WRITING THE HISTORY OF THE FUTURE:
ZKM AND THE CULTURAL WORK OF MEDIA ART CONSERVATION

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Glossary

The following technical terms are used throughout this thesis without explicit explanations.

Adobe Flash **Macromedia Flash**	A multimedia software platform, widely used for animations, and interactive web applications in the 2000s, before being made obsolete in the 2010s.
Apple II	A series of personal computers manufactured by Apple Computers Inc from 1977 to 1993.
Beta (Video) **Betamax**	A consumer analogue video cassette recording format introduced by Sony in 1975 as a rival to VHS
Betacam **Beta SP** **Betacam SP** **DigiBeta** **Digital Betacam**	A family of professional videocassette products developed by Sony as a successor to U-matic, not to be confused with the consumer Betamax format.
CED **Capacitance Electronic Disc** **Videodisc**	A commercially unsuccessful analogue video disc playback system developed by Radio Corporation of America (RCA).
CP/M **Control Program/Monitor** **Control Program for Microcomputers**	An operating system developed in 1974, for 8-bit Intel 8080/85-based microcomputers, capable of organising files on a magnetic storage medium, and executing programs.
CRT **Cathode Ray Tube** **Picture Tube**	A display technology based around a vacuum tube containing electron guns which emit beams that are manipulated to display images on a phosphorescent screen.
CV-2000	One of the world's first home video tape recorders, introduced by Sony in 1965.
DAT **Digital Audio Tape**	A tape based digital signal recording and playback format introduced by Sony in 1987

DVD **Digital Video Disc** **Digital Versatile Disc**	A digital optic disc data storage format, first released in 1996.
Emulation	Usage of software or hardware that allows one computer system to mimic the behaviour of another. Emulation may for instance be used to imitate the functions of an obsolete operating system on a contemporary one.
Floppy **Floppy Disk** **Floppy Diskette**	A type of magnetic disk storage in a square-like plastic enclosure, commonly used in computer systems from the 1970s onwards in 8-inch, 5¼-inch and 3½-inch sizes.
Game Paddle	A type of game controller with a round wheel (potentiometer) rotating at a fixed arc with a stop at each end.
Hardware (Computer)	The physical components that make up a computer, such as internal components like the CPU (processing unit) and peripherals like a monitor, mouse, keyboard.
Interlaced Video	A technique which combines two still images of a video frame captured consecutively in a signal as half-frames, without consuming extra bandwidth, effectively doubling the perceived framerate. Requires a display capable of showing the individual images in an interlaced signal, such as a CRT display.
LaserDisc	A home video format introduced in 1978 by Phillips, Pioneer and MCA, stores an analogue signal on an optical disc.
LTO **Linear Tape-Open**	A magnetic tape data storage technology, mainly used for archiving and backup
Magnetic Tape **Open Reel**	Medium for magnetic storage on a long narrow plastic film, first developed in 1929 and used throughout the 20th century for the storage of audio and video signals as well as computer data.
Master File (Video)	Highest quality final, uncompressed version of a video project.

MC Cassette **Compact Cassette** **Cassette Tape** **Audio Cassette**	A ubiquitous analogue magnetic tape format for audio recording and playback, invented at Phillips and first released in 1963.
Migration	Conservation of a digital artwork by updating its technical components (hardware) or adapting its source material (video material, source code).
Open Source	Software for which the original source code is made freely available and may be modified and redistributed
Pepper's Ghost	An optical illusion technique, first popularised in the 1860s, in which an image of an object is projected from a hidden location, to appear holographically in front of the observer.
Progressive Video	(As opposed to interlaced) Video in which all lines of each frame are drawn in sequence.
Reinterpretation	Conservation of an artwork by adapting its original design for presentation, for example replacing components with more contemporary ones, or adjusting space allotted for the presentation – usually done in consultation with the artist.
SD (Video) **Standard Definition**	Umbrella term for video resolution formats that are not considered high or enhanced definition, commonly 720 x 490 at 4:3 aspect ratio.
Software	Computer programs, such as the operating system, or application software running on top of it. Written instructions that can be stored on and run by Computer Hardware.
Sony Portapak	A portable, battery-powered camera and analogue video recording system introduced in 1967. Used by both amateurs and professionals, it offered a lighter weight alternative to earlier television cameras which required a special vehicle for transportation and a crew to operate.
Source Code	The textual representation of a computer program before compilation into machine instructions or interpretation by the computer.

subLOGIC A2-3D1 Animation Package	A software package for drawing 3D graphics on Apple II computers using 6502 Assembly Language.
U-matic	An analogue recording videocassette format developed by Sony, used mainly in the 1970s and 1980s, named after the U-shaped path of the tape threading around the drum of the cassette.
User Interface	The means by which a human interacts with, and operates a machine or computer system.
VCR Videocassette Recorder	A device capable of recording analogue video and audio, commonly on tape media such as VHS.
VHD Video High Density	An analogue video disc format mainly used by JVC in Japan during the 1980s.
VHS Video Home System	A standard for consumer level analogue video recording on tape cassettes introduced by JVC in 1976. The dominant home video format throughout the 1980s and 1990s.
Viewing Copy	Rendered version of a video for presentation or distribution purposes, may be compressed.
Window Manager	Software that controls the placement and appearance of windows in a graphical computer operating system.
Zilog Z80	A successful 8-bit microprocessor launched in 1976 by Zilog as a more performant alternative to the Intel 8080 and used in personal computers such as the ZX Spectrum, Commodore 128 and Amstrad CPC

Abbreviations

The following abbreviations and terms are used for brevity throughout this thesis

HfG	Hochschule für Gestaltung Karlsruhe (Staatliche Hochschule für Gestaltung Karlsruhe)
LAVS	Laboratory for Antiquated Video Systems at ZKM
Mediathek	Media library at ZKM
MUTECH	Museum and Exhibition Technical Services department at ZKM
Wissen	Department „Collections, Archives & Research" at ZKM
ZKM	Zentrum für Kunst und Medien Karlsruhe (Center for Art and Media Karlsruhe)

0. Introduction

In 1988, in celebration of the Summer Olympics held in Korea, the National Museum of Modern and Contemporary Art, Korea (MMCA) inaugurated a video sculpture created by a pioneering figure in media art, Nam June Paik. The large-scale installation, set up in Rotonda Hall of *MMCA*, Gwacheon, consists of a tower measuring 8.5 metres in height and 11 metres in diameter. The tower is adorned entirely with an impressive arrangement of 1,003 cathode ray tube (CRT) television monitors. The artwork incorporates a collection of televisions of the Korean brand *Samsung* of various sizes and ages, showcasing the diversity and rapid advancements in television technology. The partnership between Paik and Samsung established a symbiotic relationship, as both worked together to promote a modernised and globally recognised image of Korea.

Since the time it was installed, the title of the work took on a flavour of wicked irony for all those responsible for caring for the video sculpture. This was not only due to the fact that old equipment was failing, but also CRT monitors started to disappear from the market. Since the mid–late 2000's, CRTs have been superseded by flat-panel display technologies such as LCD, plasma display, and OLED displays, which are cheaper to manufacture and run, as well as being significantly lighter and thinner. This caused not only the screens themselves but also the components of CRTs to disappear from the market and go up in price. The in-house manufacturing or specialised limited production of parts has proven unfeasible, as custom component fabrication outside the industry often results in escalating costs for the components.

Originally a symbol of rapid modernisation, the installation quickly became obsolete, and the institution housing the work faced numerous challenges in its preservation. In 2003, just fifteen years after the sculpture's installation, a short circuit occurred in the internal cables due to the age of the monitors and the accumulation of dust. This resulted in the complete replacement of cathode-ray tube (CRT) monitors whit the latest models while they were still in production. In 2015, twelve years after the replacement of all monitors, "it was gradually reaching a critical point in maintaining the work's electronics, all of which had a ten-year lifespan average, through nothing more than constant repairs" (Kwon Incheol 2023, 138). At this juncture, the non-functional condition of the work became quite noticeable to the public. In March 2018, the exhibition *The More, The Better* was closed following an assessment by the Korea Electrical Safety Corporation. This was due to safety concerns relating to fire risk, as CRT screens generate a significant amount of heat. It was also reported that the installation overheated, and on occasion, there were reports of a burning odour and explosive sounds.

The examination revealed that out of 1003 TV sets, 652 CRTs were damaged and 86 were deemed un-reparable. Conservators were faced with a lot of struggles, the main one being the conservation of the display devices, which led to the question whether to keep the original CRT television monitors, or replace them with newer technology, namely LCD screens. This raised even more difficulties such as for example the issue with aspect ratio. The old Braun tube monitors had a 4:3 aspect ratio, which would be changed with a transition to LCD monitors which have 16:9 aspect ratio. Kwon Inceol, one of the restorers of *The More, The Better* conveyed that even change to LCD screens couldn't be safe, because the industry in Korea had already moved on to the next generation of display technologies, such as OLED (Kwon Incheol 2023). These were just the issues relating to

the sculptural part of the installation, additionally, video content which was played from U-matic tapes and laser discs needed to be digitised and restored[1].

The More, The Better represents some of the struggles which institutions that acquired media art in their collection face. Very soon after media art became institutionalised, it became clear that technology-based artworks have a short life span and were mainly created for the format of biennials or festivals. There are numerous questions and struggles institutions face relying on technological artworks in the future. *The More, The Better* is only one of the examples that present what theoretical and ethical questions can arise. For example: What aesthetic value do CRT screens have, and would Paik's sculptures still look authentic if the warm luminescence of CRT screens were changed to cooler LCDs, which show different senses of colour? Does the work remain authentic if any elements of the installation are replaced? What is more important: to preserve the concept or the material component of the work? Are the noise and flickering in the video intentionally created by the author, and should they be preserved too, or are they just signs of decay?

These challenges are further complicated by the nature of media art, which often incorporates elements of anti-permanence, performativity, and ephemerality intentionally aimed at critiquing institutions — particularly the museum's role as a site of historical authority. For example, In the case of *The More, The Better*, the artwork functioned as a critique of the museum as an institution that constructs and reinforces narratives of national greatness. Media art poses fundamental questions regarding the nature of art, both in its physical form and conceptual framework. Post-1960s practises have played a pivotal role in the destabilisation of traditional notions of artistic value and have profoundly influenced the development of the contemporary art landscape. These transformations had a significant impact on the development of media art, which not only embraced technological innovation but also internalised the critical discourse and conceptual shifts that emerged in the art world after the 1960s. Media art thus evolved in dialogue with broader artistic movements that questioned authorship, materiality, institutional frameworks, and audience engagement—embedding within itself a reflective, often self-critical dimension that distinguished it from earlier modes of artistic production.

Media art thus posed fundamental challenges to contemporary art institutions, one of the most radical being whether such inherently ephemeral and process-based works required preservation at all. In the interview with Michael König, Paik himself makes the following statement:

"Why do all musicians and music publishers believe that everything must result in something of importance to the history of music? That's crazy. I told Cage: Destroy your manuscripts and tapes when you die! He thought that was too dramatic. I think it's a crime that Cage makes tapes at all. Gottfried Michael König, his interviewer at the time, pursued the issue: "So your own works are only intended for the moment? They have no significance afterwards? Not even for you? […] Your work only exists as long as it is being performed?" Nam June Paik responded: "Yes, that is beautiful. When I die there's nothing left. I am not producing a child" (Koenig 1963, 34)

However, despite Paik's original intentions, his works were eventually acquired by institutional collections, thereby subjecting them to the logic of preservation. For a truly radical gesture of refusal, Nam June Paik would have had to reject the commodification of his work entirely by refusing to sell it. However, he deliberately chose to embed his

[1] For those interested in acquiring further information, please refer to the following publication: Han Jungin, ed., *My Paik Nam June: Memories, Conservation, and the Spread of Discourse* (Seoul: National Museum of Modern and Contemporary Art, Korea, 2023). The publication is dedicated to the conclusion of the restoration process of The More, The Better.

practice within institutional structures, ensuring his works could circulate, be preserved, and reach broader audiences. While media art holds critical potential and was initially positioned in opposition to institutional norms, it has increasingly become embedded within those very frameworks. This raises a fundamental question: how should institutions manage media art, given its inherently ephemeral, process-based, and fluid nature? Additionally, the integration of media art into museums challenges the traditional institutional paradigm, which tends to regard artworks as static, material objects. As a result, collectors and institutions are increasingly confronted with the challenges of ephemerality, technological obsolescence, and questions of authenticity. This paradox helped lay the foundation for media art conservation as a critical discipline. It framed preservation not merely as a technical necessity but as an extension of the artwork's meaning and context, reinforcing the idea that conserving media art involves engaging with its conceptual, technological, and historical dimensions.

Although media art has been incorporated into the collections of contemporary art institutions, it continues to occupy a marginal position. This marginalisation stems largely from the fact that institutional structures — originally developed around static, object-based art forms — were not designed to accommodate the specific demands of media art. Additionally, the technical complexity and high cost of preserving media artworks pose significant challenges, further discouraging their acquisition and long-term care. As a result, only a small percentage of media artworks are collected, exhibited, or properly documented by institutions. This limited institutional engagement not only hinders the historicization and preservation of these works but also contributes to the exclusion of media artists from dominant art historical narratives and frameworks of cultural memory.

This thesis investigates the primary challenges that arise when media art is integrated into institutional contexts, focusing in particular on the conceptual and theoretical transformations necessary within both institutional practises and the wider field of art theory. Its objective is to contribute to the development of strategies that enable the meaningful incorporation of technologically mediated artworks not only into museum collections but also into the broader framework of collective cultural memory. This analysis will be conducted through a detailed examination of the ZKM (Center for Art and Media) in Karlsruhe — an institution renowned not only for its pioneering work in media art preservation but also for housing one of the most extensive and diverse collections of media art. Each chapter will explore different aspects of ZKM's experience, focusing on its approaches to the institutionalisation and preservation of media art and highlighting the challenges and strategies involved in sustaining such works within an institutional framework. Throughout the chapters, key theoretical concepts – including those rooted in art history – will be examined through the lens of ZKM's institutional experience and development. This includes consideration of the institution's own ideological frameworks and structural influences. The author contends that theorisation of conservation practises must be grounded in analysis of implementation within concrete institutional contexts, to avoid overly abstract or disconnected theoretical conclusions.

The thesis also incorporates discourse and conceptual analysis, particularly around themes such as interactivity, variability, authenticity, and the myths of ephemerality and innovation that have influenced the institutionalisation of media art. It employs a qualitative, interpretive methodology centred on the mentioned case study of the ZKM, examining its role in shaping contemporary media art conservation practises. Through an interdisciplinary approach, the research combines historical and theoretical analysis with insights from interviews conducted with key ZKM staff and affiliated artists, namely: Morgan Stricot, Matthieu Vlaminck, Dorcas Müller, Christian Haardt, Felix Mittelberger,

and Olia Lialina. These interviews provided practice-based perspectives that complemented the study of institutional publications and theoretical texts. Full transcripts of the interviews are available in the appendix of this thesis.

The **first chapter**, *Conservation Theory in Transition: From Monuments to Digital Art*, provides a historical overview of conservation as a theoretical discipline, tracing its evolution from the preservation of classical monuments to the challenges posed by contemporary and digital art forms. It examines how traditional principles of conservation have been questioned and redefined in response to the conceptual, material, and technological shifts that have shaped modern artistic practises. Furthermore, the chapter outlines the development of conservation approaches within the fields of contemporary and media art, with particular attention to the ways in which these approaches address issues of ephemerality, obsolescence, and authenticity. This foundation sets the stage for a focused examination of the historical trajectory of conservation practises at ZKM, positioning the institution within broader theoretical and institutional contexts.

The **second chapter**, *HiFi (High Fidelity): Object of Media Art*, explores the evolution of the concept of the medium in post-1960s art and its profound impact on how the art object is perceived. This shift — from static, material objects to dynamic, process-based and media-integrated forms — has had significant implications for both the production and preservation of contemporary artworks. The chapter investigates how these transformations have redefined conservation strategies, moving beyond traditional methods to accommodate the fluid, technological, and often ephemeral nature of media art. Central to this discussion is a focused case study on the ZKM, exploring the institution's approaches to the documentation, conservation, and historicization of media-based artworks.

Media art embodies two dominant theoretical myths that have significantly hindered its smooth integration into institutional frameworks. The first of these myths pertains to the presumed *ephemerality* of media art, particularly in its digital manifestations. The second myth revolves around the notion of perpetual innovation, tied to the idea of media art as inherently defined by the *new*.

The final chapter, titled *"AnArcheology": A Media-Archaeological Approach to Conservation*, critically examines the origins and implications of these two narratives, and how they have obstructed the process of historicising media art. A media-archaeological approach to the conservation of media art challenges both mentioned myths, offering a fundamentally different conceptual and practical framework for preservation. Rather than emphasising novelty and obsolescence, this approach foregrounds the importance of historicization — not only of the artworks themselves but also of the machines that are part of them. This perspective simultaneously offers a critique of the technological industry, advocating for the historicization of media devices as a form of anti-capitalist resistance. The final chapter will explore the influence of media archaeology on conservation theory and practice. Particular attention will be given to the role of the *PAMAL* group in shaping ZKM's media-archaeology-orientated preservation strategies.

An example of ZKM will be discussed in each chapter. In the opening chapter, the section *The Development and History of ZKM's Conservation Infrastructure*, sets out to provide a comprehensive overview of the historical evolution of the infrastructures that have been implemented in ZKM for the purpose of conservation. In addition, it aims to offer a detailed analysis of the main theoretical contributions made by the institution to the field of conservation theory. In Chapter 2, the section entitled *Post-Media in ZKM* examines the influence of the post-media era on ZKM as an institution. The section will also include a

concise historical account of ZKM. In the section entitled *Conservation and the Media Art Object: The Case of ZKM*, the conservation experience of media art in ZKM is used as an example to analyse two important concepts of understanding the media art object. These concepts are necessary for the successful implementation of media art conservation. In the final third of the chapter, titled *ZKM: Making History*, the focus shifts to an examination of how ZKM, as an institution, assumed the role of historicising media art from an early stage in its development. This section investigates how the initial formation of the collection influenced this historiographic orientation. In parallel, it offers an analysis of the development and ongoing evolution of the ZKM collection. Special attention is given to the section *Second Original: A Media-Archaeological Approach to Media Art Preservation*, which explores ZKM's adoption of media-archaeological methods. This approach, rooted in the reconstruction and contextualisation of obsolete technologies, reflects ZKM's commitment to preservation of both media art and the media itself.

This work may be of particular interest to conservators, curators, and artists engaged with media art, as it provides an in-depth examination of the theoretical and practical frameworks necessary for the preservation of technologically complex artworks. It provides significant insights into the institutional challenges associated with the acquisition, exhibition and conservation of media-based works, particularly those reliant on obsolete technologies or requiring interactive engagement. The research highlights a persistent gap in knowledge within cultural institutions, where many curators and decision-makers still lack a comprehensive understanding of the specific technical, conceptual, and ethical considerations required to care for media art. This gap in understanding frequently culminates in the marginalisation of such works and their subsequent exclusion from acquisition strategies, or even their loss. Consequently, the responsibility for the preservation and historization of media art frequently falls on the artists themselves, who are left to devise self-conservation strategies without institutional support. By illuminating these dynamics, the present study underscores the urgent need for structural change within museums and collections. Furthermore, it aims to empower artists and conservation professionals to advocate for sustainable preservation practises. Ultimately, it calls attention to the broader systemic issues—such as the dominance of capitalist structures and short-term cultural programming — that contribute to the neglect of media art's enduring value and cultural significance.

0.1. The Mythological Phoenix: (New) Media Art

Media art has been associated with a wide array of terms and classifications, reflecting the field's inherently diverse and evolving character. These terms include *art & technology*, *art/sci*, *computer art*, *electronic art*, *digital art*, *digital media*, *intermedia*, *multimedia*, *tactical media*, *emerging media*, *upstart media*, *variable media*, *locative media*, *immersive art*, *interactive art*, and even colloquially, *Things That You Plug In*. The term *new media art* emerged in the 1980s, marking a significant conceptual shift. Since its inception, the terminology for technologically engaged artistic practises has undergone numerous transformations. What was initially described as *computer art* evolved into labels such as *multimedia art* and *cyberarts* from the 1960s to the 1990s. Today, *digital art* is frequently used interchangeably with *new media art*, although the latter often encompasses a broader range of practises, including video, film, sound art, and other hybrid or experimental forms (Daniels 2011, 5). The term *new media art* has itself become an umbrella for such a broad range of artistic works and practises that it does not describe one unified set of aesthetics.

It covers a diverse array of works, among which are web-based projects, sound events, virtual reality installations, conceptual art practises, performance practises, network-based practises, software coding, and sampling.

This phenomenon can be explained by the hybrid nature of media art. Initially, there was a convergence of multiple factors that developed somewhat independently from the 1950s to the 1970s, gradually forming a more cohesive area of study or practice (Daniels 2011, 7). These factors were the birth of electronic music, the popularity of cybernetics, the emergence of the concept of open work, reflection on mass media, the occurrence of computer graphics, the expanded cinema movement, the formation of the Experiments in Art and Technology group (E.A.T.), intermedial art, the New Dance, conceptual art and site-specific art, body art and experimental theatre, and also institutional critique and political activism. Indeed, emerging media art was not an entirely independent phenomenon but rather incorporated elements from various pre-existing practises. What is now recognised as *media art* originally emerged as a hybrid field characterised by interdisciplinary experimentation and collaboration, rather than by a cohesive conceptual or strategic identity, without a unified theoretical framework or institutional classification. This fluidity of media art is evident in the inherent difficulty of defining media art as a distinct practice, as well as in its tendency to absorb and reflect characteristics of other artistic movements of its time. Rather than developing a singular aesthetic or methodology, media art functioned as a porous and interdisciplinary field, drawing from conceptual art, performance, video art, cybernetics, and more. This hybrid nature has contributed both to its richness and to the challenges of categorisation, preservation, and historical contextualisation. Consequently, to comprehend media art, it is frequently imperative to analyse other art forms that were prevalent during the same period.

The term *phenomenon* or *movement* is more appropriately applied to media art than the term *genre*, as demonstrated by the characterisations offered by numerous theorists. Scholars such as Domenico Quaranta, Sarah Cook, and Christiane Paul have all defined media art as a phenomenon in their writings. Unlike traditional genres, which are typically defined by formal or stylistic conventions, media art encompasses a dynamic and evolving constellation of practises, technologies, and conceptual frameworks. This fluidity resists fixed categorisation and reflects the interdisciplinary, experimental, and context-dependent nature of the field. The term “media art” encompasses a vague and nebulous array of meanings, which often results in debates about its true nature. Domenico Quaranta ironically observes that “New Media Art recalls the mythological Phoenix: “everyone knows it exists, no-one knows where it is” (Quaranta 2013, 31). And this situation persists to this very day, where the definition of media art as a practice is still rather mystical than particular. The historical development of media art and its institutionalisation will be examined in Chapter Two, with the aim of providing the reader with a more comprehensive understanding of the post-media era and its impact on both media art and institutions of contemporary art.

In this text, the term *media art* will be used due to its close alignment with the cultural and institutional context of the ZKM. The German equivalent, *Medienkunst*, gained prominence in the 1990s as a localised counterpart to the English term *New Media Art* (Voropai 2017, 14). In German academic literature, *Media Art* is defined expansively to include both analogue and digital forms —ranging from print, radio, fax, telephone, satellite communications, video, television, light, and electricity to film, photography, software, the internet, and video games (Quaranta 2013, 33), but not only “new” media. This broad conceptualisation reflects a more inclusive understanding of media, one that aligns closely with the German media theory tradition. Over time (around the 2000s to

2010s), however, the adjective *new* — and with it, the connotation of continual innovation or association with cutting-edge technologies — has gradually disappeared from both common usage and critical discourse, including in English-language contexts.

"New" Media Art went hand in hand with the rise of its related academic discipline: New Media Studies. Which led to the inevitable merging of the two disciplines. For Example, Lev Manovich's introduction in the emblematic *The New Media Reader* demonstrates deliberate choice to avoid distinguishing between "New Media" and "New Media Art". Instead, it opts for the broader concept of the "new media field", which encompasses both the technological and commercial aspects of new media alongside those purely focused on art. According to Manovich, art and media emerge from a shared domain where artists and developers collaborate closely (Wardrip-Fruin, Montfort, and Crumpton 2003). Thus, Media Art is a rather interesting and peculiar mix which Siegfried Zielinski calls "mixtum compositum" (Zielinski 2006, 276). A mix, which unites two different worlds, the world of *media* (or technology) and the world of art. Media art cannot be fully understood through an art-historical lens alone; the histories of technology and media sciences play an equally significant role in shaping its formation and reception.

The history of media arts is closely intertwined with the military-industrial complex and consumer culture, along with its associated technologies. When technological objects entered the exhibition space, they introduced a host of challenges typically associated with technology and industrial production — ranging from obsolescence to maintenance complexities. Despite its conceptual fluidity, the term *media art* is used here to designate a historical movement that began in the 1960s, reached its peak in the 1990s, and saw a decline in visibility after 2020. Although media art may now seem like a phenomenon of the past, its significance remains enduring. It represented a pivotal shift in the history of art by legitimising technology as a valid artistic medium and by embedding the technological revolution within contemporary art practice. In the German context in particular, media art assumed a critical role — not only embracing technological tools but also interrogating their societal and cultural implications. Thus, media art remains a vital framework for understanding and reflecting on our technologically mediated present.

It is precisely for this reason that media art warrants examination as a cultural and historical phenomenon. Its significance lies not only in its artistic contributions but also in its role in reflecting and critiquing the technological transformations of its time. Despite many institutions holding media art in their collections, it is often under-represented relative to other art forms and lacks comprehensive curatorial or scholarly engagement. Therefore, critical attention to both the practical aspects of conservation and the theoretical frameworks of historicization is essential. Without such efforts, media art risks falling into obsolescence itself, mirroring the fate of the outdated technologies upon which it was often built.

0.2. *A Digital Dark Ages?* Conservation of Media Art

The artist Paul de Marini, in his text *Erased Dots and Rotten Dashes, or How to Wire Your Head for a Preservation*, described contemporary technological culture this way:

"We are the first culture to experience our own archaeology on a daily basis. Consider all the drawers, closets, and garages full of obsolete technological junk that only a few years ago represented a healthy investment and pride of ownership, not to mention an aura of utility. We

endure the reek of flopping diskettes, the embarrassing bulge of zip drives, and a plethora of unplayable interactive CD-ROMS. There they rest, undergoing a slow decay—the bleeding out of readability. The codes present on their surfaces require other codes resident in no longer supported mass storage hardware, to be offered up by no longer extant operating systems to software applications that are no longer maintained. These codes are rendered unreadable not only by obsolescence but by contagion. They suffer the unavoidable disease of bit rot, because there isn't any pure information devoid of material. The bits of information are stored as modulations in the structure of material objects—as color, reflectivity, residual magnetism, buried charge—and these materials change form, composition, and position over time, erasing the data stored there" (DeMarinis 2011, 111).

The whole discourse formed around new media, and consequently around media art, very symptomatically reflected the market narratives formed around it. For example, the immateriality of media, the need for constant progress and the eternal thirst for the new. However, the introduction of media art into contemporary art institutions has illuminated all these narratives, as obsolescence has become a major cultural problem. For a long time, it was assumed that media art did not need preservation techniques, that it existed only in the present moment. This later turned into a narrative that media artists do not want their works to be preserved, which rather served and still serves as a narrative to justify the inaction of institutions. In this way, artists were often not given the choice of whether they themselves wanted to preserve their work.

However, the few works that have been institutionalised have highlighted a whole range of problems that are related to our cultural perception of technology, including problems at the level of the industry and the state. And this happened precisely when attempting to practise conservation. These challenges are closely tied to broader systemic issues, including planned obsolescence, the absence of legal frameworks for preserving obsolete software, insufficient state regulation of corporate practises, lack of standardisation, proprietary software restrictions, closed-source software, intentional interdependencies between hardware and software, increasingly restrictive intellectual property and licencing regimes, the inherent instability and unreliability of digital data carriers and much more.

Terry Kuny's paper *"A Digital Dark Ages? Challenges in the Preservation of Electronic Information"*, addresses all of these issues. Their concept *A Digital Dark Age* refers to the looming risk of losing access to vast amounts of digital information due to the rapid pace of technological obsolescence and the lack of long-term preservation strategies. They write:

The tenor of our time appears to regard history as having ended, with pronouncements from many techno-pundits claiming that the Internet is revolutionary and changes everything. We seem at times, to be living in what Umberto Eco has called an "epoch of forgetting." Within this hyperbolic environment of technology euphoria, there is a constant, albeit weaker, call among information professionals for a more sustained thinking about the impacts of the new technologies on society. One of these impacts is how we are to preserve the historic record in an electronic era where change and speed is valued more highly that conservation and longevity (Kuny, n.d.).

Kuny warned that, unlike traditional media such as books or stone tablets, digital materials are highly vulnerable — dependent on ever-changing hardware, software, and file formats. Without proactive and coordinated efforts to preserve digital content, including proper metadata, documentation, and open standards, future generations may face significant gaps in the historical, scientific, and cultural record. This idea has since become a foundational concept in digital preservation discourse, underscoring the urgent need for sustainable infrastructure and policy to ensure the longevity of digital heritage.

Conservation in the context of the digital revolution is no longer merely a traditionalist or preservational endeavour; rather, it has evolved into a critical practice that interrogates and contextualises the social, cultural, and technological consequences of the digital age. It offers a framework through which the rapid obsolescence, proprietary constraints, and infrastructural dependencies of contemporary media can be examined. In this sense, conservation becomes an active, reflective tool — one that not only safeguards digital cultural heritage but also reveals the underlying power structures, market logics, and epistemological shifts introduced by the digital and technological revolutions.

During the *communicative turn* (Chapter 1), conservation emerged not merely as a technical tool for institutions to safeguard artefacts but as a critical and theoretical discipline in its own right. It has demonstrated its capacity to engage with and rethink the foundations of contemporary art, particularly post-1960s practises, and to interrogate the institutional frameworks within which these works are situated. By addressing issues of authorship, authenticity, access, and preservation, conservation challenges the conventions of institutional care and offers pathways for their transformation, positioning itself as an agent of both critique and structural change.

Conservation also provides critical mechanisms for reinterpreting artistic movements and individual artworks. It enables a framework through which artworks can be understood not solely by their material or conceptual content but through their evolving relationship with conservation practises. Conservation provides crucial tools to reconsider media art not just as an artistic phenomenon but also in how it is situated within institutional frameworks and historical contexts. Today, widespread misunderstanding of media art's significance — as well as its hybrid, technologically-based nature — has contributed to its marginalisation within institutional collections. Many institutions remain unprepared to support the technical and conceptual demands of media art, resulting in the disappearance of works produced even just a decade ago. This is exacerbated by rapid technological change and a lack of sustainable preservation strategies. What is needed now is a reframing of media art — one that shifts the focus away from its functionality and instead embraces its inherent vulnerability to obsolescence as a defining characteristic worthy of critical engagement and institutional care.

Conservation practises — particularly those informed by a media archaeological approach — play a critical role in revealing and dismantling some of the most persistent myths surrounding media art. Firstly, they challenge the notion of immateriality by underscoring the very tangible, physical components of media — hardware, cables, screens, and outdated formats — that require preservation. Secondly, they debunk the idea that media art exists outside of historical context, instead showing that it is deeply embedded in specific technological, cultural, and institutional histories. Lastly, they counter the assumption that new technologies are inherently reliable and self-sustaining, highlighting the need for ongoing maintenance, care, and expertise to ensure continued access and functionality.

Conservation thus proposes a critical rethinking of new media within the contemporary context, not solely for conservators or archivists, but as a broader cultural intervention. It challenges prevailing assumptions about technological progress and permanence, offering instead a framework that foregrounds fragility, care, and historical continuity. In doing so, conservation brings media into sharper analytical focus, demanding that it be understood not only through innovation and functionality but also through its vulnerabilities, dependencies, and the sociotechnical systems it inhabits. Therefore, the author argues that conservation practises merit not only greater attention but also thorough description and

critical analysis, as they offer essential tools for examining the cultural dimensions of new media and the broader implications of the ongoing technological revolution.

1. Conservation Theory in Transition: From Monuments to Digital Art

1.1. Brief Introduction to the History of Conservation Theory

1.1.1. Brief Introduction to Conservation Theory from 17th century until the 1980s

The history of conservation begins near the rise of Romanticism, a period that initiated significant cultural transformations. It was during this era that two foundational disciplines emerged: *art history*, established by Johann Joachim Winckelmann, and *aesthetics*, formulated by Alexander Gottlieb Baumgarten. These developments contributed to the growing recognition of both the artwork and the artist as culturally significant figures. This shift laid the groundwork for the Romantic ideal of individual expression, elevating the artwork as a unique embodiment of the artist's inner vision — an idea that continues to influence conservation ethics and practises to this day. In addition, other important factors play a role, for instance: romanticism sanctified the idea of the beauty of ruins; public access to culture and art became an acceptable idea; and the growing importance of nationalism extolled the value of national monuments as symbols of identity. Simultaneously, the ideas of the Enlightenment dictated the widespread acknowledgement of science's increasing significance. This process has played a crucial role in shaping the scientific aspects of conservation efforts.

Another significant influence of Romanticism on conservation and aesthetic theory is the emergence of the concept of *patina*, which arose from restoration practice during this period. *Patina* refers to a delicate layer that develops on the surfaces of metals like copper, brass, bronze, and similar alloys, typically resulting from oxidation or other chemical reactions. But the term *patina* probably comes from painting. Filippo Baldinucci's 1681 encyclopaedia of art uses the term patina in this sense (Jokilehto 2011, 98). The 17th and 18th centuries have similarly given rise to the debate about the value of *patina*. During this time, there was a trend towards embracing a brownish tonality, particularly evident in *picturesque* landscape paintings, which became fashionable during that period (Brachert 1985, 11). Thomas Brachert calls this process raise of *Patina-Bewußtsein* (transl. German: patina awareness). Patina becomes an important aesthetic phenomenon, which is emphasised by the historic value of the object. For example, William Hogarth, an English painter, spoke of "the deep-rooted notion" that "time is a great improver of good pictures."

(Jokilehto 2011, 98) This has resulted in the trend of *patina* that was produced partly by the artists themselves.

Unfortunately, the history of conservation theory up to the 20th century is mainly connected with the theory of conservation of architecture and idea of the monument[2]. Although the restoration of frescoes was already present in the 16th century, the restoration of the art has not left a theoretical legacy, but is mainly a series of discoveries, conventions and names of practitioners. One of these names is Pietro Edwards. In September 1778, Edwards was appointed by the Venetian Senate as *Inspector for the Restoration of Public Paintings*, tasked with overseeing the restoration of artworks throughout Venice. In response, he authored the *Capitolato*, a set of rules (*capitoli*) establishing how these paintings should be restored. Many of these principles closely align with contemporary restoration practices (Viñas 2005, 2). For examples the principles of *minimum intervention*: that no restorer, "even with the good intention of improving on the original, remove anything from the original, nor add anything of his own,"[3]. Because of this innovation one of the most influential theoreticians of contemporary theory of conservation Edwards called it the "beginning of modern conservation" (Viñas 2005, 47).[4]

The French Revolution played a crucial role in shaping the modern understanding of the monument as a sacred object. Its emphasis on equality and emancipation gave rise to both unifying and divisive forms of idealism. On one hand, this new egalitarian ethos fostered the recognition of a shared human responsibility for historic relics — transcending social and national boundaries. On the other hand, it also gave rise to a powerful ideology of nationalism, which would ultimately have greater significance for the development of conservation. This emerging nationalism grew out of the revolutionary ideals of equality and liberty, which in turn legitimised the cultural heritage of each nation as equally worthy of preservation. As a result, monuments and artworks came to be seen not merely as aesthetic or religious objects but as symbols of collective identity, history, and national pride (Miles Glendinning 2003, 361).

This concept was further reinforced by the influential works of Johann Gottfried Herder during that period. Monuments started to be regarded as evidence of a nation's culture and ongoing legacy. As a result, it became the state's duty to establish positions and organisations to guarantee the proper preservation and transmission of this "national heritage" to future generations. In 1790, France established the *Commission des*

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[2] Salvador Muñoz Viñas attributes this phenomenon to the historically prestigious social status of architects. For centuries, this prestige granted architects access to formal academic education and abundant cultural resources. In the nineteenth century, this enabled them to establish rigorous training programmes and draw upon extensive archives, libraries and collections. Furthermore, architects of this period established robust national and international professional bodies, thereby fostering sustained theoretical and technical discourse across the discipline. (Viñas 2005, 71)

[3] 'Che alcun professore neppure con buona intenzione di migliorar l'opera levi cosa alcuna dall'originale o vi aggiunga qualche parte di proprio.' A. Conti, Storia del restauro e della conservazione delle opere d'arte. (Milan: Electa, 1988) 166; the English translation is taken from A. Conti, History of the Restoration and Conservation of Works of Art (Oxford: Butterworth-Heinemann, 2007) 191–193.

[4] In this context, it is important to mention Alessandro Conti's *Storia del Restauro e della Conservazione dell'Opere d'Arte*, first published in 1973. The book reexamines numerous case studies through the lens of the evolving expertise in conservation and restoration. Adopting a long-term historical perspective, Conti focuses primarily on developments from the sixteenth to the nineteenth centuries. His work demonstrates that concerns with restoration, repair, cleaning, preservation, and conservation predate the period often assumed to mark the discipline's origin — namely, the late nineteenth century through the 1940s, which remains the central focus of much conservation literature.

Monuments, which was followed by a law two years later to protect historic objects and structures (Miles Glendinning 2003, 362). This is precisely the milieu in which the museum emerges as an institution. Museums start to play the role of the structure which is safeguarding movable objects. The Louvre Palace had been serving as a museum since 1775 (Jokilehto 2011, 117). During the eighteenth and nineteenth centuries, public museums evolved from earlier forms such as *cabinets of curiosities* and private art collections. These emerging institutions increasingly focused on the systematic collection and organisation of objects, with the aim of documenting and preserving "evidence of the nature of the universe" (Clavir 1998, 3).

Romanticism has resulted in two conflicting ideas about the ethics of conservation. Namely, these ideas belong to John Ruskin and Eugène Viollet-le-Duc, who are considered to be the first conservation theorists. From 1830 onwards, a growing appreciation of Gothic architecture emerged in France, leading to the reconstruction of mediaeval buildings being seen as a national duty. Prosper Mérimée commissioned Eugène Viollet-le-Duc to restore the Romanesque abbey of Vézelay. Viollet-le-Duc went on to develop the method of stylistic restoration, a form of historic preservation that prioritised idealised reconstruction over maintaining the existing state of an object. In his *Dictionnaire raisonné de l'architecture française du XIe au XVIe siècle*, Viollet-le-Duc famously defined restoration as the act of returning a building to a state of completeness that may never have existed at any specific point in history.

As a reaction to the development of urban growth and commercial capitalism in Britain, the idea of utopian traditionalism emerged. In this milieu appears John Ruskin, who wrote two important works for conservation theory, namely *The Seven Lamps of Architecture* (1849) and 3 volumes of *The Stones of Venice* (1851–53). John Ruskin extended a form of traditionalist utopianism to the realm of monuments, strongly opposing the *stylistic restoration* methods employed by Viollet-le-Duc. Ruskin discredited such restoration as a form of destruction, arguing that it not only erases original material but also replaces it with a false narrative. For Ruskin, architecture must preserve the historical layers of a building as a form of precious heritage. His understanding of history was not driven by historicism but by a deep attentiveness to the temporality and authenticity of the past. Ruskin drew on the historically popular concept of the picturesque — the idea that artists should cooperate with nature rather than impose a fixed form upon it. In Ruskin's hands, this concept gained new significance in the context of architectural conservation. Adopting a naturalistic approach, he asserted that preservation should support the life cycle of a building through careful maintenance, allowing it to age and eventually decline naturally. For Ruskin, preservation meant respecting the temporal integrity of a structure, rather than freezing or artificially restoring it.

By articulating the value of historical artefacts in their original, weathered state, Ruskin laid crucial foundations for modern conservation philosophy. According to Salvador Muñoz Viñas Ruskin and Viollet-le-Duc „have become icons of a sort, symbolising two extreme attitudes about conservation, from the most restrictive to the most permissive" (Viñas 2005, 5). Their opposing views crystallised a central debate in conservation theory, one that ultimately led to the distinction between *conservation* — which emphasises the preservation of an artefact's existing material state — and *restoration*, which allows for interventions aimed at recovering an assumed original appearance. The legacy of this debate presents an enduring ethical and practical dilemma for conservators: whether to prioritise the preservation of the object's current condition, including all traces of age and historical change, or to restore it in pursuit of historical completeness and visual coherence.

This dilemma continues to shape contemporary conservation practises and policies across museums, heritage institutions, and restoration sites worldwide.

Before moving on to continue analysing the history of conservation theory. It seems necessary to clarify the difference between the terms: *conservation*, *restoration* and *preservation* in the contemporary discourse and contemporary conservation theory. And define how these terms will be used throughout this text. *Conservation* usually used in the broad sense as an umbrella term for the sum of the activities, including *restoration* and other possibly related activities (Viñas 2005, 14) and throughout the text will be used in the same sense. According to the definition of International Council of Museums – Committee for Conservation (ICOM-CC) *conservation* means "all measures and actions aimed at safeguarding tangible cultural heritage while ensuring its accessibility to present and future generations"[5]. *Preservation* is primarily goal-oriented, referring to efforts aimed at extending the life expectancy of an object. The American Institute for Conservation (AIC) similarly defines preservation as "the protection of cultural property through activities that minimise chemical and physical deterioration and damage and that prevent loss of informational content," with the main goal being to prolong the existence of cultural property [6]. The AIC defines *restoration* as "treatment procedures intended to return cultural property to a known or assumed state", which also ''implies the addition of non-original material". Salvador Muñoz Viñas argues that it is important for the definition of restoration objectives that the definition does not emphasise that the object is restored to its 'original' state, because the definition of original is theoretically and practically problematic. What it preferable to talk about a 'preceding', 'known' or 'assumed' state, which may not be the state the object was in when it was originated (Viñas 2005, 17).

To illustrate these distinctions, diagram created by Salvador Muñoz Viñas will be referenced. The diagram clarifies a classification of conservation practices, highlighting that both *direct preservation* and *environmental preservation* fall under the broader category of *preventive preservation* [7].

