# Documenting the Ephemeral: Strategies for Preserving Early Internet Art

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## Abstract

The Internet has become one of the primary mediums for contemporary art, yet early Internet-based artworks from the 1990s and early 2000s pose major preservation challenges. Many of these works were inherently ephemeral, designed to exist temporarily or change over time. Additionally, they were created using early web technologies that are now obsolete or incompatible with modern browsers and systems. This paper examines strategies and case studies to preserve early Internet art in a way that maintains its essential experiential and conceptual characteristics. It discusses emulation techniques that recreate obsolete software and hardware environments. It also investigates the migration approaches that update the technical underpinnings of work to function on contemporary systems. Documentation methods such as videos, screenshots, and code archives are also considered. The paper analyzes the attempts by organizations like the Rhizome ArtBase, the Variable Media Network, and individual artists to preserve seminal early Internet artworks like Olia Lialina's *My Boyfriend Came Back from the War* (1996) and MTAA's *1 Year Performance* (1996-1997). It assesses successes, failures, and ongoing challenges. Finally, the paper proposes an integrated approach that combines emulation, migration, and documentation strategies. It argues that a multipronged preservation methodology is essential for retaining early Internet works' technical functionality and conceptual essence. The paper aims to provide strategies and principles for archiving a seminal but endangered area of new media art.

## keywords

Archiving, Internet art, ephemeral nature, preservation and documentation, digital art

## Introduction

The emergence of the Internet in the 1990s opened up new frontiers for artistic experimentation and expression. As pointed out by Frank Rose (2016) [15], "In the early days of the web, art was frequently a cause, and the internet was an alternate universe in which to pursue it" (Rose, 2016) [15]. Early Internet artists embraced the web as an interactive, participatory medium that allowed them to create innovative and pioneering artworks that challenged traditional notions of authorship, materiality, and temporality [6]. Many of these seminal Internet art projects from the first two decades of the Web, such as *My Boyfriend Came Back from the War* (1996) (see Figure 1) [12] and MTAA (M.River & T.Whid Art Associates)'s *1 Year Performance* (1996-1997) (see Figure 2) [19], were designed to be ephemeral, existing temporarily or changing over time. Additionally, they utilized early web technologies like Flash and HTML, which have become obsolete, thus making it challenging to preserve the artworks made with these technologies. As a result, preserving and documenting early Internet art in a way that retains its experiential essence and conceptual impact has become a significant challenge [2, 5, 7]. It provides a lens to explore the tension and relationship between early Internet art and today's counterpart.


Figure 1: My Boyfriend Came Back From the War, 1996, Olia Lialina.

As mentioned above, early Internet art presents challenges, such as being outdated and temporary, thus making it difficult to preserve. The art forms created in these periods laid a foundation for developing digital art in the new century. In Omar Kholeif's (2023) [9] book Internet Art, he highlights the impact of Internet art on today's art, including digital art: "Hence why the book is titled Internet 'underscore' Art, because the Internet underscores every facet

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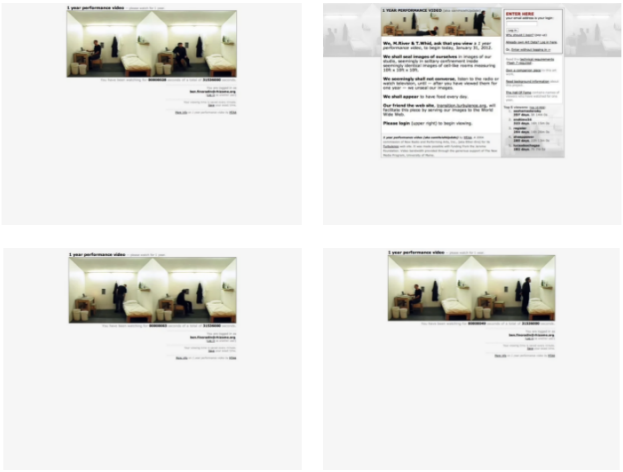

Figure 2: 1 Year Performance, 1996-1997, MTAA (M.River & T.Whid Art Associates).

of how we consume, digest, and produce visual culture today" (Kholeif, 2023) [9]. Its latter forms continue to explore certain subject matters and continue some of the unique features of the Internet as a medium. This progression has made many artists realize that the Internet was no longer just a tool for communication and information but an essential means of artistic creation [14]. There has been some technical and metaphysical distance from today's vantage point looking back on the early Internet, and it might appear primitive, plain, and even naive compared to the 5G technology that we are familiar with today. However, that does not disavow the historical value of it as a powerful medium and any possible preservation efforts. Specifically, the research question emerges: How can we archive previous Internet art in a way that not only documents it as crucial information but also rediscovers its potential for rethinking what defines art and what art can do?

