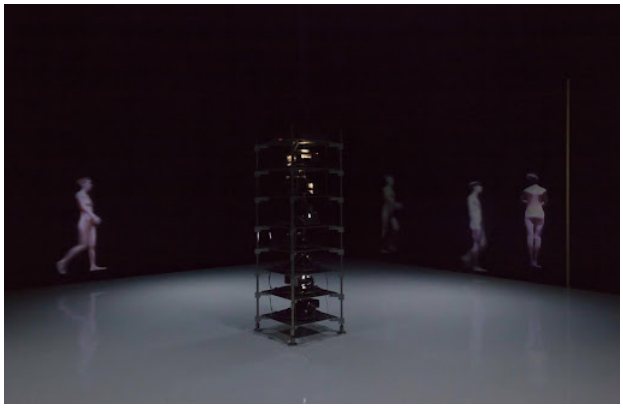

Figure 3. Teiji Furuhashi, *Lovers*, 1994, Computer controlled, five-channel laser disc/sound installation with five projectors, two sound systems, two slide projectors, and slides (color, sound), 32′ 10″ x 32′ 10″, The Museum of Modern Art, https://www.moma.org/collection/works/8136.