[5] Resolution adopted by the ICOM-CC membership at the 15th Triennial Conference, New Delhi, 22-26 September 2008. Available at athttps://www.iccrom.org/sites/default/files/2022-02/icom_cc_resolution_on_terminology_english.pdf accessed on 21 February 2024.

[6] AIC definitions of conservation terminology stated on their website https://www.culturalheritage.org/about-conservation/what-is-conservation/definitions, accessed on 17 February 2024. Also, at *Newsletter of the Western Association for Art Conservation*, 18(2), 1996. Available at https://cool.culturalheritage.org/waac/wn/wn18/wn18-2/wn18-202.html, accessed on 17 February 2024.

[7] The definition of *preventive preservation* by ICOM-CC is following: "all measures and actions aimed at avoiding and minimising future deterioration or loss. They are carried out within the context or on the surroundings of an item, but more often a group of items, whatever their age and condition. These measures and actions are indirect – they do not interfere with the materials and structures of the items. They do not modify their appearance". Available at athttps://www.iccrom.org/sites/default/files/2022-02/icom_cc_resolution_on_terminology_english.pdf accessed on 21 February 2024.

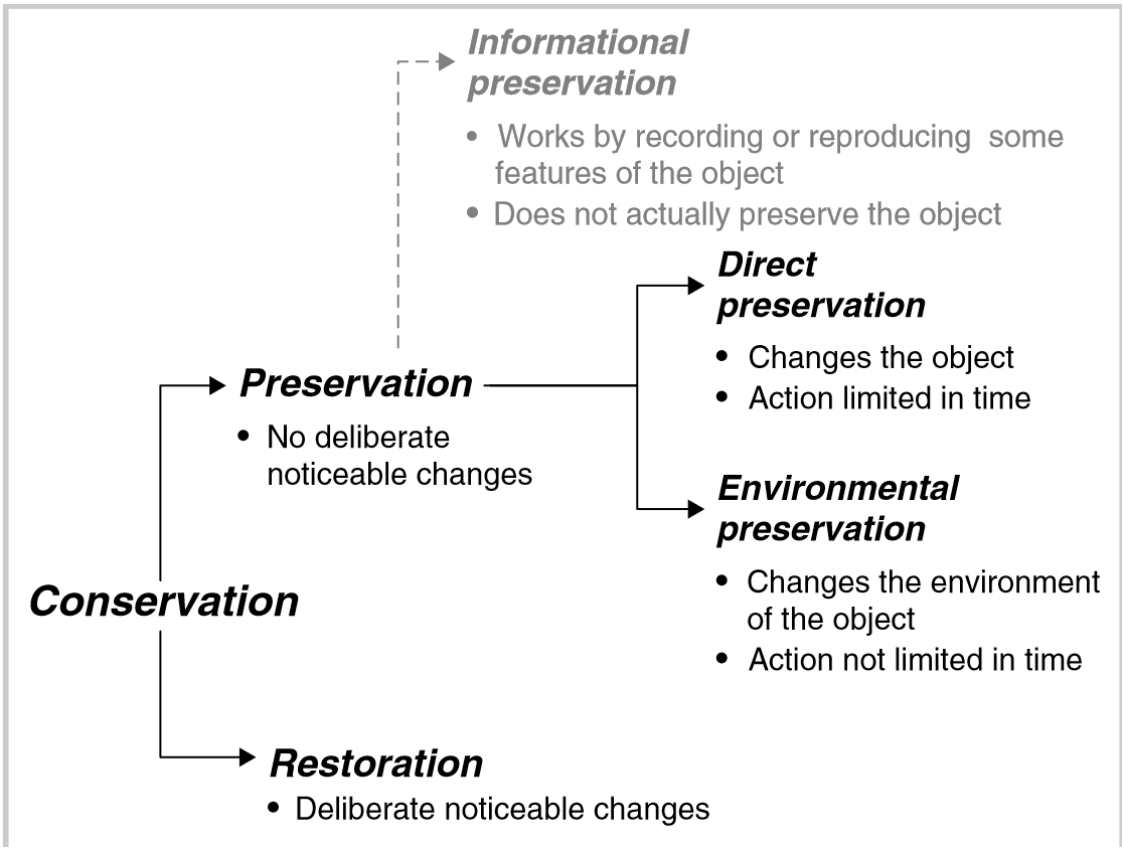

Figure 1.1 *A classification of activities within the conservation field* diagram created by Salvador Muñoz Viñas in Salvador Muñoz Viñas, Contemporary Theory of Conservation (Oxford ; Burlington, MA: Elsevier Butterworth-Heinemann, 2005).

From the late nineteenth century onwards, a collectivist and nationalist monument ethos gained strong momentum in German-speaking countries. This movement was underpinned by influential philosophical ideas that rejected absolute or religious beliefs. Thinkers such as Nietzsche and Heidegger laid the groundwork by asserting that humans are responsible for creating their own values. Rather than depending on the concept of God, they emphasised secular pursuits, such as artistic excellence, as substitutes for a higher truth. An Important text for the theory of conservation which appeared in this milieu is *Der Moderne Denkmalkultus* (en. *The Modern Cult of the Monument*) written in 1903 by the Austrian theorist Alois Riegl (Aloïs Riegl 1982). The essay was, in fact, the introduction to a draft for a preservation law, which Riegl wrote soon after his appointment to the Austrian monuments commission. This highly impactful essay is seen as the starting point of the modern understanding of monuments. Riegl challenges the conventional perception of monuments by proposing that their definition is not determined by rigid, objective standards, but rather by the subjective interpretations of the observer (Lamprakos, n.d., 420). Reigl's concept of monuments includes not only architectural objects, but also 'present-day values', which include works of art and literature. This theoretically extends the theory of conservation to all arts and imposes the concept of monuments on all cultural objects. Rather than viewing monuments as sacred or divine objects, they began to be conceptualised primarily as historical artefacts embodying the cultural and national

identity of a nation. Monuments were therefore regarded as tangible expressions of collective memory and history, deserving preservation for their significance within a historical and cultural narrative rather than for religious reverence. This reframing reinforced the idea that monuments should be conserved as witnesses to a nation's past, reflecting its evolving values and identity over time.

Alois Riegl, building upon Ruskin's emphasis on the historical value of heritage objects, introduced key concepts such as *age value* and *commemorative value*, which would later become foundational to modern conservation discourse and the notion of *authenticity*. These ideas continue to inform influential international documents like the *Venice Charter* (1964) [8] and the *UNESCO World Heritage Convention* (1972). *Age value* refers to the appreciation of the entire historical environment — not just isolated monuments — as a reflection of the passage of time and cultural continuity. Unlike restoration approaches that aim to return an object to a previous state, age value celebrates the visible effects of time, decay, and aging. Its emotional appeal lies in its resonance with human mortality; the viewer perceives the aging monument as a mirror of their own temporal existence. In this sense, Riegl argued that cultural appreciation is rooted not in intellectual understanding, but in emotional connection. He described this as a form of "socialistic" preservation, where collective sentiment takes precedence over individual or academic interpretation (Ahmer 2020, 151). Through this lens, monuments become not only historical artefacts but emotionally charged symbols of shared memory and identity.

In the twentieth century, the concept of age value underwent a notable transformation, becoming simplified and instrumentalised in the service of broader political agendas. No longer based solely on the nuanced understanding of historical depth and emotional significance as originally set out by Riegl, the concept of age value was increasingly adopted by state ideologies. Modern nation-states harnessed it as a means of legitimising power and fostering national unity. Due to its emotional appeal and collectivist undertones, age value proved to be an easily adaptable tool for states seeking to consolidate control over their populations. It was often used to assert claims over cultural landscapes and monuments, framing them as symbols of national identity and continuity (Lamprakos, n.d., 423).

Before turning to post-war conservation theory, it is important to briefly address a key development in the field, namely the emergence of *scientific conservation* in the 20th century. The first half of the twentieth century saw a decisive shift toward the integration of sciences. This transition emphasised empirical analysis, material science, and chemical testing as essential tools in conservation practices. A landmark moment in this shift was the *Conférence internationale pour l'étude des méthodes scientifiques appliquées à l'examen et à la conservation des œuvres d'art* (International Conference for the Study of Scientific Methods Applied to the Examination and Conservation of Works of Art), which was held in Rome in 1930. This conference played a crucial role in formalising conservation as a professional and scientific discipline and laid the groundwork for the institutionalisation of scientific methods within conservation. Subsequently, in 1950, the International Institute for the Conservation of Museum Objects[9] was established, strongly promoting the use of scientific methodologies. Between these milestones, numerous scientific laboratories were founded in major museums and conservation centres around

[8] The Venice Charter, formulated in 1964 by a consortium of conservation specialists in Venice, serves as a universal framework for the preservation and renovation of historical structures worldwide. Available at [https://www.icomos.org/images/DOCUMENTS/Charters/venice_e.pdf.] (Accessed on 20 February 2024.)

[9] Now it's known as the International Institute for Conservation of Historic and Artistic Works (IIC).

the world, including the *Istituto Centrale del Restauro* in Rome, the *Doerner-Institut* in Munich, the *Fogg Art Museum* at Harvard, the *Louvre* in Paris, and the *National Gallery* in London (Viñas 2005, 69). These institutions became key sites for developing and disseminating scientific approaches to the examination, documentation, and treatment of cultural heritage.

This shift is closely linked to the growing prominence of a scientific worldview during this period. This worldview replaced earlier 'God-the-Creator' paradigms with an optimistic faith in science as the driving force of human progress. During this time, there was widespread reverence for scientific knowledge, which was often associated with colonial and assimilatory ideologies. Consequently, science was increasingly regarded as the only legitimate framework for understanding reality. Alternative knowledge systems, particularly those of indigenous and non-Western cultures, were often marginalised or dismissed (Clavir 1998, 4). Within this context, conservation practises transitioned from artisanal, experience-based methods towards what became known as scientific conservation. This approach embraced principles of objectivity, empirical evidence and technical precision, redefining the field around the ideals of truth and authenticity in preserving cultural heritage.

In post-war Europe, the Ruskin-inspired notion of heritage lost prominence. While the Enlightenment belief in progress persisted, it became firmly oriented toward the future. Equally significant for the conservation was its exposure to a new form of 'total' modernity: the framework of resurgent global capitalism. This process led to the conservation movement's turn towards internationalism in the 1960s and '70s. As the modernist, social-democratic reconstruction efforts in Western Europe faced setbacks from the late 1960s, conservation emerged as a prominent opposing force. Surprisingly, the association between conservation and state bureaucracy persisted and even strengthened. However, this continuity was predictable considering the historical link between the idea of monuments and modernising endeavours. Conservation remained entwined with the pursuit of power and control (Viñas 2005, 5). In this context, another phenomenon that has characterized this period and continues to do so today is the inconsistency and lingering effects of national division in conservation methods (Jokilehto 2011, 417).

The final figure in conservation theory to be discussed here is Cesare Brandi. What distinguishes him from others – is that he was not an architect and active conservation practitioner but an art historian. In 1963, Brandi published his work *Teoria del restauro*, which argued for the significance of a factor often overlooked in scientific conservation, namely the artistic value of the object. According to Brandi, aesthetic values hold paramount importance and must be considered when making decisions about conservation efforts (Glendinning 2013, 264). Brandi purified works of art of practical considerations like "use-value," focusing instead on their material, aesthetic, and historical aspects. Restoration, according to Brandi, involved defining a work of art based on its material composition, aesthetic qualities, and historical significance, with the goal of preserving it for future generations (Salvador Muñoz Viñas 2015).

Cesare Brandi positioned restoration as a 'methodological moment' that recognises the aesthetic and physical unity of a work. Influenced by Gestalt psychology, he viewed artworks as indivisible wholes shaped by the original artistic intent and rejected creative intervention or subjective taste in conservation. He championed the principles of reversibility, respect for material and historical authenticity, and the clear distinction between an artwork's *aspect* (its image) and *structure* (its physical form). Brandi's anti-positivist stance prioritised artistic and historical criteria over purely scientific ones and highlighted the tensions between scientific analysis and aesthetic judgement in

conservation practice (H. Hölling 2017, 28). This laid the foundation for the important concept of material integrity in conservation theory, which refers to the preservation of an artwork's original physical substance, including the materials, techniques and construction methods employed by the creator. Material integrity emphasises that the physical components of a cultural object carry intrinsic historical, cultural and artistic significance, rather than being merely functional or aesthetic elements. Respecting material integrity involves avoiding unnecessary replacement, alteration or concealment of original materials and prioritising minimal intervention to ensure the object remains as authentic as possible.

1.1.2. A brief overview of the major tendencies of modern art conservation

In her text *Resurrecting Hannah Wilke's Homage to a Large Red Lipstick* Andrea Cyorody describes how coming to curate at the Allen Memorial Art Museum (AMAM) at Oberlin College in April 2017 she began investigating the collection for "any skeletons in the storerooms" (Cyorody 2021). She discovered that a once latex-based sculpture, titled Homage to a Large Red Lipstick by Hannah Wilke, was effectively dead. She writes: "What we found, when we opened the Coroplast box in which it is housed today, was something like a deflated, almost melted version of what had once existed. Presumably for ease of storage, the sculpture had been divided into several parts and stacked, separated by sheets of glassine, in a single box. The once pliable, glossy latex sheets had shrunk in size and turned rigid and brittle; the pins that once joined the sheets, allowing them to cling together on the wall in Wilke's intended shape, had migrated and dislodged; and the deep maroon that Wilke tinted the latex had become much lighter and duller. Not a few colleagues, on seeing images of the work, noted a disturbing resemblance to rotting raw meat. The off-gassing that emanated from the boxes signalled rotting too, of an acerbic chemical kind" (Cyorody 2021, 119). The author asserts that the work has never been exhibited nor made available to researchers and is not listed in the museum's collection databases, which are accessible to the public.

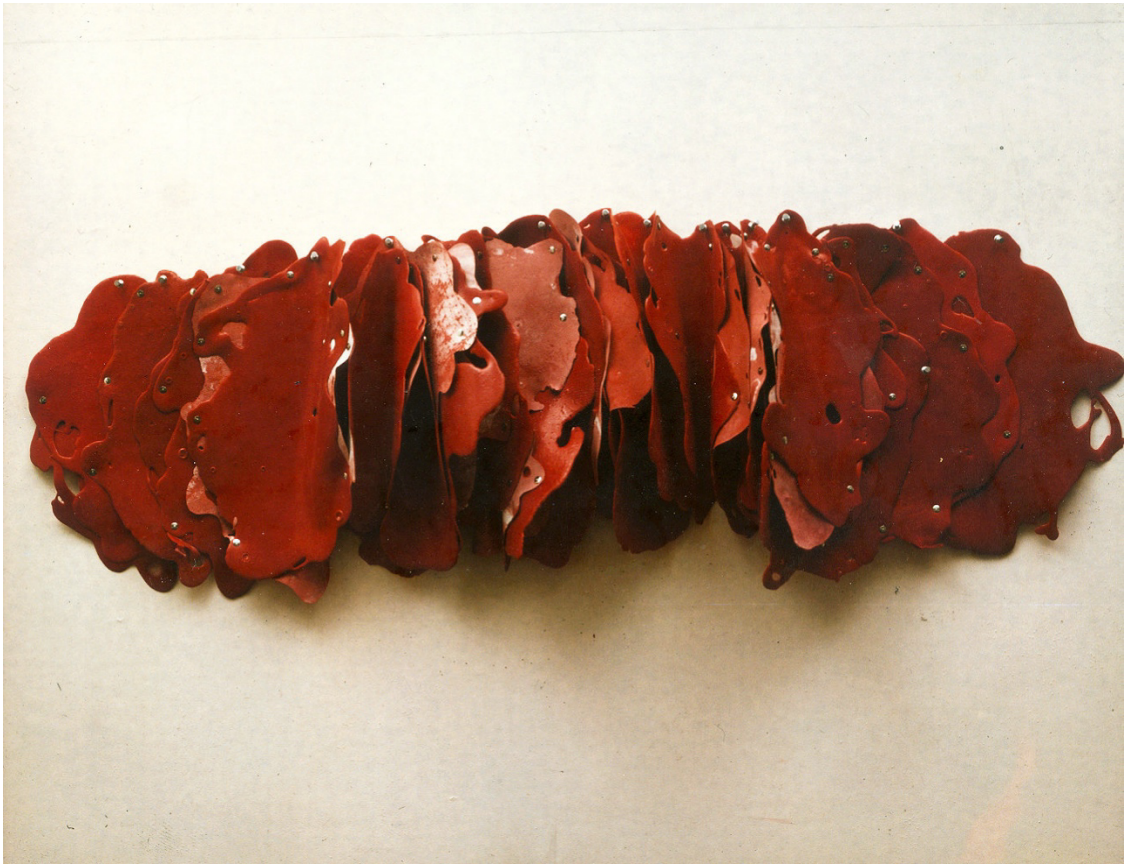

Figure 1.2 Hannah Wilke (1940–1993), *Homage to a Large Red Lipstick* 1974-75, latex with metal snaps. Gift of the artist in honour of Ellen Johnson. Allen Memorial Art Museum, 1975.55. Image credit: Hannah Wilke Collection and Archive, Los Angeles.

The unfortunate fate of this work is not an isolated incident; it is indicative of a broader issue plaguing the modernist movement in its use of unconventional materials for artistic expression. The concept of durability as a criterion of quality has played an important role in Western art for centuries. The durability of an artwork provides a certain guarantee for the buyer's investment and guarantees the artist's and the artwork's immortality. This phenomenon was accurately described by Boris Groys as 'the dream of infinity' (Groys 2012, 6), — an inherent feature of classical art or high culture. The onus has historically fallen on the artist to ensure the preservation of their work, with the expectation that they would utilise the appropriate materials and techniques.

In the contemporary artistic landscape, particularly throughout the twentieth century, artists increasingly imbued their chosen materials with personal, iconological significance, marking a departure from traditional priorities such as durability and permanence. In the post-war era, this shift became more pronounced as materials were no longer neutral carriers of form but active conveyors of meaning and temporal experience. The use of unconventional and often impermanent materials — such as mercury in Michelangelo Pistoletto's mirrors, lead in Anselm Kiefer's paintings, arsenic in Sigmar Polke's works, plastics in Eva Hesse's sculptures, and organic substances like beeswax in the practises of Mario Merz, Joseph Beuys, Wolfgang Laib, and food in Dieter Roth's — demonstrates a deliberate and deeply personal material symbolism. These materials are selected for their profound and idiosyncratic iconological significance, underscoring the artists' personal choices and the intricacies of their artistic practises (Hummelen and Sillé 1999, 171–72)

These artistic creations were swiftly included within the infrastructures of the museums. Museums quickly acquired these works, thereby recontextualising them within a museological framework that foregrounded historical significance and the imperative of preserving authenticity. As a result, a significant number of institutions have acquired works made of chemically unstable materials (e.g. latex as in the case of the example of the work by Hannah Wilke) due to a lack of knowledge and experience in working with such materials, and the resources, conservators and institutions proved to be unprepared to preserve them.

Hélia Marçal refers to the 80s and 90s as the time of birth of the contemporary art conservation (H. Marçal n.d.). It became evident that to adequately preserve a significant corpus of modernist art, institutions were compelled to fundamentally redefine their conservation and restoration policies. The genesis of this endeavour can be traced back to the meticulous organisation of a series of conferences and symposiums dedicated to the conservation of contemporary art. During this period, several influential conferences were held, include *From Marble to Chocolate: 19th- and 20th-Century Art* held at the Tate Gallery in London in 1995. Another significant conference was *Modern Art: Who Cares?,* organised by the Foundation for the Conservation of Modern Art (SBMK) and the Netherlands Institute for Cultural Heritage (ICN) in Amsterdam in 1997. The renowned symposium *Modern Art: Who Cares?* was a result of the Conservation of Modern Art project, which involved four years of interdisciplinary collaboration focused on ten case studies. The materials of the symposium were published in a book with the same title in 1999 (Hummelen and Sillé 1999). This project, along with the associated conference, laid the groundwork for the establishment of the International Network for the Conservation of Contemporary Art (INCCA) in 1999. Equally important was the conference *Mortality, Immortality? A Conference of Contemporary Preservation Issues*, which was hosted by the Getty Conservation Institute (GCI) in Los Angeles in 1998. This conference also resulted in the publication of *Mortality, Immortality? The Legacy of 20th-Century Art* (Corzo and Getty Conservation Institute 1999), which is widely regarded as a seminal text in the field. All these initiatives played a crucial role in establishing and legitimising the field of contemporary art conservation, and they shaped its research agenda for years to come. Moreover, the conference and symposium format proved to be highly productive and became an established practice within the development of conservation theory.

All these symposiums showed that the preservation of modern and contemporary art demands a strategic and well-resourced institutional response. As individual artists and collectors often lack the means to conserve complex, ephemeral, or technologically dependent works, the responsibility has rightly shifted to dedicated art institutions. For museums to effectively fulfil this role, conservation must be recognised as a fundamental institutional obligation — one that necessitates substantial investment in research, documentation, and the development of accessible, standardised data systems. Equally essential is the establishment of an international network for the exchange of conservation knowledge and practises, ensuring that the cultural heritage of the 20th and 21st centuries can be preserved with the same care and rigour as that of the past.

One of the major challenges introduced by the modernist era was the need for conservation to critically reassess its methodologies and ethical frameworks. Historically, conservation developed a structured approach to the treatment of traditional artworks, guided by well-established theoretical and practical principles. However, the applicability of this framework to modern and contemporary art remains contested. Unlike traditional materials, the media used in modern and contemporary works are often inherently fragile and conceptually diverse. Consequently, the emergence of new artistic practises has

necessitated a redefinition of conservation, reshaping both the treatment of cultural objects and the evolving role of conservators and other stakeholders involved in their care.

A significant development in the late twentieth century was the growing recognition of the need to establish a distinct code of ethics for conservation, or at the very least, a set of professional standards. During this period, efforts intensified to unify the diverse branches of conservation practice, culminating in the articulation of broadly applicable ethical codes. By the early twenty-first century, these universal ethical guidelines had been formally adopted across the field. (Ashley-Smith 2017, 2). The process of creating ethical standards for conservation proved to be a highly fluid and still evolving one[10].

Nonetheless, the prevailing ethical standards were not always applicable to the domain of contemporary art conservation. This is attributable to the influence of traditional art theories on their development. However is also imperative to acknowledge that the conservation practises for new artistic expressions have been shaped by the theoretical contributions of conservators in traditional contexts, such as the conservation of paintings and works on paper (notably Salvador Muñoz Viñas or Caroline Villers), ethnographic objects (Miriam Clavir), sculptural objects (Jonathan Ashley-Smith and Jonathan Kemp), and those engaged in preventative conservation (such as Jane Henderson and Joel Taylor), among others.

A key ethical reference point in modern art conservation is the concept of *artistic intention*, especially in cases where a work's original authenticity has deteriorated. The artist's intention — manifested through materials and techniques — plays a critical role in guiding conservation decisions. This gave rise to the practice of consulting living artists during conservation, a trend shaped by the accelerated historicization and material obsolescence of artworks in the twentieth century, which uniquely positioned artists to engage directly with institutions at the moment their works required preservation.

Another significant development has been the growing importance of artist interviews, which have become a vital tool in contemporary art conservation. Which was marked, for example, by a workshop, *Working with artists in order to preserve original intent* as part of the symposium *Modern Art: Who Cares?*. Or by the publication of *The Artist Interview: For Conservation and Presentation of Contemporary Art ; Guidelines and Practice* edited by Lydia Beerkens and Paulien 't Hoen Beerkens et al. (2012). This process is accompanied by the growing importance of documentation as a conservation practice. Documentation started to include not only artists' intention, or the work of researching, producing, designing and curating art, but also on the work of interpreting art carried out by various audiences Giannachi (2024).

And another important innovation within conservation practise which worth mentioning is the recognition of the necessity to assess artworks and their conservation strategies on a case-by-case basis (Viñas 2005, 44). This practice emerged from recent theoretical developments within theory of conservation. This acknowledgement arises from the variable nature of contemporary artworks and their evolving, sometimes conflicting values. Which led to a necessity to the process of creating a corpus of case-studies becoming a

[10] In this regard, the reader is directed to the following examples for further elucidation: '*Conservation Ethics Today: Are Our Conservation-Restoration Theories and Practices Ready for the Twenty-First Century? Introductory Notes to Some Central Issues*' by Ursula Schädler-Saub (Schädler-Saub 2019), and the publication edited by her, '*Conservation Ethics Today: Are Our Conservation-Restoration Theories and Practices Ready for the 21st Century?*' (Schädler-Saub and Szmygin 2017). Additionally, *Becoming Difference: On the Ethics of Conserving the In-Between* by Hélia Marçal (Hélia Marçal 2022).

priority in the field of contemporary art conservation. However, it is important to note that this approach is often criticised. It does not aim at facilitating the finding of material or conceptual patterns among works in order to make it possible to adopt a more rapid conservation strategies but insists on an individual approach to each work. The aforementioned method is criticised for its high resource consumption, which limits the number of works that institutions are able to conserve. Consequently, conservation becomes a privilege of major cultural institutions, as previously mentioned[11].

1.1.2.1. Communicative Turn

The experience of numerous symposiums has demonstrated that the emergence of new forms of artistic expression is inevitable. This, in turn, has resulted in the conservation and preservation of such art becoming an inherently dynamic and open process, circumventing the limitations of the museum and interacting with the world at large. The series of international symposiums have demonstrated that the formulation of visions and strategies for the preservation of modern art necessitates expertise and experience across a diverse array of disciplines. The project's findings emphasise the significance of interdisciplinary collaboration in safeguarding modern art, as evidenced by the active engagement and enthusiasm exhibited by representatives from diverse fields, including art historians, physicists, philosophers, lawyers, conservators, artists, art managers, and critics. It is evident that conservation has evolved into a discipline that is both comprehensible and accessible to a broader spectrum of specialists, transcending the confines of a niche field.

Another salient phenomenon is the fact that the evolution of conservation theory since the 1980s demonstrates that theoretical advancements have not solely originated from these traditional fields; instead, they have emerged across various specialisations and theories, such as music theory and philosophy, which often appear in the theoretical works of Pip Laurenson to conceptualise the time-based media for conservation purposes (Laurenson n.d.). Pip Laurenson herself is a renowned figure in the field of media art conservation; her oeuvre is characterised by exploration of the challenges and methodologies involved in preserving and caring for contemporary artworks, addressing issues such as materiality, technology, and conceptual frameworks. Another pertinent example would be Muriel Verbeeck's work, such as her article *There is Nothing More Practical than a Good Theory: Conceptual Tools for Conservation Practice.* In this article, Verbeeck employs structuralist philosophy as a series of conceptual tools that allow for the theorisation of the art practice of conceptual artists Verbeeck (2016). In addition, Hélia Marçal, a theorist specialising in performance conservation, frequently employs feminist theory in her work. For example, in her PhD work *From Intangibility to Materiality and Back Again: Preserving Portuguese Performance Artworks from the 1970s,* H. P. Marçal (2018). Hanna B. Hölling. writes: "Recent conservation theory sources analytic and continental philosophies, social studies, performance studies and archaeology. In a similar way to ethnographic conservation that references other knowledge domains to come to terms with the dynamic character of heritage, the conservation of contemporary art strives to grasp its objects' nature and behaviour through implementing a heurism of value-based, phenomenological and theoretical approaches to its object" (H. Hölling 2017).

This tendency can be understood through the lens of the *communicative turn*, a concept first articulated by conservator and theorist Salvador Muñoz Viñas in 2005. According to

[11] A similar critique was articulated by Dragan Espenschied (director of Rhizome's Digital Preservation programme) as part of the course on Exhibition Strategies for Media Art he conducted at the ABK, Stuttgart, in the winter semester of 2024/25, which the author attended in person.

Salvador Muñoz Viñas the turn happened in last decade of the twentieth century, characterised by growing importance of knowledge, but only in 90's "many authors acknowledged the basic relevance of communication for an object to be considered as a conservation object'' (Viñas 2005, 44). The communicative turn is defined by the idea that conservation activities involve different actors and modes of action, both inside and outside the museum. More recently, conservators and theorists have conceptualised conservation as an endeavour that focuses not only on preserving the material aspects of cultural heritage but also on safeguarding its associated values. Hence, the field of conservation has evolved to encompass not only the preservation of tangible objects but also the transmission of intangible cultural heritage, encompassing the concepts of tradition, memory, skill, and technique. This expanded scope involves the dissemination of knowledge, whether tacit or explicit, embodied or non-embodied, contributing to the continuity and perpetuation of cultural practises and beliefs H. Hölling (2017).

One notable trend in contemporary conservation theory is the incorporation of *new materialism*, which offers a reconfigured understanding of matter, agency, and material interaction within conservation practises. For instance, this phenomenon can be observed in Louis van den Hengel's work, particularly in the domain of performance art conservation. In this context, the concept of *new materialism* is employed to conceptualise the objectivity of performance art and to explore the possibility of its historization Hengel (2016). Another prominent theorist who frequently employs *new materialism* is Hanna B. Hölling. She specialises in the study of art and cultural developments since the 1960s and 70s, with a particular focus on aspects of time, change, materiality and archives. In her work, references can often be found to Karen Barad's *agental materialism* and Jane Bennett's *vital materialism* in relation to many works of art created after the 1960s, including performance art, as well as works of media art that incorporate a performative element. While Hölling's work will be referred to frequently throughout this text, it is important to mention two projects in which she was involved, and which are particularly significant in this context.

One of the projects is *Conserving Active Matter*, conducted at the Bard Graduate Center as part of the broader *Cultures of Conservation* initiative — a ten-year programme aimed at fostering interdisciplinary collaboration between conservators and conservation scientists and scholars from the material culture-orientated human sciences, such as art history, anthropology, archaeology, and history. The scope of the project encompassed the development of a teaching curriculum, the organisation of research events, the curation of exhibitions, the establishment of fellowships, and the publication of academic works. This initiative culminated in the publication *Conserving Active Matter* (Poh and Miller 2022), which brought together a range of scholarly contributions, including those by Hanna B. Hölling, to critically reflect on the theoretical and practical implications of conserving dynamic and mutable materials.

The core premise of the project lay in recognising that scholars in the humanities were increasingly formulating sophisticated questions about the epistemological status of objects —specifically, their ability to function as historical evidence — and possessed more nuanced theoretical frameworks for conceptualising material culture. In contrast, conservators and conservation scientists offered precise, empirically grounded insights into the physical composition, chemical stability, and preservation strategies of objects. However, the entrenched disciplinary and institutional compartmentalisation between these fields often reinforced their separation. The project's central aim, therefore, was to bridge this divide by fostering interdisciplinary collaboration and dialogue.

Another significant project is the publication *Object – Event – Performance: Art, Materiality, and Continuity Since the 1960s*, which is edited by Hanna B. Hölling. The aforementioned publication employs the theoretical framework of new materialism, alongside other theoretical frameworks, including the phenomenology of Edmund Husserl. This volume calls into question the long-established principles of conservation and museum collecting, which have developed over the centuries to align with the conception of art as static, fixed, and permanent objects. In the contemporary context, conservators and museums face challenges related to the conservation of works created after the 60s, which are characterised by their instability over time. The contributors to this volume explore the implications of conservation for artworks that are inherently characterised by change and transformation.

Another significant theoretical influence that merits mention is that of *Actor-Network-Theory* (ANT), a concept that is associated with Bruno Latour. In her research, Vivian van Saaze integrates Actor-Network Theory (ANT) into the discourse of contemporary art conservation, as elaborated in her seminal work *Installation Art and the Museum*. The research is predicated on the idea that, in the process of doing art, the artwork, like any other participant (both human and non-human), is an *actant* Latour (1987). In the author's own words, this perspective shifts the focus away from viewing the artwork as a static, fixed object, enabling instead an understanding of its transformations and inherent indeterminacy over time. This methodological framework facilitates the analysis of "art in action", drawing attention to changes, transformations, and areas of friction. This approach facilitates an examination of the museum's constitutive role and highlights the distinctions among the various actors involved — nuances that are often overlooked in traditional analyses (Saaze 2013, 28). This strand of thought emerged within the research programme titled *New Strategies in the Conservation of Contemporary Art*, drawing from the discipline of cultural anthropology.

Consequently, conservation theory and practice have evolved to become more receptive to interdisciplinary interaction and have also evolved to become a practice that focuses on the production of knowledge. It is evident that conservation has evolved into a knowledge-generating activity, which is dynamic, creative, and reflexive. "In creating knowledge, conservation is never impartial, objective, or general but rather relational, establishing connections between objects and subjects and contingent on the predominant cultural, economic, and political perspective in the present moment" (H. B. Hölling 2021, 3). This text explores conservation as a theoretical practice. Building on the communicative turn, conservation now actively engages with the status of art, reshaping how it is perceived and fostering new theoretical frameworks for contemporary art. The concept of conservation challenges us to reconsider what defines an artwork within contemporary institutional contexts and calls for a critical examination of how museums must evolve structurally to effectively preserve contemporary works.

1.1.3. A Brief Overview of the History and Main Challenges of the Media Art Conservation

Before delving into the different practices for conserving media art, it is important to clarify the terminology employed in this paper. Historically, media art conservation has been categorised into distinct branches — such as *time-based*, *software-based*, and *net art*

conservation — due to the diverse material and conceptual nature of media artworks, each requiring specialised approaches.

In this text, *time-based* will refer specifically to durable media forms such as audio and video artworks. The term *software-based* will be replaced with *computer-based*, in alignment with the preferred terminology at ZKM, which underscores the integral role of hardware in these works and recognises that many *software-based* artworks are, in essence, *computer-based* installations. *Net art conservation* will denote practices concerning Internet-based artworks, which typically do not necessitate the original hardware for their preservation due to their specifics. The term *technology-based* (which also sometimes referenced as *industrial medias*) will be used in reference to electronic and kinetic artworks, including, for example, the works of Walter Giers and other pioneers of kinetic art[12].

1.1.3.1. Preservation of Time-Based and Technology-Based Art

The origins of media art conservation are more closely aligned with the tradition of film conservation than with the classical lineage of art conservation. However, similar to the broader development of contemporary conservation practises, the emergence of media art conservation was catalysed by a series of symposia held during the 1980s and 1990s. One of the first symposia was the *Media Arts in Transition* symposium, which was organised by the *Walker Art Center* in Minneapolis from 8-11 June 1983. The conference on film and video commenced with a panel discussion dedicated to the preservation of film and video. The speakers in attendance were Frank Hodsoll, Jean Firstenberg, Jay Leyda, Jonas Mekas and Lynn Blumenthal. Following this, the publication of *Media Arts in Transition* (Horrigan 1983) was initiated.

The emergence of media art has been primarily influenced by the evolution of video art. The popularity of the video format has led to the emergence of the need for its preservation as early as the 1980s, marking a significant milestone in the field of media art preservation. The close affinity of video art to film, coupled with the advancement of digital formats that have served to blur the technological distinction between video and film, has resulted in the position of video art as a medium within film archives and film institutes. This transition was also facilitated by the greater institutionalisation of cinema in the 1980s compared to media art, which provided a platform for dissemination and conservation, among other things.

This rapid obsolescence of video technology can be attributed to its nature as a commercially driven medium, subject to the fast-paced cycles of technological innovation and market demand. Following the success of Sony's Portapak camera and the CV-2000 videotape recorder in the 1960s — both of which significantly advanced the possibilities for home video production — consumer demand for accessible recording and post-

[12] It is evident that these categories are not strictly delineated. In some instances, a single media art conservation department may encompass multiple branches within an institution, and the distinctions between them are not always formally acknowledged. Nonetheless, this division highlights the reality that emerging new media art formats necessitate distinct conservation strategies, many of which remain underdeveloped. At ZKM, this division is institutionalised: time-based media are preserved by the LAVS department, computer-based formats are managed by conservators Morgane Stricot and Matthieu Vlaminck, while technology-based media restoration is overseen by the MUTECH department, notably through the work of Marlies Peller.

production equipment increased sharply. This surge in interest catalysed intense competition among manufacturers seeking to capture the burgeoning market. Competition had already been evident in the development of the Open Reel Video format. Notably, the emergence of incompatible standards — such as Sony's CV (Consumer Video) and Ampex's AV (Audiovisual) — underscored the fragmented nature of early video technology. These proprietary systems were not interoperable, meaning that tapes recorded on one system could not be played on another, thereby requiring consumers to use format-specific playback equipment and contributing to the technological obsolescence that would later challenge media art conservation.

The culmination of this process is represented by the *format* wars, which emerged in the late 1970s and persisted throughout the 1980s. During this time different manufacturers competed to produce a wide variety of video formats and the corresponding playback devices. This market competition centred on the incompatibility of consumer-grade analogue videocassettes and videocassette recorders (VCRs) during this period. Rival manufacturers promoted proprietary formats that were often mutually exclusive, thereby fragmenting the market and creating significant challenges for long-term accessibility and playback. The primary focus of this conflict was the competition between the Betamax and Video Home System (VHS) formats.

In 1974, Sony unveiled a prototype videotape recording system to other electronics manufacturers, dubbed "Beta". The company anticipated that these manufacturers would endorse a unified format for the benefit of all stakeholders. However, JVC opted to pursue an independent format. Concurrently, manufacturers introduced an array of alternative systems, including needle-based, record-style discs (RCA's Capacitance Electronic Disc, JVC's Video High Density disc) and optical discs (Philips/MCA/Pioneer's LaserDisc). Despite their introduction, these disc formats failed to garner significant market share due to their inability to facilitate home recording. Instead, they each occupied modest niche markets. This process has resulted in a situation where the necessary playback equipment for various previous formats has become increasingly scarce. The rapid advancements in technology, coupled with the absence of standardisation, have rendered a significant number of tapes and formats susceptible to obsolescence, thereby jeopardising the preservation of the information they contain. This phenomenon of risk is characteristic of the diverse video formats that emerged in the subsequent years.

In the context of the rapidly expanding and competitive market in the 1980s, video artists found themselves in a particularly vulnerable position. The so-called 'format wars' compelled them to migrate their work incessantly between different formats, a process that frequently resulted in a decline in quality or even loss. This issue was further compounded by the fact that the cost of preserving artists' work increased significantly. This necessitated the urgent preservation of their work, as the obsolescence of video technology was proving to be a more rapid process than that of film. It was a considerable surprise to many that video was generally found to be a medium with a relatively short lifespan.

A subsequent issue emerged with the advent of digitisation, as analogue technologies and video signals transitioned to digital formats. This shift required artists to acquire new technical knowledge, skills, and resources to ensure the continued maintenance and viability of their works, thereby introducing additional challenges in the preservation of time-based art forms. These challenges included the need to study digitisation processes and digital video formats, develop strategies for long-term digital storage, and keep pace with evolving technological standards—all of which significantly impacted the preservation and sustainability of media artworks.

In consequence of the increasing intricacy involved in the preservation of works in the context of technological developments, artists have come to acknowledge the imperative for institutional intervention to facilitate the long-term conservation of their creations. This realisation prompted numerous artists to establish collaborative communities and alliances, thereby fostering networks in which knowledge, resources and best practices could be shared [13]. This was frequently due to a lack of financial resources, which precluded the possibility of condemning artist their own work. These collective endeavours sought to empower artists to navigate the technical and conceptual challenges posed by digitalisation and obsolescence, thereby ensuring the preservation and maintenance of their artworks beyond the individual capacities of the artists themselves. Such collaboration also strengthened advocacy for the development of specialised conservation frameworks and encouraged dialogue between artists, institutions, and conservators. This period also coincided with the establishment of the first video art archives and the broader institutionalisation of media art, marked by an increase in the acquisition of video art by contemporary art institutions.

One of these initiatives was the *Symposium on Video Preservation*, which was held at the *Museum of Modern Art* in New York from 13-14 June 1991. This was the inaugural video preservation symposium for the media arts field in New York. It was convened by the *Media Alliance*[14] (under the leadership of Mary Esbjornson) and the *Electronic Media and Film Program* (part of the *New York State Council on the Arts*, NYSCA). As part of a long-term advocacy plan, the *Media Alliance* launched an initiative to address the critical issue of video preservation in 1991. *The Media Alliance* conducted a resurvey to assess the efforts of individuals and institutions in preserving their video collections. To this end, they developed a questionnaire and disseminated it to 111 individuals and institutions, primarily located in the Northeast Region of the US. The questionnaire addressed the content of collections, collection management, preservation and funding for preservation. The results of the survey revealed that a significant proportion of video is not only held by museums and archives, but also by libraries, distributors and producers. Moreover, the researchers were able to collect data on extant preservation and archiving models, as well as the principal critical issues in this domain. The research findings were subsequently published in the publication *Video Preservation: Securing the Future of the Past* (Boyle, n.d.) accompanied by the results of the symposium, as well as information on U.S. video recording formats, facilities for cleaning and remastering videotape, etc.

Another significant event that was also partly organised by the *Media Alliance* was the *Playback '96: Video Preservation Roundtable*, which was held at the *San Francisco Museum of Modern Art* (SFMOMA) on 29-30 March 1996 [15]. The event represented a pioneering endeavour in the realm of interdisciplinary discourse, uniting professionals from diverse fields including conservation, museology and media arts to deliberate on the intricacies of videotape preservation. It garnered a distinguished assemblage of

[13] As will be demonstrated in the following section, the Bay Area Video Coalition (BAVC), Media Alliance and The Kitchen are some of the groups, initiatives and institutions to be discussed.

[14] The Media Alliance was a non-profit membership organisation that worked to develop the media arts field, primarily in the US. Its activities were divided among the following areas: expanding resources, support and outlets for independent media arts; facilitating networking and information-sharing about issues and opportunities; and providing programmes and services that respond to membership needs.

[15] The transcript of the conference is available for consultation at the following URL: http://web.archive.org/web/20070907171328/http://palimpsest.stanford.edu/byorg/bavc/pb96/transc/ (accessed 09.03.25).

participants, comprising conservators, scientists, video artists, media curators, television engineers, archivists, librarians and preservation administrators. The event was organised by *BAVC* (Sally Fifer) with assistance from *AIC* (Debra Hess Norris) and *Media Alliance* (Mona Jimenez). It was supported by the *Getty Foundation* (Tim Whelen) and the *Andy Warhol Foundation* for the Visual Arts (Pamela Clapp). *BAVC* convened eight groups of professionals throughout the US to each discuss topics in the eight months prior to the event: Analysis and Evaluation Procedures; Cleaning and Remastering; Storage; Ethical Principles and Dilemmas; Changes in Technology and Practice; Maintaining Installation Art Using Technology; Current Preservation Practices & Education and Awareness; and Establishing Priorities for Preservation. Each of the groups presented its findings to the conference in the form of papers and panel presentations. On this occasion, the symposium boasted a more international character, and an *International Panel* was also included. This conference also marked the initiation of processes that have never previously occurred: namely, the establishment of collaborative relationships between experts from the conservation community and those from various aspects of the media arts, with the shared objective of preserving video collections held in museums, galleries, libraries and other repositories worldwide[16].