Researchers must find methods and strategies different from art-making to overcome this problem. Against this backdrop, this paper examines the approaches to preserving early Internet art of the 1990s and introduces case studies to illuminate today's implementation. Quintessentially, the challenge of preserving early Internet art varies, but it can be understood from the following aspects: technological obsolescence, ephemerality, originality, and artist involvement. Based on these factors, this paper provides a new framework for preserving early Internet art while reading it alongside today's digital art. As our research objective, this paper strives to facilitate artists, administrators, and archivists in their thinking and working around this subject.

## Background

The birth of net art (also known as Internet art, although net and Internet can mean different stages and entities in the early days with the prefix "Inter" as a development in the interconnectedness) can be traced to the early 1990s with the increasing accessibility and prevalence of the Internet, especially the World Wide Web [4]. Net artists embraced the interactive nature of the nascent web, using it as both a creative medium and a means of distribution. Many seminal net artworks were designed to evolve or disappear over time, intentionally challenging notions of permanence and the art object [3]. For example, Dutch-Greek artist Mouchette created a 1996-born provocative e-persona that periodically "committed suicide" [6]. Other net artists like Heath Bunting created early locative works using mapping technologies.

In addition, ASCII transcoded art was an early form of Internet art, with the American Standard Code for Information Interchange (ASCII)developed in the early 1960s as a collaboration between government officials and corporate technicians [20]. As *Spying at the Wall* exemplified, ASCII-based art peaked in the 1980s, mainly on Usenet. The type of artwork is characterized by using underscores of varying lengths and the letters m and o [1]. A representative example is *Deep ASCII* (1998) (see Figure 3), a collaboration between Vuk Cosic, Luka Frelih, and Walter van der Cruijsen, based on the erotic movie *Deep Throat*. The 63-minute work is visually striking, with the characters moving across the screen in green [2].

Certain features of early Internet art stand out. The first feature is the fuzzy boundary between art and technology. In the early days of the Internet, there was no clear boundary between art and technological features. According to Rose (2016) [15], it was unclear when people saw a system glitch whether what they were looking at was art or a broken web server (Rose, 2016) [15]. This feature imbued the early Internet art with an anti-commercial potential. It opened up the space for creative intervention, which can be seen in Miao Ying's work *Chinternet Plus* wherein the full image of Mao Zedong failed to load, only revealing the iconographic forehead of this provocative symbolism, positing as a liminal space which straddles between political art and technological accident. However, it creates the problem of deciding which elements should be regarded as artistically relevant and thus preserved.

Another feature of early Internet art lies in its mode of organization and communication. As the name of Rhizome, an important online archive of early Internet art, also vividly indicates, early Internet art reflects "a horizontally distributed, non-hierarchical network" compared to today's digital world, which is often monopolized by capital and power (Rose, 2016) [15]. Early Internet art is thus idealistically horizontal.

Additionally, according to Gobira and Mucelli (2017) [18], Internet art is often developed through co-authorship that mirrors contemporary art's interactivity and plurality (Gobira & Mucelli, 2017, p. 346) [18]. Specifically, many projects emerged through the artist collaboration and public participation in the works, which can also be dynamic

[1]Early Web Art II: The Art of ASCII Transcoding, https://mp.weixin.qq.com/s/4hFaZZ5Hj0aWgLZMK5Yz_w, Accessed on September 20, 2023.

[2]Deep ASCII, https://postmastersblockchain.com/deep-ascii/, Accessed on September 20, 2023.

and generative, possessing personal and social values (Gobira & Mucelli, 2017, p. 346) [18]. Coauthorship should be reflected and carefully dealt with in preserving Internet art of this type.

The last feature is the dichotomy and reciprocity between the software and hardware. In making, presenting, and even preserving any Internet-based art, "The files don't mean anything without the browser," and "the browser doesn't mean anything without the computer" (Rose, 2016) [15]. Preserving only one aspect isolated from the other does not bode well with their mutual reliance. Wendy Chun (2006) [10]compares software to ideology by analogizing how software relates to hardware to how humans relate to the world and state through an invisible yet powerful system of ideas (Chun, 2006) [10]. However, the relationship between software and hardware is lost in the process, which requires more effort and attention.