After that point in time, the popularity of symposia dedicated to the preservation of video recordings has increased, as has the number of such events. It would be impractical to list them all; however, it is important to mention one more. Around the 2000s, a few initiatives have emerged with the objective of popularising the subject and facilitating knowledge exchange between institutions, also considering the issue of time-based media art forms. One of the most significant of such initiative has been *Matters in Media Art: Collaborating towards the care of time-based media* which was conducted from January 2003 to December 2015. This project was a collaborative effort between MoMA, SFMOMA, and Tate. The establishment of guidelines for best practice in the management of time-based media within institution (e.g. video, film, audio) was the objective of the project. The consortium initiated its first phase, which focused on loaning time-based media works, in 2004, and its second phase, which concentrated on acquiring time-based media works, in 2007. The project was led by the following individuals: Pip Laurenson (Tate), Jill Sterrett (SFMOMA) and Glenn Wharton (MoMA). Upon completion of the project, a website was initiated, containing all the information that the researchers had been able to ascertain[17]. The website was designed to serve two primary functions: firstly, as a repository for institutions and individuals with the collection, and secondly, as a resource for those seeking to acquire and document media art collections. The website offered more than just information; it also provided a concise guide to building and caring for a media art

[16] One of the inaugural conferences about preservation of media art to be held in Germany was entitled *Wie haltbar ist Videokunst? / How Durable is Video Art?*, and was hosted by the Kunstmuseum Wolfsburg on 25th November 1995. This conference was held on the occasion of the exhibition of Nam June Paik's *High-Tech-Allergy*. The proceedings of the conference were published in 1997 (Otterbeck et al. 1997). The subsequent symposium was entitled *Video im Museum: Restaurierung und Erhaltung, neue Methoden der Präsentation*, which translates to *Video Arts in Museums: Restoration and Preservation, New Methods of Presentation*. It was held on 9 September 2000 at the Museum Ludwig in Cologne (Friedrich and Museum Ludwig 2008).

[17] The archived website, in its previous form, can be accessed via the following link: http://web.archive.org/web/20080621032706/http://www.tate.org.uk/research/tateresearch/majorprojects/mediamatters/ (accessed 20.03.25). The current version can be found here: http://mattersinmediaart.org/ (accessed 20.03.25).

collection. This guide included examples of the Collection Survey and a budget template, which were designed to assist users in planning and managing their media art collections.

Moreover, it swiftly became evident that the issue of video art preservation is not confined to the domain of video preservation or the digital conversion of analogue video into digital formats. This is due to the fact that often a video artwork was not so much a file or a tape that could be shown in different environments, but sometimes an installation or a sculpture, which meant that sometimes the playback device or the screen became an important part of the work (as in the works of Nam June Paik, *The More, The Better*). In certain instances, the artist may have created an entire environment in which the player or screen constituted a constituent element, or created a custom playback device or similar apparatus, such as the Synthesizer that was created by Nam June Paik and Shuya Abe[18]. This renders preservation significantly more complex, as it necessitates the preservation, or replacement with an identical one, of not only the video itself but also the original technological devices on which it was displayed. These works posed significant challenges to established institutions by posing critical questions concerning issues such as authenticity and the evolving concept of the art object in the post-1960s era. Furthermore, it was demonstrated that effective conservation requires the involvement of technologists who possess specialised knowledge of obsolete device functionality.

Additionally, it was found that video installations often face the same problems as technology-based installations, like kinetic art, which need mechanical or electrical parts replaced regularly, like the works of Walter Giers that also need ongoing replacement of electronic parts to keep working. Technology-based art perpetually deteriorates due to its constant state of connectivity and operation. While the constituent components may be engineered to withstand a steady influx of electrons, the picture tubes are prone to failure. Furthermore, on-and-off transients have been observed to result in the wear-out of relays in equipment due to electrical surges. The continued accumulation of heat in a system has been shown to cause the degradation and subsequent failure of parts. The unpredictability of machine failure, exacerbated by the absence of manufacturer-provided data on device lifespan, remains a significant source of frustration and concern. Because the primary objective of an art institution is to maintain the artwork's original integrity, and due to the conservation ethic associated with the 'minimal intervention' approach, numerous works have been deemed too difficult to preserve, consequently leading to their loss.

In the symposium *Playback: A Preservation Primer for Video*, Mark Roosa's talk, *Maintaining Technology-Based Installation Art*, emphasised the distinctive requirements of *technologically-based* works. He underscored the necessity for standardised documentation of the works and of artists' intentions, for recommended treatment practises, and for the establishment of a curriculum for conservation schools. The present report was instrumental in the preservation of the technologically-based arts. In this manner, Mark Roosa articulated the necessity for a tradition of technologically-behaved art and, moreover, established its foundation. The next significant event for *technologically-based* art was titled *TechArchaeology: A Symposium on Installation Art* Preservation and was held at the *San Francisco Museum of Modern Art* (SFMOMA) on 5-6 January 2000.

[18] From 1969 to 1971, Paik collaborated with television technician and specialist Shuya Abe to construct a video synthesizer that enabled the simultaneous editing of seven different sources in real time. The apparatus comprised seven cameras, each calibrated to receive a single colour, thereby enabling the capture of a specific hue. The combination of video feedback, magnetic scan modulation, and non-linear mixing, followed by colourisation, resulted in the generation of novel imagery. The equipment was further enhanced by a button for mixing, as well as a small clock that reversed the colours from ultraviolet to infrared (Vasulka and Vasulka, n.d.). Subsequently, Paik created his manifesto, entitled 'Versatile Video Synthesizer'.

TechArchaeology is notable for its move beyond theoretical discussions of electronic installation works, instead adopting a case study format to address complex pieces. The concept for *TechArchaeology* evolved into an investigative working group model, drawing parallels with *Playback*. A group of twenty-five curators, conservators and artists examined works from the exhibition *Seeing Time: Selections* from the Pamela and Richard Kramlich Collection of Media Art at SFMOMA. The initiative was conceived by Mona Jimenez and Paul Messier and was funded by the Getty Foundation. A special journal issue was published in 2001 (Reedy 2001) with contributions from Pip Laurenson, Timothy Vitale and others. The event was succeeded by *TechArchaeology Reformatted* (2002) and *TechFocus* (2010).

1.1.3.2. Preservation of Computer-Based and Net Art

The 1990s are frequently regarded as the apogee of media art, a period marked by the widespread adoption of digital technology, and particularly the decline in the cost of personal computers. It was also the time of the advent and widespread use of the Internet and the transition from analogue to digital technology. All of it gave rise to the establishment of more diverse practises and works of a more ephemeral nature than technological installations have emerged: net art, software art, multimedia installations and other formats within the ambit of media art. This period was also rapid enough to demonstrate that the lifespan of computer-based pieces exhibited is, on average, even shorter than that of video art. At the conference *Preserving the Immaterial: A Conference on Variable Media*, Bruce Sterling famously described the demise of computer-based art: "When a piece of software decays, it does not degrade like a painting, slowly and nostalgically. When a software fails, it crashes; it means the Blue Screen of Death." (Sterling 2001).

It became clear early on that the conservation of computer-based art was very different from the conservation of process-based formats such as audio and video. The integration of computers into art practice has introduced a significant increase in the complexity of the conservation process due to the unique architecture of computers, which consist of both hardware and software components. At a high level, a computer follows a layered architecture. At the base is the *hardware layer*, which includes components such as the CPU, RAM, and I/O devices, responsible for executing low-level machine instructions. Above this, the *software stack* is structured into three layers: *the operating system layer*, *the application support layer*, and *the application layer*. This hierarchy aims to provide increasing levels of abstraction, with each layer shielding the complexities of the lower levels. The *operating system layer* (e.g., Windows, Linux, Unix, Mac OS) sits directly above the hardware, making hardware functionalities accessible without exposing their complexity. Above it, the *application support layer*, which includes development environments, window managers, and user interfaces, abstracts the operating system, ensuring applications remain unaffected by OS changes. At the top, the *application layer* hosts everyday software, such as web browsers and social media applications (Yılmaz 2022, 102). Digital art, created using computers, is typically located in *the application layer*. When representing the structure of a computer as a triangle, or even as an iceberg, it is important to note that the part containing the artwork is only the top. In order to preserve this work, it is necessary to preserve the whole structure, as a part of the work can be created for a special environment, and its transfer to a new environment is problematic.

The abstractions provided by the underlying hardware and software stack introduce dependencies between the artwork and the supporting system layers. These dependencies can become problematic when the underlying layers evolve. This may result in changes to interfaces, semantics, and interactions, or the obsolescence of components. Since digital artworks have no control over these foundation layers, they are vulnerable to maintenance challenges, requiring ongoing adaptation to ensure longevity and functionality. The inability to comprehend the architecture of the computer system has resulted in the emergence of misconceptions. This is due to the perception that the object of purchase or preservation is the object that has undergone an artistic intervention, which is normally just an application. However, in the case of digital art, the work of art happens to be not a single file or software but the entire environment, which is usually not visible or obvious to the user. The work is thus contingent on a considerable number of factors, including but not limited to hardware, operating systems, programmes (for example Adobe Flash), and occasionally external platforms such as social networks or search engines, which are also the property of corporations.

It has been demonstrated that digital art forms are characterised by a high degree of fragility, frequently resulting in their immediate obsolescence. For example, in the domain of software art, the prevailing challenge is characterised by the recurrent modifications to operating systems (software) and the discontinuity of hardware. Consequently, artists are required to dedicate a substantial amount of time to the maintenance of their artworks. In the process of maintaining technological art, it is imperative to update the hardware and software components that constitute the work. Simultaneously, the audio and visual materials must be adapted to comply with contemporary systems. A salient concern is the potential loss of functionality in the technological components that comprise these works, which could result in their obsolescence in the future.

The instability of internet art presents a particularly pressing challenge. A frequent issue is the malfunction of hyperlinks, which require ongoing updates to maintain functionality. The longevity of network-dependent internet artworks is compromised primarily by the rapid and continual evolution of web technologies. Consequently, artworks created with outdated technologies face increasing risks of becoming inaccessible, while the structure of new web-based works concurrently evolves in tandem with technological advancements. This dynamic necessitates the development of conservation strategies capable of accommodating the evolving nature of these artworks.

Furthermore, even more ephemeral forms of media art — such as computer viruses — have emerged, further complicating preservation efforts. In this context, artists are often compelled to undertake continuous updates and maintenance, assuming ongoing responsibility for the preservation of their work. Moreover, they were obliged to devise methodologies for the institutionalisation of their art and the engendering of a market for it, including the marketing of works to private collections. Concurrently, there was a necessity to establish dedicated platforms for the dissemination of computer art, as well as the formation of a community to share responsibility and knowledge. One of the most significant platforms happened to be *Rhizome*.

In the 90s a growing awareness among numerous artists emerged that the conventional practice of merely documenting and distributing media art in paper format was inadequate, as it could not adequately mediate the content in book form. Conventional art and cultural mediation remain predominantly print-based. Conversely, net-based media have yet to establish platforms that extend beyond the usual circle of insiders, and the logical solution was to create these platforms in the internet domain. Rhizome constituted one such platform. In 1996, the artist and curator Mark Tribe established Rhizome as an electronic

mailing list for individuals associated with net art. By August of that year, the organisation had launched its website, which by 1998 had cultivated a notable readership within the Internet art community. Originally designated a business entity, Rhizome transitioned to the domain name suffix ".org" and adopted the status of a nonprofit organisation in 1998. Since its establishment in 1999, Rhizome has been responsible for the *ArtBase*, an online archive which was initially conceived exclusively as a database of net artworks. However, the scope of the ArtBase has since expanded to include other forms of art engaged with technology, including games, software, and interdisciplinary projects with online elements.

The advent of *ArtBase* concomitantly gave rise to the imperative to preserve and maintain the works exhibited by the archive. It is not a collecting institution in the formal sense of the term; rather, artists upload their projects to the ArtBase voluntarily, and *Rhizome* stores a "copy" of a work with its metadata. The organisation works to repair links when broken and provides constant access to works once they are included. Nowadays, the remit of *Rhizome* has expanded to encompass not only the function of an online repository but also the preservation of born-digital art and the updating of obsolete code. It is evident that *Rhizome* has become a prominent institution in the domain of digital art preservation, employing a distinct methodology. Since 2003, *Rhizome* has held the status of an affiliate in residence at the Museum of Contemporary Art in New York City. Following its establishment as an affiliate of the *New Museum* in New York in 2003, *Rhizome* initiated the development of its institutional infrastructure, which resulted in the appointment of curator Lauren Cornell as Executive Director in 2005 and Ben Fino-Radin as its inaugural Digital Conservator in 2006. In 2014, the appointment of Dragan Espenschied to lead Rhizome's *Digital Art Conservation Program* marked the institution's full establishment of its digital preservation infrastructure and consolidated its reputation as a leading platform in this field (Quaranta 2019)

The organisation's programmatic activities — many of which occur online — encompass commissions, exhibitions, events, discussions, archives, and artist portfolios. However, collaboration with the *New Museum* also enabled the organisation to realise offline exhibitions. One of the most significant exhibitions organised there by Rhizome was '*The Art Happens Here: Net Art Anthology*,' which premiered in winter 2019 (Connor et al. 2019). The project's distinctiveness lies in its status as a pioneering large-scale historical exhibition dedicated to the subject of net art. The series undertook the intricate task of identifying, preserving, and presenting 100 exemplary works within a field. This ambitious undertaking was aimed at establishing a comprehensive net art canon, offering a valuable contribution to the field. The objective of *ArtBase* is to preserve art objects in a manner that closely resembles their original context, whilst also providing a sustained capacity to research and interact with these works and the history they collectively represent. One of the most significant and innovative approaches endorsed by *Rhizome* is the historicization of media art. This approach entails the presence of a substantial collection of works, a feature frequently absent in conventional art institutions. This approach involves the formulation of preservation strategies that preserve art objects in a manner that closely and accurately resembles the work within its historical context. Such strategies also provide a sustained capacity to research and interact with these works and the history they collectively represent (Fino-Radin, n.d., 6). In recent years, *ArtBase* has modified its collection policy and now makes its preservation documents available online. Furthermore, several related publications have also been made available in this way. These documents represent only a fraction of the research projects currently underway in this area. The international collaboration had a significant impact on the current discourse surrounding the collection and preservation of variable and media-based work, which is now as varied and sometimes open as much of the work itself (Jones 2014, 164–67).

In the early 2000s, *Rhizome* participated in a significant initiative pertaining to the conservation of computer-based art. This initiative, known as the *Variable Media Network*, comprised a consortium of institutions, including the *Guggenheim Museum*, the *Walker Art Center*, the Berkeley Art Museum, and others. The coordination of this project is overseen by two individuals: Jon Ippolito and Alain Depocas. This initiative culminated in the organisation of a conference, titled *Preserving the Immaterial: A Conference on Variable Media*, which was held at the Guggenheim Museum in New York City on 30-31 March 2001. A two-day symposium was convened to both introduce and discuss the *Variable Media* paradigm in a public forum. The panel discussions focused on the issues and challenges of preserving reproducible, performative, interactive, and duplicable artworks. The Guggenheim explored and tested the variable media methodology, focusing on a selection of case studies, including Ken Jacobs's Bitemporal Vision: *The Sea* (1994), *Net Flag* (2001) by Mark Napier, *Site* (1964) by Robert Morris, *TV Garden* (1974) by Nam June Paik, and *The Erl King* (1983-1986) by Grahame Weinbren and Roberta Friedman, to name a few. Subsequently, the publication *Permanence Through Change: The Variable Media Approach* was issued (Depocas et al. 2003). The publication under consideration comprises excerpted transcripts from the *Preserving the Immaterial* conference, in addition to essays authored by members of the Variable Media Network.

The principal conclusion of the initiative was the recognition that effective conservation strategies for digital artworks must address both their inherently ephemeral nature and the necessity of ongoing maintenance. Additionally, the rapid obsolescence of technological components and the increasing scale and diversity of museum collections must be taken into account. The *Variable Media Network* responded to these challenges by introducing an innovative methodology that shifted the focus from medium-specific descriptions to the notion of an artwork's 'behaviours.' This approach aimed to capture the essential qualities of a work that must be preserved, regardless of the medium used. A key tool developed within this framework was a questionnaire designed to gather direct input from artists about their intentions and to anticipate how their work might be adapted when it can no longer exist in its original form [19].

Furthermore, the initiative holds historical significance, as it laid the groundwork for several core strategies in media art conservation, including *migration*, *emulation*, and *reinterpretation*." In computer-based preservation, both hardware and software are maintained systematically, often with spare parts, to sustain the functionality of a work. However, replacing outdated technology poses major challenges, particularly in preserving the interaction between hardware and software over time. *Emulation* — using software to mimic obsolete systems — offers a solution by allowing legacy works to function in modern environments. Originally used in video game preservation, emulation has become central to media art conservation, especially for digital-born works. In this regard, the exhibition *Seeing Double: Emulation in Theory and Practice* organised by the *Variable Media Network* was of particular significance. This exhibition brought together eight significant works of media art from the 1960s through to 2004, pairing the original versions with "emulated" ones. The aim was to compare what they might look like in the future if their original components were no longer available. The exhibition featured works by Cory Arcangel, Mary Flanagan, Jodi.org, Robert Morris, Nam June Paik, John F. Simon Jr., and Grahame Weinbren, along with their potential future iterations. This approach

[19] A video tutorial to the Variable Media Questionnaire is available at https://tutorials.nmdprojects.net/use_vmq_1/help.html (accessed 18.02.2025), it provides an explanation of the questionnaire's functionality and links to additional screencasts that address the questionnaire in detail.

enabled the testing of questions concerning obsolescence and authenticity in a tangible context.

A seminal example illustrating the impact of the *Variable Media Network* is Grahame Weinbren and Roberta Friedman's *The Erl King* (1982–85), an early work of interactive cinema. The Network undertook a year-long preservation case study in close collaboration with the artists, including interviews and technical analysis. The artwork originally ran on a Zilog Z-80-based personal computer with a CP/M operating system, a touchscreen, and a custom laserdisc interface. Despite its outdated hardware, the piece offered an advanced level of interactivity. The study revealed that preserving the physical hardware indefinitely was impractical. While the artists did not view the original equipment as essential, understanding its limitations was crucial. The original code, authored by the artists and collaborators, was identified as central to the work's authenticity and thus vital to its preservation (Depocas et al. 2003, 101–7). For this reason, the decision was made to preserve the original code and digitised video/audio components of *The Erl King*, rather than migrate the work to newer systems. A custom programme was developed to interpret the original source code, while all hardware — except monitors and the touchscreen — was emulated (Dimitrovsky 2004). Throughout the process, decisions had to be made about whether to replicate system behaviours exactly, including flaws, or introduce modifications. For instance, system crashes raised questions of authenticity versus stability. Notably, faster response times in the new system undermined the intentional pacing of interactions, which, according to the artist, weakened the work's impact. To preserve the original experience, the emulator was calibrated to retain the original system's timing and nuanced behaviour (Depocas et al. 2003, 101–7). The emulated version of the work exhibited was of such a quality that it was deemed equal to the original version. However, the team decided to exhibit the technological components of the work behind transparent glass in order to demonstrate the difference between the two versions. Consequently, the strategy employed to preserve *The Erl King* proved to be a resounding success, as the team effectively created an emulated version of the work that, to the viewer, appeared indistinguishable from the original. However, this emulated version enabled a substantial extension of the work's lifespan.

Thus, the Variable Media Network introduced several revolutionary solutions to the world of media art conservation. These solutions encompassed not only the use of emulation but also the active use of interviews with the artist to define the boundaries of the authenticity of the work. Furthermore, the initiative proposed a series of concepts pertaining to the "originality" of the work, encompassing technological components that are not always perceived by the viewer (such as, in this case, the source code). The *Variable Media Network* initiative also laid the foundation for a specialised discipline in computer-based art conservation. It became clear that preserving such works requires both technological expertise and a deep understanding of media art history. This realisation prompted institutions to recognise the need for specialised training and the exchange of knowledge — particularly among well-resourced museums with research capacity and dedicated staff.

The *Matters in Media Art* and *Variable Media Network* projects are part of a broader international movement addressing evolving collection and conservation practises. Key initiatives, such as the International Network for the Conservation of Contemporary Art (INCCA), have played a central role in fostering knowledge exchange among professionals. While media art presents unique challenges, many of its preservation concerns align with broader issues in contemporary art conservation. These challenges also reflect wider cultural anxieties, particularly the rapid obsolescence of digital media — a

phenomenon often described as the ‘digital dark age’ or ‘digital amnesia’ — which threatens not only artistic and cultural heritage but digital culture in everyday life.

The issue of digital obsolescence has significantly affected both institutions and individuals. Notably, individual-led preservation efforts have at times proven more effective than those of professional institutions. In his essay *Trusting Amateurs With Our Future* (Ippolito 2016a), John Ippolito explores why unofficial, amateur-driven practises have often succeeded where institutional approaches have lagged. While professional conservators have preserved only a small fraction of new media artworks since the 1980s, a global network of amateurs has played a vital role, especially in conserving early computational media such as video games. These efforts, largely fuelled by personal passion and facilitated by open-source culture, have led to the development and maintenance of emulations. This model proved effective due to its low cost, collaborative nature, and relative legal immunity — given the anonymity and decentralisation of contributors, which complicates enforcement of proprietary claims by corporations.

Amateur enthusiasts have proven more effective than art institutions in preserving media art reliant on specific platforms and large corporations. This realization has encouraged conservators to collaborate closely with these *amateurs* to safeguard digital culture. One such practice involves publishing research and findings on platforms like GitHub, which ZKM also participates in [20], aiming to reach a wider audience beyond traditional art circles. Institutions recognized that creating a supportive environment — centred on a community of interested individuals — was essential for sustainable digital art preservation. Equally important was the development of an open-source ecosystem, which required considerable time and effort. This approach supported two key preservation strategies: the *cultivation* strategy, focusing on keeping software accessible via open-source platforms, and the *hibernation* strategy, which preserves the critical knowledge needed for future software restoration (Hong 2015).

Furthermore, it can be said that amateurs’ internet practices have influenced not only the formation of conservatory practices but also institutional practices. One such example is the borrowing of version logic from GitHub by Jon Ippolito to document variation in works. In his text *Death by Wall Label* (Ippolito 2008) he proposes a new Wall Label format that would incorporate the idea of variation in the work. For example, Ippolito suggests documenting the artwork *TV Garden* using Description versions 1.1 or 3.4 (see fig. 1.2). Moreover, another important practice in digital preservation — especially concerning the Internet — is the growing use of Wikipedia as an open platform for knowledge sharing. Wikidata is a popular platform that is frequently utilised for digital preservation purposes Thornton et al. (n.d.) Thornton et al. (2018) Meyerson et al. (2017). For instance, Wikibase has been employed since 2015 by *Rhizom*.org for its archive of born-digital art and digital preservation activities (Fauconnier 2018). In addition to other initiatives, ZKM utilises the Wiki platform for the purpose of documentation and knowledge sharing concerning their computer-based works amongst employees[21].

[20] The following link provides access to the ZKM Karlsruhe GitHub repository: https://github.com/zkmkarlsruhe (accessed 21.03.25).

[21] The ZKM Wiki is not accessible to individuals outside the institution due to legal restrictions. However, to facilitate orientation, the reader is directed to view the publicly accessible pages such as *Dokumentation Model* https: //werke.zkm.de/wiki/index.php/Documentation_model (accessed: 20.05.25). URL: https://werke.zkm.de/wiki/index.php/Acquisition_workflow_(Software-based_artworks)#Post-Acquisition_marathon_(be_prepared_to_be_proactive) (accessed: 28.03.25) and with *Documentation model* URL: https://werke.zkm.de/wiki/index.php/Documentation_model (accessed: 28.03.25).

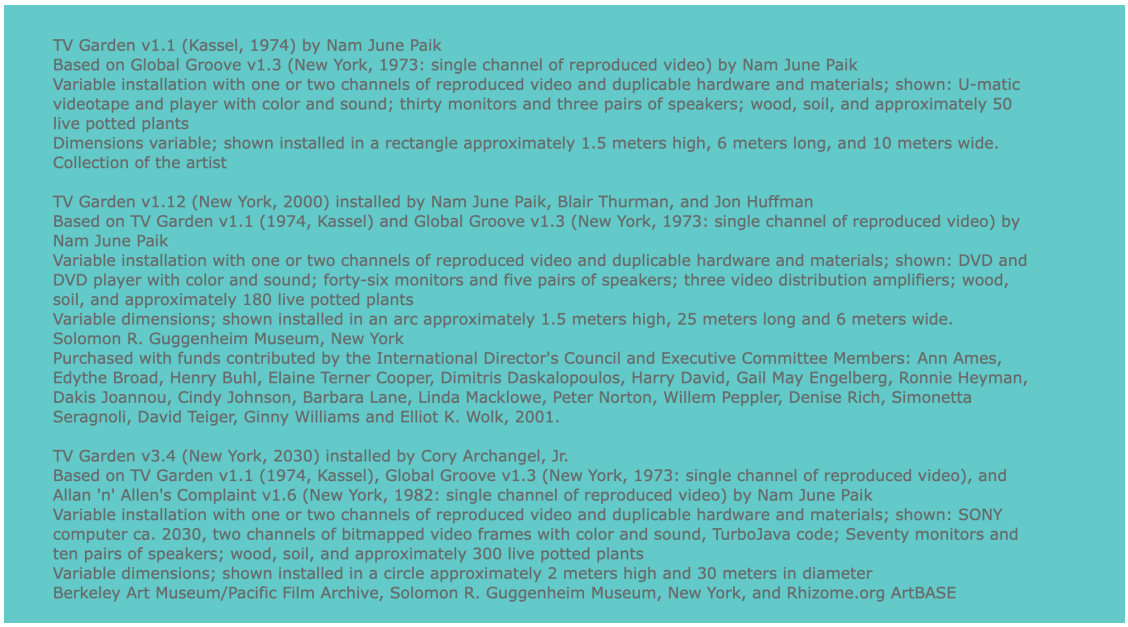

Figure 1.3. *Example of Ippolito's Versioned Wall Label.* URL: http://vectors.usc.edu/thoughtmesh/publish/11.php?collaboration (accessed 27.03.2025)

Although by the early 2000s large institutions had begun to raise sufficient funds to preserve individual works, the cost of conservation proved to be significant, not only in terms of money but also in terms of human and time resources. Jon Ippolito, for example, notes that *The Earl King* re-creation was only made possible by an extraordinary team of individuals and organisations willing to fund it. "It is hard to imagine spending two years and tens of thousands of dollars to recreate every interactive video installation from the 1980s, much less every endangered example of media art" (Ippolito 2016b, 542). In such circumstances, artists found themselves in a particularly vulnerable position, lacking the resources and expertise to adequately preserve their own works.

In this environment, artists confront the challenges of sharing knowledge and creating specialized tools to preserve their own work. A seminal contribution on this topic is Rafael Lozano-Hemmer's *Best Practices for Preserving Media Art From an Artist's Perspective* (Lozano-Hemmer [2015] 2023), published on GitHub. Lozano-Hemmer explores how artists working with complex media installations can institutionalise their work and details the strategies his studio has developed over time to facilitate the sale and long-term preservation of media artworks. Another noteworthy initiative was led by Rhizome. In collaboration with newly appointed Executive Director Zachary Kaplan and other contributors, Dragan Espenschied worked on *Webrecorder* [22], a freely accessible tool designed to create and share high-fidelity, fully interactive replicas of virtually any website. *Webrecorder* utilises emulation of operating systems and legacy browsers to present websites and desktop applications in their original software environments. Recognising its broad public significance — applicable not only to net art but to all forms of online artifacts — the Andrew W. Mellon Foundation awarded Rhizome a $1 million grant in 2018, marking the largest donation in the organisation's history (Quaranta 2019). This tool has empowered individuals lacking advanced technical skills to preserve their

[22] The source code and GitHub publication are available for consultation at the following address: https://github.com/webrecorder/ (accessed 21/03/2025). The project's website can be found at https://webrecorder.net/ (accessed 21/03/2025).

own digital creations, representing a major step forward in the practice of self-preservation within media art.

A further potential avenue for artists to preserve their work was the delegation of their work to institutions or organisations. In some cases, artists were required to donate their work for it to be taken care of. The aforementioned *Rhizome* was an organisation that facilitated this process, as artists uploaded their work to *ArtBase* themselves, on a voluntary basis. Another such platform that is orientated towards preservation and distribution of works is *LIMA*, Amsterdam. The Foundation *LIMA* was established in 2012 by experts from the Netherlands Media Art Institute with a focus on providing sustained, long-term access to works of media art. *LIMA* offers digitisation and preservation services, as well as permanent digital storage for media artworks by more than five hundred artists and for more than fifteen collections.

ZKM is one such institution, with a significant portion of its archive and video art collection formed primarily through donations. After establishing the Antique Video Systems Laboratory, many artists — especially those connected to Peter Weibel — became aware of ZKM's digitisation efforts. Motivated by this, numerous artists voluntarily entrusted their archives to the institution for preservation. Initially, some archives were outright donations; later, ZKM introduced a program that allowed artists to digitise their archives free of charge while retaining digital copies for its own holdings. This arrangement offered artists the opportunity to preserve their works and to contribute to the institution's extensive video art collection, thereby facilitating the historicization of their work.

1.2. The Development and History of ZKM's Conservation Infrastructure

1.2.1. Laboratory for Antiquated Video Systems

The evolution of conservation practises within ZKM has been a gradual process. The institution did not immediately recognise the necessity for a conservation department to be established. As with the development of the field of media art conservation, the establishment of preservation structures within ZKM has been a gradual process

The history of conservation at ZKM can be traced back to the foundation of the *Laboratory for Antiquated Video Systems* (germ. *Labor für antiquierte Videosysteme*). The Laboratory was founded in 2004 with the objective of conserving video art in the ZKM archives and collection. Dorcas Müller, the head of the laboratory, expounds that the establishment of the laboratory was chiefly motivated by ZKM CEO Peter Weibel's aspiration to safeguard his personal artist video archives from potential loss during the transition from analogue to digital video formats. Consequently, the decision was made to establish a laboratory dedicated to the digitalisation of obsolete video formats. Prior to this, various departments at ZKM were engaged in video-related activities, namely *the Media Library* (germ. *Mediathek*), which possessed additional video archives, or the *Video Studio*, which specialised in video documentation of events at ZKM. However, none of these departments

were involved in digitizing or preserving ZKM's video holdings. Subsequent to the establishment of the laboratory, a concerted effort was made to integrate all extant departments into this process. For instance, the *Video Studio* was incorporated into the long-term storage system that was implemented.

The establishment of the *Laboratory for Antiquated Video Systems* (LAVS) was initiated by Peter Weibel and supported by a group that included Steina and Woody Vasulka — artists in residence at the time — who contributed a collection of obsolete video equipment. Another key contributor was Christoph Blase, son of Karl-Oskar Blase, who donated analogue tapes documenting *Documenta 5* and *6*, along with a collection of outdated machines. Christoph Blase later became the head of LAVS. Dorcas Müller played a central role in the development of the lab, overseeing video digitisation projects, assembling a dedicated team, and building the necessary infrastructure. She was also responsible for developing an information system for video retrieval and designing a long-term storage solution.

The establishment of the laboratory also depended on assembling a technologically skilled team capable of managing a broad range of expertise, including obsolete analogue video equipment, computer systems, digitisation processes, and long-term storage. This team was responsible for integrating these diverse technical domains. One such specialist is Friedrich Sambs, whose expertise in obsolete video equipment remains vital to the lab's ongoing operation. He is not only responsible for repairing playback devices and old CRT monitors, but also for designing custom equipment for cleaning tapes — tools that are not always commercially available. Also, an important role in the creation of the Laboratory was played by Technicians and IT specialists from the *Institute for Visual Media Karlsruhe*[23], who played a key role in building the studio's technical infrastructure, developing storage solutions, and configuring the long-term storage server.

The establishment of a long-term storage solution has been one of the most difficult and long-lasting challenges, which significantly slowed down the process of setting up the LAVS. The primary rationale behind this phenomenon pertains to the economic constraints imposed by storage media during that period. Consequently, the available capacity of storage media at the turn of the millennium proved inadequate for the purpose of storing uncompressed video files. This predicament necessitated the process of digitisation. During the initial years of this period, digital cartridge systems emerged in the electronic marketplace, offering substantial storage capacity at a reasonable cost. These cartridges offered affordability, and in 2004-2005, a proprietary system was established, utilising an open-source Linux-based server and data management. This development marked a significant moment at ZKM, as it enabled the effective storage of digital masters, a prerequisite for the substantial restoration and digitisation of analogue video media.

The Laboratory, though not prominently visible, plays a crucial role in ZKM's long-term storage strategy. As Dorcas aptly describes, the approach is "both homemade and economically friendly, yet remarkably effective, as it facilitates the retrieval of all products since its inception without any loss" [24]. While the technical environment has evolved slightly, the core storage medium has remained consistent. ZKM continues to rely on the

[23] *The Institute for Visual Media*, which was established within ZKM in 1991 under the direction of Jeffrey Shaw, was among the leading international research and production facilities in the field of digital art. In 2016, the institute was united with the Institute for Music and Acoustics. The institute resulting from this fusion is now known as the *Hertz Lab*.

[24] Quote from an interview conducted on 4th February 2025 with Dorcas Müller

LTO (Linear Tape-Open) format, which is compatible with open-source software — a principle that has remained central to their philosophy. The digitisation of uncompressed SD content is ongoing, and file containers have not been altered, as modifications can be made at any time. Since its initial adoption of LTO-3 in 2005, the institution migrated to LTO-6 in 2013, and now, as the decade nears its end, preparations are underway for the transition to LTO-8. This upcoming migration will commence as the current cycle concludes, reflecting the continuous refinement characteristic of long-term storage practices.

Another key step in establishing the laboratory was acquiring the necessary obsolete equipment for digitisation. Prior to launching the laboratory initiative, ZKM had already owned some outdated equipment, though amounts of it proved inadequate for the long-term digitisation process or for exhibitions, which often require historically accurate devices. In addition to the archives of obsolete video equipment donated by the Vasulkas and Christoph Blase, ZKM significantly expanded its collection through purchases on eBay. Following the widespread transition from analogue to digital systems — and the rising profile of the Laboratory — many organisations and individuals began donating their outdated equipment to ZKM. These included video studios that had either shut down or were upgrading their infrastructure. Notably, several universities contributed, including the pedagogical department of Heidelberg University, which donated one of the first editions of the 1963 portable 1-inch video recorders.

Another valuable source of obsolete equipment was local dump sites. Friedrich Sambs, a technician at LAVS, established informal agreements with these locations. In 2006, coinciding with Germany's hosting of the FIFA World Cup, a national transition from the 4:3 video standard to the widescreen 16:9 format led to a mass disposal of outdated video equipment, including monitors. Many of these discarded items were retrieved from dumps, where ZKM negotiated an unusual but effective arrangement: exchanging cigarettes for equipment. Additionally, Peter Weibel facilitated the acquisition of a large cache of video equipment previously used by television stations. Notably, the SWR station deaccessioned all 423 of its monitors, a significant portion of which was secured by ZKM. These efforts were made possible only through the personal initiative and dedication of the individuals involved in LAVS at the time. In many cases, staff members personally transported the equipment, underscoring the grassroots nature of the laboratory's early development and its deep commitment to preserving video heritage.

As of today, the *Laboratory for Antiquated Video Systems* is a facility that houses a curated collection of functioning original video devices from past decades. These devices encompass the entire spectrum of video technology, from the earliest consumer video systems utilising open reels to contemporary cassette formats. With a collection of over 300 devices, *LAVS* possesses the capacity to perform high-quality digitisation of nearly fifty contemporary video formats. Furthermore, the laboratory is currently equipped with the necessary apparatus and has several specialists who can facilitate the digitalisation of obsolete audio formats, including magnetic tape, DAT, MC-Tapes, etc. In addition, ZKM assembled a team of technicians specialising in the servicing of obsolete video and audio hardware.

The laboratory's initial emphasis was on the digitalisation of the collection, which at the time comprised two distinct institutions: the *Media Museum* (germ. *Medienmuseum*) and the *Museum of Contemporary Art* (germ. *Museum für Neue Kunst*). However, as the laboratory gained popularity, a significant number of video artists began donating their archives to the institution or entrusting them to digitisation. One notable group was the *Raindance Foundation*, a pioneering collective of American artists and thinkers active in

the 1970s. Although their archives were originally housed at MoMA in New York, the artists specifically requested that the digitisation be carried out at ZKM. As a result, the archives were shipped to Karlsruhe for this purpose. This initiative led to two significant events: the symposium *Raindance. Research and Development in Video Art and Media Ecology* (1 July 2017) and the exhibition *Radical Software. The Raindance Foundation, Media Ecology and Video Art*, held from 1 July 2017 to 28 January 2018.

Since its inception, the LAVS has gained enough recognition to secure its ongoing operation. Although it does not receive direct funding from ZKM's general fundraising efforts, it remains financially supported through project-based grants from various non-profit foundations. These projects frequently pertain to the domains of digitalisation and research processes, which the laboratory offers as a service to several artists and institutions. One of the examples is the project, *Joseph Beuys. Aktionen 1963–1986* (English: *Joseph Beuys. Actions 1963–1986*). For a period exceeding four years, the ZKM, in collaboration with the Joseph Beuys Estate and with financial support from the Kunststiftung NRW, undertook the project of producing a DVD edition of the audiovisual recordings of Joseph Beuys's legendary actions (that were a precursor to performance art). These recordings had previously been isolated and were thus hardly accessible. The DVD edition is accompanied by a book, which has been augmented with archival material (e.g. notes, photographs, drawings, scores) from the private collection of Joseph Beuys.

1.2.2. Archive and Department *Wissen*

Another significant institutional component of ZKM dedicated to the preservation of history is the archive, which currently houses a portion of the collection. During the initial years of ZKM's institutional development, the primary responsibility for archival functions was assumed by the Media Library (germ. *Mediathek*). Originally, ZKM was conceived with the intention that the *Mediathek* would serve as the institution's central archive (Klotz 1989, Ergänzungen:12). It was designed to support visitors by providing access not only to all textual materials related to ZKM's activities but also to a wide range of audiovisual content. To facilitate this, dedicated viewing stations were developed to offer direct access to these materials. Although these stations are no longer in public use and no longer perform their original function, they have since become a symbolic element — serving as the visual identity of the Mediathek.

Figure 1.4. *The ZKM | Mediathek* / © Foto: ZKM | Karlsruhe

In 2004, the exhibition *Masterpieces of Media Art from the ZKM Collection* marked a significant milestone in the institution's public engagement with its audiovisual holdings. For the first time, the audiovisual collection — previously accessible solely for research purposes within the ZKM Media Library — was made available to the public. This development was made possible through the efforts of the *Laboratory for Antiquated Video Systems* (LAVS), whose work enabled the digitisation and presentation of the media works. This practice has since become a tradition, with the *Mediathek* continuing to serve as a platform for broader public access to the audio-visual collection of ZKM.

However, with the establishment of the Laboratory and the major institutional reorganisation in 2017 — which included the merger of the Museum of Contemporary Art (MNK) and the Media Museum—ZKM formalised the creation of a dedicated archive. The creation of the archive was part of a broader institutional initiative to establish a department dedicated to the collection and management of knowledge. This led to the founding of the department *Wissen* (en. Knowledge) in 2017, which was tasked with overseeing archival functions, collection care, and the systematic integration of research and documentation within ZKM's institutional framework. It consolidated all pre-existing infrastructures dedicated to data collection and dissemination — such as the Library, Media Library, and the Laboratory for Antiquated Video Systems (LAVS) — while also integrating them with the institutional collection and newly established archive, marking a significant structural innovation within ZKM at the time.

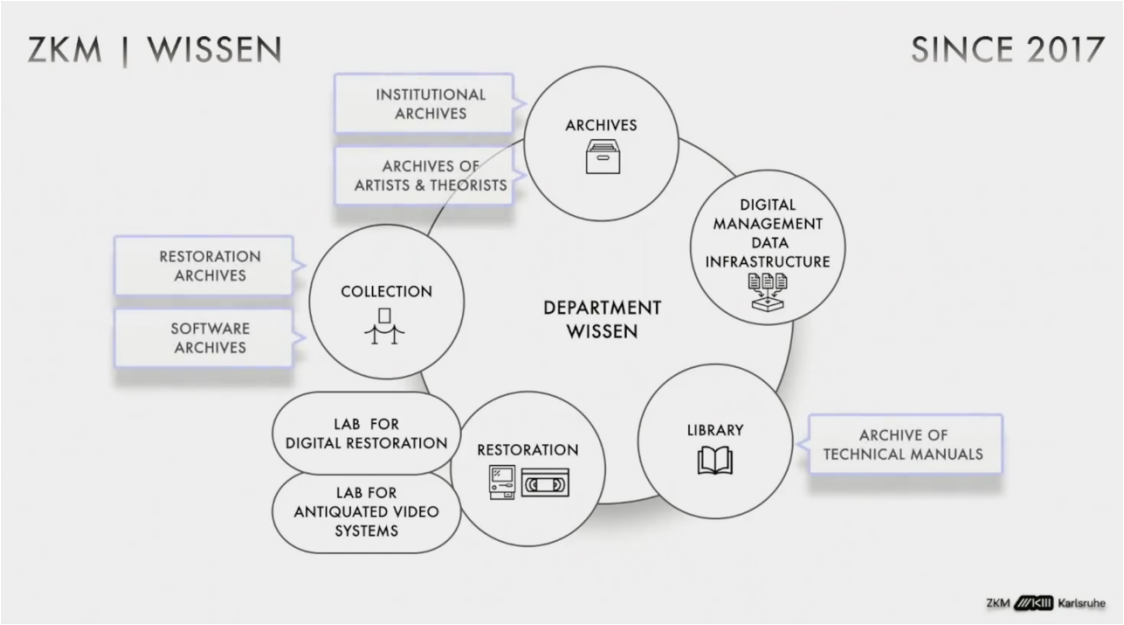

Figure 1.5.. *Infrastructure of the Wissen Department.* Diagram from a presentation by Margit Rosen (Head of the Wissen – Collection, Archives, and Research Department, ZKM), titled *Working Knowledge: Introduction to the Department 'Wissen',* presented on 12 September 2014.

One of the primary objectives of the *Wissen* department was to consolidate all institutional infrastructures related to the collection within a single, unified framework. The department's name — *Wissen*, meaning "knowledge" — reflects ZKM's self-conception as an institution primarily dedicated to the generation and dissemination of knowledge. This structural reorganisation was intended to place knowledge production and dissemination on an equal footing with the traditional functions of collection and archiving, thereby aligning internal infrastructure with the institution's broader epistemological mission.

This established archive fulfils a dual function: on the one hand, it serves as an institutional archive, safeguarding administrative, curatorial, and operational records that chronicle the history, development, and internal processes of ZKM as a cultural institution. On the other hand, it operates as a classical archive, encompassing a wide array of printed materials— such as exhibition catalogues, artists' publications, and press materials — alongside an extensive body of audiovisual media, including video artworks, documentation of performances, and interviews. As of now, the archive holds approximately 250 archival estates, ranging from individual artist collections to institutional holdings, reflecting the breadth and depth of ZKM's engagement with contemporary and historical media practises. This hybrid archival structure exemplifies ZKM's overarching mission to integrate documentation, preservation, and historical research within the dynamic and evolving field of media art. It not only ensures the continuity and accessibility of knowledge within the institution but also supports scholarly inquiry and curatorial innovation, reinforcing ZKM's role as a nexus for critical engagement with media culture.

The *Laboratory for Antiquated Video Systems*, which commenced its operations at the beginning of 2000, has attracted a substantial number of audio-visual archives to ZKM. At the time of writing this text, the archive contains more than 20,000 documented objects (including not only audio, video and film, but also data carriers). To effectively navigate

and manage the vast array of materials housed within the ZKM archives, Felix Mittelberger developed a specialised database system designed to accommodate the complex nature of media art documentation[25]. This database integrates multiple layers of metadata, enabling the categorisation and retrieval of diverse types of information related to each archived object, whether administrative, technical or contextual. It serves as a comprehensive tool that unifies the wide spectrum of media formats present in the archive — from video recordings and digital artworks to printed ephemera and institutional documents. By taking this approach, the system not only optimises internal archival processes but also establishes the foundation for future accessibility, research, and preservation strategies that are customised to the requirements of media art collections.

1.2.3. Conservation of Computer-Based Art and MUTECH

Although ZKM began collecting media art at an early stage in its institutional development, specialists in the conservation of computer-based art joined the institution at a later point. ZKM began collecting and producing digital artworks in 1989, at a time when no standardised methods existed for managing digital and media art collections (Stricot, Vlaminck, and Heiss 2022, 195). The maintenance of these works initially relied on individual specialists who possessed highly specific knowledge of artworks. Over the years, ZKM has made a concerted effort to consolidate this dispersed knowledge — previously communicated through emails, printed documents scattered across various locations, and informal exchanges — into a systematically structured and sustainable documentation framework. Until 2017, the responsibility for maintaining the media artworks in the collection rested solely with the technology department, formally known as *Museum and Exhibition Technical Services* (German: *Museums- und Ausstellungstechnik* or *MUTECH*). This department's expertise spanned a broad spectrum of disciplines, including information technology, restoration, object documentation, audiovisual media technology, art handling, electrical engineering, lighting technology, depot management, transport logistics, loans, and technical project management for exhibition productions.

The emergence of this institutional system was influenced by several factors in its initial stages. Primarily, the absence of a discipline of media art conservation, and more specifically, computer art conservation, at that time. As mentioned, this discipline only emerged in the late 2000s. This development was further influenced by the rapid obsolescence of technical equipment, which led to an urgent need to devise strategies for the conservation of specific works. This realisation was not immediately apparent at the inception of media art as a genre, largely because media itself was perceived as inherently transient and continuously evolving. As a result, early media artworks were often not conceived with long-term preservation in mind, reflecting the broader cultural perception of technology as ephemeral rather than archival.

Consequently, institutions such as ZKM—much like many others — initially relied heavily on their technological departments to develop preservation and exhibition strategies. These efforts, by necessity, required close collaboration with the curatorial teams. This reliance was not solely structural, but also shaped by personal factors. The rapid obsolescence of media art equipment — often within the span of a single generation — meant that technical knowledge about the operation and display of specific works remained concentrated

[25] The structure and functionality of this database will be examined in greater detail in Chapter 3.

among a few experienced individuals. These specialists were frequently consulted whenever a work was retrieved from storage and prepared for re-exhibition. It was not until 2017 that ZKM fully recognised the urgency of transferring this specialised knowledge to younger generations, prompted by the imminent retirement of these key individuals. This recognition underscored the need for sustainable institutional memory and formalised documentation practices. The subsequent establishment of the *Wissen* Department — tasked not only with overseeing the archive but also assuming responsibility for the collection — was a direct response to this need, marking a strategic shift toward long-term preservation through knowledge integration and organisational restructuring[26].

This institutional arrangement, however, was not without its limitations. Although both the leadership and staff were acutely aware of the challenges posed by the rapid obsolescence of media technologies, the department was often constrained by limited personnel, time, and financial resources, which hindered its ability to adequately maintain the entirety of the collection. Compounding these challenges was the lack of a dedicated collection department within the *Media Museum*, which effectively placed the sole responsibility for the care and technical upkeep of the media art collection on the *Museum and Exhibition Technical Services* (*MUTECH*) team. The most significant challenge lay in the fact that the technology department lacked the necessary resources to provide continuous maintenance for all works in the collection. In practice, the focus was typically orientated towards those artworks scheduled for imminent exhibition. Consequently, the department's limited capacity resulted in the ongoing care and technical upkeep being reserved for a select number of pieces, while the majority of the collection – particularly works not scheduled for display – remained unattended. This reactive approach to maintenance further compounded the issue of uneven preservation of the media art collection.

The establishment of a department dedicated to the conservation of computer-based art at ZKM in 2017 marked a significant historical moment. To address all the mentioned issues, Morgan Stricot was invited to join the institute in 2017. Margit Rosen, head of the *Wissen* department, extended an invitation to Morgan to join the collection department, rather than the technical department, with a view to enabling her to focus on research. The objective was to establish a comprehensive workflow at ZKM for acquisition, maintenance and conservation of computer-based art. Upon her arrival, Morgane undertook a comprehensive assessment of the collection, identifying which works remained operational and which had been in storage for over a decade without adequate backup or documentation. This intricate and ongoing process underscores the vast scale and complexity of the collection. Today, the collection and technical departments work in close collaboration, drawing on the extensive expertise of the technical team. While Morgane's initial evaluation revealed significant gaps in preservation practises, it also provided a critical foundation for implementing systematic backup protocols and significantly improving documentation standards across the collection.

In 2017, Matthieu Vlaminck joined ZKM through the *Archivists in Residence* programme. Although his initial tenure was planned for just four months, the significance of his contributions led to an invitation to extend his residency. Working in close collaboration with Morgan Stricot, he began by assessing the state of the collection and initiated several research projects aimed at improving preservation strategies. Together, they developed new workflows for disc imaging, with Vlaminck designing a custom-built computer

[26] Today, MUTECH encompasses all technological specialists, including figures such as Friedrich Sambs, as well as certain conservators, notably Marlies Peller, who works as the conservator for electronic art.

specifically tailored to support this process. These collaborative efforts resulted in innovative procedures for both the storage and ongoing maintenance of digital artworks. Currently, Vlaminck's research focuses on the long-term preservation of digital art, particularly those works that rely on commercial software components. His work addresses the challenges of maintaining and adapting historical and obsolete commercial software and application programming interfaces (APIs), which are often integral to the functioning of digital artworks. In addition, he is actively involved in the archival documentation of artworks using 3D visualisation techniques, further broadening the scope of preservation methodologies at ZKM.

Morgan Stricot and Matthieu Vlaminck developed an acquisition workflow, drawing upon the methodologies outlined by Rafael Lozano-Hemmer, particularly his text entitled *Best practices for the conservation of media art from an artist's perspective*. The reader is referred to the *Acquisition Workflow (Computer-Based Artworks)* text in the appendix for a detailed overview of the process. This event marked a revolutionary development for the ZKM, as it enabled the establishment of rigorous criteria for the selection of works to be included in the collection. These criteria considered the future value of the collection in terms of conservation. Vlaminck's involvement in the acquisition committee ensures that the voice of the restorers is heard in decision-making processes regarding the purchase of works, a practice that was not previously observed at ZKM. Prior to this development, all decisions regarding acquisitions were made exclusively by the curatorial department, based solely on their perceptions of the historical significance of the work.

Building on this foundation, Stricot and Vlaminck developed a questionnaire for artists, which artists were obliged to complete when their work was acquired by the institution. This documentation model was also informed by Rafael Lozano-Hemmer's influential text, *Best Practices for the Conservation of Media Art from an Artist's Perspective*, as well as by a comprehensive questionnaire developed by the Matters in Media Art project. Together, these resources provided a foundational framework for capturing the technical, conceptual, and contextual dimensions necessary for the sustainable preservation of media artworks. Stricot also initiated the practice of conducting personal interviews with artists at the stage of purchasing a work. This approach facilitated communication with artists using terms they found agreeable, thereby fostering positive relationships during the acquisition process.

Subsequently, a bespoke Wiki was developed by Stricot and Vlaminck to facilitate knowledge sharing within the institution. This platform continues to serve as a repository for the documentation of the individual works in the collection, a function it fulfils to this day. Subsequently, the development of the Wiki was influenced by research conducted by both conservators, building upon the foundations laid down by earlier work. It includes documentation of individual works in the collection, a structured documentation model, and a questionnaire for newly acquired artists. Additionally, it details the acquisition workflow and contains records of ongoing acquisitions and loans. The platform was originally conceptualised as an open knowledge transfer. However, due to legal constraints, the Wiki is currently inaccessible to individuals from outside the institution with the exception of some pages on "Acquisition Workflow of Software-based Artworks" and "Documentation Model".

1.2.4. ZKM's Theoretical Contributions

In addition to its practical conservation efforts, ZKM and its staff have made consistent contributions to the theoretical discourse surrounding media art conservation. These activities have taken various forms, including the organisation of symposia, the publication of academic research, and the presentation of papers at international conferences. Through these initiatives, ZKM has positioned itself as a key player in shaping both the practice and theory of media art preservation

Since its inception, LAVS has contributed to numerous projects, with one notable example being the second part of *40jahrevideokunst.de*: *RECORD > AGAIN!* (2009). This project, like its predecessor *40jahrevideokunst.de - Part 1*, explores the history of German video art from its origins in the 1960s and 1970s through to the early 21st century. It particularly highlights the role of *LAVS* in enabling the digitalisation and preservation of this art form. For the project, *LAVS* developed specialised equipment to digitise over 50 video formats dating from the mid-1960s to the mid-1980s, ensuring their preservation. The project culminated in an exhibition toured across Germany and the publication of a catalogue featuring contributions from Christopher Blase, Dorcas Müller [27] and other employees of *LAVS* (Weibel and Blase 2010). These texts also familiarise the reader with the Laboratory's operational processes and highlight its role as a vital institutional entity, particularly in the historicization of video art.

Another significant project that garnered attention was the EU-funded research project *Digital Art Conservation*. In 2010, the ZKM launched the three-year *Digital Art Conservation* project, which included two symposia, a travelling exhibition, and a comprehensive publication in English, French, and German. The project was remarkable for its scale, and it is one of a very limited number of projects of this magnitude that have been carried out in Europe. In addition to ZKM, the project was also participated in by several other European institutions, including art and educational institutions. The project was driven not only by the increasing prominence of digital art conservation discourse but also by the rising interest in digitisation and the availability of substantial EU funding related to this field.

The exhibition, *Digital Art Works: The Challenges of Conservation*, featured artists such as Hervé Graumann, JODI, Michael Naimark, Nam June Paik, and Jeffrey Shaw. A series of works were exhibited at the exhibition, and a subsequent research study was conducted based on these works, with a view to determining possible conservation tactics. Some works were presented in both original and reconstructed forms, similar to the Guggenheim exhibition. The accompanying volume documented each artwork as a case study, detailing preservation strategies, artist interviews, provenance information, and contextual essays.

Within the framework of this project, two symposia were convened. The first, entitled *The Digital Oblivion, Substance and ethics in the conservation of computer-based art* took place on 4-5 November 2010. A further symposium, entitled *Digital Art Conservation: Practical Approaches: Artists, Programmers, Theorists,* was held at *École supérieure des arts décoratifs de Strasbourg* on 24 and 25 November 2011. The symposia discussions were devoted to practical and theoretical issues related to the conservation of media art.

[27] Dorcas Müller's text, *From Analog Restoration to Digital Master*, is available to the reader in the appendix.

Thematic concerns encompassed ethical dilemmas and the applicability of conventional criteria for conservation, such as originality, longevity, and inherent economic value, to new media art. The subjects of temporality, materiality, and historicity were similarly addressed. Furthermore, there was a call for the establishment of standards for best practice in the conservation and collection of digital media art. As was the case in earlier examples of similar symposia. These two events were also characterised by a strong interdisciplinary nature. The participants represented a wide range of academic and professional disciplines.

An extensive publication, comprising approximately 700 pages, was released entitled *Digital Art Conservation* (Serexhe 2013) in 2013. It was a comprehensive outcome of the research endeavours, complemented by a dedicated exhibition and a series of symposia, collectively fostering discourse and knowledge dissemination in the field. The publication comprises contributions from eminent theorists, including Siegfried Zielinski and Jussi Parikka. In addition to individuals engaged in the activities of the institution during the period under discussion, such as Peter Weibel and Bernhard Serexhe, who was then the director of the Media Museum. The publication also includes texts by several artists, such as Herbert W. Franke and Antoni Muntadas, as well as contributions from representatives of other institutions. The publication also incorporated the results of case studies. Each submission was accompanied by an essay that provided both historical and technical context and documentation of research and the conservational process. In certain instances, these case studies were accompanied by interviews with the artists.

Another important set of initiatives connected to the practice of media art presentation, in collaboration with ZKM, includes the *Centre for Digital Tradition* (CODIGT) (2011–2016), a research and service centre at the Centre for Applied Cultural Research at the Karlsruhe Institute of Technology (KIT); the *Archivists in Residence* programme (2016–2018) in cooperation with KIT; ongoing collaboration with the Academy of Art and Design Karlsruhe (HfG); and the project *Browser Art: Navigating with Style* (2019–2022) at the Institute of Art History and Architecture, KIT. The outcome of this collaboration was the exhibition *Choose Your Filter! Browser Art since the Beginnings of the World Wide Web*, held from February 1 to August 24, 2025.

Another significant contribution was Morgan Stricot's presentation at the International Conference on Digital Preservation (IPRES18), titled *"Open the museum's gates to pirates: Hacking for the sake of digital art preservation"*, which later resulted in the paper (Stricot, Vlaminck, and Heiss 2018). Since the 1990s, museums have increasingly struggled to preserve computer-based art, particularly works dependent on commercial platforms or environments. Examples include virtual reality applications hosted on platforms such as Steam VR, Oculus, or Windows Mixed Reality, as well as smartphone and tablet apps. The lifespan of these artworks is often limited unless their creators continuously update them to remain compatible with evolving technologies. Additionally, digital art frequently depends on various digital services and social media platforms. For instance, artists who previously relied on search engines like Google or social media services such as Twitter encountered significant challenges when these platforms discontinued their application programming interfaces (APIs), causing their works to become inoperable (Rosen 2024).

The paper discusses the significant threat that third-party software dependencies pose to digital artworks, drawing on ZKM's experiences with works like *Remote Control* by Shane Cooper and *net.art generator* by Cornelia Sollfrank. It outlines ZKM's innovative research projects that confront the challenges of accessing abandoned proprietary software and hacking APIs to ensure the longevity of its digital art collection. The paper highlights the potential of crowdsourcing as both a sustainable preservation strategy and a catalyst for

new creative practises. By embracing pirate and hacker communities, ZKM acknowledges their crucial role in the ongoing preservation of digital art.

Another notable theoretical contribution was made by Morgan Stricot and Matthieu Vlaminck through their participation in the *Technological Arts Preservation Project* conference and its accompanying publication. In their text, *Media Archaeological Reconstruction of Media and Digital Artworks: Practical Case-Studies*, the two conservators present the media archaeological approach to restoration as practised at ZKM. Through concrete examples, they illustrate how this method goes beyond traditional conservation, aiming not only to preserve the functionality of artworks but also to reconstruct their historical and technological contexts. Their contribution offers valuable insights into the practical and conceptual challenges of conserving media and digital art.

Moreover, ZKM remains engaged in theoretical discourse and professional exchange within the field. The institution frequently hosts and organises symposiums and conferences that address pressing issues in the domain of media art preservation. For instance, ZKM organised the symposium Just in Time in 2022, which focused on strategies for preserving media art legacies. Alternatively, the organisation hosts a variety of initiatives, including, for instance, the 2023 international conference entitled *No Time to Wait 8*, which was dedicated to open media, preservation, and archiving practises. Moreover, staff members from ZKM are regular contributors to international conferences. They present their methodologies and experiences, thereby contributing to global conversations on media art conservation.

2. HiFi (High Fidelity): Object of Media Arts

2.1. Medium is the Message

2.1.1. Media vs. Medium

The term *media* (Latinate plural of *medium*) in its modern application relating to communication channels was introduced into language by Marshall McLuhan. For McLuhan *media* — are all the technologies which mediate our communication, "extensions of ourselves" (McLuhan 1994). The scope of McLuhan's concept of media is not limited to conventional forms such as print or television; it encompasses any technology or tool that enhances human capabilities, including language itself. According to McLuhan, the forms or structures of media exert a profound influence on the entire psychological and social fabric of human beings. He asserts that a medium's specific effects, rather than its content, determine its nature. Consequently, the concept of media encompasses the multifaceted impact of media on the individual and society. The McLuhan formula, which has gained a high level of renown, states that: "the medium is the message", posits that a given communication is the medium itself, rather than the messages it conveys.

Another important theorist who influenced the development of media theory and media discourse was sociologist Nicholas Luhmann. The concept of *medium* is one of the elements of his systems theory. The *medium*, along with *form*, is one of the elements that create *meaning*. The central focus of Luhmann's theory revolves around the issue of the contingency of meaning, which consequently positions it as a theory of communication. The medium, along with form, is one of the elements that create meaning.

For Luhmann, works of art serve the communication of meaning. This, in turn, necessitates the existence of a *medium* that facilitates communication. Luhmann for the first time reduces not only the entire social process but also art to a single operation — communication (Luhmann 1987, 101). According to Luhmann *media* "consist of elements or of events in the time dimension, but these elements are only loosely coupled. Relative to the requirements of form or thingness they can be regarded as actually independent from each other" (Luhmann 1987, 102). Thus, the object of art for Luhmann is first of all a fragmented, performative, time-based event within the process of communication, but not a *form*, *matter* or *thingness*. He writes: "No medium gives only a single form, for then it would be absorbed as medium and disappear" (Luhmann 1987, 103). In the text "The Medium of Art," Luhmann provides the following example of *medium*:

"money is a medium because payments can occur in any size, because a payment does not depend on the meaning and purpose of another payment, because the medium is extremely forgetful (because, in order to preserve the value of money, it does not need to remember what the payment was made for) and only the ability to pay decides whether a payment is possible". (Luhmann 1987, 102)

One of the fundamental concepts of modern art is that of the *medium* (plural *mediums*). Concurrently, during the 1960s, the term *medium* was gaining traction within the field of art theory and has become associated with the art critic Clement Greenberg. In his essays, such as "Towards a Newer Laocoön" and in "Avant-Garde and Kitsch," he develops the concept of *medium specificity*, which gained significant popularity later on. *Medium specificity*, which is closely associated with modernist and especially with abstract painting, refers to the idea that each artistic, medium (such as painting, sculpture, etc.) has unique qualities and characteristics that define its essence. Greenberg argued for autonomy and purity in each artistic medium, suggesting that its true potential could only be realized through a rigorous exploration of its inherent qualities. This concept was pivotal to Greenberg's formalist approach to modernist art, a philosophy that prioritised the formal elements of artistic production over external factors such as subject matter or social context. Furthermore, this approach underscored the belief that artistic expression could evolve autonomously from social or political influences.

In this manner, Greenberg established a definitive interpretation of the medium in arts, as mere physical object, "in all its reductiveness and drive toward reification" (R. E. Krauss 2000, 6). The interpretation of the medium, which involves a relation between technological materiality, sensibility and the idea of art, has been firmly established within the discourse of art for most of the 20th century. As Rosalind Krauss would later write, since the 1960s the name of Clement Greenberg became attached to the notion of medium (R. E. Krauss 2000, 6).

The 1960s witnessed the publication of Marshall McLuhan's seminal work, *Understanding Media*, and the introduction of the Portapak camera, which could be carried and operated by one person, and CV-2000 — one of the world's first home open-reel videotape recorders. These technological advancements enabled artists to engage in video production in an independent and domestic setting. These developments signalled the beginning of the video art movement. Consequently, video emerges as one of the earliest mediums to be adopted for individual artistic expression. This served as a forerunner to the emergence of media art. Concurrently, the television begins to enter the exhibition space. The apotheosis of this process was the legendary exhibition *Information* at MoMA, New York, in 1970. One of the primary objectives of the exhibition was to present works of art, which "are part of a culture that has been considerably altered by communications systems such as television and film, and by increased mobility" McShine (1970).

This served as a forerunner to the emergence of media art. However, these machines were not yet accessible to the public due to the necessity of specialised knowledge for their operation. Moreover, digital media started in the mid-1960s with the advent of computer graphics, which provoked artistic interest to move away from the linearity of text and the two-dimensionality of images. Nevertheless, this time is more typical for the artists to work in close contact with engineers while keeping their respective roles distinct. Later during the 70s, the shift in perspective led to a paradigm shift in the role of digital media, establishing it as an artistic medium. During the late 80s and throughout the 90s, technical media transitioned away from exclusively serving the privileged few in society. Instead, they began appealing to broader audiences without specific social, regional, or national limitations. Since at least the mid-1980s, the prefix *media* gained widespread acceptance,

particularly in political and economic spheres. This led to media art being labelled, with the prefix *media*.

After the outset of the phenomenon of media art, the interpretation of the *medium*, which is characteristic for the discourse of art, as "artistic medium", went in parallel with the understanding of *media* as generic means of communication. The two terms collide in the discourse of media art and often got confused; nevertheless, both maintained their distinct interpretations: one is emblematic within the domain of art criticism and associated with the name of Clement Greenberg, while the other draws from Marshall McLuhan and the tradition of media studies. Due to the lexical similarity of the terms in the discourse of media art, there was a semantic intertwining of the two radically different concepts which became commonplace. In Rosalind Krauss's recently published book *Under Blue Cup* (2011) she finally considers the importance of media theory in the development of contemporary art, and she is stating the following: «Medium and media are what the French would call "false friends" — French look-alikes for English words that are strictly not synonymous» (R. E. Krauss 2011, 33). It can thus be concluded that the 1960s witnessed the genesis and popularisation of the terms *media* and *medium*, which later infected the discourse of the 20th century and resolved into dozens of other media-related terms. It is evident that these terms have influenced the comprehension of each other, particularly within the context of discourse pertaining to technologically based art, which is situated at the intersection of art theory and media theory.

It is imperative to acknowledge that the notion of media specificity influenced early video art and manifested in the idea that artists should examine the physical properties of the medium, specifically analogue and later digital video (Carroll 1985). One example that can be mentioned in this regard is Steina and Woody Vasulka, who operate at a fundamental level by manipulating various parameters of the electronic signal, such as frequency, amplitude, or phase, which directly determine the resulting image and its visual characteristics. However, in this regard, Domenico Quaranta claims that the blurring of these two concepts (*media*, *medium*) led to oversimplifications of both. And the main simplification he calls the criticism often directed at art employing new technologies, accusing it of formalism. He claims that "neither the enthusiastic exploration of the medium's potential, or the critical testing of its limits, or the examination of its social and cultural consequences, can be attributed to Greenberg's formalism" (Quaranta 2013, 30). It is therefore inaccurate to claim that media art is a direct heir to formalism. However, it was influenced by Greenbergian formalism along with other era-specific trends.

2.1.2. Intermedia vs. Multimedia

In a seminal essay published in 1965 in the *Something Else Newsletter*, Fluxus artist and head of the Something Else Press, Dick Higgins, reintroduced the term *intermedia* to describe artworks that exploit the structural continuities between different art forms. Examples of intermedia artworks, described in the text, include poetry that is both read and perceived visually (visual poetry), prose that is both read and heard (sound poetry), and theatrical performances incorporating musical and painterly elements (happenings), among others. Higgins posited that the utilisation of intermedia is pervasive across the domain of fine arts, functioning as a unifying ''new mentality'' rather than a means of classification (D. Higgins 1966). The *intermedia* approach offers an alternative to the restrictive formal categories typically associated with fine arts, providing a means of transcending the boundaries of specialisation and professional standards that have hitherto characterised this field. The concept of *intermedia* is indicative of the anti-establishment ethos that pervaded both elite and popular culture during the 1960s. In 1995, the intermedia relationships were

visually represented by Higgins in the form of a schematic, designated the “Intermedia Diagram.”

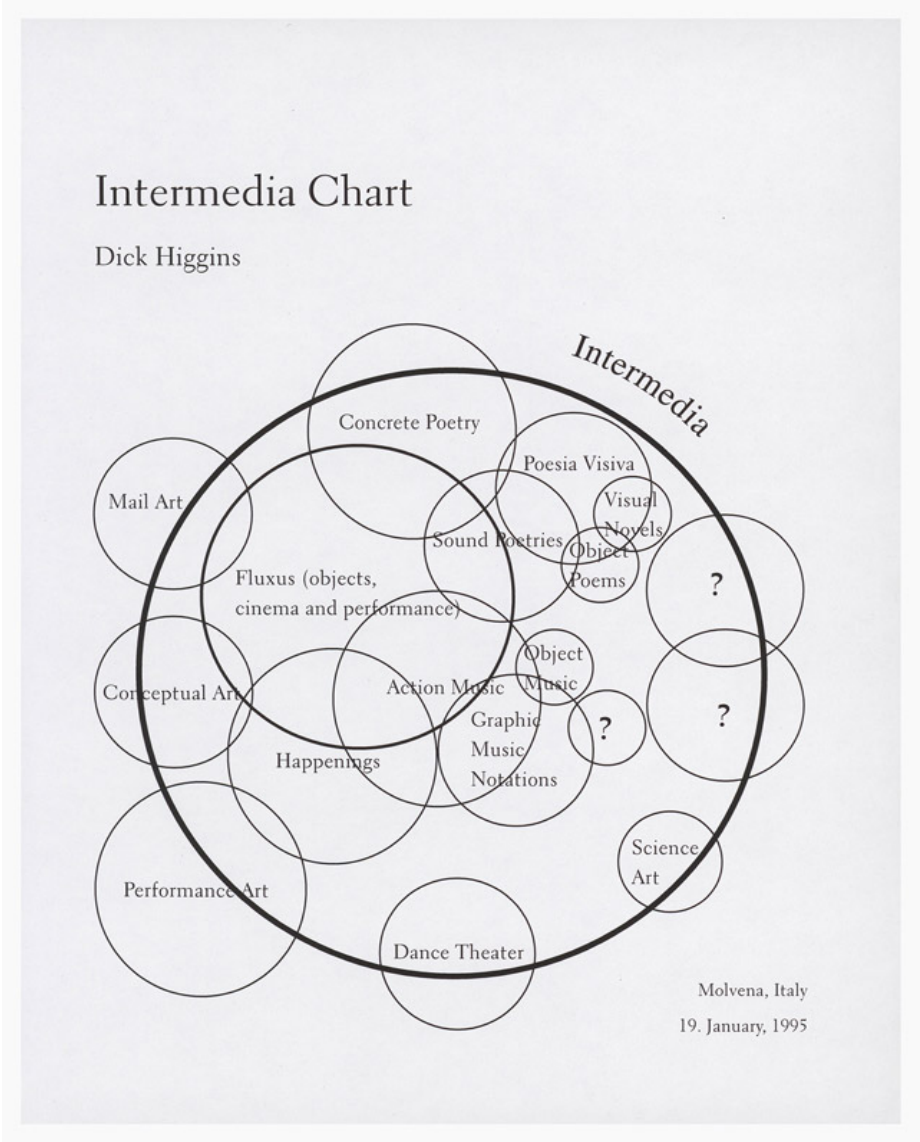

Figure 2.1. Dick Higgins, *Intermedia Chart,* 1995. Reproduced courtesy of the Estate of Dick Higgins.

Dick Higgins offers an illustrative example of the distinction, demonstrating how *intermedia* works with the medium, emphasising the linguistic component of the term *intermediality*.

“In intermedia, on the other hand, the visual element (painting) is fused conceptually with the words. We may have abstract calligraphy, concrete poetry, “visual poetry” (not any poem with a strong visual element, but the term is sometimes used to cover visual works in which some poem appears, often as a photography, or in which the photographed visual material is presented as a sequence with a grammar of its own, as if each visual element were a word of a sentence, as in certain works by Jean-François Bory or Duane Michaels)”. (D. Higgins and Higgins 2001, 52)

In an essay" Intermedial Perception or Fluxing Across the Sensory" released by Hannah B. Higgins (daughter of Dick Higgins), it asserted that one of the most important pathos of intermediality is to re-locate subject of art between the general idea of art media and those of life media (Hannah B. Higgins 2021, 43). However, it is not the intention to erase the distinction between art and life.

The categorising tendencies of the modern era have had a significant impact on the way the senses are perceived, particularly within the cultural mainstream. These tendencies have extended beyond the traditional domains of painting and sculpture, contributing to the establishment of a hierarchy of the senses, and it is this hierarchical structure which is challenged by the concept of intermediality. Hannah B. Higgins writes "The hovering bubbles of the lntermedia Diagram (whose sizes seem indeterminate) imaginarily expand, contract, pass over and through each other in a visualisation of the fluidity characteristic to intermedia arts. The changing boundaries between different types of media in the intermedia chart require us to recognize that our senses work together and create aesthetic experiences. Put differently, intermedia studies draw attention to the overlapping aesthetics and their relations to the senses as implied by the *Event* format. Such an examination also calls for an expanded concept of aesthetics beyond its routine association with the visual arts." (Hannah B. Higgins 2021, 43) Therefore, we can propose that the fundamental principle of *intermediality* is to establish a distinction from the more traditional arts.

The genesis of media art is frequently ascribed to Nam June Paik, a member of the Fluxus group who was also an early proponent of *intermediality*. Nam June Paik's *Exposition of Music —Electronic Television* (1963) is widely regarded as a seminal example of *intermedia*. Integrating elements of New Music, randomness, open artwork, and mass media, Paik created a participatory, multi-sensory total artwork within one space. The exhibition comprised four 'prepared' pianos, mechanical sound objects, several record and tape installations, twelve modified TV sets, and the head of a freshly slaughtered ox above the entrance. Through repurposing and transforming objects, Paik pioneered a form which foreshadowed the subsequent evolution of distribution media into production media and the emergence of new interactive applications. It is widely accepted that this room is regarded as the genesis of the video art that subsequently emerged. Paik's contributions to the realm of art is widely acknowledged, with his oeuvre being recognised as a seminal influence in the development of video art, sound art, installation art, and interactive art and heralded the birth of a 'heroic' era of media art in which "media art used to be a hybrid area where multiple interdisciplinary cross connections and collaborations had become possible without forming a common conceptual or strategic identity" (Daniels 2011, 5)

Figure 2.2. Nam June Paik, *Exposition of Music —Electronic Television,* 1963, Photograph: Manfred Montwé. Sitting within the room containing numerous television sets, the Fluxus artist Tomas Schmit assisted Paik in the preparations for the exhibition

Consequently, Paik's influence often links *intermediality* to the concept of media art. However, in the present era, most of the work pertaining to the concept of *intermedia* approaches and interactivity diverges significantly from its original interpretation. Hannah B. Higgins posits that only a select few computer-based artworks can be considered intermedial in structure within the historical context (Hannah B. Higgins 2021, 48). The term was adopted, applied, and often misused, frequently being conflated with the concept of "mixed media." The latter is a term that has been in use in the field of art criticism for a considerable period to describe works of art that have been created using more than one medium.

One of the factors that contributed to this change in the development of media art took place in the 1970s and is linked precisely to the popularisation of the two concepts described above (*media* and *medium*). his shift is characterized by the loss of *intermediality* in media artworks, which have become increasingly media specific. During the 1970s, the field of media arts underwent significant diversification, with the emergence of highly specialised scenes and contexts replacing the intermedial blend that characterised the 1960s. The major categories that emerged during this period included computer graphics, video art, experimental cinema and performance art. Each of these artistic disciplines underwent a process of evolution that resulted in the establishment of a distinct identity, founded on its distinguishing characteristics as a medium. The objective of this process was to establish an independent genre defined by its technical medium. Subsequently, each of these genres developed subdivisions that reflected the diverse artistic approaches (Daniels 2011, 7).

Another factor that influenced this phenomenon was the growing interest in media art among technology corporations; by the time of the 1980s, there had been a considerable growth in media art because of the growing interest among traditional art institutions. Emerging technology was a hot topic at the time, and it was not difficult to obtain sponsorship from the high-tech industry and television networks. By the early 1980s, critical reflections on the media and its capacity for manipulation had been articulated by artists and intellectuals and had begun to permeate the public. This resulted in Nam June

Paik's intermedial works, including *Exposition of Music —Electronic Television* (1963), mutated into *The More, The Better* (1988).

Subsequently, the term *multimedia* has become a defining concept in the context of digital technologies and media art. The term *multimedia* was first formulated by artist Bobb Goldsteinn to promote his July 1966 show "Lightworks at L'Oursin" in Southampton, New York. *Multimedia* is the successor to the term *intermedia*. In the sphere of contemporary art, *multimedia* implies art that specifically involves the use of electronic or digital media, such as video, film, audio, and computers, often in combination with traditional materials, but with an emphasis on the integration of digital technology. But the term became also significant in the history of computer science there *Multimedia* refers to the integrated combination of digitally manipulated text, photographs, graphic art, sound, animation, and video elements. And subsequently the term *interactive multimedia*, which is used to describe a multimedia project in which the end user, or "viewer," is given control over the content that is delivered.

When this interactive experience is structured into a network of interlinked elements that the user can navigate, the result is *hypermedia*, which represents a further evolution of the concept of *interactive multimedia*. The term *hypermedia* was introduced by Ted Nelson in a 1965 article "Complex information processing: A file structure for the complex, the changing and the indeterminate" Nelson (1965). It refers to a form of multimedia that incorporates interactive components like hypertext, buttons, and interactive images or videos. This interactivity enables users to explore and interact with content in a non-linear fashion.

The history of the second half of the 20th century reveals that the capitalist system demonstrates a remarkable aptitude for the absorption and repurposing of avant-garde protest movements, effectively integrating them into its own structure and utilising them for its benefit. And so it was with the term *multimedia,* which has achieved considerable currency within the technology industry. During the 1990s, the incorporation of advancements in graphical and audio quality led to the designation of some computers as *multimedia* computers. The *Amiga 1000*, for instance, could produce 4096 colours (12-bit colour), facilitating the output of signals for televisions and video cassette recorders, and possessed four-voice stereo audio capabilities.

2.1.3. Post-Medium vs. Postmedia

The concept of the *medium*, when considered from an art historical perspective, has also undergone significant evolution throughout the course of the twentieth century. Concurrently, the 1960s witnessed the advent of a phenomenon that the American art critic Rosalind E. Krauss terms the *post-medium condition*, first formulated in the early 2000's. In her book *A Voyage on the North Sea: Art in the Age of the Post-Medium Condition*. According to Kraus, *Post-Medium Condition* was born under the influence of conceptual art, television, poststructuralist theory, Walter Benjamin's "The Work of Art in the Age of Mechanical Reproduction" and was also strongly influenced by Sony's Portapack entry into the market and video art, Fluxus and *intermedia* (R. E. Krauss 2000, 24).

The main pathos of the *post-medium condition* is the criticism of Grinberg's *medium specificity*, autonomy of aesthetic experience and *purism*. Krauss highlights an amplified sense of media heterogeneity that challenges earlier notions of wholeness and purity of art. Krauss (referring to Jacques Derrida and his Grammatology) offers an understanding of the medium based on the theory of deconstruction. Where the idea of the interior set apart

from exterior is “metaphysical fiction” (R. E. Krauss 2000, 32). In terms of art, the interior work of art is not opposed to its context. Which leads to the idea ”that nothing could be constituted as pure interiority or self/identity, that this purity was always already invaded by an outside, indeed, could itself only be constituted through the very introjection of that outside, was the argument mounted to scuttle the supposed autonomy of the aesthetic experience, or the possible purity of an artistic medium, or the presumed separateness of a given intellectual discipline” (R. E. Krauss 2000, 32). The reconceptualization of medium is now understood not as the raw physical basis of the work but as a set of conventions based on — though not identical to — the material conditions of a given technical medium.

According to Krauss development of technology “allows us, by rendering older techniques outmoded, to grasp the inner complexity of the mediums those techniques support” (R. E. Krauss 2000, 53). In her other article for October, entitled ‘Two Moments from the Post-Medium Condition’, Rosalind Krauss develops this argument and delineates the role of the medium in technologically based works of art as “*technical support*””, as a way of warding off the unwanted positivism of the term “medium” (R. Krauss 2006, 55). She posits that the obsolescence of modernism, including the classical techniques of the fine arts, has resulted in modern goods (including technological goods) functioning as a means “which contemporary artists exploit” (R. Krauss 2006, 57). In Krauss’s view, these commodities do not become a medium in themselves but rather function as a conduit. In this context, artist” is inventing a new medium” (R. E. Krauss 2000, 58). Furthermore, abstractions such as “fiction” or “society” can be regarded as mediums in themselves, whereas technological mechanisms are viewed solely as a form of “support”.

Krauss presents a neoliberal interpretation of a new postmodernist understanding of the medium. Nevertheless, her theory has also been adopted within the field of media theory. At approximately the same time, Lev Manovich initiates a discussion on *postmedial aesthetics*. Manovich, building on Rosalind Krauss’s ideas, questions whether new media art represents an embodiment of the post-media condition. In his “program for post-media aesthetics,” a novel framework proposed, that transcends the conventional notion of discrete media, more effectively encapsulating the complexities of post-digital, post-networked culture. Building on his concept of cultural transcoding, whereby computing concepts are applied to digital cultural artefacts (as discussed in The Language of New Media, 2001), Manovich suggests replacing the concept of ”medium” (which was challenged by the emergence of new artistic forms, such as event, happening, and installation, etc.) with terms from the digital realm, including information, data, interface, bandwidth and storage (Manovich 2001). Consequently, he reframes Krauss’s *post-medium* as *postmedial* and thus proposes the idea that, in terms of aesthetics, the notion of *medium* is obsolete and must give way to *media*.

Similarly, as for Krauss, for Manovich, the position of the individual viewer is of significance, as they too become an integral part of the work. However, Manovich tries to expand this idea of the medium by including the author-reader (or, based on information theory, sender-message-receiver) model in post-medial aesthetics and building on it. Which has not only three components, but seven: “sender, sender’s code, message, receiver, receiver’s code, channel and noise” Manovich (2001). He is incorporating software as a pivotal component that is used by both the creator and the audience. This approach acknowledges the impact of digital tools on both the production and reception of media.

The expression “post-media era” appeared for the first time in some of Félix Guattari’s later writings, published in Soft Subversions (1996). Guattari provides little clarity on what

such a concept would entail, apart from describing it as the outcome of a schizoanalytic production of subjectivity. And that the objective of it is to displace or, at the very least, decentralise the hegemony of the mass media (Guattari 2009). Although Guattari's concept of the post-media age is not directly related to network culture (Goddard, n.d.), it is evident that the latter's development can be viewed as a realization and affirmation of specific elements of rhizomatic machinic thinking. This approach enabled subsequent art theorists, including Beryl Graham and Sarah Cook, to advance the argument, supported by the work of the philosopher Nicolas Zurbrugg, that the evolution of technology exerted a significant impact on the evolution and formation of postmodernism and the main factor which distinguishes it from modernism (Graham and Cook 2010, 29).

One of the most significant trends that emerges (and very good seen on the example of Manovich's 'postmedia aesthetics') is the impact of technological categories on the very concept of art substance. This trend represents a shift where technology becomes the prevailing norm. This, in turn, has led to a situation where the distinction between media and medium is becoming increasingly blurred. This is because communication now plays an important role in art. This period marks the culmination of the process of legitimising media art as a form of artistic expression. This results in a phenomenon whereby the formal similarities between art and media are not only evident but also extend to their common distribution patterns. This is not a fortuitous outcome; rather, it is the consequence of a process of mutual fusion that has occurred in the context of the postmedia era. The prefix "media," which was designed to facilitate the delineation of new artistic practices as opposed to traditional "old" ones, became associated with "art" and staked its claim for tapping into historically developed markets, distribution channels, and discourses (Zielinski 2006, 276). This process also involved the emerging relationship between media theory and art history.

Furthermore, the increasing presence of media art within institutions has also led to the transformation of traditional art institutions themselves Since the early 1990s, a sustained body of critical literature has re-examined the role of museums and the evolving practices of exhibition-making. Increasingly, museums are no longer perceived solely as repositories of objects or as authoritative custodians of art history. Instead, they are being reconceptualised as sites of public engagement, interactivity, and "edutainment," reflecting broader shifts in cultural consumption and institutional purpose, which follows the inclusion of life 'events' and 'projects' in museum programme (Cook 2008, 28–29). From the 1960s onward, museums were largely unequipped to display media artworks, which were often categorised as "alternative" and thus remained outside the purview of traditional exhibition spaces. Instead, such works circulated primarily through festivals, experimental art circuits, and academic settings. By the 1970s, however, media art began to gain gradual inclusion within institutional exhibition contexts. This shift brought to the forefront a set of inherent characteristics that continue to pose challenges for integration within museum frameworks — namely, the time-based, durational, participatory, transient, interdisciplinary, and internationally mobile nature of media art (Cook 2008, 29). However, media art achieved broader institutional acceptance and entered the mainstream discourse only after *Documenta X* in 1997. Still, its acceptance varied by location and often relied on government funding and cultural policies, showing that media art still depends on certain institutions and political situations (Cook 2008, 30).