One final feature of Internet art is its impermanence, its nature of perishing in a relatively short period. According to Gobira and Mucelli (2017), "the theme of ephemerality in the arts, especially in contemporary art, is a constant debate on aspects of preservation, exhibition and memory" (Gobira & Mucelli, 2017, p. 345) [18]. This ephemerality should be considered part of the global challenge of preserving contemporary and modern art. Depocas et al. (2004) [5] observe that "the perishability of classic media such as film, the upheaval in new broadcast media, the near-ubiquity of the Internet, the explosive growth of digital media in a constantly evolving environment challenges us as we seek to preserve the original artworks" (Depocas et al. [5], 2004 as cited in Albuquerque, 2019, p. 2:1) [1]. The resolution of this ephemerality entails the twofold conception of digital art as an organic whole of software and hardware.

The interactivity of early Internet art should also be considered. On the one hand, this interactivity is subject to impermanence, making the old interaction experience irretrievable. On the other hand, this ephemerality opens the door to "a defence of poor images" (Steryl, 2009) [17]. The inevitable loss of resolution and data as images travel through networks and the failures of preservation challenge the value system of art, which prioritizes and cherishes authentic and original works within a static and restrictive frame, forestalling the liberation of marginalized and experimental artworks (Steryl, 2009) [17]. Consequently, the migration and degradation of images and data can open up a new form of interaction. For example, the ACGI communities gather around the autotunes and remixes of earlier images, videos, and music as a creative way of individual expression and community-making through sharing and collaboration.

In retrospect, the unique characteristics of early Internet art seem to have given way to a more bleak view of preservation. Nevertheless, we should always regard this difficulty as a double-edged sword. It is not only a challenging but also a liberating and enabling process to help us better understand digital art today.

Therefore, developing thoughtful strategies to retain both the technical elements and the artistic relevance of early Internet artworks is critical for making and keeping this crucial part of digital art history accessible to future generations.

Figure 3: Deep ASCII, 1998, video, running time 59 minutes, Vuk Cosic, Luka Frelih, and Walter van der Cruijsen.

The following section identifies the common challenges in preservation and reviews previous literature on preserving net art and related new media arts to corroborate and examine these challenges.

## Common Challenges

Some common challenges in preserving early Internet art include but are not limited to the following aspects.

**Technological obsolescence**, Early Internet art was created using software, platforms, and coding languages that are outdated and incompatible with contemporary systems. Plugins like Flash and Shockwave, programming languages like HTML 1.0, and operating systems like Windows 95 cannot run properly on most computers in today's market.

**Ephemerality.** Many early Internet artworks were intended to be temporary, performative, or constantly evolving. Preserving the ephemeral essence of works meant to disappear or change over time poses conceptual challenges.

**Interactivity.** The interactive and participatory nature of early Internet art is difficult to preserve for an audience decades later. The original experience of clicking through links or making user-generated content is challenging to recreate.

**Documentation.** There was a lack of detailed documentation like screenshots, videos, and code archives when many seminal Internet artworks were created. Important contextual information was not captured or maintained by a universal standard.

**Hardware dependency.** Some works relied on specific hardware that is now obsolete. Requiring outdated monitors, input devices, or peripherals limits the ability to reconstruct the works accurately.

**Artist participation.** The artists who created the works are sometimes unavailable or unwilling to help preserve their art. Their guidance and permission are often needed for constructive preservation.

**Intellectual property.** The rights management, intellectual property, licensing, and rights ownership for early Internet art can create nebulous issues. This creates legal barriers

for archivists to preserve these works.

## Related Work

There has been a sizable body of scholarship on preserving digital art in general. Still, little has been spent on early Internet art despite the challenge and significance of this subject. The most direct approach to preservation so far is establishing online archives. However, it is never as simple as turning everything digital and filling the infinite rooms of the Budapest Hotel. Preservation is not merely "a matter of uploading old computer files," especially when considering the unique features of early Internet art (Rose, 2016) [15].

For preserving the digitally-born art, Albuquerque (2019) [1] also recognizes the challenges by highlighting the issues of sustainability and data loss (Albuquerque, 2019, p. 2:3) [1]. In addition, Albuquerque (2019) [1] observes "two predominant approaches for preventing the physical decay or the obsolescence of digital media: Migration and emulation" (Albuquerque, 2019, p. 2:3) [1].

Specifically, migration is the transfer of tangible material to digital data. By contrast, emulation "aims to simulate a certain digital environment that a digital object needs to be accessible" (Albuquerque, 2019, p. 2:3) [1]. The two approaches can be further subsumed under the "four strategies for preserving digital art – documentation, migration, emulation and re-creation" proposed by "a 2002 conservation project called 'Archiving the Avant Garde: Documenting and Preserving Variable Media Art,' a set of guidelines was offered to document and preserve media art" (Albuquerque, 2019, p. 2:3) [1]. The issues become trifold: the sense of loss in the process of emulation, the difficulty in maintaining "the integrity and quality of the medium through which the artwork will be read or played, as well as the devices where original artwork is located" (Serexhe, 2013) [16], and the different positions between artist and institution regarding aesthetic presentation (Albuquerque, 2019, p. 2:4) [1].

Albuquerque's (2019) [1] approach to preserving early Internet calls for the active participation of media artists themselves to take on the job of preserving their old work while appealing to institutions and curators to respect and prioritize the artist's intent, as the essential subject for preservation (Albuquerque, 2019) [1]. This position also echoes Devon Mordell's (2020) [8] calling for "developing the capacity of media artists to preserve the works they create, then – such as determining which file formats are deemed to be archival, how often to refresh digital files, what metadata ought to be captured and so on," because self-preservation is difficult but necessary and most efficient (Mordell, 2020) [8]. This change can be achieved by "embedded librarianship" in institutions and aligning preservation directly with creation, instead of as two separate fields and tasks. Moreover, it is also crucial to treat the database as "a culture of its own" and activating the agency of database by channeling "unprecedentedly vigorous energy of art into our archival display with new technologies of data restoration and presentation" (Chiu&Yeh, 2020) [8]. This approach builds on Albuquerque's emphasis on migration and emulation, arriving at the fourth strategy, "re-creation" as Albuquerque briefly mentions but does not articulate.

According to Gobira and Mucelli (2017) [18], "re-creation" is the re-creating of the old work as part of the preservation (Gobira & Mucelli, 2017, p. 347). As "one of the most intrusive possibilities in the process of preservation and memory, in the sense of reviewing," re-creation "will produce a new context, a new work of art and maybe a new critical narrative" (Gobira&Mucelli, 2017, p. 347) [18]. This approach seems to rely on a new contextualization of the old material, thus connecting the original artist's intent with a contemporary space. Information should not be organized merely by practical standards but in a way that allows new interpretations of realities, social memory and access, and the role of the community in processing and organizing information (Gobira &Mucelli, 2017, p. 344) [18]. Hence, it is desirable to "carry out initiatives" that encourage open-end "exchange of content in a constructive and complementary way" and reflect the triad relationship of "art artist-work-public" as object and information (Gobira&Mucelli, 2017, p. 349) [18]. This position expands on art preservation's mechanic and administrative nature by relating information to community, memory, and storytelling.

Based on the previous scholarship, we are led to move toward a balanced approach combining emulation and migration with the artist's intent and capability of preserving their art and the institutional position of information management. The following case studies examine and expand the abovementioned approaches and engage artists and institutions in this process.

## Case Studies

These examples in the following sections showcase the importance of emulation, migration, documentation, and artist involvement in successfully retaining the functionality and intent of seminal early Internet artworks. They provide models that can guide the preservation of other endangered pieces from the early era of net art.

### Web-Based Archiving and Re-exhibition of Early Internet Artworks

Firstly, documentation is the most fundamental to all approaches. Documentation is a comprehensive archive of an artwork's appearance, functionality, and intent, including user interactions, screenshots, code, and related commentary. Documentation of an early web art project might include how it appears in different browsers, a video of how users interact with it, and an artist's explanation of their process and intent. The most typical example is Rhizome, an online platform that documents Internet art chronologically based on periodizations like "post-bubble" and "pre-bubble", emphasising the completeness and diversity of artwork-related information. However, it does not differ principally from the traditional method of digitizing physical artworks in platforms like Artstor.

*My Boyfriend Came Back from the War* (1996) (see Figure 1) is a typical example of emulation. This seminal hypertext fiction piece by Russian net artist Olia Lialina was restored and re-exhibited by the Rhizome ArtBase using emulation and support from the original artist. The Rhizome Art-

Base saved this artwork. The process of archiving this artwork in Rhizome ArtBase indicates the complexities of preserving digital art. Although the Rhizome ArtBase demonstrates progress in digital art preservation because it relies on previous Internet technologies, there are many challenges when protecting it. For example, technological obsolescence means Rhizome ArtBase faces the challenge of continuously updating its preservation methods to ensure the accessibility and functionality of artworks as technology evolves; limited scope and selection bias means that when collecting the early Internet artworks, Rhizome ArtBase might not represent the full spectrum of digital art, as subjective criteria or logistical constraints could influence the selection process. This could lead to a certain bias in the archive, favouring particular styles, regions, or artists. In summary, the emulation by the Rhizome ArtBase poses fundamental questions about the relationship between the original artwork and its archived version, offering a compelling example of the intersection of art, technology, and preservation.