Following the digital revolution, digital technology became widely used and proliferated. The 90's are the time of the real peak of media arts and are just as significant for the rise of technological optimism. The further significant process in the development of media art in the post-media era is the fact that in the mid-nineties, digital media, which had been

confined to universities and research bodies for the preceding three decades, developed the means for mass distribution. This development had a significant impact on artistic production at all levels, giving rise to new art forms, such as net art. Domenico Quaranta asserts that this process has also resulted in the establishment of media art as a distinct *art world*. This phenomenon signifies not only the infiltration of old art institutions with technological-based art but also the establishment of a *new media art world*, replete with its own tradition, institutions, jargon, distribution circles and conceptualisation of art (Quaranta 2013, 40). Quaranta contends that this time also witnessed a certain degree of divergence between these two *art worlds*. In her book *Medienkunst als Nebenprodukt: Studien zur institutionellen Genealogie der neuen künstlerischen Medien, Formen und Praktiken* (en. *Media Art as a by-product: Studies on the Institutional Genealogy of New Artistic Media, Forms and Practices*) (Voropai 2017), Lioudmila Voropai asserts that media art is a genre that has emerged because of the institutionalisation of artistic movements such as *electronic art* and *computer art*. In other words, in the post-media era, it is the emergence of a separate *art world* that has affected not only the appearance of the new art forms but also the very emergence of the tradition of media art as an institutional phenomenon.

2.1.4. Post-Post-Media or Medium of Media Art

The advent of media art within the domain of the "art world", and consequently within the institutions of contemporary art, has engendered substantial ramifications. Which led to several different phenomena. One of these phenomena was that the digital revolution fundamentally challenged the traditional concept of artistic medium. Computers absorbed all media, applying universal operations like copy-paste, morphing, and interpolation to diverse forms. This convergence blurred the boundaries between previously distinct mediums. Additionally, the web introduced a multimedia standard that seamlessly integrates text, images, and sound. Artistic objects now often exist in multiple forms and mediums — for example, a video can be originally recorded to U-matic and then copied to DVD for exhibiting purposes, or generative software could be transformed into a video or print, and a website might function as an interactive installation in an exhibition (Quaranta 2011).

New media art is characterised by its engagement with a wide range of media in its realisation. The prevailing impression of new media art is its deeply hybrid approach, encompassing its methodology, content, and form. The focus of both readings is on the level of tool — the machine in the studio — when, in fact, new media art employs a wholly distinct system of relating meaning, one that is not predicated solely on the separation among maker, tool and work. The combination of technology and media is not merely a tool in the studio; it is a system, for creating the work and informing the artist's methodology and the means of the work's distribution. It is important to note that the same set of media can be employed for both production and distribution (Graham and Cook 2010, 36).

The advent of media art within the domain of the art world has precipitated a paradigm shift and has prompted a re-evaluation of the continued relevance of the concept of medium. One of the important trends in the findings of the postmedia era, as many authors such as Domenico Quaranta (Quaranta 2013), Beryl Graham and Sarah Cook (Graham and Cook 2010, 5) have pointed out, is that the medium as a category has become inapplicable to media art, including also post-digital and post-net culture. Curators such as Steve Dietz

and Andreas Broeckmann have at times expressed a critical stance toward the term and its suggested framework. It would appear that the concept of the medium with the beginning of a new century should have become obsolete itself. Nevertheless, we can still observe the theoretical presence of the term today; it has not lost its popularity and continues to frequently appear in art discussions.

This phenomenon occurred due to a shift in the conceptualisation of the medium. The concept of the medium as an art-related term has undergone a significant transformation in its interpretation and application, succumbing to the important influence of media theory and related fields. The post-medium condition did not merely result in the complete abolishment of the term 'medium'; it thus marked the conclusion of the 'drive to "Greenbergize"' (R. E. Krauss 2000, 6) and modernist urge to ensure the autonomy of different art forms. The medium was initially conceived of as a physical and material entity or as a sensually perceived phenomenon (e.g. sound or light). However, the artist has since conceptualized it as a system of signs, or sensorium, that deliberately conveys a specific meaning. Additionally, the medium started to assume the role of mediation. Which means that art medium, therefore, is presumed to facilitate the transmission of the content of an artwork to a receiver.

The concept of *medium* in the realm of art is subject to variation in meaning and is inherently fluid. An example of this is provided by Jacques Rancière's text, "What Medium Can Mean". Rancière identifies an conflict between the modernist "fidelity to the medium" and "the medium as that which resists both idea and art" and he proposes a third interpretation of the medium, namely the *medium* as milieu: "the milieu in which the performances of a determined artistic arrangement come to be inscribed, but also the milieu that these performances themselves contribute to configuring" . Furthermore, he posits the concept of *mediality*, which is defined as "the relation between three things: an idea of medium, an idea of art and an idea of the sensorium within which this technological apparatus carries out the performances of art" (Jacques Rancière 2011, 36).

Rancière dedicates his text to the artistic medium of photography This emphasis is because, by the time the work is written, photography has become a legitimate genre of art. However, the advent of photography and the subsequent development of mass production techniques have raised a salient question about the role of technology as the artistic medium. Rancière's definition of the medium as milieu effectively removes the notion of the technological device as a mere tool or instrument, thereby de-technologising technique. The various schools of simultaneism, futurism, surrealism, and others have a tradition of de-technologizing technology. Rancière's argument demonstrates how the concept of the medium underwent a transformation with the emergence of novel technologically-based art forms.

Rancière also identified a further intriguing paradox, namely the existence of an alternative interpretation of the technological apparatus as a medium. Rancière attributes all the above logic of reading the medium to Barthes' understanding of technology, which suggests "an identity between technological materiality and sensoriality" (Jacques Rancière 2011, 38). However, he also mentions the opposite optic, which he associates with Jean-François Chevrier and James Lingwood, and which consists in considering the technological apparatus as only the means of reproduction. "The artist who uses it does so specifically as such, which is to say he utilizes its resources qua apparatus, without pretending to turn it into a milieu or a sensorium. <…> The photographic apparatus, on this view, is a means of providing objective and reproducible information about what is placed before the lens" (Jacques Rancière 2011, 39). In this reading of technology as a medium, the concept of technical reproduction becomes a medium itself.

This division described by Rancière has persisted in the art world, even after the merger of two different worlds: media and art. With the development of technology and its greater economic accessibility, the art world has generally accepted that not all art using technological tools claims the status of media art or digital art. Advocates of new media art have historically maintained that emerging technologies exert a profound influence on artistic practice and that it is the responsibility of art to critically engage with and explore the creative and conceptual possibilities afforded by these technological developments. Now it's common to differentiate between art that utilises digital technologies as a tool for producing traditional art objects from media art artworks, which creatively use technology (Paul 2016) (Paul 2008b).

However, a further paradox emerged during this period: works of art that did not align with the realm of media art, yet employed digital media in their creation, began to be accepted into established institutions and "the high-profile examples of Olafur Eliasson, Mariko Mori and many others" (Quaranta 2013, 40) show it. This happened due to the increasing accessibility of technologies. Because "the digital medium no longer requires specific training, absolute dedication, access to tools and labs, etc.: more often than not, a home computer equipped with consumer software is more than enough to make art. And a home computer is just one of the many tools available in any artist's studio" (Quaranta 2013, 40).

Notwithstanding the previously noted distinction between the domains of media art and contemporary art, the proliferation of digital technologies has progressively blurred this boundary. This shift has facilitated a broader dissemination of media art practises across artistic and institutional contexts. In this transitional landscape, a new generation of artists has emerged who seek autonomy in their use of both traditional and digital media. They aim to cultivate a revised conceptual framework, expand the available platforms for artistic production and dissemination, contribute to a more inclusive historical canon, and articulate alternative economic models. Crucially, these artists advocate for recognition within the broader field of art, rather than under the limiting label of "New Media Art."

Nevertheless, media art begins to lose the media specificity of its definition. This occurs because media art has often defined itself by using technology (or media) as its medium. Consequently, the boundaries between fine art and media art are becoming increasingly blurred. This process is concomitant with a decline in the popularity of the term "media art" as a discrete phenomenon and the meaning given to media art per se. This is evidenced by the irony that has emerged in relation to media art. For example, in 2005, Sara Cook and Steve Dietz are curating an exhibition in Walter Phillips Gallery called *The Art Formerly Known as New Media*, which has marked an era in which media art entered a state of crisis. This crisis manifested itself in the decline of interest in media arts as a discrete genre, including the loss of institutional interest, which consequently led to a decrease in the number of institutions or departments that specialised in media arts. In this regard, Stefan Heidenreich's 2008 review of the Berlin *Transmediale* is particularly pertinent, as he writes: "Media art was an episode. But since the institutions that support it are still extant, it survives as a dinosaur from the 1980s and '90s. […] There is a wealth of good art that naturally works with media. But there is no media art." Stefan Heidenreich (2008).

A comparable challenge is encountered by Media Theory, as described by Dieter Daniels: "how can its definition as a separate field be legitimate if media technology has become part and parcel of our everyday life. Put the other way around: can a genre of art or theory exist as an entity outside media technology and its cultural significance, without either explicit reference or implicit dissociation? Isn't every form of theory necessarily media theory today, and doesn't every artwork to a certain extent belong in the field of media

art?" (Daniels 2011, 2 Critics of media art and its associated theoretical discourse often focus on the genre's early entanglement with the techno-utopian optimism that characterized the emergence of digital technologies in the 1980s and 1990s. During this period, media art was frequently celebrated for its alignment with innovation and experimentation, yet this enthusiasm was accompanied by an uncritical embrace of technological progress. Such a stance has since been questioned, revealing underlying assumptions about digital media's emancipatory potential and prompting more critical, reflexive approaches within the field.

This period also coincided with a growing institutional crisis. As the media artwork acquired in earlier decades began to deteriorate, traditional art institutions were forced to confront their limited capacity to preserve and maintain such works. The preservation of media art demands significant material and human resources — requirements that many institutions were ill-prepared or unwilling to meet. As a result, reluctance to acquire media art increased, further contributing to its marginalisation. The lack of alternative institutions formally tasked with supporting or conserving such works exacerbated this marginal status.

Additionally, the establishment of media art revealed significant problems: traditional art history and curation often didn't have the right ideas or methods to properly understand the time-based, tech-driven, and interactive aspects of media art, resulting in many misunderstandings, neglect, or even loss. The varied origins of media art have meant that conventional art institutions have not been suitably prepared to preserve and curate this genre. This situation has led to the necessity of reconceptualising media art within classical institutional frameworks. In this regard, in 2010 Sarah Cook and Beryl Graham sought to formalise and legitimise a distinct framework for media art in their book *Rethinking Curating: Art after New Media*. The central objective of the publication is to rethink curatorial practice in postmedium condition and to analyse organisations that support the production and distribution of new media art also beyond the museum. Sarah Cook and Beryl Graham, among others, were among the first to apply the emerging theory of media art preservation to the interpretation and theorisation of media art, incorporating preservation issues into the tradition.

One of the key ideas highlighted by both curators is that media specificity should be seen not as a strict list of material features but as a mix of different traits and actions (Graham and Cook 2010, 35). Sarah Cook and Beryl Graham explain that when media art is included in contemporary art institutions, it often leads to misunderstandings about media art, which usually come from trying to apply the idea of media specificity to it. The concept of media specificity, which posits the objectification of art through its physical properties, was rendered moot by the greater complexity of media art in comparison to traditional artistic mediums. Furthermore, it is posited that new media art employs an alternative system of conveying meaning that is not predicated on the division between creator, instrument and work. In the context of media art, this paradigm shift enables a more dynamic understanding of artworks, where the focus is placed on how a work operates, responds, and interacts within its technological and conceptual environment rather than on its static formal or material properties. As Graham and Cook note, the physical components of new media art are inherently unstable — constantly evolving, subject to upgrades, and frequently rendered obsolete (Graham and Cook 2010, 35). Therefore, when approaching media artworks—particularly within traditional institutional contexts — it becomes imperative to prioritize an initial assessment of the artwork's behaviour (Graham and Cook 2010, 5).

Recent years have seen a discernible shift in the prevailing interest in the medium as a conceptual entity. The development of novel buzzwords that include the word medium or media has stagnated, and concomitantly, numerous artistic practises have transitioned towards what can be called, a ‘cross-media’ or ‘hybrid’ approach, particularly within the context of art research practises. A hybrid media artwork involves the integration of different media, resulting in a creation where the individual components mutually influence and blend into a cohesive whole. This shift towards hybridity is also attributable to the commercial development of the technology.” in commercial media, the word convergence is used instead of hybrid, but on a practical level they mean the same thing: that television, Internet surfing, computer games, and e-mail are likely to meld into one commercial service and possibly one piece of equipment” (Graham and Cook 2010, 5).

2.1.5. Post-Media in ZKM

ZKM a prime example of a post-medial project. The concept of ZKM emerged during a period marked by a growing interest in media art, and its official opening aligned with the peak of this cultural and institutional enthusiasm for the genre. In the post-media era, media art has historically faced challenges in gaining full acceptance within traditional and modern art institutions. Both the need and the desire for a new museum have necessitated its establishment This gap has prompted the emergence of media art centres, such as FACT in Liverpool and ZKM in Karlsruhe — some with collections, others without. These institutions were created because there is a rising need for places that can connect the artistic and technological sides of media art, showing a wider interest in having organizations that understand the complexities of this mixed area.

The founding of the ZKM can be traced back to a 1984 initiative by the Cultural Department of the City of Karlsruhe. By 1986, a project group was formed comprising representatives from local government, academia, the State University of Music, the Nuclear Research Centre, and the Karlsruhe art community. Their collaborative efforts culminated in the presentation of *Concept ’88*, a foundational document that articulated the vision of integrating artistic practice with emerging media technologies — both in theory and application. ZKM started as a series of festivals, and before its official opening in 1997, the ZKM Foundation operated through a decentralised model, organising a diverse array of events across Karlsruhe. Notable among these were the *ZKM in the Factory* event series, the biennial *MultiMediale* media art festival, and high-profile award ceremonies such as the *Siemens Media Art Prize* and the *International Video Art Prize*. *MultiMediale 5* was presented as the inaugural exhibition of the newly established Media Museum at ZKM.

In its foundational document, *Concept ’88*, reflects the conviction that the emergence of new media — such as television, radio, video, computer graphics, holography, cassette recorders, personal stereos, and CDs — had ushered in a paradigm shift in public engagement with art and technology. These developments were seen not only as tools but as catalysts for reconfiguring aesthetic experience. The ubiquity of these media fundamentally altered the ways in which individuals interact with cultural and technological content. In this context, ZKM was envisioned as a “centre for human technology” — a space where the deeply human drive for aesthetic expression could be meaningfully integrated with technological innovation (Heck et al. 1988).

The ZKM, and in particular its *Media Museum*, was conceived as a ”museum of the future”, built with the specific purpose of displaying technological and media-based art. ZKM introduced two revolutionary concepts for its time: the integration of media art into

museum collections and permanent exhibitions, and the beginning of the "digitalization of the museum," which enabled the breaking down of the static nature of traditional museum structures (Schwarz and Medienmuseum 1997, 18). ZKM presented an alternative to the conventional exhibition space models of the white cube and the black box. It can be called a grey cube, which is the exhibition space that transitions from the white cube to the black box easily. This is achieved by allowing for flexible presentation formats, including screen-based and light-based works, while enabling precise control over the level of illumination within the galleries. The museum was equipped with an advanced electrical infrastructure, which effectively addressed practical challenges such as the availability of sockets and cable management. In this regard, the ZKM fully realised the utopian aspirations of the post-medial era, positioning media art not merely as a marginal phenomenon but as a legitimate and integral component of contemporary art institutions.

The establishment of ZKM was not solely for the purpose of serving as a museum for exhibition and collection; it was also conceived as a centre for art production and education first. In this capacity, it was expected to provide the broader public with the opportunity to gain knowledge about technology and develop a more critical approach to the tech industry. The Media Museum was conceptualised as a multifaceted institution, encompassing both a museum and a network of studios and institutes. These institutes provided artists with the resources necessary to produce their works, thus contributing to the establishment of ZKM's reputation as the 'digital Bauhaus' (Schwarz and Medienmuseum 1997, 15). The establishment of two key institutes, namely *the Institute for Visual Media* and *the Institute for Music and Acoustic*, was pivotal in establishing a conducive research and production environment for artists working with visual or acoustic media. One of the goals of these institutes was to make technological equipment more accessible to artists. As noted in one of the first publications about ZKM Zentrum für Kunst und Medientechnologie (1995): "Previously, access to such equipment was limited to private individuals due to high costs. Now, advancing into new areas of artistic and technical experimentation is made possible through the computer laboratories." (H. Klotz and Zentrum für Kunst und Medientechnologie Karlsruhe 1995, 11)

Another essential component of ZKM's vision was its educational mission for the public. One such initiative was the media library services, designed to provide access not only to textual resources but also to audiovisual materials. Additionally, ZKM planned to establish workshops as hands-on learning spaces for both visitors and artists. As described in *Concept '88*:

"Everyone, that means all groups of society, including lay and expert users, should have access to the workshops. Personnel from the three major sections will staff the open workshops, experimentrooms for individual projects and the instructional studios in order to profit from the experience gained there. The visitor to these workshops will be able to receive training, to work and to experiment with and without guidance, to produce works and present them. As an extension to the introductory and educational seminars in the Services area, the center will also provide Instructional Studios for Further Training, in which artists, photographers, stage technicians, teachers, students, etc. will be able to acquire the necessary tools and skills for dealing with new media." (Heck et al. 1988)

Although ZKM, as both a museum and a project, emerged directly in the post-media era — with its fascination with technology and the ambition to establish a distinct art world for media artists — this chapter will examine other phenomena that the post-media condition introduced at ZKM, particularly through the lens of Peter Weibel, the institution's second director. It will explore how his interpretation of the post-media state aligned with the institutional structure and mission of ZKM. Peter Weibel, one of the most prolific media

theorists, has theorised *post-media* as well. In 2006, when Weibel was already the director of ZKM, he published the text 'The Post-media Condition.' The text was most likely written for the catalogue of the exhibition 'Postmedial Condition' (ital. Condición Postmedia) which was made by Neue Galerie Graz and staged at ARCO, Madrid, in 2006. The project lists Weibel as a scientific advisor. And this text is the sole theoretical text included in the catalogue. The exhibition is indicative of the contemporary Austrian art scene of the period. In this sense, the curators posit the hypothesis that the Austrian artistic tradition has embraced a distinctive manifestation of post-mediality, which manifest in the fact that "Austria has a tradition of blurring the borders between the liberal and applied arts, between architecture and design, between sculpture and stage design. It also has a distinct media tradition ranging from the avant-garde film to virtual reality" (Weibel 2006, 90). However, the focus will be more on Peter Weibel's text, which provides an excellent overview of the interpretation of the post-medial state by him.

In Peter Weibel's version of post-mediality, the *post-medial* state refers to the "equality among all the media and genres" within the art (Weibel 2006), where all the different media influence and determine each other. In the wake of Manovich, Weibel emphasises that the impact of (new) media is universal, and they impact old art mediums. He writes: "the central agendas of 20th century art: the crisis of representation, the dissolution of the traditional notion of artwork and the disappearance of the author — all these factors are due to the emergence of the new media. The radical turn towards the culture of reception which occurred in the 20th century, the explosion of the visual in art and science, the pictorial turn, are all consequences of the new media" (Weibel 2006). Thus, post-mediality as a phenomenon entail breaking down the traditional hierarchy in which one medium of art dominates without question, allowing for a harmonious coexistence and simultaneous integration of various media forms within artworks. In this manner, Weibel puts forward the proposition of eradicating the distinction between art and media art. This constitutes one of the most significant themes within the text. On par with the ideas of totality of the media: "Hence in art there is no longer anything beyond the media. No-one can escape from the media" (Weibel 2006).

The ZKM was conceptualised by its inaugural director, Heinrich Klotz, as the '*Museum aller Gattungen*' (en. Museum of all arts) (H. Klotz, Bredekamp, and Frohne 1997a, 7). This approach ensured the comprehensive representation of all genres within the museum's collection. However, an institutional divide existed within the museum, with it being comprised of two separate entities: the *Museum für Neue Kunst* (MNK) and the *Media Museum*. The two entities were consolidated under a single institutional umbrella, namely the *Zentrum für Kunst und Medien* (ZKM). The *MNK* was referred to as a 'collector's museum' (ger. *Sammlermuseum*), because it was the one physical space that is advertised as offering "selected works from private collections" (Graham and Cook 2010, 204), that collections increasingly consist of easily collectable artworks. The *Museum für Neue Kunst* was managed as an independent institution under the direction of Götz Adriani, focusing predominantly on the history of painting, contemporary painting, sculpture and object art of the 20th and 21st centuries, thus encompassing more collectable art, though also featuring performances, body and media art. The concept of MNK was following: "Both fixed and moving images will be combined in our display, and this will be both despite, and because of, their apparent aesthetic incompatibility and the resulting challenge to the visitor's expectations. At first sight, an oil painting encountered alongside an image on a computer or television screen in a museum context presents an almost irreconcilable contrast of media and associations". (H. Klotz, Bredekamp, and Frohne 1997b, 7). ZKM was among the first institutions to adopt a pioneering approach towards the inclusion of diverse media and genres within its collection. From the outset, its acquisition policy was

based not on privileging any medium of artistic expression but on recognising all media and artistic forms as equally legitimate. The overarching aim of the project was to establish a museum that would comprehensively represent the full spectrum of artistic production across media and genre. However, the collections were divided among two different institutional entities.

However, in 2017, the Museum of Contemporary Art (MNK) and the *Media Museum* were formally dissolved as part of the restructuring of the ZKM. The collections of the museums were merged, as the separation of artworks according to media increasingly contradicted contemporary artistic and curatorial practice. Following the presentation of the exhibition *GLOBAL CONTROL AND CENSORSHIP* (2015–2016), the ZKM has effectively abandoned the distinction between the *Media Museum* and the *Museum of Contemporary Art*. Therefore, the interpretation of the equal status of all artistic genres, introduced by Weibel in the text, was manifested in the structural organisation of ZKM. It became evident that the establishment of a unified exhibition platform, devoid of internal divisions, more accurately reflected the contemporary *zeitgeist*. In this era, media and media art have become integral to contemporary artistic practice — this is due to a general increase in the availability of technology — thus negating the need for spatial and institutional separation. Instead, a media-oriented perspective after this event thematically informs all ZKM exhibitions, leading to a deliberate move away from old organisational structures.

From its inception, the ZKM established interactivity as a foundational principle in media art, distinguishing this form of art from more traditional, static artistic expressions. In interactive media artworks, the viewer is transformed into a participant whose actions — whether physical, sensory, or digital — directly influence the form, content, or behaviour of the work. *Concept '88* states: "We need to break out of the rigid opposition between observer and exhibited object" (H. Klotz 1989). Accordingly, the museum was conceived not only to exhibit interactive works but also to collect them. This strategy was also positioned to critique 'high culture,' (H. Klotz 1989) a concern that appears to have been particularly significant for Heinrich Klotz, the founder of ZKM.

Furthermore, Peter Weibel redirects the focus to the viewer, who is now primarily considered as 'user', which was very characteristic of the post-media. Since the early 19th century, the emergence of recipient culture has shifted the role of the viewer in art. Throughout the 20th century, movements such as Op Art, Kinetics, Fluxus, and Conceptual Art increasingly centred the viewer, requiring their physical or intellectual engagement to complete the work. With the advent of digital art in the 1980s, interactivity became fundamental, culminating in immersive virtual environments. By the 2000s, the concept of the 'user' — prevalent in Internet culture —reflected long-standing demands for participation in art. Web 2.0 technologies reinforced the expectation that audiences could engage with institutions continuously, not only on-site but remotely and interactively. In the text *Das intelligente Museum* (en. The Intelligent Museum), specifically in the chapter *Das Web 2.0-Prinzip* (en. The Web 2.0 Principle), Weibel discusses how this principle was implemented at ZKM. He describes how ZKM embraced the participatory and interactive qualities of Web 2.0, allowing visitors to engage with the museum and its works beyond traditional, passive observation and realises the "Mensch-Maschine-Interaktion" (en. Human-Machine Interaction) principle (Weibel and Szope 2020, 33). This approach reflects the shift towards more dynamic, user-driven experiences in the museum context. At ZKM, it manifested itself in the idea that ZKM should integrate digital interactions and data into the physical museum experience. Visitors could access networked information through an installation that projected data into the actual exhibition space. This created a dynamic in which museum visitors had access not only to local

content from curators and artists, but also to contributions from people who were physically absent. In addition, remote participants could engage with the exhibition not only as viewers but also as active users, further enhancing the interactivity of the museum experience (Weibel and Szope 2020, 34–35)[28].

For Weibel, the concepts of media and genre equality and the notions of 'user' and 'participation', are imbued with a political and democratic significance. He writes: "The very terms 'user innovation' or 'consumer generated content' bear witness to the birth of a new kind of democratic art in which everyone can participate" (Weibel 2006). This realisation marked a significant turning point in the era, coinciding with the media's awakening to their political potential. This idea was most likely formulated by the exhibition *Making Things Public* (2005) that took place in ZKM a year before the publication of the text *The Post-media Condition* (2006). And Weibel's text in the publication (Latour and Weibel (2005) *Art and Democracy. People Making Art Making People* (Weibel (2005)) strikingly coincides with his text about the postmedial state.

The *Making Things Public* exhibition was announced as an exploration of the endeavour to revitalise politics through the application of the ethos of art and science. It continues the tradition of the *Gedankenausstellung* (en. thought exhibition) initiated by Bruno Latour and Peter Weibel with the exhibition *Iconoclash* (ZKM, 2002), which addressed the crisis of representation in art. In contrast, *Making Things Public* addressed the issue of representation in politics. The exhibition can be seen as an extension of Actor-Network Theory, with its influence evident in the critical questions and thematic concerns articulated through the curatorial framework. A seminal concept that emerged from this exhibition was Bruno Latour's formulation of the notion of *Dingepolitik* (or object-oriented democracy). This concept entailed a paradigm shift in the conventional understanding of politics, to the one which is "no longer limited to humans and incorporates the many issues to which they are attached" (Latour 2005, 41). Furthermore, objects in this context are reinterpreted as things. Latour writes: "Objects become things, that is, when matter of fact, give way to their complicated entanglement and become matter of concern" (Latour 2005, 41).

This reading of the policy for Weibel is reflected in the exhibition methods, that he also calls "assembly principle", including those performed at ZKM. He states in *Making Things Public* publication: "The exhibition itself is a real commonwealth and the model for a commonwealth that arises from the relationship between "hings". It shows that, implicitly, any exhibition is an assembly. An assembly with a political character. The exhibition shows quite manifestly and renders quite transparently what essentially constitutes every public assembly that is "thing"-based: a complex set of technologies, interfaces, platforms, networks, media and "things," which gave rise to a public sphere. Precisely in this way, the exhibition itself becomes the model of an "object-oriented democracy": a "gathering," a "thing" in itself. The visitors' behaviour triggers influences, responses and changes at every moment, repeatedly creating new public spheres. To this extent, the exhibition and its design are not only the image of an "object-oriented" democracy and not only the model of res publica but are themselves a democratic "gathering" (Weibel (2005), 1026).

In this manner, he establishes an exhibition method. In this exhibition, he perpetually juxtaposes tangible technological objects of consumption with media artworks, situating

[28] This approach has had a considerable influence on the practice of continuous video documentation at ZKM, where each event is recorded and made publicly available online at the ZKM website. Consequently, the archive has expanded to encompass a substantial amount of material, which remains accessible to the broader public, even beyond the confines of Germany.

them within a unified display. A notable example of this integration can be seen in the Bio Media exhibition, which took place at ZKM from December 18, 2021, to August 28, 2022. For instance, in the Bio Media exhibition, which was held at ZKM from 18 December 2021 to 28 August 2022, the *NAO* robot, developed by the French company Aldebaran Robotics in 2008 (Weibel, Donderer, and ZKM Zentrum für Kunst und Medien 2023, 178–79), and the therapeutic robot *Paro*, created by the Japanese National Institute of Advanced Industrial Science and Technology (AIST) (Weibel, Donderer, and ZKM Zentrum für Kunst und Medien 2023, 180–81), were presented alongside media artworks.

Another phenomenon associated with Peter Weibel's logic is the ZKM's commitment to preserving both media art and the technological infrastructure required to display it. In this logic, equal significance is attributed not only to artworks but also to technological apparatuses as cultural artefacts. This interpretation of the equality of all 'things' has resulted in ZKM amassing not only a substantial collection of artworks but also an extensive archive of obsolete hardware and playback devices. This curatorial and political stance had a direct influence on ZKM's conservation tradition, as the need to preserve and maintain outdated technologies became increasingly urgent. Obsolete technology plays a crucial role in the exhibition and preservation of media art, as many works depend on the specific hardware and software environments for which they were originally created. At *LAVS* as Dorcas Müller observes, one of the laboratory's most critical objectives in its early years was to expand the collection of playback devices — a task so integral to the institution's mission that it prompted Peter Weibel himself to participate in acquiring technological archives[29]. Later the collection of vintage hardware played a pivotal role in facilitating the preservation of computer-based art, which was part of the ZKM collection, as also assert Morgan Stricot and Matthieu Vlaminck.

2.2. The Idea Becomes a Machine That Makes the Art

" *The idea becomes a machine that makes the art*."
- Sol LeWitt, 1967 (Lippard 2007, xiv)

As was stated previously, the notion of *medium* is one with a complex and varied history and which is laden with different connotations. The concept is replete with meanings, and all its sub-forms are gravitating towards the field of media art. This has resulted in the nomenclature of numerous media art festivals, including the *Transmediale* in Berlin and the *MultiMediale* (ZKM Foundation's Media Art Festival). As previously outlined, the term *media art* has consistently existed within the semantic constellation of the terms *medium* and *media*, wherein multiple meanings coexist and intersect simultaneously. These meanings can also be elucidated through the utilisation of the previously cited *Intermedia Chart*. Where "hovering bubbles […] imaginarily expand, contract, pass over and through each other" in a visualisation of the fluidity characteristics of media arts. This statement

[29] The process of collecting old equipment for *LAVS* proved to be a highly entertaining endeavour, as detailed in an interview conducted on 4th February 2025 with *Dorcas Müller*

can be well illustrated with a quote from the book *Rethinking curating: art after new media*: «New media art has frequently had problems with categories of medium because of its mixed-media, multimedia, intermedia, or hybrid media nature» (Graham and Cook 2010, 5).

Nevertheless, an examination of the conceptual evolution of the notion of *medium* reveals a non-linear progression, wherein the development of one concept did not necessarily supersede or replace another. Instead, these various notions coexisted, collectively influencing the comprehension of the objectivity of media art. So not only the specific ideas but also the entire semantic field that has been constructed around the terms *medium* and media' influenced the formation of media art as we witness it now.

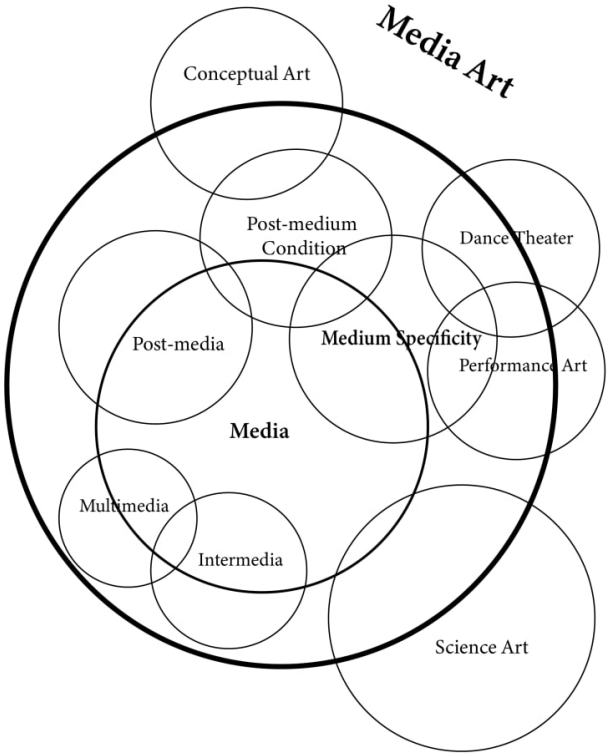

Figure 2.3. *Media Art: Medium Chart,* 2024. The diagram was made by Anastasiia Bergalevich

In contrast to other forms of artistic expression, the realm of technological arts often occupies a space, oscillating between medium specificity and immaterial performativity. This is how *multimedia* has left its mark on theory, as media art theory is deeply intertwined with the theories of visual art, performance, installation, and related disciplines. However, within the prevailing disorder of concepts, a salient consequence emerges: the de-objectification of the work of art, which is inextricably linked to the concept of *medium*. Due to the growing prominence of the medium concept, a notable distinction has emerged between the traditional art object and the object of media art, with the latter frequently being defined by its object-ness.

One of the most significant developments that accompanied the dissemination of the term "medium" was the decline of representationalism in painting, characterised by the removal of the depicted object. This transformation is exemplified by the reconceptualization of the canvas —not merely as a vehicle for representation but as the very object of the artwork. Consequently, there was a shift in the conceptualisation of the work of art, which came to be understood as an object in its own right — a development characteristic of the logic of medium specificity, where the essential qualities of a given medium are foregrounded as the central focus of artistic inquiry. Donald Judd's response to Greenbergian *medium specificity* can be characterised by his conceptualisation of the 'specific object', which represents a departure from the characteristics of Greenbergian modernism. It is neither painting nor sculpture but a three-dimensional object" that gets rid of the problem of illusionism and of literal space" (Judd 1965). The shift in the interpretation of media specificity that minimalism brought to art may be related to the fact that the object of art began to be perceived primarily through the interaction of the subject with the work of art.

The distinction between Judd's sculpture and Duchamp's readymade — despite both employing commercially available and industrial materials — lies in Judd's deliberate avoidance of incorporating everyday objects into the museum context merely to strip them of their utilitarian function. Instead, Judd foregrounds the spatial and perceptual interaction between the viewer and the object, emphasising the experiential and phenomenological dimensions of the work. Michael Fried called this approach" the literalist espousal of objecthood" (Fried 2009, 152). His 1966 essay, *Art and Objecthood*, is known to launch a scathing critique of minimalist art. Fried contends that proponents of minimalism have misinterpreted Greenberg's call for purity. Instead of engaging with the materiality of the medium, these artists merely present the materials as they are. Fried contends that this shift in focus results in an overemphasis on the viewer's encounter with the object, rather than on the formal qualities intrinsic to the object itself. This interaction, as posited by Fried, assumes a theatrical character, unfolding within the constraints of space and time (Fried 2009).

Nonetheless, the conceptualisation of the medium as a 'specific object' rapidly gave rise to the notion of the object as a performative entity. The object was most strongly interpreted as presenting itself to the viewer through perception because of its inaccessibility to the thinking subject. The subsequent theoretical framework, characteristic of the emergence of the 'post-medium condition', posited the conceptualisation of the work of art as a "non-object" — a shift that moved away from the material essence of a specific medium toward an emphasis on idea, process, and intermediality. "Non-object" is the term introduced to the art speak by Brazilian poet and art critic Ferreira Gullar in his text *Theory of the Non-object* (1959). He defined a non-object as," special object through which a synthesis of sensorial and mental experiences is intended to take place. It is a transparent body in terms

of phenomenological knowledge: while being entirely perceptible, it leaves no trace. It is a pure appearance" (Gullar 2014, 120).

Indeed, emerging media art was not an entirely independent phenomenon but rather incorporated elements from various pre-existing practises. The adoption of minimalist principles thus gave rise to the utilisation of commercial materials (new materials that had not until then been considered suitable for 'art') and an emphasis on the use of whole, unified shapes. This development subsequently paved the way for the integration of technology (as an industrial material) within exhibition spaces, thereby giving rise to the emergence of media art. Indeed, the late minimalist movement, exemplified by Richard Serra's *Television Delivers People* (1973), was among the first to incorporate television into exhibition spaces. It is imperative to acknowledge that minimalism inaugurated the notion of artistic creations that transcend conventional classifications of artworks, such as paintings and sculptures. Minimalist artists shifted focus away from representational content and traditional mediums, challenging the boundaries between art and object. This redefinition of artistic practice laid the groundwork for future movements that further questioned the nature, materiality, and function of art in contemporary culture.

The phenomenon under investigation can be attributed to the adoption of a phenomenological approach (like by Gullar), followed by the subsequent influence of minimalism. The object began to manifest itself primarily through its qualities or performance. This shift in focus contributed to what Ursula Meyer terms the *de-objectification of the object*. In her analysis, minimalism disrupted the traditional authority of objectivity by foregrounding the ephemeral and temporal dimensions of the artwork rather than its material permanence (Meyer 2014, 129). This process was particularly fuelled by the technology industry. This technological development served to accentuate the object's abstract nature to the greatest extent possible, states Meyer. Mayer identifies *multimedia* as one of the forms of this abstraction. This phenomenon can be attributed not only to the increasing inaccessibility of hardware for the consumer, who often lacks the requisite knowledge of how this object functions. However, rather the fact that *Multimedia* "exposes the viewer to a superabundance of sensory stimuli" (Meyer 2014, 130), rather than make them engage with objectivity. So, she emphasises the tendency for a work of art to create an experience above all else.

It can thus be argued that the introduction of hardware into the exhibition space has both accelerated and radicalised the process of de-objectification initiated by Minimalism. Media art is characterised by a fundamental non-objectivity — a condition in which the artwork is no longer defined solely by its material presence but by its performative and processual dimensions. This non-objectivity is evident in the use of technological media, which are often commercial devices repurposed within the artistic context to execute specific actions or behaviours. In this framework, the medium itself becomes active, not merely as a conduit but as an agent that shapes both the aesthetic and conceptual experience of the viewer.

Consequently, the discourse between Greenbergianism and Minimalism gave rise to spontaneous responses, which can be categorised into two distinct groupings: "the first is an immediate reaction to the American modernist debate, mainly through the abandonment of objects and the turn to language and philosophy. The second, less immediate reaction is a history of performative art practices, which proposed new bodily interactions with objects" (Hudek 2014, 18). Media art, influenced by major currents in contemporary art, occupies an intermediary position that integrates aspects of both conceptual and performative practises. Drawing from conceptual art, media art reflects the dematerialisation of the art object and embraces the idea of the artwork as a linguistic act

of communication. It prioritises formal instructions and intellectual frameworks over the physical form, shifting focus from material presence to the conceptual and intellectual dimensions of art. At the same time, media art embraces performativity, which has evolved into interactivity — positioning the viewer as an active participant and emphasising process, event, and engagement over static material presence. This dual alignment underscores media art's unique capacity to bridge thought and experience, concept and action. The following chapters — *Object as an Event* and *Object as a System* — will explore how these two distinct turns have influenced conservation practises and given rise to differing conceptions of the object within media art.

This process gave rise to the aforementioned phenomenon, whereby the object of media art began to be defined primarily through the set of its functions or it's behaviours, as conceptualised by Sarah Cook and Beryl Graham. They write: "If we are to consider the issue of the physical properties of the work of new media art rather than its conventions or how it behaves, we would be continually chasing a vapor trail because the physical properties of new media are so mutable, emerging, evolving, being upgraded, and becoming defunct" (Graham and Cook 2010, 35). Thus, the object of media art became defined through its properties and medium's inherent characteristics and behaviours, for example "such as its participatory and generative features" (Paul 2008, 2). For instance, the curator Steve Diez defines media art objects through the following categories: *interactivity*, *connectivity*, and *computability* (Steve Dietz 1999).

Furthermore, by the time that media art came to be categorised as a genre, the formal qualities of the digital object had begun to coincide with, and be transferred to, any object of media art. As demonstrated by Lev Manovich, a renowned media art theorist, this concept can be readily observed in relation to one of the most significant definitions of media art. In his book *The Language of New Media*, Lev Manovich delineates five key principles that define new media: *numerical representation*, *modularity*, *automation*, *variability*, and *transcoding*. *Numerical representation* is the foundation, asserting that all digital objects are ultimately comprised of code, enabling algorithmic manipulation. *Modularity* is defined as the fractal structure of new media; whereby digital objects are composed of discrete parts that can be altered without affecting the overall structure. The advent of digital media has led to a significant increase in *automation*, whereby computers are able to execute processes and commands automatically, thereby reducing the necessity for human intervention. *Variability* is an inherent characteristic of digital technologies, as they are capable of existing in multiple and potentially infinite versions, thereby reflecting societal and technological changes. *Transcoding* can be defined as the process of translating or remediating older forms of media into a digital format. This concept underscores the intricate interplay between technological and cultural influences on the evolution of new media (Lev Manovich 2001, 44–65).

Consequently, in the domain of media art, objectivity undergoes a transition from being anchored in the materiality of a solitary physical entity to being characterised by a series of dynamic attributes inherent in digital media. This transformation is indicative of a more extensive theoretical stance within the domain of media studies, wherein media are not understood in terms of their physical substance, but rather in terms of the effects they engender, particularly on human perception and the sensorium. Media theorists frequently emphasise that the defining characteristic of a medium is its capacity to shape, prioritise and restructure sensory experience, thereby establishing a novel hierarchy of senses and modes of interaction. In this context, the appreciation of media art is focused on its experiential, processual and affective dimensions, rather than on any fixed material form.

2.2.1. Media Art Artefact in the Institution: the Question of Collecting and Problem of Authenticity

Since the invention of telematic communication, technology can no longer be understood merely as individual objects or artistic forms. Instead, it must be considered as a complex system involving technical infrastructures, the education of engineers and computer scientists, technology policy, economic structures, and its broader social and cultural implications. This network also encompasses the roles of the arts, sciences, and their institutions, all of which contribute to and are shaped by the evolution of communication technologies (Zielinski 2006, 277).

As previously stated, one of the outcomes of the post-medial era was the integration of media art into contemporary art institutions, thereby introducing the associated structures, including archives and collections. The postmedial state that has emerged from the merging of two distinct realms — the art world and the media world — has given rise to a significant phenomenon. This is the popularisation of the understanding of a work of art not as an object, but rather as a medial event. Boris Groys in his work *Under suspicion: a phenomenology of the media*[30] demonstrates and explains this phenomenon. For Groys, the important conclusion from McLuhan's *medium is the message* was not only the separation of object and "the medial surface of signs" (Groys 2012, 12). Another significant phenomenon was the establishment of what is termed *submedial space*. This is the space between object materiality (or object as an entity) and its (cultural) meaning or performance, which became apparent at the moment of the object of media (or *New*, as it is referred to) entering the archive (Groys 2012).

In the following passage, Groys explains *submedial space*:

"Artificially constructed sign carriers such as books, canvases, computers, or videotapes exist for us in an evident enough manner only in profane space. <...>. If we want to examine what TVs or computers look like inside and how they function, we have to first turn off the apparatus and also extinguish the pictures sustained by the apparatus. And this means that neither the canvas nor the media apparatus are ever accessible to us as media carriers. They are accessible to us only when they no longer function as media carriers, but present themselves as nothing more than things that belong to the profane world outside" (Groys 2012, 12)

This is not a novel problem, as emphasised by Groys, but its visibility is accentuated when an object of media art enters an archive or the exhibition space of a museum. Because their function as a profane object becomes completely invisible, while their function as "the medial surface of signs" takes centre stage. Consequently, media art has found itself in an intriguing position wherein the tangible technology underlying the artwork is rendered entirely invisible. This has consequently given rise to a fascinating phenomenon, namely the fact that a significant number of contemporary art institutions were entirely unprepared

[30] Boris Groys's *Under suspicion: a phenomenology of the media* was published in 2000. At that moment he was a lecturer at the Karlsruhe University of Arts and Design (germ. *Staatliche Hochschule für Gestaltung Karlsruhe*) for 4 years. He was also actively involved in the cultural life of ZKM, as can be seen from a few publications in which he has participated since at least 1996. Therefore, it can be argued that ZKM's experience as an institution may have influenced the formation of this publication.

for the necessity of preserving and maintaining these works of art. The fragility of the technological elements was not immediately apparent, and the necessity of their permanent maintenance was unobvious. This was because most decision-makers within institutions, who were responsible for the formation of collections, were unable to see the object behind the artwork. They were more able to perceive the performance of this artwork, its cultural significance or its meaning, but not the technological object, which is the product of consumption and has its own specifics. As Groys also observed, this phenomenon can be attributed to a multitude of historical factors, but fundamentally to the popularisation of the concept of mediality.

The tradition of introducing the commercial object into the institutional space was not new and began with Duchamp's famous *Fountain* (1917), or his *Bottle Rack* (1914) and other profane manufactured objects introduced into the exhibition space. Nevertheless, the most significant distinction that set apart 'readymade' from media art was the requirement for the object of media art to undergo a transformation in its function, transitioning from a state of profane usage to the object imbued with an 'aura'. The ready-mades of Duchamp were consistent with the logic of 'artefacts'. The definition of an object as an artefact is contingent upon its being devoid of utilitarian value and no longer fulfilling its original purpose when it is brought into the exhibition space. It was imperative for the object of media art to serve as the medium for an action conceptualised by the artist and to be "the medial surface of signs". However, the object in question was rendered invisible, yet exhibited behaviour or cultural actions. Consequently, the media art object transitioned into what Groys designated as the "sub-medium space", where their material shell was rendered entirely invisible, and the body of artwork was un-obvious.

The distinctiveness of the media art object lies in the fact that, even within the institutional context, it must continue to perform its original function on performing this *submedial space* and acting as the profane object but embedded with 'aura". Unlike traditional artworks, media art relies on technological components — such as screens, video players/recorders, and computers — which are industrially manufactured and come with inherent challenges. These devices not only tend to malfunction but are also deliberately designed with a limited lifespan, known as planned obsolescence. This means their functionality is intentionally constrained to a specific period, creating ongoing complications for their long-term preservation and presentation in institutional settings.

Despite minimalism's role in paving the way for media art's entry into institutional spaces — by challenging traditional notions of form and objecthood — most institutions were still unprepared to embrace the radically different interpretation of the art object that media art introduced. While minimalism did indeed disrupt expectations of artistic materiality and permanence, it nevertheless relied on material presence and spatial experience. Conversely, media art placed emphasis on concepts such as transience, interactivity, process, and technological infrastructure, frequently necessitating systems and conditions that deviated significantly from conventional museum practises.

Institutions were, and to a degree still are, structured around the collection, preservation, and display of stable, tangible objects — paintings, sculptures, and photographs — that conform to long-established models of authorship, conservation, and commodification. Media art, on the other hand, introduced new challenges: it often lacked a single, fixed object; it depended on proprietary or rapidly obsolescing technologies; it required active viewer participation; and it operated more like an event or process than a static artefact. The institutional apparatus —curatorial methods, conservation departments, technical infrastructure, and even insurance policies — was simply not configured to manage such instability and complexity.

Furthermore, the epistemological shift introduced by media art, with its emphasis on systems thinking, code, networks, and performative interaction, required institutions to rethink not only their logistical practises but also their theoretical frameworks. In many cases, institutions lacked both the technical expertise and the conceptual vocabulary to engage with media artworks as living, evolving systems rather than as finite objects. This has resulted in a state of liminality for media art, rendering it comprehensible to artists and theorists yet frequently marginalised or misunderstood within mainstream institutional contexts.

Indeed, the emergence of media arts collections has introduced numerous challenges for institutions. Unlike traditional artworks, media art often depends on rapidly evolving technologies, proprietary software, and interactive components, making preservation, conservation, and exhibition complex and resource intensive. These works frequently defy traditional object-based models, requiring institutions to rethink their strategies for documentation, storage, display, and long-term accessibility, all while maintaining the authenticity and functionality of the original artworks. The integration of media art into contemporary art museum collections has revealed a host of challenges that go beyond technological concerns. Media art disrupts traditional frameworks of fine art by questioning established notions of objecthood, authorship, exhibition formats, economic models, and institutional roles. Its dynamic, process-based nature demands a fundamental rethinking of how artworks are categorised, documented, and presented to audiences. As a result, despite its historical significance and sustained presence, media art remains only partially integrated into major institutional collections, highlighting the need for systemic adaptation within the museum world.

One of the key challenges for institutions lies in determining what exactly should be collected when it comes to media art, and how the work should be represented. Unlike traditional art forms, media artworks often involve intangible elements such as code, interactivity, or networked systems, raising complex questions about whether to preserve the physical components, the experience, the behaviour, or a combination of these aspects. The challenge of collecting media art often stems from issues of taxonomy — new media artworks frequently do not fit into existing categories within a museum's collection management systems. This disconnect can lead to their exclusion, not necessarily because of their content or value, but because curators have yet to establish conceptual or structural links between these new forms and the institution's established classifications, making integration difficult within traditional collection frameworks (Graham 2014). Consequently, many media artworks have not been adequately preserved, exhibited, or documented because they did not fit into the pre-existing categories used by institutions. This lack of clear classification made it difficult for curators and conservators to integrate them into traditional museum systems, leading to their marginalisation within collections and often resulting in their neglect or loss over time.

Contemporary museums continue to organise their collections according to conventional classifications, such as object, reproduction, or score/performance rights. These categories significantly influence the nature of the collections and the methods of organisation (Graham 2014, 32). This issue was also evident at the level of commissioning. In the process of acquiring works of art, it was frequently unclear what pieces the institution should procure. This was since the objects to be acquired were often fragmented into individual items or registered under a single entry but not as a whole system or environment. Beryl Graham posits that when examining the actual new media objects that museums have in their collections, it can be interesting to see and handle the solutions that artists themselves devise. The following example is provided by her to illustrate this point:

"Searching the online collection for Casey Reas' 2010 "Process 18 (Software 3)" comes up with nine separate items in the collection: two CDs containing software, one documentation print signed by the artist, five other digital prints, and a presentation box. If these are requested for examination, then it becomes clear that the artist has carefully considered how to present the work for a collection. The aluminum presentation box neatly contains the CDs and signed print. The CDs are annotated by hand in pen and are sewn between two sheets of drafting vellum, bringing a certain presence and hand of the artist to highly immaterial software art". (Graham 2014, 32–33)

Nowadays, many institutional media artists are adequately prepared to address this issue. Typically, the institution procures the media installation accompanied by pre-prepared installation instructions, which are generally developed by the artist themselves or their studio (thus implying that the quality of execution remains subject to variation). Additionally, the artist stipulates which technological components can be substituted in the event of malfunction and occasionally provides the institution with reserve components (e.g. screens). However, to this day, the responsibility for deciding what the institution buys when it buys media art and how to document their own work remains mainly with the artists. Regrettably, the responsibility for the durability of the artwork is frequently entrusted to the artist themselves, contingent on their understanding of institutional frameworks and preservation methodologies.

For example, the solution for purchasing and preserving net art is not straightforward. One existing strategy entail acquiring not only the artwork itself, but also the entire device and technological environment from which it originated. This includes hardware, software, and system configurations, aiming to maintain the contextual integrity and functionality of the work as it was initially experienced. However, this technique results in high costs for artists, as each new work may require the purchase of a dedicated device. As a result, strategies for selling and collecting internet art remain largely experimental, with institutions continuing to explore sustainable and effective models for acquisition and preservation. For example, Olia Lialina, a pioneering Internet artist, has noted a growing trend in media art involving "flat computers" —all-in-one units that combine a computer, hard drive, and monitor into a single module (Lialina 2007) (Lialina 2010, 40). These devices have become increasingly popular for housing works of computer-based art, offering a more convenient and marketable format for digital art. This development has created a sense of permanence and commodification for digital art, which was once considered ephemeral and unmarketable, providing a tangible form that can be more easily sold and preserved.

Another significant issue in purchasing non-traditional artworks was the legal challenges, as most institutions and collectors were unprepared to legally acquire "ephemeral," behaviour-oriented, and process-based works. Net art, for example, presents a unique challenge in this regard, as its intangible and constantly evolving nature complicates ownership, copyright, and legal rights. The transient and interactive elements of net art make it difficult for institutions to navigate traditional legal frameworks designed for more permanent, static objects. A notable example is the *Art Website Sales Contract* devised by Rafael Rozendaal. In the preamble to his contract, he states: "Each URL serves as both the title and the location of each art piece. These websites are public, and their ownership is exclusive. It is important to note that domain names represent one of the internet's few scarcities. They are unique, and consequently cannot be forged or copied" (Rozendaal (2012)). While Rozendaal's contract successfully delineates the terms of sale, it does not guarantee long-term viability or authenticity, as the contract stipulates the transfer of responsibility for the work to the owner, along with the domain name, but does not address issues such as ongoing accessibility or the potential for technological obsolescence. To provide the reader with insight into how the issue of purchasing computer-based works and

accepting archives is legally handled at ZKM, two drafts of the contract that the institution concludes with artists are provided in the Appendix. The inclusion of these contract drafts offers valuable context for understanding how institutions like ZKM navigate the complexities of legal ownership, rights, and responsibilities concerning ephemeral and process-based artworks.

A further salient issue that becomes evident once a piece of media art has entered the collections is that the conventional institutional structure is ill-suited to the unique needs of media art. As demonstrated by Groys, media art frequently obscures the distinctions between two significant institutional frameworks: the archive and the collection. Because the distinction between a work of art and its documentation has become increasingly indistinct (Graham 2014) Steve Dietz (2014). A notable example is *Rhizome*, a platform that serves as a nexus for the convergence of archival and collection elements. The genesis of *Rhizome* can be traced back to *ArtBase*, which was established as a web archive. However, in the face of challenges pertaining to preservation, the organisation transitioned towards the formation of its own collection of net-based art. This collection continues to be exhibited in the form of a web archive and remains accessible online. The organisation operates a digital preservation programme, led by Dragan Espenschied, which is focused on the creation of free, open-source software tools to decentralise web archiving and software preservation practises and ensure continuous access to its collections of born-digital art. Graham and Corcoran (2014). *Rhizome* obscures the distinction between a collection and an archive because it operates at the intersection of both concepts, blending aspects of preservation, access, and curation in ways that challenge traditional institutional frameworks. *Rhizome* is maintaining a dynamic and living archive of net-based art that is not just for storage but is actively curated, exhibited, and made accessible online. This hybrid approach reflects the unique challenges of preserving digital and internet art, where the lines between static objects, archival materials, and living works of art become blurred.

Museums often use terms like “display collection,” “study collection,” “archive,” or “library” to denote varying degrees of accessibility and institutional control, reflecting underlying hierarchies of power. While a “display collection” implies public visibility, a “study collection” may only be accessible to researchers, and archives or libraries might restrict access further or require special conditions. As such, the institutional framing of a collection directly shapes the public’s ability to experience and understand the artworks it contains (Graham 2014, 46). Moreover, museums are conventionally preoccupied with the curation of precious, rare, or unique artefacts. Conversely, libraries are primarily concerned with the dissemination of generally accessible materials. Many digital artworks are inherently replicable, and artists often prioritise accessibility over rarity. In this context, the distinctions between a museum’s collection of digital artworks and a library’s collection of digital objects begin to blur, as both institutions must grapple with similar challenges around access, preservation, and categorisation of reproducible digital materials (Graham 2014, 22). It can thus be concluded that, to effectively collect media art, a museum must adopt certain functions typical of a library. This is because many digital artworks are easily replicable, and artists often prioritise accessibility over preservation (Steve Dietz 2014, 66).

A central challenge in the collection of media art is the question of authenticity. In the context of contemporary art collecting — where value is often tied to notions of originality — media art complicates traditional conceptions. Digital works, such as video files, lack a fixed original and can be reproduced infinitely without loss of quality. Unlike analogue media, which retains some degree of material uniqueness, digital media is inherently mutable; components may be updated or replaced without necessarily undermining the

work's authenticity. This shift necessitates a reconceptualisation of authenticity, one that prioritises conceptual integrity and functional continuity over material singularity.

Authenticity is essential for institutions because it underpins public trust, scholarly integrity, and the cultural, ethical, and financial value of their collections. It ensures that what is preserved, exhibited, and interpreted is genuinely representative of historical and artistic truth. As media artworks continue to evolve, mutate, and exist in various formats, the challenge lies in determining what constitutes the "authentic" version of a work. This issue has been addressed by numerous institutions in various ways, with many opting to popularise such documents as *certificates of authenticity*. For instance, in a GitHub post where Rafael Lozano-Hemmer outlines conservation methods for artists, he explains that he issues certificates of authenticity for each of his works, which are then sold to institutions or collectors — highlighting that, despite the fluid and replicable nature of media art, both remain deeply invested in traditional notions of authenticity. He writes: "In my case, the certificate is an A5-sized doubly anodized aluminium ingot that shows the details and picture of the work. I sign the certificate by hand, adding the edition number. The certificate is also engraved with our studio numbering system, has three digital watermarks and soon it will also have a blockchain unique signature. This is what you keep in the safety deposit box as it is completely irreproducible" Lozano-Hemmer ([2015] 2025). Stedelijk Museum Amsterdam, for instance, as institution has a same requirement. It stipulates that artists who sell media artwork to their collection must provide certificates of authenticity, and these must be created by the artists themselves[31]. While these certificates do not contribute to the preservation of the artwork's material or functional integrity, they play a crucial role in establishing its market value. Without the certificate, the work cannot be resold, making it a key mechanism for maintaining monetary worth and authenticity within the collector's market, even in the context of inherently reproducible media art.

The issue of authenticity and object-ness of media art has long been a central concern not only within the sphere of collecting but also in the field of conservation, where it continues to present complex challenges. The foundational concepts of conservation emerged during the 19th century, a period profoundly shaped by Enlightenment ideals and the concurrent rise of philosophical inquiry into art, aesthetics, and science. These intellectual developments significantly influenced the evolving notion of the artwork, emphasising core values such as authorship and authenticity. As previously discussed, the formation of conservation theory is closely linked to the parallel development of architectural conservation and the preservation of historical monuments. This paradigm shift gave rise to the conception of the object of conservation as a material entity, situated within specific temporal and spatial parameters. Within the framework of traditional conservation methodologies, the identity of a work is primarily understood through its material characteristics.

Fine art conservation is fundamentally based on the premise that material objects embody physical evidence of authenticity and the artist's presence. This conception forms the basis for defining the 'object of conservation' — the material entity upon which conservation efforts are focused (Viñas 2005, 27). A key ethical principle in conservation is integrity; this is defined as the process of ensuring that the intrinsic nature of the object is not altered. This involves ensuring that the object remains unaltered in its essential characteristics. The physical integrity of the object is particularly emphasised, as any

[31] This information has been derived from a personal discussion with Flavia Fortunato, who serves as a time-based media conservator at the Stedelijk Museum Amsterdam.

compromise is believed to diminish its authenticity and, by extension, its cultural and historical value (Clavir 1998, 1).

Traditionally, discourses on authenticity have focused on two principal dimensions: material originality and the completeness of the object. Traditionally the material object has historically been regarded as the foundation of aesthetic experience, anchoring the viewer's engagement through its tangible presence. In this context, the conservator's role is to remain faithful to the 'original' work by preserving its material integrity and maintaining the continuity of its form and meaning over time (Laurenson n.d.). The transient, processual, and often intangible nature of contemporary art — particularly since the 1960s — has significantly challenged conservation's traditional, object-centred approach. While conventional artworks such as paintings and sculptures can often be interpreted through material composition, authorship, and display history, these criteria are inadequate for time-based and media works. Multimedia artworks, which may include moving images, organic materials, and complex display technologies, cannot be fully understood through their physical properties alone. Such works resist classification within traditional paradigms of material authenticity that prioritise physical and chemical identification (H. Hölling 2017). The institutional focus on preserving original materials and equipment —often driven by a fetishisation of authenticity — can paradoxically contribute to the loss of media artworks. This rigid approach may hinder necessary interventions such as migration or emulation, which are sometimes the only viable strategies for ensuring a work's survival. Given the technological fragility and obsolescence inherent in media art, the ability to replace failed components or even entire hardware systems is often essential to maintaining the work's functionality and integrity over time.

Furthermore, a traditional emphasis on storage as the primary preservation strategy has constrained the capacity of museums, libraries, and archives to adapt to the evolving nature of media technologies. This approach often prioritises the retention of a work's original materials and equipment —even when these are inherently ephemeral — while overlooking the contextual and relational dimensions essential to understanding the work. As a result, storage tends to isolate artworks from their original environments and interactive frameworks, leading to collections of static, disconnected objects that lose their vitality, meaning, and ability to engage audiences over time (Rinehart and Ippolito 2014, 75). Ippolito and Rinehart not only highlight this challenge but also advocate for a shift in institutional focus — from traditional notions of storage to the more dynamic and context-sensitive concept of memory (Rinehart and Ippolito 2014, 86–87). "Only by devoting more of their energy to nourish the memories of artists, scholars, and ordinary folks can collecting institutions hope to keep up with a culture of constant change" (Rinehart and Ippolito 2014. 86).

Integrity is an interesting concept in the context of ethics, as it is not explicitly defined in most codes of ethics. However, there is a tendency to specify physical integrity, aesthetic integrity, and historic integrity. The field of conservation underwent further development in the post-1960s era, driven by the increasing intricacy of the objects requiring conservation. In 1989, the Canadian code of ethics was further developed with the addition of 'conceptual integrity', which, while not explicitly defined, is understood to include the metaphysical properties of objects, such as cultural significance or specific religious significance. In the domain of art conservation, the evaluation of 'artist's intent' emerges as a pivotal ethical concern. Within the context of archives, the term 'intrinsic value' has been in prevalent use for an extended period to denote materials that are not retained as copies, yet possess inherent value derived from their original form (Clavir 1998, 2).

2.3. Conservation and the Media Art Object: The Case of ZKM

2.3.1. Object as an Event

In the field of contemporary art, a significant shift in attitude towards the art object occurred in the 1960s. During the 1960s and 1970s, artists began to focus more on creating performances, instructions, event scores, and language-based constructions. They deliberately chose inexpensive materials that were meant to either vanish or blur the line between traditional art and everyday actions, sounds, and visuals. While artists had previously incorporated elements from popular culture and urban life into their work — such as Pablo Picasso and Georges Braque's collages using newspaper clippings — conceptual and performance artists of the Vietnam War era took this approach further. They produced pieces that defied easy preservation or categorisation within the traditional confines of museums and art history. The fleeting nature and ambiguous medium status of these new artworks were crucial to their democratic potential. Objects like a deck of cards or a typed notecard could be easily distributed due to their reproducibility and low cost, unlike monumental paintings which had limited accessibility. The incorporation of everyday objects into institutional settings served not only as a critique of institutional authority but also as an expansion of the concept of art's democratisation.

The emergence of this phenomenon led to a proliferation of new artistic forms, including happenings, performances, video art, and experimental film. Post-1960s artworks often eschewed material permanence in favour of ephemerality and transformation, representing a significant shift in artistic ontology. These works were performed, re-performed, installed, dismantled, and reinstalled — emphasising process over permanence. This period marked a conceptual transition from the artwork as a static object to the artwork as an act or event. This shift is also reflected in the increasingly procedural nature of artworks, where the emphasis lies on process, iteration, and enactment rather than fixed material form. The procedural and ephemeral nature of post-1960s art significantly contributed to the development of performativity in media art by shifting the focus from static objects to dynamic, time-based experiences. Media artworks often rely on activation — whether by technology, audience interaction, or environmental input — making the artwork an event that unfolds in time rather than a fixed material entity. As a result, media art embraces variability, iteration, and participation, aligning closely with the logic of performance and event.

This influence is particularly evident in the development of time-based media art formats, which emphasise processuality and are fundamentally grounded in the medium of time. Unlike traditional art forms that are primarily spatial and static, time-based media — such as video, sound, performance, and interactive installations — unfold over time and often rely on duration, sequence, rhythm, and change. These works foreground temporality as both a structural and conceptual element, allowing for dynamic experiences that evolve and transform during their presentation. As a result, the artwork is not a fixed object but a temporal event, shaped by its unfolding in time and, frequently, by audience interaction or contextual variables. This temporal dimension challenges traditional conservation approaches and necessitates a reconceptualisation of the art object as inherently fluid and performative.

The fluid nature of the media art object is particularly evident in the festival exhibition format, which has emerged as a popular mode of presentation for this genre. Unlike traditional artworks designed for long-term display within museum or gallery settings, media art often resists permanence due to its technological, temporal, and interactive characteristics. Festival contexts provide a more suitable environment for these works, allowing them to exist as temporary, event-based installations that emphasise process, performance, and audience engagement. This format accommodates the experimental and often ephemeral qualities of media art, highlighting its dynamic nature and its reliance on specific spatial, temporal, and technological conditions for activation and meaning.

The conceptualisation of the artwork as an event has been significantly shaped by the practises and philosophy of Fluxus, which emphasised ephemerality, participation, and the blurring of boundaries between art and everyday life. The Fluxus's *Event* emerged as a consequence of John Cage's instruction of an experimental composite course at the New School between 1958 and 1959. The course was attended by several notable figures, including George Brecht, Al Hansen, Allan Kaprow and Dick Higgins (Hanna B. Higgins 2022, 40). The influence of the course was immediate and can be seen in George Brecht's instructional and observational works, as well as in the Happening created by Allan Kaprow, Al Hansen and others.

In this course, Cage presented 'morphology' methodology as a potential source of music writing. Morphology is the study of linguistic elements and their combinations. However, Cage proposed that elementary units, such as sound, derivation, formation, and mixed or compounded forms, should be employed as a source of musical composition. This signified the potential for words and objects to be examined in hitherto uncharted combinations, scenarios and sensory experiences, which in turn gave rise to the creation of expanded art forms such as Events and Happenings (Hanna B. Higgins 2022, 42). The event structure is fundamental to exploring the contextual nature of language within the physical world, including its inherent limitations and its capacity to both conceal and reveal meaning. But at the same time *event* adapts to various contexts while its structure prioritises perceptual systems over semiotic ones, aligning with the concept of the global sensorium. (Hannah B. Higgins 2021, 43)

Hannah B. Higgins posits that the Fluxus Event is distinguished by the interpretation of the object as an instrument, albeit not in the manner of Krauss, but rather in the manner of Martin Heidegger, who "wrote of *tool-being*, as a way to get to a true nature of things through their use" (Hanna B. Higgins 2022, 51). In this regard, she cites food as a tool in the context of Fluxus Events (because it got frequently used by the art group); this is because food is subject to the process of decomposition and alteration over time, which in turn affects its form. Hanna B. Higgins asserts that the art group was characterised by an understanding of form as the correspondence between material presence in space and temporal duration. Accordingly, the collective was defined by the belief that matter is not fixed in a singular form but rather exists as a continuous process of becoming. And that "the material world (including art) is in constant flux, and the evolution of its form, its flow, is of primary concern" (Hanna B. Higgins 2022, 51). It can thus be concluded that the defining characteristics of an object are not its material permanence or its permanent form, but rather its relationship to time and space. Consequently, a principal objective of the Fluxus Event is to "express the musicality (or temporality) of everyday materials" (Hanna B. Higgins 2022, 52). It was posited that changeability was one of the salient properties of the object for Fluxus. And this movement views the world as a series of events in flux, rather than revolving around thinking subjects and inaccessible objects.

Nam June Paik takes this interpretation further when he begins to play with the technological product and its obsolescence. In the early stages of Nam June Paik's artistic practice, he demonstrated how commodities introduced into the exhibition space could undergo processes of transformation, modification, or even destruction. Like, for example, in *Exposition of Music —Electronic Television* (1963) or *One for Violin* (1962), — a performance piece in which he slowly raises a violin before suddenly smashing it, symbolically challenging traditional notions of musicality, authorship, and the sanctity of the art object. In a subsequent interview conducted in 1989 with the Japanese architect Arata Isozaki, Nam June Paik reflected on the distinctive nature of his work:

"You are born only once. You die only once. The most important things happen only once. A human being has an essential yearning or angst for the non-repeatable. The reason I became well-known through destructive art was also because of this non-repeatability. Once you break an expensive piano, it cannot be put back together. Once you throw water on the ground, you cannot scoop it back up. From this fear and yearning born of the fragility of life, our philosophy of "the eternal return" emerges" (Isozaki 1993, 125).

Figure 2.4. Nam June Paik's *One for Violin,* performed during Neo-Dada in der Musik, Kammerspiele, Düsseldorf, June 16, 1962, © 2025 George Maciunas

Paik's critique of Western art institutions was radical in that, once the object-in-flux entered institutional frameworks, it exposed fundamental tensions surrounding notions of permanence, authorship, ownership, and authenticity. Among these, the most pressing challenge was the question of preservation — specifically, how to conserve an artwork whose very essence resists fixity and embraces continual transformation. It is widely accepted that when a museum acquires an artwork, the piece becomes "frozen" at the specific historical moment of its accession. This conventional approach, often described through the notion of "freeze strategies," aims to preserve the artwork as it existed at the time of acquisition. The related concept of the "freeze-frame paradigm" refers to conservation practices that prioritise scientific analysis and material stability, often at the expense of phenomenological experience and interpretative dimensions of the artwork

(Hanna B. Hölling 2017). Paik's artistic strategy effectively subverts the dominant temporal logic of traditional art institutions by fundamentally challenging the convention of permanence and static preservation, thereby disrupting the prevailing tradition of "freezing." The act of destroying an authentic object in the very process of exposing it presents an institutional dilemma — one that traditional frameworks were unprepared for and, arguably, continue to struggle with today

Due to the fragility of the technological object itself and its short life span, a significant question in the fields of conservation and art history concerns the intention behind Paik's artistic practice — namely, whether he deliberately sought to render his TV sculptures and installations inherently obsolete as a means of critiquing the European art tradition and the institutionalisation of art itself. This question explores whether the obsolescence present in Paik's works was an intentional artistic strategy or an unintended outcome of insufficient anticipation, consequently placing the onus of preservation on cultural institutions. However, it is important to recognise that this issue extends beyond the work of Fluxus alone. By pioneering the integration of technology within exhibition spaces, Paik established a genre that both embodies the Fluxus legacy and critiques traditional art institutions. Consequently, all subsequent artists who incorporate technology into their exhibitions inevitably confront similar questions regarding the nature and preservation of their work and artist intent.

It was precisely Fluxus's emphasis on temporality — as a core attribute of its approach to the art object — that made the movement particularly influential in shaping the conceptual foundations for the conservation of *time-based* media art, because they embraced the concept of processuality as a defining characteristic. Time frequently emerges as the primary medium in such works, with video and audio exemplifying procedural forms that unfold through temporal progression. This emphasis on temporality complicates the conservation of such artworks by introducing the additional challenge of obsolescence and impermanence. Furthermore, one could argue that the traditional binary opposition between object and event — between stasis and action — becomes increasingly untenable in the context of time-based artworks. In this light, impermanence itself may be regarded as the only enduring condition. Consequently, it becomes essential to consider whether conservation practises might shift their emphasis away from the material outcomes of artistic performance toward the performative act itself as the locus of preservation.

In her analysis of the core principles of traditional conservation — authenticity, change, and loss — Pip Laurenson, the eminent time-based media conservator, highlights the distinctive nature of media-technical art forms such as video, audio, slide-based, and computer-based works (Laurenson n.d.). She argues that, like music, these are inherently time-based and therefore require models akin to musical scores and performance interpretation to identify which aspects of the work's identity are essential to preserve. This temporal quality is one of the reasons why Pip Laurenson introduced the concept of 'allographic arts,' [32] to emphasize that such works are not fixed entities but are instead instantiated through repeatable performances or installations. In this context, the identity of the artwork lies not in a singular, unchanging material form, but in its capacity for re-presentation according to a set of guiding parameters, such as artist instructions,

[32] The concept of allographies is predicated on the philosophical work of Nelson Goodman, who distinguished between forgeable and non-forgeable arts, thereby establishing a fundamental demarcation between autographic and allographic works. Autographic arts, according to Goodman, encompass domains such as painting and sculpture, while allographic arts include musical and theatrical works that are performed (Laurenson n.d.).

technological requirements, and contextual knowledge. In this context, authenticity is understood as the 'identity' of the work — referring not to a fixed material essence, but to the core elements and conditions that define the work across different iterations. Pip Laurenson writes: "Authenticity in the context of musical performances is used to identify where the parameters of change are set in relation to the identity of the work of art" (Laurenson n.d.).

Laurenson creates the convention of defining time-based media conservation practises in accordance with the tradition of Western notated music, wherein the focus is on the performance experience. In terms of the parameters of change, the notion of a performance possesses a distinct logic compared to that of a traditional conservation object. Works that are performed enable a greater degree of variation in their form. In the context of musical discourse, the concept employed to delineate the parameters of acceptable change is 'identity', as opposed to the material notion of the 'state' of the object that is central to the concept of conservation (Laurenson n.d.). Since time-based media artworks function as installed events and share characteristics with allographic works — those created in two stages — their preservation must move beyond the static object. It must also encompass the artist's installation instructions, contextual documentation, and an informed understanding of the work's production environment. This enables the artwork to be meaningfully re-executed in multiple iterations, each aligned with the artist's intent.

This suggests that conservation practice can accommodate the possibility of change within the artwork. Such a methodological approach allows for the artwork's variability over time and acknowledges changeability as an inherent characteristic of certain art forms. Within the context of preserving time-based and media artworks, documentation assumes a central role — not merely as a supplementary record, but as an essential act of conservation. It functions as a means of preserving the identity of the work across time, iterations, and technological changes. Through detailed records of installation procedures, artist intent, contextual information, and technological components, documentation enables the continued reactivation and interpretation of the artwork, ensuring its conceptual and experiential continuity even in the absence of material permanence.

At ZKM, the *Laboratory for Antiquated Video Systems* (LAVS) plays a central role in the preservation of time-based media, a category in conservation practice that encompasses artworks reliant on duration, such as video, film, audio, and digital installations. The primary objective of the Laboratory for Antiquated Video Systems (LAVS) is the digitisation of audiovisual materials. As discussed in Chapter 1, the rapidly evolving market for personal audiovisual devices has led to the swift obsolescence of the media on which many artworks were stored and played back with. Consequently, artists frequently engage in continuous media migration to adapt their works to new formats. Particularly following the digital revolution, the question of preserving the original physical medium of video works within institutions has diminished in importance. It has become evident that, to safeguard the heritage of audiovisual art, institutions must shift their focus from preserving the material identity of these works to ensuring the preservation of their conceptual and experiential identity. For instance, at *ZKM*, although some of Paik's original works may have been created on laserdiscs, this does not imply that they must be exhibited solely using the original medium; rather, it is more common and practical to present high-quality digitised versions of the artworks in exhibitions.

Although Paik could not have anticipated the digital revolution, he paradoxically safeguarded his works from loss by introducing the concept of the art object as an object in flux within institutional contexts. Thus, a fundamental attribute of media artworks that came to be preserved is their temporal duration, exemplified by the length of an audio or

video file. This temporal dimension functions as an essential aspect of the artwork's identity and integrity. Unlike traditional static objects, the continued existence of time-based media art relies heavily on maintaining this duration intact. As long as the duration remains unaltered and faithfully represented, the essence of the work is preserved, allowing the artwork to persist over time despite changes in the physical or technological medium through which it is accessed or exhibited. Thus, preserving duration becomes a critical criterion for conservation, ensuring that the temporal experience intended by the artist remains accessible to audiences and that the artwork's conceptual and perceptual continuity is upheld. Moreover, according to Dorcas Müller, head of *LAVS*, one of art's key contributions to the understanding of machines which was uncovered by art lies in its revelation of their inherent unreliability (Dorcas Müller 2023, 132).

Within the *LAVS*, this challenge is addressed by redefining the concept of authenticity: rather than prioritising the original physical medium or object, authenticity is understood as the faithful preservation of the work's content and experience through the creation of copies that are as close to the original as technologically possible. This approach acknowledges that the material substrate may change over time, but the integrity and identity of the artwork are maintained through meticulous digital migration and replication processes that preserve its essential qualities. According to Dorcas Müller the identity of a work, as well as its authenticity, lies above all in "the work's ability to transmit its meaning, that is, whatever the artist's intention can be re-presented as it was at the moment of their idea's realization within the limits of the humanly — and very nearly divinely — possible." (Dorcas Müller 2023, 128). Therefore, preserving the digital file in its best condition, which minimises the loss of information, constitutes the primary preservation strategy for the laboratory. Building on Pip Laurenson's analogy, ZKM's approach to preserving time-based media is like music conservation, where the original instrument is less important than the notation that enables reproduction. Similarly, in media art, the video created by the artist functions as the notation, and it is this, that conservators prioritise preserving.

To ensure the highest possible quality during the digitisation process, LAVS adheres to specific guidelines and has implemented a consistent workflow. The reader can familiarise themselves with this workflow in Dorcas Müller's text *From Analog Restoration to Digital Master* (2010), which can be found in the appendix. However, it is important to address the ethical considerations of the *LAVS* in relation to the exhibition and digitisation practices. Within the context of *LAVS* practice, a key ethical principle lies in the deliberate avoidance of post-production interventions, emphasising instead the creation of a digital surrogate that remains as faithful as possible to the original. Technological advancements have substantially enhanced video quality, often eliminating noise caused by magnetic tape playback errors and achieving higher resolutions. However, as Dorcas Müller contends, embracing these imperfections is essential to understand the authenticity of time-based media and especially of video art[33]. This entails recognising the presence of noise, artefacts, and playback errors as integral components of the original work. Accordingly, the role of the conservator may be understood as not only addressing the material degradation of time-based media but also engaging with its inherently dynamic character — accepting its existence in a state of flux.

Although LAVS is solely responsible for the digitisation and care of physical information carriers and does not engage in the installation of works with an installation-based

[33] The following text contains quotations from an interview conducted on 4th February 2025 with Dorcas Müller.

character, the responsibility for installation-related decisions lies with the MUTECH Department (Museum and Exhibition Technical Services). However, the laboratory does participate in certain technological decisions — particularly in selecting the playback devices and display screens that will present the work in the highest possible image quality. For instance, when exhibiting video art from the 1960s and 1970s, CRT monitors are often chosen due to their compatibility with interlaced video formats that were standard during that era. This decision prioritises technical fidelity over strict historical accuracy in hardware selection. At ZKM, contemporary LCD displays are generally avoided, primarily due to discrepancies in aspect ratio and secondarily because they are not natively suited to interlaced signals. Playing interlaced video on progressive scan displays requires deinterlacing, a process that can introduce artefacts, degrade image quality, and cause input lag due to additional signal processing. As a result, CRTs are preferred to maintain the visual integrity of the original works.

As previously discussed, the growing emphasis on performative elements in media art has led to an increased awareness of the need for comprehensive documentation —not merely of audio or video data, but of the work as a whole — for effective preservation. At ZKM, the archive was developed around the Laboratory for Antiquated Video Systems (LAVS), following the recognition that the preservation of audiovisual heritage requires not only the safeguarding of media files but also a robust data infrastructure to support them. Currently, most digitised files are housed primarily within the archive rather than the museum's collection. For Archive Felix Mittelberger developed a specialised database using *FileMaker*[34]. This database encompasses detailed metadata on the material characteristics of each object, its content, and all associated documentation within the audiovisual archive. As a result, researchers can engage with not only textual records but also the audiovisual materials connected to a given artist, offering a more holistic understanding of the artist's archive. In the context of ZKM, Felix Mittelberger employed *FileMaker* to construct a bespoke database capable of integrating technical metadata, descriptive content, and supplementary documentation. This approach is conducive to both archival integrity and scholarly research by allowing users to navigate the material, conceptual, and contextual layers of a media artwork.

Thus, ZKM positions itself primarily as a site of knowledge transfer, interpreting its institutional role less as a traditional repository of artefacts and more as a space for the dissemination and exchange of knowledge. Dorcas Müller observes that "even the Fluxus movement was not always free to choose its stance; as one player within society and its structures, it was always dependent on existing factors" (Dorcas Müller 2023, 135). In a similar way, ZKM positions its institutional practice in response to current circumstances shaped by broader social structures and ongoing developments in media and technology. The centre's emphasis on knowledge transfer reflects this adaptive approach, highlighting its role as an active participant within, rather than apart from, these evolving conditions.

2.3.2. Object as a System

As demonstrated in the preceding chapter, Fluxus redefined the concept of the artwork by challenging traditional boundaries and introducing the notion of the art object as a seminal,

[34] FileMaker is a relational database platform recommended by the *Matters in Media Art* initiative for managing documentation of time-based media art. The initiative emphasises the importance of flexible, sustainable data infrastructures in the management of the complex and variable nature of media artworks. Known for its flexibility and ease of use, *FileMaker* allows institutions to build custom data infrastructures without extensive technical resources.

performative entity. Rather than perceiving the artwork as a static, self-contained entity, Fluxus accentuated process, participation, and temporality, thereby establishing the foundations for a more expansive conception of art as an event or action. This shift not only called into question the authority of the art institution, but also anticipated later developments in media and conceptual art, where the immaterial, interactive, time-based and algorithmic[35] qualities of the work became central to its identity and meaning. As previously noted, Fluxus influenced not only the development of audiovisual artworks but also more technologically advanced forms of media art. With the ongoing evolution of technology, these works became increasingly complex and multifaceted, extending beyond the conventional framework of a screen and playback device.

This shift is particularly evident in Nam June Paik's later works, especially his satellite-based pieces such as *Good Morning, Mr. Orwell* (1984), *Bye Bye Kipling* (1986), and *Wrap Around the World* (1988)[36]. These projects exemplify how media art began to incorporate global communication technologies, live broadcasting, and networked collaboration, thereby expanding the boundaries of the medium both conceptually and technically. While satellite broadcasting may evoke McLuhan's idea of "instant communication," the technology is a complex system involving satellites, ground stations, and signal infrastructure. "Broadcast satellites relay and amplify televisual signals through transponders, a system of devices that take in, convert, and transmit information to and from Earth" (Gregory Zinman 2021, 88). Despite its global reach, it remains controlled by powerful states and corporations. Like the early internet, satellite networks promised open, real-time communication, but were ultimately shaped by structures of capital and control.

Consequently, the media art object has come to be understood not only as an event but also as a complex system. This conceptual shift has been significantly influenced by the integration of systems theory into media art discourse. Originating as a scientific and methodological framework, systems theory focuses on understanding entities as integrated wholes composed of interrelated elements. It is closely connected to the systems approach, a mode of scientific inquiry that examines objects as dynamic configurations of interacting components. In media art, this theoretical foundation has proven particularly influential due to the field's inherently transdisciplinary nature, drawing from disciplines such as cybernetics, engineering, biology, and philosophy. Systems theory provides a framework for analysing dynamic, interrelated processes across various domains. Media art, with its transdisciplinary character, readily absorbed concepts from systems theory, drawing on fields such as the philosophy of science, cybernetics, biology, and engineering. It is evident

[35] Theorists such as Peter Weibel have drawn attention to the influence of Fluxus on the development of later, computer-based forms of media art. Weibel's argument posits that the Fluxus movement of the 1960s foreshadowed the advent of algorithmic art by virtue of its employment of instruction-based performances. These performances, characterised by their adherence to predefined sets of rules, are analogous to the function of algorithms. In this manner, Fluxus can be regarded as a harbinger of generative and interactive digital practices that depend on procedural structures. As Weibel's essay, *It is Forbidden Not to Touch*, observes, the conceptual framework for the advent of interactivity and virtuality in media art was established by Fluxus, who placed emphasis on process, participation and systemic logic (Weibel 2007).

[36] Nam June Paik is frequently referenced in discussions of media art conservation (and in this text) not merely due to institutional fascination or his prominence as a singular figure in media art, but because of the innovative nature of his practice and his wide instituanalistion. Paik's work serves as a critical case study in the field of media art conservation precisely because it was among the first to challenge museums and archives with questions of technological obsolescence, interactivity, and installation-based complexity. His widespread inclusion in institutional collections —before the full implications of conserving media art were widely understood —has made him a key figure for understanding the practical and theoretical challenges involved in the preservation of media art.

that artists have begun to conceptualise their works as living or adaptive systems, exhibiting responsiveness to inputs and environmental conditions. This transformation has been facilitated by the integration of interactive technologies, algorithmic processes, and "network" infrastructures. This systemic approach not only redefined the ontology of the artwork but also challenged conventional models of authorship, materiality, and conservation, necessitating new curatorial and preservation strategies that could account for variability, interactivity, and technological obsolescence.