Documenta X (1997) (see Figure 4) is another example of emulation. The work is the last document of the twentieth century, directed by a woman, the French curator Catherine David. The net art and painting selections from this exhibition were archived and accessed through emulated historical browsers by the Documenta Institute [3]. Although online websites make the archived results openly accessible, the accuracy of information and images can be a looming issue resulting from the inevitable data loss in emulation because certain visual information might only be palpable and accessible through the original formats.

Migration is often intertwined with emulation, but a typical example is the Oldweb website. It is an intriguing example that opens up a porthole for time travel and fully displays the elements endemic to the early Internet but is now lost or embedded. It has a nostalgic but critical undertone to this open-access portal that can lead visitors to other archives in a full-blown early-2000s fashion. By migrating the old content and, most importantly, the senior user experience to the website, where the surfing mode can be chosen between Internet Explorer 5.5 and Safari 2024, it is not just an archive. Still, it is as much an inter-archive as a search engine and an artwork per se.

## Reviving Early Internet Artworks from Institutions

Museums and other art organizations are also crucial in preserving early Internet art based on migration and re-creation. For instance, Mark Hansen and Ben Rubin's interactive audio-visual installation *Listening Post* (2002–2006) (see Figure 6) was carefully documented and migrated to new hardware and software environments by the artists and the Guggenheim Museum. This installation is based on several small screens; there were about 231 electronic displays (11 by 21), enabling real-time communication. Transitioning to new technological platforms and environments could allow the *Listening Post* (2002–2006) to make meaning through intermedia comparison, exposing the challenges of hardware

[3]Documenta X, https://www.documenta.de/en/retrospective/documenta_x. Accessed on September 20, 2023


Figure 4: Documenta X (1997), Arnold Bode, cited by https://www.documenta.de/en/.

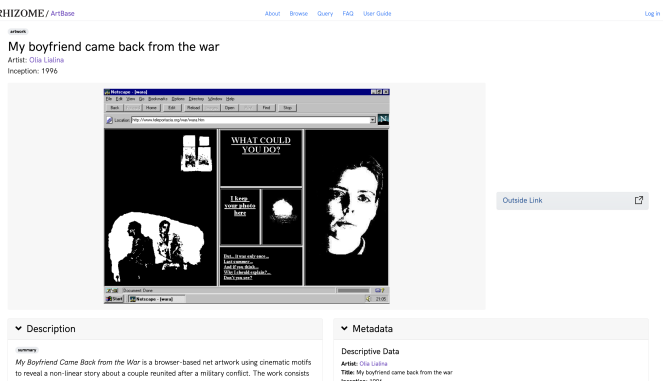


Figure 5: Rhizome ArtBase, My boyfriend came back from the war, Artist: Olia Lialina, Inception: 1996.

obsolescence and software compatibility and their implications in a post-Internet epoch. This act ensures the original artwork is re-shown in a contemporary context. It also brings about a new discussion on how the work changes regarding the artist's intent and new technology. This question is the critical challenge for the migration and re-creation approaches.

Artist involvement is also essential in preserving such a conceptual form as early Internet art. For example, *Teleporting an Unknown State* (1994/1998) is a participatory project by Indian artist Shu Lea Cheang (see Figure 7), and it was preserved through detailed documentation and collaboration with the artist at the Guggenheim. This installation confronts the question of the life of the Internet; in other words, it explores whether the Internet can support the life of an artwork based on digital participation. It breaks the inherent physical limitation and overcomes the spatial distance of remote Internet users [4]. In Shu Lea Cheang's (2001) [13] opinion, this work generated a new sense of community and collective responsibility without the need to exchange any verbal in-

[4]Teleporting an Unknown State, https://ekac.org/teleporting_%20an_unknown_state.html. Accessed on 20 September 2023

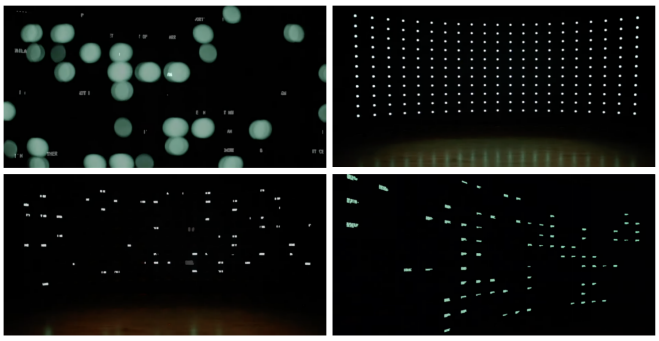

Figure 6: Listening Post, audio-visual installation, Mark Hansen and Ben Rubin, 2002-2006.

formation [13]. For such a work, the Guggenheim must obtain the artist's agreement and, most importantly, understand the artist's expectations. For instance, if this artwork relies on 1990s Internet technology, which influenced the original work's perception and interactive method, then ensuring that the technology and preservation approach align with the work's original spirit and functionality becomes essential.

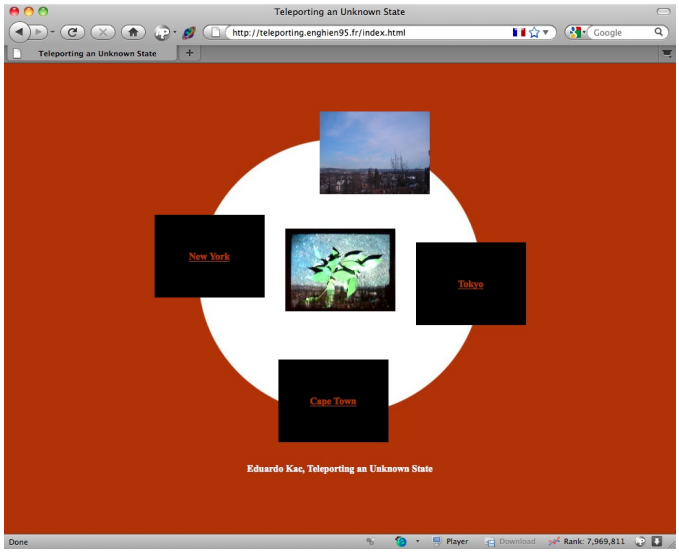


Figure 7: Eduardo Kac, Teleporting an Unknown State, 1994, plant, Internet, wood, webcam, video projector (web interface). Edition of 2.

## The Re-presentation of Early Internet Artworks via Other Agency

There are also other examples of migration and re-creation from institutions. *Hell.com* (2000) is a collaborative online narrative project acquired and re-launched by the Walker Art Centre, working closely with artist Ada'web. Hell.com was an enigmatic and exclusive digital art platform known for its avant-garde and secretive nature. It functioned as an invite-only online space, showcasing interactive and often abstract

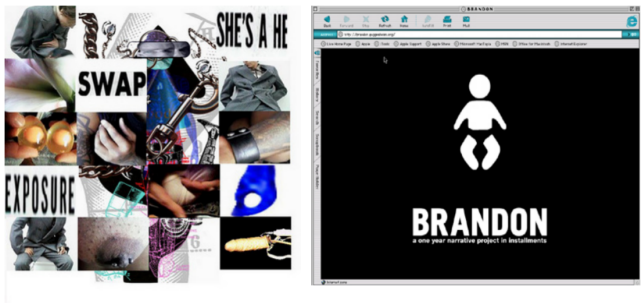


Figure 8: Shu Lea Cheang, BRANDON, 1998 – 1999

digital art. Although Walker Art Centre re-launched this project, the biggest challenge is the legal and ethical considerations. In particular, the original website is an invite-only space; issues around copyright, user rights, and privacy may emerge in its re-launch regarding the criteria for an invitation.

Netherlands Media Art Institute (NIMK) [5]is a pioneering institution that has preserved and re-exhibited early net art through emulation and artist participation [11]. Emulating the original format as closely as possible and actively involving artists in decision-making allows viewers to experience Internet art as initially intended, preserving the artwork's authenticity through reconstructing the experience and upholding the artist's authorship. However, the limitation of NIMK is also related to emulation since this method is complex and resource-intensive. Hence, the sustainability of this approach will be highly contingent on specialized knowledge and financial sponsorship.

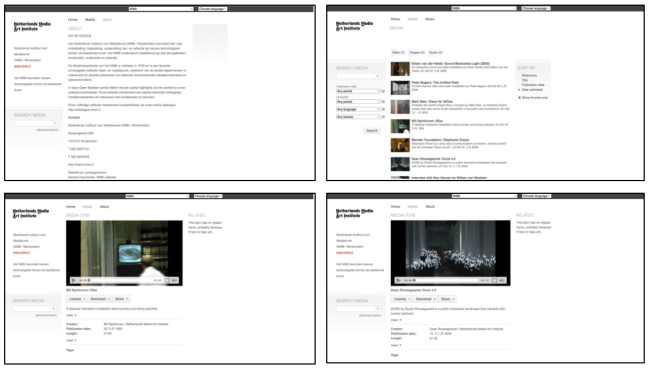

Figure 9: Netherlands Media Art Institute (NIMK), 1978

## Methodology

As the Related Work indicates, we can identify four significant strategies from the previous scholarship and practice of preserving Internet art: migration, emulation, and re-

[5]Netherlands Media Art Institute, https://nimk.openbeelden.nl/about. Accessed On 23 September 2023

creation, alongside documentation. However, this quadruple framework can be further expanded or dissected through the specification of each strategy. Although both artists and institutions we examined in the Related Work section have followed the four strategies interchangeably, they preserve their works based on either artist intent or institutional concerns such as public access, community engagement, fiscal issues, and other conceivable factors. As these factors vary, the specific implementation and prioritization of the strategy varies accordingly. To expand on this quadruple framework, we have used case studies to show that only a hybrid and dynamic framework can resolve the specific shortcomings of each approach.