The advent of conceptual art practices in the 1960s constituted a component of a more extensive historical transition towards the systematisation of society and lived experience, as theorised by Jack Burnham, who curated the 1970 exhibition *Software: Information Technology: The exhibition, entitled Its New Meaning for Art*, was hosted by the Jewish Museum in New York (Graham and Cook 2010, 53). Jack Burnham, who served as a contributing editor of Artforum between 1971 and 1973 and authored, employed technologically driven systems as a metaphor for cultural and artistic production and created his own interpretation of *Systems Esthetics* in September issue of the *Artforum* in 1968. He emphasised the transition from an object-oriented to a systems-oriented culture, highlighting the notion that "change emanates not from things but from the way things are done" (Burnham 1968). Burnham asserts that any situation, irrespective of its placement within or outside the context of art, may be conceptualised and evaluated as a system. "In evaluating systems, the artist is a perspectivist considering goals, boundaries, structure, input, output, and related activity inside and outside the system. Where the object almost always has a fixed shape and boundaries, the consistency of a system may be altered in time and space, its behaviour determined both by external conditions and its mechanisms of control" (Burnham 1968). He thus proposed the concept that an artwork should be defined not so much as a material object, but as a system that can encompass a diverse array of elements, including people, ideas, messages, atmospheric conditions, and power sources, among others[37].

In the context of Media Arts, Burnham's logic assumed paramount significance, because as accurately articulated by Siegfried Zielinski: "In this, our world, we are confronted not with individual technical artefacts, but with technical systems built of multiple elements and, in the exact sense of the term, with technology." (Zielinski 2006, 277). Thus, through the lens of systems theory, technical apparatuses in media art have been redefined not merely as isolated technological artefacts but as complex systems that encompass a network of interdependent elements — technological, performative, and environmental. This expanded understanding situates media art within a broader ecology of relations, where hardware and software are only part of the system. The viewing conditions, audience interaction, institutional context, spatial environment, and even network infrastructure are all integral to how the work is constituted and experienced.

This perspective aligns with a growing tendency in media art to move beyond object-based practises toward process-orientated and system-based approaches. For example, the work

[37] It is evident that the text under scrutiny places significant emphasis on the impact of phenomenology and minimalism on the development of systematic aesthetics. This development is regarded as a progression towards a more rationalised understanding of the aesthetic process in general. This is achieved through a reduction in the iconic content of art objects and Judd's candidness regarding the conceptual origins of these objects. Burnham writes that, "The point is not to internalize scrutiny in the Freudian sense, but to infer the essence of a situation through detailed examination of surface effects. Similar attitudes were adopted by Judd for the purpose of critical examination. More than simply an art object's list structure, Judd included phenomenal qualities which would have never shown up in a fabricator's plans, but which proved necessary for the "seeing" of the object" (Burnham 1968).

of artists like Lozano-Hemmer demonstrates how media installations function as responsive environments in which input from viewers or environmental conditions shapes the behaviour of the work in real time. In such cases, the technological apparatus is not simply a tool of representation but a dynamic agent within a larger system of interaction. This systemic approach also challenges traditional models of conservation and curatorship, demanding that preservation strategies account not only for the material integrity of individual components but for the logic of the system as a whole — including performative protocols, interface behaviours, and the conditions of display. For example, curators Sarah Cook and Beryl Graham write the following:

"In the context of new media art that is not object-oriented, but rather born of social processes, the network and the system function as the medium. In order to comprehend the"mediums" of new media art, it is necessary to grasp the intricate network structure that new media art generates and utilises, in addition to its protocols, which are facilitated through the nodes within this network. The nodes in question include, but are not limited to, the artist, the artwork, the curator, and the audience (Graham and Cook 2010, 36)".

This understanding of the object has primarily influenced practises that are now classified within conservation discourse as *computer-based* art — including net art, interactive computer installations, early generative works, digital and similar forms. As outlined in the preceding section, the theoretical tradition of conservation has historically maintained a material-centric conception of the object — one rooted in the physical integrity and authenticity of tangible artefacts. However, this framework does not fully align with the notion of the artwork as a system, which emerged in the post-medial era and emphasises process, interaction, and contextual adaptability over fixed material form.

But in this interpretation of the object, the key question is identifying it and defining the system's boundaries (Espenschied and Rechert 2022). In the context of conservation, particularly in the digital domain, it is imperative to delineate the boundaries of the object, a task that is often ambiguous. A common misconception is the erroneous equating of the digital object with its physical storage medium (e.g., a disk, a file, or a computer). As Dragan Espenschied contends, this conflation fails to acknowledge the intricate layers of complexity inherent in digital artworks. These artworks are embedded within extensive software environments comprising operating systems, drivers, and default resources, the majority of which are beyond the artist's control or authorship (Espenschied 2022). To address this, for example Espenschied proposes a reconceptualisation of the digital object — not as a discrete entity, but as an artefact embedded within a broader "assemblage of performative digital environments," wherein multiple interdependent components must be aligned (Espenschied 2022, 116). This view shifts the focus of conservation from static preservation to the active reconstruction of the conditions that enable a digital artwork to function meaningfully over time

The role of the *computer-based* conservator in this case encompasses not only the preservation of the work in the long term but also the assurance of its operability in exhibition conditions, in addition to the organisation of loans. Espenschied further critiques the assumption that exhibition strategies can be seamlessly applied to conservation. While physical framing may support the re-installation of a work in new institutional contexts, such an approach risks failure in the long term when applied to conservation (Espenschied 2022, 117). This is particularly problematic when the work's perceived portability conceals dependencies on now common but ultimately unstable infrastructures. Even detailed installation instructions may be insufficient, as they cannot fully account for the evolving nature of digital systems and interaction norms.

Another significant conservation challenge of system objects lies in determining the originality of the work. When a work is inherently variable or subject to change over time, identifying a fixed, authentic version becomes increasingly complex. In cases where an artwork is inherently dynamic — perpetually evolving, continuously reinterpreted, and effectively an ongoing performance — the concept of a fixed original becomes untenable. In such contexts, the conservator must define the threshold at which an artwork's transformation results in the loss of its identity, rendering it no longer the work acquired by the institution or envisioned by the artist. This responsibility is further compounded by the rapid obsolescence of technology, which necessitates continual migration of artworks to new platforms. However, it is important to note that each technological shift introduces alterations that have the potential to affect the work's form and meaning. The conservator's critical task, therefore, is to discern which changes are materially or conceptually insignificant and which compromise the integrity of the work itself.

2.3.2.1. Variable Media Approach

One of the most influential responses to the challenges posed by media art within institutional contexts has been the development of the *Variable Media Network*. While Chapter 1 introduced the initiative from an institutional perspective, this chapter offers a more in-depth analysis of how the Variable Media Network redefines the conservation object. The *Variable Media Network* addressed the preservation challenges of media art by shifting focus from medium-specific characteristics to the notion of behaviours, including interactivity, internet connectivity and performativity. It was through continuous discourse amongst artists, curators, conservators and technicians that a fundamental principle was elucidated: that artistic creations should be comprehended and sustained not only in terms of their physical elements, but also in consideration of their behavioural characteristics. The methodology under discussion sought to achieve a reconciliation between artistic intent and conservation practice, with the participation of artists and the articulation of their intent being central to the preservation process (Ippolito 2003).

Variable Media Network has identified a pivotal property of the restoration object, which also serves as the name of the initiative: namely, its *variability*. As previously stated, variability is not a novel concept in the context of media art. Indeed, Manovich has previously identified this property as one of the salient characteristics of media. He writes: "A new media object is not something fixed once and for all but can exist in different, potentially infinite, versions. This is another consequence of numerical coding of media and modular structure of a media object. Other terms which are often used in relation to new media, and which would be appropriate instead of "variable" is "mutable" and "liquid."" (Lev Manovich 2001, 56). Nevertheless, *variability* has been demonstrated to be one of the most significant properties of media art for its endurance within an institutional framework. While an earlier discussion has already addressed the nature of it[38], Jon

[38] Furthermore, it is imperative to draw a distinction between variability and changeability, the concepts elucidated in the preceding chapter. *Variability* is defined as the occurrence of controlled variation within predefined parameters, such as a score or instruction, frequently relying on a normative or average framework. Conversely, the concept of changeability suggests a more extensive and less constrained transformation over time, encompassing both intrinsic and extrinsic shifts. The concept is not constrained by predetermined parameters; consequently, it may result in substantial alterations, including transitions from interactivity to relic status or from analogue to digital formats. Changeability is distinguished from variability by its temporal character, defined by the concept of disruption and deviation from established norms. In

Ippolito and Richard Rinehart, important members of the Variable Media Network, provide a more comprehensive definition in their seminal publication *Re-collection: art, new media, and social memory* (2006).

At the book, Ippolito undertakes a comparative analysis of two art works produced in close temporal proximity, namely the *Expanded Expansions* by Eva Hesse and Sol LeWitt's *Wall Drawing*[39], with the objective of ascertaining the work that has achieved a more enduring presence within the institution (Rinehart and Ippolito 2014, 3–7). The reason for the greater cultural longevity of Sol LeWitt's piece, as opposed to Hesse's, is that he imbued his work with a set of meticulously worded instructions that were as universal as possible. This enabled his drawings to adapt to new spaces as and when required. Ippolito thus concludes that the longevity of Sol LeWitt's work is not due to its durability, but rather to its variability (Rinehart and Ippolito 2014, 7). Hence "secret of cultural longevity lies not in a medium's technological sophistication but in the work's relation to that medium" (Rinehart and Ippolito 2014, 6). Thus, the variability of a work of art and thus its longevity lies precisely in the set of correctly allocated behaviours (or instructions, as in Sol LeWitt's case). In the context of Sol LeWitt's work, it can be argued that conservation does not require preserving a specific material embodiment, but rather focuses on documenting the instructions, behaviours, and inherent variability of the piece, allowing for its faithful re-creation in different contexts

contrast to variability, which assumes the continuity of systems within established limits, changeability is characterised by the occurrence of temporal shifts and disruptions to the established order (H. B. Hölling 2015).

[39] Sol LeWitt's *Wall Drawings* represent a paradigm of conceptual art, wherein the conceptual framework takes precedence over its physical manifestation. The creation of each piece is informed by written instructions provided by the artist, which can be executed by others, often assistants or gallery staff. For example instruction for is following *Wall Drawing #47* "A wall divided vertically into fifteen equal parts, each with a different line direction, and all combinations" ("Sol LeWitt | Museo Nacional Centro de Arte Reina Sofía" n.d.). The drawings are typically made directly on gallery walls using simple materials like pencil, ink, or paint. They range from geometric patterns to complex systems, and can be re-created in different spaces, emphasising the work's conceptual and procedural nature over its physical permanence.

Figure 2.5. *Expanded Expansion* by Eva Hesse, 1969, © Eva Hesse, Expanded Expansions is a large-scale installation made of rubberised cheesecloth, latex, and fibreglass. It consists of repeated vertical panels suspended to form a walk-through structure. The work highlights the artist's use of industrial materials and fragile, impermanent forms typical of post-minimalism.

In this context, the concept of authenticity is redefined, with the emphasis shifting from the material originality of an artwork to the artist's intent as the primary indicator of authenticity. The primary task of the conservator, therefore, is to document and safeguard the artist's original intent to be able to keep the work authentic. The group also determined that it is imperative for decisions concerning the future adaptability of a work to be addressed at the point of acquisition, rather than as an afterthought. One of the key objectives of the *Variable Media* Initiative is to formalise this process by having artists specify, in a systematic manner, which elements of their work may be subject to alteration and which must remain fixed to preserve the integrity of their artistic intent. To support this approach, the initiative developed a questionnaire with the aim of eliciting input from artists regarding the intended behaviours and variability of their works, including potential adaptations in response to future obsolescence.

The concept of variability thus poses a significant challenge to conventional definitions of the 'original' in the context of media art, where works are frequently reproducible, duplicable, and interactive. In the domain of analogue media conservation, particularly in the context of video, a convention derived from film and photography establishes the 'master' as the original version, thereby engendering a hierarchical structure of authenticity and quality. This is logical, given that analogue copies are subject to degradation with each successive generation, and the master is paramount for the purposes of future digitisation. However, for works created exclusively in digital form, this logic becomes inapplicable. The replication of such works results in exact replicas, with no loss

of quality occurring during the duplication process. Digital media has the potential to challenge the traditional view that the most accurate version of a cultural artefact holds the greatest value. Instead, its value may lie in its fecundity, the capacity to produce a wide variety of iterations.

In this regard, Richard Rinehart proffers a divergent conception of 'original', as he writes: "With new media, instead of "master" copies we should think of 'mother' copies. Mother copies not only result in greater commercial value but also offer the greatest chance of preservation, like a species that is able to mutate within a generation and thus survive sudden environmental changes" (Rinehart and Ippolito 2014, 24). For instance, he posits that an institution should acquire the source code when purchasing software art, as opposed to 'viewing copies'. Furthermore, when acquiring a video, it is recommended that the institution not only purchase a locked-down DVD, but also the raw video files, etc. The determination of the originality and authenticity of a work of art is thus made through its potential for preservation and reproduction, as opposed to its objective value. It is evident that the act of collecting media artworks confers upon the institution or collector the prerogative to reproduce the artwork, as opposed to the classical idea of the physical original.

Another significant contribution of the Variable Media Network was the popularisation and adoption of emulation as a conservation strategy. While hardware and software are often dependent on each other, preserving the artist's original hardware is neither functionally nor conceptually necessary. Hardware that is compatible or equivalent with the required software environment can serve as a substitute without compromising the work's integrity. Emulation is a process that facilitates the recreation of historic software environments on contemporary hardware. This ensures the continued access and presentation of computer-based art. This approach has been instrumental in preserving numerous works that might have otherwise been lost to history. However, this raises significant questions for conservators: when should original hardware be preserved, and what role does hardware play in how a work is perceived and interpreted, and does it align with the artist's original intent?

2.3.2.2. Variable Media in ZKM

In the digital epoch, the primary objective of conservation shifts towards facilitating the reproduction of the artwork within the institutional context. The initial version of a computer-based artwork serves as a critical point of reference for the development of any subsequent conservation strategy. Comprehensive documentation, appropriate environmental storage, systematic backup of software components, and the acquisition of compatible spare parts constitute essential steps in safeguarding the work in its original condition. However, for conservators working with computer-based art, these actions represent only the foundational layer of a broader and more complex set of responsibilities. Their role extends beyond the preservation of physical and digital components; it requires the interpretation and continual negotiation of the artwork's technical systems and conceptual framework. In anticipation of technological obsolescence, conservators must evaluate and prepare alternative conservation strategies such as emulation, migration, or reinterpretation. These approaches necessitate close collaboration with artists, curators, programmers, and other technical specialists to ensure that the behavioural and experiential aspects of the work are retained in alignment with the artist's intent.

In her master's thesis, Morgan Stricot presents a diagram (fig. 2.6) that visually outlines the necessary actions for preserving technically complex (or *variable*) works of art. According

to Stricot, conservation comprises three key categories of action: *anticipation*, *documentation*, and *action*. The process begins with the creation of detailed *documentation archives*, incorporating elements such as interviews, catalogues, and information on optimal operating conditions. This is followed by the development of a *conservation plan*, which informs both *preventive conservation* measures (e.g., the acquisition of spare parts, redundant data backups, and proper storage protocols) and *curative conservation* strategies (including emulation, migration, and reinterpretation). The cyclical layout of the diagram underscores the iterative, interconnected, and ongoing nature of digital conservation practises. The diagram and theoretical work previously formulated by Stricot in the context of workflow development have exerted a profound influence on the conservation practises at ZKM, where Morgan Stricot and Matthieu Vlaminck implement its principles in their daily work.

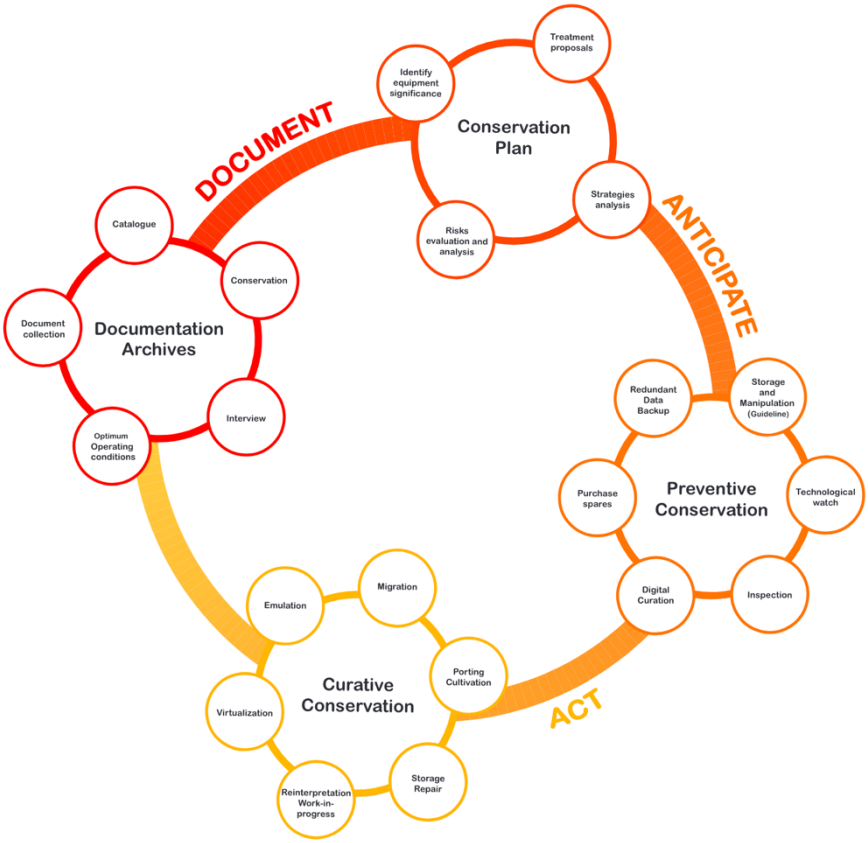

Figure 2.6. *Methodological diagram of the preservation of digital complex objects* by Morgan Stricot. From Morgan Stricot, La préservation des objets numériques complexes, théorie et pratique. (École Supérieure d'Art d'Avignon, 2013).

Furthermore, the book *Re-collection: art, new media, and social memory* (2006) stipulates that the variability of media art objects must be considered during the acquisition process. Within the framework of ZKM, conservators play an active role in the acquisition process, and computer-based conservators are part of the acquisition committee, leveraging their expertise to assess the variability of the work and estimate its future conservation costs. This comprehensive evaluation is frequently conducted prior to the purchase of an object. A recent development in the ZKM approach involves the acquisition of works that have been exhibited at ZKM exhibitions. This practice enables the organisation to assess the construction of the works and confirm their functionality under exhibition conditions. At ZKM, the conservation process now begins at the very moment of acquisition — or even prior to it — due to the specific challenges posed by complex computer-based artworks. Recognising the need for early intervention, Morgan Stricot and Matthieu Vlaminck have collaboratively developed a dedicated conservation workflow tailored to the needs of such works. This proactive approach allows for the early identification of technical requirements, risks, and preservation strategies, ensuring that the long-term viability of the artwork is considered from the outset. The detailed steps of this *acquisition workflow* can be found in the appendix of this thesis.

Within the framework of the *Variable Media* approach, a crucial task for ZKM conservators is to determine the boundaries of the conservation object and how these are articulated through specific behaviours. Central to this process is direct communication with the artists, ensuring that the conservation strategy aligns with the artist's intent and the inherent variability of the work. To this end, Morgan Stricot has developed an artist questionnaire, which is disseminated to the artist immediately following the acquisition of media art by the institution. This questionnaire was based precisely on the *Variable Media* questionnaire *Matter in Media Art* recommendations and GitHub piece from Rafael Lozano-Hemmer *Best Practices for Conservation of Media Art from an Artist's Perspective*. Stricot also notes that documentation practices were already in place at the institution prior to her arrival; her contribution lay in systematising and expanding these existing strategies. Subsequently, in collaboration with Matthieu Vlaminck, a special Wikipedia was developed. This unique platform provides documentation of media artworks, together with information about collections and current acquisitions. In addition, it features a comprehensive inventory of alterations made to the artworks by conservators[40].

[40] Documentation model can be acseesed by the link https://werke.zkm.de/wiki/index.php/Documentation_model (accessed 21.02.2025)

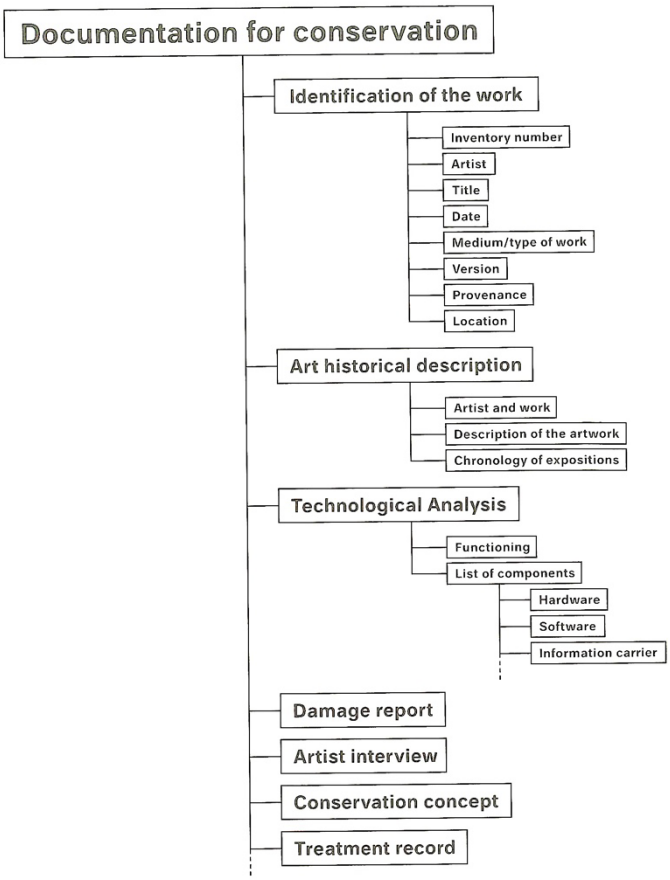

Figure 2.7. *Documentation structure for inventorying the artworks selected for the project digital art conservation*, 2013, Photo © ZKM| Karlsruhe. From Bernhard Serexhe, ed., Digital Art Conservation (Wien: Ambra V, 2013), p. 316.

The arrival of Morgan Stricot at ZKM precipitated a substantial augmentation in the scope of documentation, which now encompasses not only the technical aspects of the object but also its historical, aesthetic, and curatorial dimensions. This approach is particularly well-suited to the preservation of complex works, such as system-based or installation-based media art. It also came to include *setup* instruction and knowledge about *technique*; a crucial aspect aimed at preserving and transmitting an understanding of the technological features and operational principles of obsolete media and techniques. This knowledge transfer — from the older generation of media artists, technicians, and conservators to the newer — is essential for maintaining the integrity and reproducibility of historical media artworks. Moreover, the documentation has begun to incorporate a more extensive array of information pertaining to the maintenance of artwork in exhibition settings.

Contents

Figure 2.8. *Content of Documentation Model* at ZKM Wiki, 2024

2.3.2.2.1. *Fac Similes*: Practice of Duplication of Artworks

One key benchmark that helps conservators navigate the balance between functionality and historicity and determine the boundary of the object is not limited to the artist interview method but also includes a broader culturological analysis of the artwork's *aura*, as conceptualised by Bruno Latour and Adam Lowe in the text *The migration of the aura or how to explore the original through its Fac Similes* (Latour and Lowe 2011). The term 'aura' was introduced to art theory by Walter Benjamin in *The Work of Art in the Age of Mechanical Reproduction*, where the author suggests that technological reproduction and the ability to copy an object cause a work of art to lose its aura, namely its feeling of authenticity, as "unique existence" of an object, and "detaches the reproduced object from the domain of tradition" (Benjamin 1969, 4).

However, Latour and Lowe take this theory further by considering how, in the modern age of copying, which often does not result in a loss of quality, copies influence the perception of the original. The authors write: ""copy" does not need to be so derogatory, since it comes from the same etymology as "copious," and thus designates a source of *abundance*" (Latour and Lowe 2011, 5). The phenomenon of how a copy can sometimes feel more original than the original itself is considered, as is the understanding of the original changing from that of a singular unique material object to that of an original as "trajectory" or "career" (Latour and Lowe 2011, 4). Which reduces the question of originality to the question "*Is it well or badly reproduced?*" (Latour and Lowe 2011, 4). It is therefore the responsibility of the conservator to reproduce an original that will continue to enhance its originality and trigger the creation of new copies (Latour and Lowe 2011, 4), according to authors.

In the domain of computer-based conservation, this approach to originality and authenticity is the most fruitful, as the original must undergo constant change to remain alive. The concept of the original, as understood by conservators, entails a comprehensive evaluation of the social, historical and material context in which the work was created and is currently exhibited. This evaluation involves a meticulous assessment of the technological and experiential authenticity of the piece, ensuring that it remains consistent with its original form. In the event of significant ruptures – such as hardware obsolescence, migration across platforms, or the loss of interaction patterns – conservators can evaluate whether the work in question has crossed a threshold at which it no longer preserves its original *aura*. This evaluation process can inform decisions regarding reconstruction, reactivation, or reinterpretation.

Furthermore, as previously stated, digital objects possess the characteristic of being replicated without compromising their authenticity. It is evident that the practice of producing facsimiles of a work is a customary aspect of conservation methodologies. As previously stated, the exhibition entitled *Seeing Double: Emulation in Theory and Practice* (2004, Solomon R. Guggenheim Museum) is widely regarded as a seminal moment in the institutionalisation of the practice of copying works. The exhibition was dedicated to the testing of the potential of experimental processing (emulation) to preserve new media art and protect it from the effects of time. It comprised a series of original art installations that were paired with their emulated versions. It was observed that the emulated versions frequently exhibited a level of originality that was comparable to that of the original artworks.

Figure 2.9. Grahame Weinbren and Roberta Friedman, *The Erl King,* 1982-1985. Installation view as part of "Seeing Double: Emulation in Theory and Practice," Solomon R. Guggenheim Museum, New York, 2004

Duplication of works is also very actively practised at ZKM. The practice of copying commenced long before the conservators (Morgan Stricot, Matthieu Vlaminck) arrived at the institution. The practice has been present in the institution since Bernhard Serexhe occupied the position of chief curator of the ZKM's *Media Museum*. Historically, the practice of copying was frequently employed in the context of loans. Should a work from the collection be loaned, it was imperative that a full replica be created from the original technology, thus enabling the institution to safeguard the "original". It has been demonstrated that, over time, the practice proved to be very productive. This was because it saved many works, not only by preserving the "original", but also by providing conservators with enough copies of identical hardware. These copies could be used to replace parts of the work in the future in case some parts of the work became dysfunctional.

This practice continues to be utilised by ZKM conservators to the present day. Rather than relying solely on digital backups stored on institutional servers, ZKM employs a rigorous protocol of creating a clone of the original work using identical hardware. This approach ensures that the entire configuration, including all interdependencies and potential hardware-specific behaviours, is thoroughly documented and preserved. It also helps to pre-empt issues related to undocumented hardware features, incompatibilities, or licencing restrictions (Rosen 2024). An article published in 2018 for the 15th International Conference on Digital Preservation (iPres18) Morgan Stricot states: "To keep old artworks alive, the ZKM based its preservation strategy on the mantra "Lots of Copies Keep Stuff Safe". This means we are always trying to accompany the artwork with a spare ready-to-run computer and spare hardware/peripherals if needed (mouse, camera, sensor, screen etc.). Instead of keeping the backups on our servers and magnetic tapes, we additionally implement them on spare computers to create multiple, identical, and functional examples of the entire hardware-software environment" (Stricot, Vlaminck, and Heiss 2022). At ZKM, the strategy of duplication is supported by an extensive stock of spare hardware, legacy software, and system components. By duplicating the original setup using identical

equipment, conservators avoid introducing changes to the artwork's behaviour and outputs, while also mitigating risks associated with hardware failure during exhibitions.

In recent years, as the pace of technological obsolescence has accelerated, the role of the conservator at ZKM has become increasingly centred on preserving both the authenticity of digital artworks and their long-term accessibility for research and exhibition. Within this framework, documentation assumes critical importance, serving as a foundational tool that enables conservators to determine the permissible range of changes a work can undergo while still maintaining its identity. Establishing these parameters often requires in-depth dialogue between the artist and the conservators, frequently supported by a series of structured interviews. These conversations form the basis for comprehensive documentation that guides future conservation efforts. Morgan Stricot notes that she first encountered this methodological approach through her engagement with the Variable Media Questionnaire. However, she argues that the questionnaire can often be overwhelming for artists, who may struggle to anticipate future technological developments. As a result, conservators must take on an interpretive role, helping to identify the technological components that the artist considers crucial for the meaningful preservation of their work through a series of in-person dialogues. In the context of conservation at ZKM, a key strategic focus is the articulation — by the artist — of the boundaries that define the authenticity of their work, which in turn shapes the institution's preservation protocols.

This practice not only preserves the integrity of early digital artworks, complete with their original glitches and system quirks, but also facilitates their study within the frameworks of media theory and software archaeology. Due to their fragility and dependence on obsolete technologies, these historical versions are typically displayed only in-house, while updated versions — developed collaboratively with artists — are prepared for loans and future exhibitions. In cases where the original no longer functions, media-archaeological reconstructions using historical components are employed, resulting in a "second original" that serves as both an archival reference and a foundation for future conservation efforts.

The duplication practises employed by ZKM have also been utilised for the creation of an exact replica of numerous lost works of art or works which are in danger of loss in accordance with the principle of the *Second Original*. This subject will be addressed in the subsequent chapter. Morgan Stricot and Matthieu Vlaminck employ the technique of duplication as a retroactive preventive conservation strategy with a view to averting the disappearance of early acquired artworks. The reconstruction of such works is frequently undertaken, using the original hardware and software. However, it is also commonplace for additional duplicates to be created for the purpose of exhibition, which may incorporate components that are more recent in nature. The conservators at ZKM are engaged in research to ascertain the viability of such a duplicate for display, with a focus on its durability and resilience to prolonged periods of stress, such as those associated with extended periods of exhibition display. Should the study conclude that modifications are necessary to extend the lifespan of the replica and enable it to withstand the stresses associated with prolonged exhibition display, these modifications will be implemented. Conversely, the original is preserved in its state, with conservators responsible for maintaining its integrity at the level of both hardware and software. This practice not only preserves the integrity of early digital artworks, complete with their original glitches and system quirks, but also facilitates their study within the frameworks of media theory and software archaeology. Due to their fragility and dependence on obsolete technologies, these historical versions are typically displayed only in-house, while updated versions — developed collaboratively with artists — are prepared for loans and future exhibitions. In

cases where the original no longer functions, media-archaeological reconstructions using historical components are employed, resulting in a “second original” that serves as both an archival reference and a foundation for future conservation efforts (Stricot, Vlaminck, and Heiss 2022, 195–99).

3. “AnArcheology”: A Media Archaeological Approach to Conservation

3.1. “Les Immatériaux”: Myth of Ephemerality

Since the 1960s, a noticeable trend toward the dematerialisation of art has emerged, shaped by broader shifts in artistic thought and technological development. Central to this transformation is the concept of *mediality*, which redefined artworks not as static material objects but as carriers of information. Conceptual art played a significant role in this paradigm shift, emphasising the primacy of ideas over physical forms. Artists like Sol LeWitt, alongside minimalists and other conceptualists, helped detach art from its material substrate, aligning its production increasingly with theoretical and discursive practises. This move reoriented the understanding of art as an intellectual inquiry rather than a purely visual or tangible experience. The impact of conceptualism on the progression of artistic expression was exemplified by the process of art being purified from its material form, and the process of art production becoming inextricably linked to the formulation of “theory-about-art” (Krauss 2000, 10–11). Ephemeral art gained prominence in the 1960s with the emergence of the Fluxus movement, where artists like Joseph Beuys aimed to create works that functioned outside conventional institutional frameworks such as galleries and museums. These practises deliberately resisted commodification and played a significant role in influencing the conceptual turn toward dematerialisation, reinforcing the shift from object-based art to process- and idea-driven forms.

In her 1973 book *Six Years: The Dematerialization of the Art Object from 1966 to 1972* (Lippard 2007), Lucy Lippard, a renowned conceptual art theorist, undertook a database-like approach, chronologically compiling exhibition invitations, action and happening announcements, and excerpts from project reviews. When read sequentially, the compilation reveals the progressive dematerialisation of art — shifting from object-based exhibitions to descriptions of objects in space, then to pure descriptions of space itself, all shaped by artistic ideas. It is noteworthy that numerous works from this period exist primarily as written instructions, thereby emphasizing conceptual rather than material presence. The artistic development under discussion here transcends the six-year timeframe analysed by Lucy Lippard and is not limited to the New York art scene. Rather, it reflects a broader, international tendency within contemporary art of the period — a shift toward conceptual frameworks, dematerialisation, and an emphasis on process and theory that emerged across diverse cultural and geographic contexts.

During this period, the *dematerialisation* approach was considered a political act, given that creative processes are not commonly subject to commodification or sale as objects. The way artists started to perceive artistic creations cannot be considered in the first instance as that of an object; rather, it is as a creative process which cannot be monetised through the mere sale of the object in question (Krauss 2000). The presence of this artistic logic was evident not solely in the domain of conceptual art but also in performative actions and various forms of process-orientated art. This phenomenon exerted a significant

influence on the evolution of art as a whole and media art in particular. And it manifested in the categorisation of media art as an inherently ephemeral and non-locative art form.

The genealogy of immateriality can be traced back to the concept of the general intellect, as articulated by Karl Marx in the *Grundrisse*, specifically in the section titled “Fragment on Machines.” In this formulation, "general intellect" signifies the increasing infusion of human knowledge, affect, and subjectivity into the labour process. Moreover, Marx’s account marks a shift in the production of wealth, moving from individual endeavour to collective productivity embedded within the social body and mediated by both labour and technological systems. This notion suggests that value is no longer determined solely by monetary output. Rather, the intensity and richness of social relations, affective labour, modes of expression, and lived experience determine value. (Pasquinelli 2019).

At the first time, the term *immateriality* is invoked in the context of the Italian Autonomia Marxist tradition, where it functions as a critical response to the transformations experienced by labour under post-Fordist or networked conditions. Within this framework, *immateriality* foregrounds the shifting nature of labour and value production, emphasising the increasing centrality of social relations, communication networks, and information systems — forms of production that are less materially tangible but deeply embedded in contemporary modes of life and economic organisation (Krysa 2006, 9). From the autonomist perspective, the production of immaterial goods is driven by information systems and communication networks. The redefinition of labour in contemporary society is closely tied to shifting configurations of power and mechanisms of control.

Maurizio Lazzarato and Antonio Negri have identified this transformation through the concept of "immaterial labour," which accounts for the growing significance of communication technologies and the decentralization of productive processes. *Immaterial labor* encompasses activities that produce not only commodities but also social relationships, cultural content, and subjectivities — thereby reshaping both the nature of work and the structure of economic and political power (Krysa 2006, 10). The proposed redefinition of production and labour within the Italian Autonomia Marxist framework extends beyond traditional industrial work to encompass forms of creative labour, including research, management, and programming. This broader understanding positions *immaterial labour* as a key concept in theories of immateriality, highlighting the central role of intellectual, affective, and communicative activities in contemporary modes of production (Krysa 2006, 23).

In art, in the post-Duchampian era, the idea of the unification of life and art and the introduction of the commodity into the exhibition space brought with it the full range of problems associated with the commodity object. One of the salient issues identified was the issue of dematerialisation of the product of consumption, which has become increasingly prevalent in late capitalism. This issue is thoroughly explored in the concept of medium. The connection is particularly evident when revisiting Niklas Luhmann’s definition of medium — for instance, to illustrate, he uses the example of money. A striking resemblance can be observed regarding the notion of *real abstraction* (by Alfred Sohn-Rethel) based on the ideas of Marx, a concept also frequently illustrated by the example of money. The notion of ‘real abstraction’ pertains exclusively to the social relationship of commodity exchange, or more precisely, to their exchangeability in this context.

The transition from the conception of art as a solitary material entity to art as an idea or concept embodied in a tangible form is concomitant with the diminution of art’s (medium) specificity and the onset of the post-media era. For instance, Rosalind Kraus asserts that

Broodthaers's Museum of Eagles contemplates the reduction intrinsic to commodification, or as she puts it "homogenizing principle of commodification" (Krauss 2000, 15). Specifically, Broodthaers employs a single motif, the eagle, and uses it to juxtapose all possible material commodity variations of the eagle image in a single collection Krauss refers to this approach as the critique of specificity. However, if we reduce the problem of mediality to abstraction, we uncover a significant issue of materiality. Despite their manifest materiality as objects, both money and Broodthaers' eagles attain a novel level of "aesthetics of the sensuous supra-sensuous" (Khatib 2017). Sami Khatib argues that this Marxian insight demands a new aesthetic perspective. The term "sensuous supra-sensuous" signals that the commodity's appearance and its hidden meaning fuse together and commodity's value "transcends the realm of sensuous aesthetics" while remaining material (Khatib 2017). Khatib thus calls for an *aesthetics of the sensuous supra-sensuous* – an approach that attends to how abstract social substance (value, class) emerges through sensory forms. In this view, the commodity's concrete form is itself an aesthetic surface in which capitalist relations play out. Khatib writes: "Marx's aesthetics of the sensuous supra-sensuous ultimately points to the visual metaphor of theory and the myth of pure theoretical vision" (Khatib n.d.).

This phenomenon manifested in the fact that conceptual and systems art of the 1960s and 1970s posited that the idea was more important than the form, making the medium of the work often immaterial. One of the links among conceptual art practises of the 1960s, networked and systems-based art practises of the 1970s, telecommunications works of the early 1980s, and Internet-based art of the 1990s is the approach to the question of the dissolution of the autonomy of the art object (Graham and Cook 2010, 83–84). It can thus be summarised that, following the post-media turn, which included the merging of the terminologies of media and medium, the work of art has moved into a space of the 'sensuous supra-sensuous'. This transition is characterised by an obsession with the theorisation of the artwork and its loss of the importance of its singular material shell. This shift was also provoked by a divergent trajectory that emerged with the incorporation of commercial and technological artefacts into the exhibition space, which challenged traditional aesthetic categories and further destabilised the autonomy of the artwork.

Consequently, these artistic practices often explicitly aimed to critique the art market and the commodification of art. By challenging the autonomy of the art object and embracing immaterial, processual, or participatory forms, such works disrupted conventional models of ownership, display, and circulation. Consequently, they have often encountered difficulties in being accepted within conventional art market structures and institutional frameworks, which often prioritize stability, collectability, and material permanence.

The dynamics of the technological device market have exerted a significant influence on the perception of media art as ephemeral. As previously mentioned, technological development has had a significant impact on the evolution of postmodernism. The tendency towards the de-materialisation of the art object is associated with not only the art discourse and the widespread popularisation of conceptualism but also with the history of technology and communication theory. The development of communication technology has given a new twist to the philosophical ontological theory of substance, which has been a subject of debate for many centuries. Communication has come to be recognised as an immaterial act. This recognition has led to the dissemination of the concept of immateriality in relation to the technological mediums that facilitate communication.

This development within the discourse of contemporary art was influenced by one significant event: the exhibition *Les Immatériaux* (1985) by the eminent philosopher Jean-François Lyotard. The exhibition which occupied the entire fifth floor of the Centre

Pompidou is widely considered to be a significant moment in the conceptual development of contemporary thought, marking a significant theoretical turning point important for media art. The exhibition is frequently cited as a precursor to contemporary exhibitions of art and technology in museums worldwide (Cook 2008, 26), because *Les Immatériaux*, brought together a striking variety of objects. These included the latest industrial robots and personal computers, as well as holograms, interactive sound installations, and 3D cinema. The exhibition also featured paintings, photographs, and sculptures, with the latter ranging from an ancient Egyptian low relief to works by Dan Graham, Joseph Kosuth, and Giovanni Anselmo (Hui and Broeckmann 2015, 72).

The premise of *Les Immatériaux* is that the emergence of electronic communications has sparked a swift and significant process of dematerialization in human existence. This phenomenon, at least in part, signifies a loss of corporeality. To conceptualize this change and to enable a completely new way of looking at the relationship between the material and the immaterial, Lyotard created the artificial word, which was meant to become a concept — *Immatériaux* (eng. *non-materials*). It was formed from the adjective *immatériel* and the noun *matériaux* — the noun became negative to indicate that the model of 'matter' as hitherto understood no longer exists (Wunderlich 2008, 87).

Lyotard's use of the term is somewhat ambiguous, which complicates its definition. At times, *immatériaux* is employed to denote technologies, such as telecommunications and information technology. Other times, these technologies engender epistemological transformations, which we refer to as immatériaux. This perspective facilitates the exploration of phenomena such as "the dematerialisation of transferable securities and electronic money, on the one hand, and, on the other, aesthetic developments including Suprematism and Minimal Art in painting, or Serialism in music" (Jean-François Lyotard 2005). Nevertheless, the term is fundamentally used to denote that matter can no longer be regarded as being in opposition to a subject, such as an object (Lyotard and Derrida 1985, 25).

The fundamental question that Lyotard sought to address in the exhibition pertains to the following: "Do 'immaterials' leave the relationship between human beings and material unaltered, or not?". Lyotard's analysis explores the shift from the model of matter to the model of language in modernity. He refers not to the theory of communication but rather to the cybernetic model of communication, where communication is interpreted more as a flow of information. Lyotard's approach involves the separation of the communication system from its 'anthropological connections'. This results in the term 'message' no longer denoting a component of the communication act between personal actors, as in the earlier models of Lasswell and Jacobson. Instead, it acquires a metaphorical significance (Wunderlich 2008, 87). According to Lyotard, this relationship is undergoing a fundamental shift in its nature. The change is primarily evident in the concept of the immateriality of communication. This immateriality is also evident in the concept of production, which reinforces the idea that the medium of communication is *non-material* and highlights the opposition between software and hardware.

To illustrate this point, one may consider the example of radio as a medium of communication, wherein the primary emphasis lies on the transmission of information – that is, the radio signal itself, which is fundamentally immaterial. The term 'radio' is most used to denote the method of transmitting messages across distances via electromagnetic waves. It is important to note that the public does not typically conceptualise radio as a sophisticated system comprising filters, antennas, detectors, microphones, speakers and wires. Instead, it is generally perceived as an intangible signal that can be accessed by a multitude of receivers.