The case studies above also lead us to see the challenges comprehensively and contextualize them in different scenarios. Through web-based archiving, museum re-creation, and artist involvement, we find it most important to balance the strategies organically but also manage them in a way that speaks to the specific artist and institution. This synergy and specification is the key to expanding on the original framework while keeping early Internet art in a dynamic dialogue with a post-bubble world and digital economy.

## Framework for Preserving Early Internet Art

Each of these approaches has its merits and limitations. Combining these approaches helps offset the limitations of individual approaches, while a profound knowledge of when and how these approaches should be used to achieve an ideal result is indispensable. In addition, the following are some other preservation strategies that can be utilized in addition to the discussed ones for further consideration, although some may be regarded as variations.

**Encapsulation.** Bundling the original software dependencies and operating environment along with the artwork files into one self-contained package means that, although the original environment will no longer be used, the work will run on contemporary systems. Imagine one scene: an early 3D animation artwork runs in a specific system. Now, we can establish a new virtual machine that includes a generation system, graphic software, and the original artwork. One thing should be considered: the program and context must be included to avoid compatibility issues.

**Reinterpretation.** This involves inviting contemporary artists to reimagine important works, retaining the conceptual essence but updating technologies. This results in a "version" rather than authentic reproduction. An artwork focusing on the early Internet can be reinterpreted as a new work reflecting the present net communication phenomenon, such as the artwork concentrating on the 2000s chat room. This strategy's core is coordinating with the original artist and maintaining the original work's concept.

**Annotation.** Ask the original artists to provide insights into meaning, technical structure, optimal display parameters, and links between projects to guide preservation. For example, in the artwork *BRANDON*, the artist could explain their perspectives on the evolving nature of digital communication and privacy. This understanding helps preservationists maintain the integrity of the artwork's message during preservation. For optimal display parameters, the original artists can offer guidelines for displaying their work, including screen resolution, colour settings, sound levels, and interactive components. With the artist's participation, preservation efforts can be more accurately aligned with the original vision and purpose of the artwork. This ensures the preserved piece remains true to its initial technical and artistic conception.

**Virtualization.** It executes legacy software and environments within contemporary operating systems using virtual machines. This replicates older computer systems. Using tools like VMware or VirtualBox, art software that can only run on outdated operating systems is virtualized to run on contemporary operating systems. Virtualization allows for the simulation of the original software environment, enabling the artwork to function as intended on modern systems.

**Digital Archaeology.** They studied Internet art using data science techniques to reconstruct lost elements like deleted sites, unusable links, missing assets, etc. They also used this method to rebuild a disappearing online art gallery. Firstly, people used web archiving and data recovery techniques to gather information, then contacted original artists and users to acquire further information. Using the collected data, people began reconstructing the gallery's user interface. Finally, the public could access the website and look at the previous artworks.

**Crowdsourcing.** They are leveraging the public's help to collectively provide missing details on poorly documented artworks that may have been widely experienced. An example is the restoration and reconstruction of an early web art exhibition. Due to technological obsolescence and a lack of formal archiving, many details of the works were lost. To reconstruct this exhibition, people can use crowdsourcing, inviting the public who have experienced the exhibition to share their memories and archives; these data also come from original artists. This process revived a once-lost digital art space in a new form. This represents the preservation of digital art history and the respect and celebration of cultural heritage.

## Implementation and Challenges

In deploying the strategies above to represent and preserve early Internet artworks, old and new issues arise and deserve our attention:

**Technological Obsolescence.** Both emulation and migration require bridging the gap between obsolete platforms and modern systems. Future obsolescence needs to be continually addressed. That means emulation and migration are not one-time solutions and must be updated continuously. At the same time, it needs solid and sustainable support of technology, specialized knowledge, and other resources. The author recommends establishing a professional technology team that includes artists, engineers, and technologists to keep technology sharp and up-to-date.

**Loss of Authenticity.** Strategies like reinterpretation, simulation, and migration can produce an experience that may deviate from the original concept. While this can make the artwork more accessible or relevant to modern audiences, it can also alter the original message or context the

artist intended in a reductive manner. For instance, updating the visual elements of an early Internet artwork to align with current aesthetic standards might shift the piece's original impact or significance. The involvement of original artists, detailed documentation, public engagement, critical analysis, peer review, and other methods can address this problem.

**Cost Management** Many strategies like migration, emulation, and virtualization require extensive technical development work to be feasibly implemented, which can be costly. Therefore, cost management is critical. Alternatively, archivists can seek grants specifically aimed at digital preservation. Many cultural preservation funds and technology grants focus on preserving digital art and heritage. Another approach is crowdfunding, and public donations can also be a source of funding, especially for high-profile or culturally significant projects.

**Documentation deficit.** When employing various strategies to represent and preserve early Internet artworks, a significant challenge often encountered is the deficit in documentation. This lack of comprehensive records about some artworks' technical structure, appearance, and intent can make their preservation incomplete or inaccurate. One solution is to interview artists or the debut institution to capture their recollection of their work's technical details, appearance, and intent.

**Rights Issue.** Obtaining rights and permissions to preserve and exhibit proprietary software environments and artworks can be challenging. The rights come from the following aspects: proprietary software or platforms, artist agreements, and artwork permissions. Hence, people will try to negotiate with software companies or rights holders to obtain permission for use in preservation. Legal experts who are related to property and copyright areas also need to

**Artist Participation.** When representing early Internet artworks, artists can be unavailable or uninterested in assisting with preserving their early works, and their input is often invaluable. This phenomenon is because they might have passed away, stopped their artistic activities, or cannot be located and found. Facing these difficulties, people find other resources to replace some work, such as past reviews, interviews, exhibition catalogues, and any materials related to the artwork. Encouraging artists to participate also plays a vital role; a consensus between the archivist and the artist(s) should be pursued regarding the significance of rebuilding this work. When artists agree to participate in the preservation, connection and communication appear explicitly necessary.

**Audience Experience.** Early Internet art was created in a technological and cultural context vastly different from today's digital landscape. The hardware, software, and internet capabilities of that era influenced both the creation and the experience of these artworks. Modern audiences, accustomed to high-speed internet and advanced graphics, may not fully appreciate early digital art's nuances (which might appear as limitations). The early Internet had its own culture, aesthetics, and user practices, which were integral to understanding the artworks from that period. However, a lack of context about this era can lead to a disconnection for the audience, potentially resulting in a superficial or misinformed interpretation of the artwork.

**Performativity and Tolerance** Within the inevitable process of data loss, despite any possible preservation efforts, there should be reasonable tolerance for the natural decay of any artwork, even if it only consists of a pile of data. Based on this tolerance, archivists should actively engage the Derridean power of "archiving" in a way that constructive and critical performativity can spawn from this natural process of decay as part of the artwork just as a fissure enriches the interpretative possibility of Duchamp's *The Bride Stripped Bare by Her Bachelors, Even*. In this way, archivists should recognize and use this performativity by letting archiving become a performance and by allowing certain meanings and communities to form around the "imperfect preservation" so that early Internet art is not just a canonical absolute but a constructive element of contemporary visual culture.

The limitations inherent in each preservation strategy must be carefully weighed, given the specific needs and challenges of preserving the artwork. A combination of approaches is often recommended.

## Conclusions

To encapsulate, this paper begins with the development of Internet art and continues to explore the preservation of early Internet art. It recognizes the value of preserving this art form by heeding the unique features of early Internet art, especially its earlier state. Confronted with a multitude of common challenges of preserving early Internet art, including ephemerality, interactivity, documentation, hardware dependency, artist participation, and rights management, we find from previous scholarship and practice the efficacy of the quadruple framework of documentation, migration, emulation, and re-creation. Through the following case studies, we examine the variations of this framework and attribute their limits to the inherent issues arising from the oversized emphasis on one aspect instead of a more synthetic consideration. To account for the limitations partially highlighted as technological obsolescence, cost, correct issues, and more, we propose expanding on the quadruple framework by tailoring each aspect to the artist's intent and reaching out to other elements at stake. This paper is in no way an exhaustive survey of all preservation approaches to early Internet art regarding the complexity of this genre. However, this paper mainly proposes a hybrid and flexible framework combining all the discussed approaches based on the specific situation. Nevertheless, when and how these approaches should be combined will be left for future scholars and artists to contemplate. In addition, as a qualitative study, the lack of quantitative data can also be complemented by future projects that can evaluate these approaches on a numerical scale.

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