This perceptual framing is closely linked to market-driven processes. As communication becomes increasingly dematerialised, the physical radio apparatus becomes secondary and can be easily replaced by newer alternatives. The device in question has been observed to lose its material integrity and become subject to cycles of technological obsolescence and consumer-driven renewal. This phenomenon is exemplified by the continuous production of updated radio models within the electronics industry, which reflects and reinforces the cultural expectation of continual innovation and the disposability of older technologies.

The influence of Lyotard on the domain of media art can be expressed in the following ways. Nowadays in the context of contemporary art, immateriality is frequently employed to describe the "new conditions that the digitisation of artistic and cultural practices in general has prompted," wherein "software and digitised data are replacing the traditional physical dimensions of artworks" (Lillemose 2006, 117). The concept of immateriality after *Les Immatériaux*, has been intertwined with the tradition of conceptualism, particularly regarding its core tenet of the dematerialisation of the art object. Within this framework, dematerialisation refers to a conceptual approach to materiality — an emphasis on the idea over the object — while immateriality, by contrast, designates a new material condition. This understanding of *the immaterial* is characteristic of network-based artistic practises, which build upon conceptual strategies but operate within the technological and communicative infrastructures of the digital age (Lillemose 2006). Following the theorization of Lyotard, the concepts of dematerialisation and the *immateriality* became intertwined, particularly within the discourse of media art in the post-1990s era.

3.1.1.1. "Immaterials" in Curatorial and Conservatorial Practice

One of the most emblematic works in the ZKM collection is *Tempo Liquido* (*Liquid Time*) by the Italian artist Fabrizio Plessi. The artwork under consideration, a five-metre-high mill wheel constructed from steel, features a monitor mounted on each of its blades. Each screen displays imagery of falling water on a matte surface, creating a visual echo of the surrounding environment. As the wheel rotates continuously, it is partially submerged in an actual stream of water that flows from an overhead gutter, producing the illusion that the cascading water originates from the wheel itself.

Heinrich Klotz, in the publication dedicated to the festival, writes the following artwork description:

"Just as the water in the monitor's water-wheel plunges into the real water, so, too, does Plessi juxtapose the image of appearances with the facts of reality in many of his works. It is not always immediately obvious where mere appearance ends and reality begins. What is truely fascinating with regard to our perception is the almost perfect illusion that we could mistake the electronic water for the real water. We, as viewers, experience an ironic "aha-moment" when we realize that the artist has consciously taught us the difference between illusion and reality (Klotz 1993, 31).

The work gained widespread acclaim and emerged as the emblematic piece of the *Multimedia 3* exhibition, frequently featured in press coverage of the festival (*MultiMediale 3. Pressespiegel* 1994). Its popularity can be attributed to its compelling embodiment of the prevailing notion of virtuality — closely linked to the concept of immateriality. The installation shows how media technologies can create believable illusions of time and space, making the physical material of the medium almost unnoticeable as it blends into the reality it creates.

In the case of *Tempo Liquido*, the material presence of the CRT monitors was largely overlooked, as they functioned primarily to simulate the illusion of a downward-flowing stream of water. The work's widespread acclaim led to its inclusion in the ZKM's exhibition *Writing the History of the Future* (2019–2022), where it was reinstated following repeated requests from the public. However, its reinstallation presented several challenges. By this time, the CRT monitors — already technologically obsolete — proved ill-suited for continuous rotation, frequently malfunctioning during the exhibition due to mechanical strain. Furthermore, ongoing repairs were both logistically unfeasible within the context of a long-term display and increasingly costly, owing to the scarcity of replacement components. In response, curators and conservators opted to suspend the kinetic function of the wheel to keep only a select few monitors operational on one front of the installation because they were positioned normally. Despite this intervention, the screens continued to overheat and deteriorate during the exhibition.

Figure 3.1. The sketch of Fabrizio Plessi's *Tempo Liquido*, 1993, single-channel video installation; 21 monitors, 1 laserdisc, 1 laserdisc player, millwheel, steel basin, 500 x 400 x 1800 cm, ZKM |Centre for Art and Media Karlsruhe. © Fabrizio Plessi the text says: ""_The ideal partner for my current international exhibitions is Philips." (Fabrizio Plessi) "Video and water are accomplices. Both are fluid, transparent and mobile," says Plessi. This is how he wants to connect "nature with technology, the future with the past". Most of his spectacular projects play with the symbolism of flow, with the blurring of reality and electronically generated appearances. His video installation "Liquid Time", which he presented at Philips Electronic Art on the occasion of the International Radio Exhibition '93 in Berlin, operates with the latest media technology from Philips Consumer Electronics. That speaks for itself and makes us a little proud. It shows how right it is for a company to live not only from its sales, but also from its reputation". This picture is found in the edited volume by Heinrich Klotz and the Zentrum für Kunst und Medientechnologie Karlsruhe, titled 'MultiMediale 3: 5 - 13 November 1993, IWKA-halle, Lorenzstraße; das Medienkunstfestival des ZKM Karlsruhe' (Karlsruhe: ZKM, 1993).

The processes of art's de-materialisation have also had a significant impact on curatorial practices and around the '60s to '90s, a phenomenon was formed that would later be called the curatorial turn. Since the early 1960s, with the de-objectification of art, discourse around art in exhibition began to shift from forms of critique of the artwork as an autonomous object of study/critique towards a form of curatorial criticism, in which the space of exhibition was given critical precedence over that of the objects of art. During the 1990s, curators and artists responded to and engaged with *neo-criticality* by extending the parameters of the exhibition form. This involved incorporating more discursive, conversational and geopolitical discussion within the ambit of the exhibition (O'Neill 2012, 13–14). The exhibition started to serve as a significant medium of criticism and communication and a means for the dissemination of knowledge. However, this curatorial model has also led to the increasing blurring of boundaries between curator and artist, often elevating the curator's creative authorship and interpretation practises at the expense of focused engagement with individual artworks as material entities. As a result, the responsibility for the material care and preservation of artworks within contemporary art institutions has increasingly shifted to conservators, whose work now bears the primary responsibility of maintaining and interpreting the physical integrity of art in an era of conceptual and post-object

The post-media era has seen the dematerialization of both the material art object and its spatial context. Since the 1960s, the field of post-war art has been preoccupied with concepts of abstract space rather than geographical space. The creation and exhibition of artworks, as well as the question of materiality, have become integral aspects of this discourse (Graham and Cook 2010, 52). In the context of new media art, these concerns extend further into the realms of the virtual. Conceptual art positions materiality within a broad and horizontal aesthetic field — encompassing multi-, inter-, and post-media practises — where materiality is transformed into a virtuality that is actualised, though never fully realised, through the specific abstractions of individual works (Lillemose 2006, 121). The popularization of the idea of virtuality, thereby influencing the perception of media art as non-locative and immaterial.

Considering the theoretical trends previously outlined, the genres of computer art, software art and net art have been designated as immaterial forms. Within the exhibition space, the issue of dematerialisation manifests not only in the form of the artwork but also in the broader problem of presence. As previously noted, media art is frequently misperceived as inherently non-locative and immaterial, leading to misconceptions about its spatial and material demands. These assumptions risk marginalising media art within institutional contexts, reinforcing the fallacy of its immateriality and impeding its proper presentation and preservation. In her essay *The Myth of Immateriality — Presenting & Preserving New Media*, Christiane Paul challenges the widely held notion of digital art's immateriality, arguing instead that such works are inherently material, deeply embedded in the technological apparatuses through which they are produced and experienced. She highlights how hardware and software not only shape the conditions of artistic creation but also influence the conceptual and aesthetic dimensions of the artworks themselves (Christiane Paul 2007).

Interviews conducted during this study revealed that such misunderstandings are particularly prevalent among curators, many of whom erroneously assume that media artworks require minimal spatial accommodation. As a result, these works are often not recognised as spatially and temporally situated installations, despite their reliance on specific configurations of equipment, environment, and viewer interaction. This

misperception is further compounded by a widespread lack of curatorial familiarity with the technical and logistical requirements of media art. Curators often underestimate the time-intensive nature of installation, and the often-substantial costs associated with transport and equipment setup.

To elucidate the phenomenon that the concept of media contains a religious and supernatural interpretation of matter, reference will be made to a course taught by Boris Groys at Karlsruhe University of Arts and Design (HfG) in the summer term of 2000[41], entitled *Genealogie des Begriffs Medium* (Genealogy of the Definition of Medium)[42]. In this course, Groys addresses the original definition of medium as a spiritualistic terminology, arguing that the medial problematic is related to the problematic of the soul, in the form in which Descartes affected it. For Descartes, the soul was distinct from the body and could not exist in space; it was only capable of perceiving meaning and memory. Thus, it can be argued that the media have already absorbed this problematic from the very beginning, resulting in the frequently committed thought fallacy, which fails to contextualise media art within both time and space, is a common error, and one that is often made by curators.

The concept of immateriality of media art proved to be the most significant misconception, which subsequently resulted in considerable challenges during the process of media art conservation. In his presentation at the *Preserving the Immaterial* conference, Bruce Sterling made the following statement:

"Total immateriality is a metaphysical illusion, it has nothing to do with physics or engineering. It's exhilirating to watch these heaps of data vanishing into microscopic scales, and if it's doubling every eighteen months <…> then it looks like it's going to totally vaporize, just any second now. But it never does. Never. Even vapor is a material. Mass and energy are conserved in an Einsteinian universe, so things just don't "immaterialize." Forget about it. Software is very protean, so you can call it a lot of things: you can call it art, science, free expression, mathematics, a medium, data, information, code, artificial intelligence, cyberspace; frozen thought; you can call it the noosphere and the Holy Ghost. But if you don't preserve it in some material form, you are not preserving immateriality: you are preserving nothing." (Sterling 2001)

The fundamental misunderstanding pertained to the perception of hardware as a standalone entity, separate from and independent of software. Software was erroneously regarded as immaterial and not contingent on hardware. This paradox was previously articulated by Bruno Latour within the framework of actor-network theory, where he referred to it as *blackboxing* — a process through which complex networks and operations become obscured as their outcomes are taken for granted and their internal mechanisms rendered invisible. In *Pandora's Hope* he writes that the *blackboxing* is: "the way scientific and technical work is made invisible by its own success. When a machine runs efficiently, when a matter of fact is settled, one needs to focus only on its inputs and outputs and not on its internal complexity. Thus, paradoxically, the more science and technology succeed, the more opaque and obscure they become." (Latour 1999, 301)

[41] 2000 was not only the year than First Geramn edition of *Under suspicion: a phenomenology of the media* was published (germ. *Unter Verdacht. Eine Phänomenologie der Medien*). However, it was also the moment at which the ZKM became aware of the necessity to preserve the old analogue video formats, thus initiating the process of establishing The Laboratory for Antiquated Video Systems, according to Dorcas Müller.

[42] The course has been audio documented and is available via the following link: [https://groys.hfg-karlsruhe.de/] (accessed 03.02.2025).

The persistent notion of immateriality in media art is swiftly challenged within the domain of collecting and conservation practises. This perceived immateriality is undermined by the inherent technological dependencies of such works, which are fundamentally tied to the specific hardware and software through which they were originally produced. Often, he recreation or continued functionality of computer-based media artworks is unfeasible without access to the original technical components, equivalent systems from the same period, or sophisticated emulation strategies. This dependency reveals a critical disjunction between theoretical discourses that frame media art as immaterial and the practical realities of its conservation, which expose its material foundations. It is conservators who most directly engage with this tension, as they are routinely tasked with devising methodologies to ensure both the operability and exhibition of ageing media artworks. Similarly, technical personnel responsible for the handling, installation, and maintenance of such works — particularly those on loan — must confront these technological limitations, negotiating between historical authenticity and contemporary display conditions.

Nevertheless, dematerialisation has given rise to a few other issues in the field of conservation, which relate to the classical theory of conservation and the perception of the object of conservation as a single material entity. This perception has gained strength due to the advent of scientific conservation, which was greatly influenced by the scientific world picture and the influence of scientific materialism and naturalism. This worldview assumes that reality is objective and coherent, that human beings have the capacity to perceive it accurately, and that rational explanations can be formulated for its constituent elements. Crucially, such a perspective does not require a supernatural interpretation of matter — one that would incorporate notions of the immaterial — but rather treats material reality as intelligible through empirical and logical inquiry.

In conservation (especially post-Brandi times), the medium of a work of art is inseparable from its material substrate; the fundamental principle of restoration is that only the original material of the work of art may be conserved. Once the material has been incorporated into the artistic process, it acquires a historical character; therefore, its replacement, even by a chemically identical material, constitutes a violation of historical continuity. Material, as the vehicle of artistic manifestation, can be understood as both ‘appearance’ and ‘structure’. Of these, appearance is regarded as the essence of the work and must remain inviolable, while structure — while still integral — may be reinforced or, in exceptional cases, partially replaced, but only when such intervention is necessary to ensure the continued preservation of the work. (Jokilehto 2011, 417–18)

The fundamental issue underlying this dependency is that it is impossible to recreate a piece of computer-based media art without the original hardware and software or hardware from the same series or period or without an emulation process. When applied to media art, a conservation approach that prioritises the preservation of the original material substrate alone proves inadequate. Within this framework, practises such as digitising video works or exhibiting early computer-based artworks on contemporary hardware would be deemed impermissible, ultimately rendering these works inaccessible. This inflexibility undermines the longevity of media art and conflicts with its inherently dynamic and technology-dependent nature. The fetishisation of authenticity and the traditional collecting practises commonly upheld by museums have led to a paradox: many artists who originally conceived their work as ephemeral have been compelled to materialise it in order for it to be collected and preserved by institutions. In doing so, the very nature of these works is altered, often in tension with the artists’ original intentions. At the *Payback ’96* conference, during *The Artist’s Perspective* panel, artist Mary Lucier reflected on the challenges of preserving time-based media. She stated:

"We [artists] find ourselves in this very ironic position, 20, 25 years later, of attempting to rematerialize, to remake in a material form, these works that, for us, were valuable at that time, precisely because of their ephemerality. So, one of the things that needs to be preserved in the reconstituting of these pieces and in the preserving of them, is the sense of their ephemerality. I mean, we mustn't make them overweight in their object-ness, while at the same time, we do have to reconstitute and preserve them. We need to retain that sort of vitality that was there when we were, at that time, rebelling against the art object, and the art. <…> So we all find ourselves somehow trying to bridge this gap of where we are conceptually in our understanding of the totality of what we've done, and how we have changed and the work has changed, and the necessity of the moment, that history, the needs of history, which involve this act of preservation" (Riley et al. 1997)

As a result, conservation theory has had to look for new ideas that can support the ethics and methods needed to preserve temporary, process-based, and technology-dependent artworks. This theoretical reorientation finds articulation in the utilisation of New Materialism, which has provided a crucial framework for rethinking conservation practises in relation to media and ephemeral art forms. Chapter 1 outlines a range of projects that have adopted New Materialist principles as the foundation for developing alternative conservation theories.

New materialism has contributed significantly to the redefinition of matter as active, dynamic, and relational — thereby enabling a reconceptualisation of change as intrinsic to the ontology of the artwork. In contrast, during the 19th century, when conservation emerged as a formal discipline, its central aims were to slow, stabilise, minimise, or manage change. Within this traditional framework, activity in material terms was often framed negatively; change was equated with degradation, and transformations arising from the material composition of an object were labelled as an inherent vice — a term that presumes the material's own properties as a threat to the object's preservation (Poh and Miller 2022). However, the reconceptualisation of the object as an *actant* — a term drawn from actor-network theory that attributes agency to non-human entities — has prompted a significant shift in conservation goals. Rather than focusing solely on the stabilisation of material change, contemporary conservation increasingly prioritises the documentation and transmission of the meaning, context, and knowledge over time.

In part, the turn towards materiality suggested by new materialism can be seen as a response to the perceived immateriality of digital culture. Postmodern theory, particularly the work of Jean Baudrillard, has emphasised how cultural reality has become increasingly abstract and immaterial through the dominance of signs, as seen in phenomena ranging from financial systems to simulation technologies. These processes of abstraction and dematerialisation have contributed to a crisis of the phenomenological human body. In response, new materialist thought demands a rearticulation of our conceptual frameworks and a vocabulary that accounts for the emergent forms of materiality that characterise the technical media age. This shift reframes media as materially entangled with bodies, infrastructures, and environments, rather than as disembodied or ephemeral (Parikka 2012, 84).

3.1.1.2. Ephemeral and the Memory

From Pierre Nora's *lieux de mémoire* (French for "*site of memory*" or memory space) and Marcel Proust's *À la recherche du temps perdu* (french for *In Search of Lost Time*) it becomes evident that memory — whether individual or collective — is frequently anchored in material objects. Nora's *lieux de mémoire* demonstrate how societies preserve memory through tangible sites or artefacts that serve as symbolic anchors for shared identity and historical consciousness. Similarly, Proust's *À la recherche du temps perdu*

famously illustrates how involuntary memory can be triggered by a sensory experience tied to a physical object, such as the taste of a madeleine (Proust 1965, 54–58). When the narrator dips a madeleine into linden tea, the familiar taste unexpectedly triggers a vivid, involuntary memory of his childhood Sundays in Combray and time spent with his aunt Léonie. This simple sensory experience revives an entire world from the past — his aunt's house, the town, and its surroundings — reappearing in his mind with striking clarity, evocatively described that memory is unravels "like the scenery of a theatre" (Proust 1965, 58).

This episode demonstrates how the material world has the capacity to preserve and reawaken the past, a concept that profoundly influenced 20th-century understandings of memory, including Pierre Nora's notion of *lieux de mémoire* (sites of memory), where objects, places, or practises function as anchors for collective or individual memory. Their principal function is to safeguard and symbolise the shared memory of a group. These sites may take diverse forms — ranging from individuals, events, objects, buildings, books, and songs to geographical locations — each imbued with a symbolic aura (Nora 1989). Their primary role is not merely archival but representational, serving as instruments through which societies construct and negotiate their self-image and historical consciousness. A key feature of *lieux de mémoire* is their semantic fluidity: they are open to reinterpretation, and their meanings may evolve over time in response to shifting cultural and historical contexts. Both perspectives underscore the notion that memory is not purely abstract; it is frequently materially mediated.

In cultural and institutional contexts — particularly within museums and archives — objects function not merely as representations of the past but as active agents in the processes of recollection and historical reconstruction. The effectiveness of museums as custodians of collective memory is underscored by their foundational role as institutions dedicated to the collection and curation of materially and symbolically significant artefacts. Museums may thus be understood as sites that gather the physical manifestations of memory, serving to preserve, interpret, and present past events, cultural narratives, and historical moments. In an institutional context, *lieux de mémoire* are traditionally material objects. The issue arises when objects are rendered ephemeral, as museums are historically ill-equipped to collect and historicise objects that lack a single material manifestation.

Due to the prevailing myth surrounding the ephemeral nature of media art, the phenomenon struggled to establish itself as a site of memory for a significant period. The supposition that media art's artefacts are intrinsically ephemeral and evanescent has resulted in an underestimation of its capacity to function as *lieux de mémoire*. Ephemeral works that were neither documented nor acquired were largely excluded from processes of historicization. As a result, a considerable portion of media and performance-based practises has been irretrievably lost or are in danger.

The field of art history has faced challenges in addressing the dynamic and technical nature of contemporary art. Unlike traditional art, contemporary works are not static, fixed objects. Traditional methods of analysis, which view art as an autonomous object, are insufficient for examining art forms that are collaborative, multidisciplinary, and ever evolving. These works may be generative or algorithmic, constantly changing in appearance and behaviour, and rely on ongoing technological development, along with its associated social implications (Cook 2014, 204). This is exactly why Mary Lucier, in the speech mentioned earlier, argues for a new way of thinking about history or creating different methods of recording history that can include the unique aspects of temporary and media-focused practices.

The use of ephemeral materials by artists does not necessarily signal an intention for their work to be transient. Rather, it often reflects conceptual or aesthetic decisions that are fully compatible with a desire for the work's longevity and historical recognition. Nonetheless, the perceived ephemerality of media art is still frequently misinterpreted as a deliberate resistance on the part of artists to historicization. This assumption has, in many cases, led to institutional inertia and a lack of engagement with preservation practises. It is important to recognise that this line of reasoning is not universally applicable. Many artists have limited or no agency in determining whether or how their work is historicised by institutions. Moreover, artists working with inherently ephemeral materials are often structurally excluded from processes of historization, not by choice, but by the very material conditions of their practice.

In the context of the growing ubiquity of digital technologies, media artworks have often been perceived as inherently ephemeral — an assumption stemming from the apparent immateriality of digital media. Unlike a painting, a media artwork may not exist as a static object, yet its preservation—through archives, exhibitions, or digital platforms—transforms it into a site of social memory. Crucially, this process depends on the work being materialised in some tangible form. This material manifestation might take the form of documentation, instructions, or a digital file. Each of these, in turn, must exist on a physical medium — such as paper, hard drives, or LTO tapes — to function as a durable site of memory.

Despite its seeming ephemerality, digital data carriers have always possessed an intrinsic material dimension. The notion of 'the cloud' serves as a potent metaphor within contemporary digital culture, yet it masks the physical realities of digital storage. Cloud infrastructures rely on vast data centres — material entities that are, like all physical systems, subject to wear, failure, and obsolescence. "The Cloud isn't made of vapor, but of underwater cables. Its ubiquity doesn't liberate us from space: it reduces the autonomy of the hard drive to the subsidiary nature of the terminal. There is no Cloud, only someone else's hard drive". (Emmanuel Guez n.d.)

To historicise media art practises, institutions employ a range of mechanisms to preserve and transmit memory. One such mechanism is the act of collecting, whereby works are preserved and institutionalised to safeguard their continuity. These collected works require a form of custodianship to ensure the transmission of their historical and conceptual significance. Another essential tool is curatorial and exhibition practice, which not only renders these works publicly visible but also facilitates the construction of cultural memory through their display. Another significant practice is that of conservation, particularly in the context of intermittent artworks that necessitate constant reinstallation and reenactment (e.g., multimedia, installation, performance). In this regard, conservation practises are very important because they generate knowledge through active and creative contributions to the subsequent materialisations of these artworks. It can therefore be posited that conservation contributes to the establishment of both the historicity, or historical actuality, and the materiality of its objects (H. Hölling 2017). In this context, the role of the media art conservator extends beyond the preservation of the physical object to include the safeguarding of its conceptual integrity and "aura." but also the conservator must also make the conserved object visible so that it can enter social memory (Rinehart and Ippolito 2014, 86–87).

3.2. “On the New”: Myth of Modernity

Since its inception, new media art has frequently been met with an overzealous celebration of its novelty by the general public, and it was widely regarded as a manifestation of the prevailing passion for velocity and acceleration. The rhetoric of the “new” proved to be a source of fascination for curators and critics alike. This tendency is also exemplified by Jean-François Lyotard, whose exhibition placed a greater emphasis on lauding the emerging information age than on critically engaging with artworks that reflect on or interrogate contemporary conditions (Graham and Cook 2010, 22). The designation of media art as ‘new’ was rapidly established, positioning it in direct contrast to ‘old’ or traditional forms of art. This binary framing not only underscored media art’s technological distinctiveness but also reinforced its role as a critical counterpoint within the broader art historical discourse.

In *On the New*, Boris Groys explores the cultural desire for innovation and its entanglement with mechanisms of the cultural economy. He argues that this drive toward the new is rooted in modernist thinking, often linked to utopian ideals — aspirations for radical transformation and a new historical beginning. Modernist ideologies are marked by the belief that time is propelled by the anticipation of a singular, transformative event, after which no further novelty is expected, only the sustained dominance of that new paradigm. In contrast, postmodernity marks a shift: the utopian element fades, and the logic of perpetual innovation gives way to a cycle of continuous variations on what already exists — novelty without foundational change (Groys et al. 2014, 6–8).

The notion of the new in arts emerged within the avant-garde, alongside a burgeoning desire for innovation and the conceptualisation of modern art. Unlike earlier eras, modern era thought assumes that universal truth can emerge not only from the past but also from the present or future. Truth is no longer tied solely to tradition but is expected to reveal itself through the present — offering hope for liberation from past errors. “In other words, it assumed that truth announced itself in reality, beyond tradition, as meaning, essence, being, and so on” (Groys et al. 2014, 25). Boris Groys delineates how the utopianism inherent in modernity precipitated destruction, manifesting in wars and revolutions, with a particular emphasis on the obliteration of the sources of the past, notably archives, and the emergence of censorship, an act that purified and absolved the burden of the past. As Groys asserts, “The utopianism of modernity was, in its fashion, a conservatism of the future” (Groys et al. 2014, 25). This is the reason why modernist ideologies have adopted an extremely conservative stance from the moment they have come to power. He cites the Russian Communist Revolution and the experience of the USSR as examples, wherein the ideology postulated that it had triumphed in achieving truth in the new order and in completing the course of history. Nevertheless, it is evident that archaic structures of thought were swiftly re-established (Groys et al. 2014, 27).

Building on the discourse of the “new,” the idea of ‘contemporaneity’ took shape in the artistic milieu of 60s-70s and was largely associated with the repudiation of traditional art and critique of traditional art institutions, particularly in response to its appropriation of traditional art by totalitarian regimes. After the 70s, art is increasingly regarded not as the study of tradition but as a critical analysis of contemporary phenomena. Notwithstanding the critical and political function undertaken by post-war art, the art of the 1970s exhibited a recurrence of the logic of modernism, a movement primarily concerned with the pursuit

of the new in art and the radical repudiation of tradition. This phenomenon manifested as the pervasive aspiration among artists to contribute an element of novelty to the artistic domain and the profound preoccupation with the notion that the creative act is inherently characterised by its capacity to introduce something novel into the artistic discourse.

In the early days of media art, this logic was exemplified by the notion that artists functioned as primary innovators, directly engendering novelty through their interaction with emerging technologies. This notion was further entrenched by the pervasive influence of an optimism regarding technological innovation within the domain of media art during its zenith. However, it was the advent of the post-post-media era, marked by the global proliferation of digital technologies, that disrupted the initial optimism surrounding media art. During this period, media art gradually shed its status as a "new" phenomenon and began to be acknowledged by cultural institutions and theorists as significant — primarily because of its inherent critical stance toward technology. In the European context in particular, media art increasingly assumed the role of a cultural critique, challenging the dominant technological paradigms and interrogating the socio-political implications of digital innovation.

Boris Groys, in his examination of the concept of the "new", contends that idea of novelty in contemporary times is inextricably bound to economic processes, functioning not only as an aesthetic category but also as a mechanism of value production and market differentiation. Media art was considered 'new' not only because of its technological foundations but also because it mirrored and incorporated the dynamics of the market and the ideology of progress. This ideology is intrinsically connected to the broader discourse of innovation, which itself is closely aligned with the re-evaluation of values and functions as a strategic economic operation (Groys et al. 2014, 17).

The concept of innovation fuses cultural and economic imperatives, effectively dissolving the classical distinction between the material and spiritual value of an object. Within this framework, the material value of a product is either disproportionately amplified or diminished, as innovation tends to conflate material worth with ideal or symbolic value (Groys et al. 2014, 17). Innovation, driven by market dynamics, continually introduces an increasing array of new devices — each more sophisticated, fashionable, user-friendly, or perceived as valuable primarily due to their novelty. The concept of innovation has played a significant role in the development of technological devices whose materiality is deliberately designed with planned obsolescence in mind. This strategy ensures a continuous circulation of the new, aligning product life cycles with market-driven imperatives of constant renewal and consumption. This prevailing logic of technological development has resulted in significant levels of exploitation, along with the unsustainable consumption of resources and the subsequent occurrence of environmental crises.

One of the central challenges in preserving media art lies in its inherent susceptibility to obsolescence — an outcome closely tied to the logic of market-driven technological innovation. The technology industry, driven by the imperative to sustain capital circulation, continuously produces newer products while simultaneously rendering older ones increasingly difficult to repair or maintain. This planned obsolescence directly undermines the longevity of media artworks, complicating their preservation and threatening their continued accessibility. The contemporary computer industry is characterised by a logic of continual acceleration and rapid technological advancement. This evolution is marked by increasing product sophistication and a trend toward software systems that are progressively more closed and tightly coupled with specific hardware configurations. Such developments further exacerbate issues of obsolescence and dependency, posing significant challenges for the long-term sustainability and preservation

of digital and media-based artworks. Whereas conservators were once able to ensure the preservation of computer-based works for a minimum of ten years, the accelerating pace of technological change has necessitated a re-evaluation of these expectations. Consequently, the standard time frame for preservation has been reduced to approximately five years.

The logic of production has extended into the realm of media art, where the phenomenon of planned obsolescence has paradoxically become culturally internalised. Sarah Cook and Beryl Graham contend that media art, as a comparatively recent artistic field, has been profoundly embedded within the dominant discourses surrounding emerging technologies. Drawing upon the concept of the "hype cycle", formulated by Gartner Inc. in 1995, they illustrate the extent to which the historical trajectory of technological industry growth and the concomitant digital revolution have influenced the formation and development of media art genres (fig. 3.2.). Following the widespread adoption of technological innovations, the emergence of new artistic genres significantly diminished. This phenomenon became particularly apparent after the technological developments reached the *Plateau of Acceptance* in the hype cycle. Simultaneously, numerous genres that had gained prominence during the earlier *peak of inflated expectations* began to experience a marked decline in popularity.

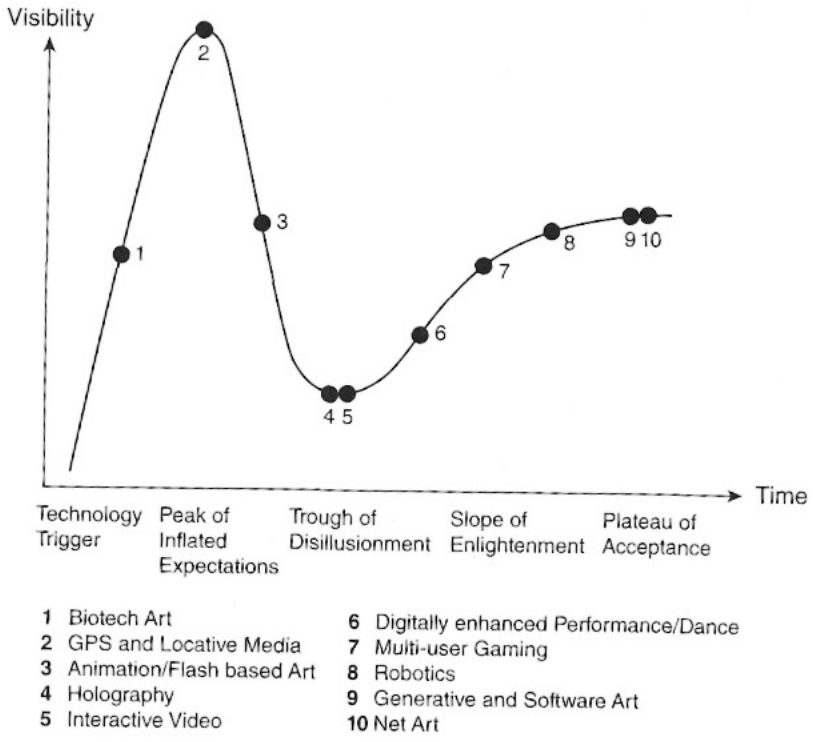

Figure 3.2. *The Gartner Hype Cycle*, adapted in 2005 to represent developments within new media art, illustrates how different art forms evolve over time in relation to technological trends. Typically, "hype cycles" chart the number of years required for a technology to progress through various stages. The diagram was produced by Sarah Cook and Verina Gfader and published in Beryl Graham and Sarah Cook, *Rethinking Curating: Art after New Media*, Leonardo (Cambridge, Mass: MIT Press, 2010).

A pertinent example of this dynamic can be observed in the trajectory of *biotech art*. The popularity of biotech art experienced a significant rise during the late 1990s and early 2000s, coinciding with the broader cultural fascination with biotechnology. Nevertheless, its prominence has since diminished. As biotechnology became more prevalent within scientific and industrial contexts, the sense of radical innovation that was once associated with biotech art began to wane. Concerns pertaining to ethics, in regard to the utilisation of living organisms, in conjunction with the substantial resource demands inherent to the production and maintenance of such works, have further contributed to those work's limited visibility. In the contemporary art world, biotech art has become a specialised genre, though it no longer occupies the central position it once held during its initial emergence. Moreover, certain genres such as *holography* and *Flash-based art* have effectively become obsolete because of technological advancement, highlighting the inherent vulnerability of media-dependent art forms to shifts in digital infrastructure.

In consequence of the persistence of the modernist logic of the new in the domain of media art, the prevailing emphasis on innovation and its conceptualisation as a genre orientated towards the future gave rise to a paradox: the initial prioritisation of preservation was not a central concern. Moreover, the historical dimension of the media art phenomenon remained largely unacknowledged. Media art was primarily viewed as present- and future-orientated. It was not until the 2010s, because of the increasing obsolescence of technologies, that the urgency to historicity emerged, giving rise to concerns over the potential loss of a significant body of work from the late 20th century. This phenomenon is largely attributable to the inherent logic of constant renewal that is embedded within the perception of technology.

For a considerable period, it was widely accepted that technology (especially digital) offered a reliable medium for the storage of data due to its continuous advancement. However, history has demonstrated that this assumption is erroneous. The notion of technology as a stable medium for information storage is a fallacy. Despite their common perception as being inherently renewable and future-orientated, technological media are subject to rapid obsolescence, planned deterioration of hardware and software, and physical degradation. Media art is contingent on specific configurations of software and hardware, rendering it highly vulnerable when those systems become outdated or unsupported. Moreover, the absence of standardisation practises, coupled with the industry's reliance on proprietary formats and systems, serves to compound the risk of data loss. Consequently, despite its apparent durability, technology is an unstable and fragile medium for long-term preservation.

The notion of preserving media art appeared to be an inherently paradoxical concept for a considerable time. This perception emanated, in part, from the prevailing modernist ideology of the new, which implicitly rejected the value of conserving technological artefacts from the past. Conventionally, the field of conservation has been predicated on the notion of safeguarding historical heritage, with the premise that the material stability of objects in the present enables access to the past. This approach is further informed by conservation's fundamental belief in sequentiality and the potential for the recovery of the past (Hanna B. Hölling 2017). However, within the paradigm of media art, this rationale was rendered inapplicable by the transient, process-orientated nature of the medium and its future-orientated ethos. Consequently, there was a clear discordance between the practice of preservation and the genre's conceptual foundations.

The logic of perpetual technological renewal has re-framed the stewardship of media art not as a process of conservation in the traditional sense, but rather as one of ongoing maintenance. In numerous institutions, this shift in perception has resulted in the

responsibility for the upkeep of technological artworks being assigned not to conservation departments, but to technical or IT departments. Consequently, the historical specificity of the original medium was frequently disregarded, with the primary institutional priority being the sustained operability of the work. In most cases, a logic of constant migration from one generation of technology to the next has been established as a preservation strategy. It is posited that this has the potential to engender substantial alterations, encompassing both the visual manifestation of the work and its overall intricacy. Consequently, questions of artworks "original state" or "authentic condition"[43] — central to the conservation of traditional artworks (Hanna B. Hölling 2017) — were frequently marginalised and ignored in the treatment of media art.

Furthermore, the institutionalisation of media art introduced a new paradox, arising from the differing temporalities between media art and traditional or even contemporary art institutions. The advent of post-war institutions, specifically contemporary art institutions, engendered a novel conception of temporality, one that diverged significantly from the temporal framework of traditional museums. Museums have been instrumental in showcasing contemporaneity; Pip Laurenson has characterised this accelerated pace as a 'brisk tempo'. This term refers to the rapid pace at which contemporary art engages with the present, thereby necessitating that museums maintain a high degree of agility to reflect the evolving cultural landscape (Laurenson 2024, 388). Consequently, contemporary art encompasses numerous temporalities, including rapid cycles of engagement paired with sustained follow-through, in-the-moment presence coupled with reflection, and breakneck speeds that work in tandem with strategic pauses (Laurenson 2024, 388).

It is important to note that another related temporality is characteristic of the conservation process and linked to effective care. In order to take care of existing works, a slow approach is sometimes required for the care of the work. Despite the apparent novelty of media art, its maintenance is a labour-intensive undertaking that necessitates significant time and resource investment. It is evident that this process does not align with the principles of acceleration. In museums, object conservation typically involves slow, meticulous processes such as cleaning, stabilisation, or repair, often performed under magnification. In the field of time-based media conservation, this may include the careful monitoring of video signals, assessment of film grading, evaluation of source code, adjustment of film projector mechanics, or recalibration of sound to suit a specific display environment. Such focused work can sometimes take place amid the accelerated pace of exhibition installations, highlighting a tension between conservation practises and the broader institutional tempo (Laurenson 2024, 387).

It is imperative that the accelerated pace of exhibition production does not undermine the meticulous processes necessary for the preservation and presentation of media artworks. A recurrent challenge emerging from the tension between curatorial urgency and conservation requirements is the inadequate time allocated to conservators for the proper preparation and installation of works. To mitigate this, it is essential that the divergent temporalities of curatorial and conservation practises are acknowledged and integrated into the exhibition planning process from its inception.

[43] The concept of an "authentic condition" is grounded in a linear conception of time, wherein earlier stages in an artwork's lifecycle are often deemed more valuable or legitimate than later ones. As a result, authenticity is typically aligned with the initial phases of a work's development. Similarly, the notion of the "original" is closely tied to the moment of an artwork's conception and is often understood in relation to the artist's original intent (Hanna B. Hölling 2017). Both terms — authentic and original — thus privilege origins and early temporal moments as key determinants of value and meaning in the history of an artwork.

3.2.1.1. The “New” in the Archive

As Groys asserts, the demand for the new emerges when established values are consigned to the archives (Groys et al. 2014, 24). The development of media art did not follow this trajectory in relation to archival practices. The persistent framing of media art as inherently and perpetually ‘new’ has posed significant challenges to its archiving. Unlike traditional art forms, media art was not initially conceived with the archive in mind, as both the archive and the institution were often regarded as outdated structures. One of the core demands of media art was the creation of new institutional frameworks capable of addressing its distinct temporalities, materialities, and orientation toward novelty. Consequently, many early media art institutions lacked archival infrastructures altogether[44]. The core issue lay in the logic problem of attempting to archive what was, by definition, perpetually new, because in the moment that new is entering the archives, it is consigned to become the past. The archive, traditionally associated with permanence, authority, and institutional legitimacy, stood in contrast to the fluid, time-based, and process-oriented nature of media art. As media art became subject to archival logic, it was gradually incorporated into the historical continuum it once sought to resist.

However, the situation underwent a radical transformation following the so-called ‘archival turn’. The ‘archival turn’ is a term used to describe a critical shift in the humanities and arts, beginning in the late 20th century, in which archives moved from being passive repositories of historical records to active subjects of theoretical inquiry and artistic exploration. This period was characterised by an emerging recognition of the manner in which archives do not merely preserve cultural memory and historical knowledge but rather play a significant role in their construction. An interrogation of the political, institutional and ideological dimensions of archival practises was initiated by scholars and artists. The focal point of this inquiry was the examination of the collection process, the preservation of materials, the exclusion of certain elements, and the subsequent influence of these decisions on the formation of collective understanding of the past. This shift was influenced by post-structuralist theory, particularly the work of Michel Foucault and Jacques Derrida. Foucault’s conceptualisation of the archive as a system of discursivity is significant in understanding the conditions that enable knowledge production. Derrida’s 1995 work, *Archive Fever* (Derrida 1996), has become a paradigm for understanding the ‘archival turn’.

The ‘archival turn’ redefined the role of archives from static containers of the past to dynamic, contested spaces central to the politics of memory, identity and representation. In a later phase of media art’s evolution, institutions increasingly turned to archival practises as a means to historicise, collect, and disseminate media art. At that point — particularly following the ‘archival turn’ — archival logics began to be adapted to media art conservation purposes as practises central to knowledge production, memory, and historiography. In this context, media art — originally positioned as an ephemeral and anti-institutional practice — underwent a significant transformation. Its integration into archival systems effectively marked the end of its status as “new.” The archival turn thus signified not only the emergence of new strategies for the conservation and documentation of media-based works but also a symbolic shift: media art was no longer purely aligned with

[44] For instance, the professional archive at ZKM was only officially established in 2016, it was only then that the institutional need to systematically structure both digitised files and physical artifacts was fully acknowledged — facilitating improved accessibility for external researchers as well as internal staff.

technological novelty or radical innovation but was instead re-situated within the frameworks of art history and social memory.

The archive only gained significance in media art preservation at a later stage, when the question of how to conserve ephemeral works became urgent. At that juncture, the documentation practises originally intrinsic to the archive began to be extended to media art preservation. As demonstrated by the practice of ZKM, a significant proportion of media artworks are not incorporated into collections but rather preserved in archives. The archive facilitates the documentation of works and the establishment of a data infrastructure that enables the aggregation of information from multiple sources. This process generates a comprehensive representation of works for which the material component is either incomplete or unavailable because of the archive's ability to preserve the variability and changeability of a work of art.

Embracing the archival turn perspective enables the acknowledgement of artworks as inherently open to transformation. This is true of both the vibrant, animate materiality of the object itself and the dynamic contexts that shape and reshape its meaning (H. B. Hölling, n.d., 76). It is therefore possible to consider archival practises as mediating between the concepts of memory and historicity and as offering a framework through which to engage with the continual material flux of objects — a notion that has been prominently introduced into contemporary art discourses, notably through movements such as Fluxus.

3.3. ZKM: "Making History"

Hans-Peter Schwarz, the first director of the ZKM's *Media Museum*, references Roy Ascott's seminal essay "The Digital Museum" (Ascott 1996) in his introductory text to one of the Media museum's first publications (Schwarz and Medienmuseum 1997). In reflecting on the evolving role of media art institutions, Schwarz draws attention to Ascott's assertion that, in the digital age, the museum's function is not merely to document or record history but rather to actively participate in the making of history. This perspective challenges traditional museological paradigms by foregrounding the museum as a site of generative cultural production, particularly within the context of new media. In the case of ZKM, this paradigm proved to be remarkably prescient. From its inception, ZKM was intentionally structured not merely as a site for exhibiting media art but as an active collaborator in its production — functioning as both a facilitator for artists and a platform for the dissemination of their work.

Crucially, the institution assumed the role of an agent in the construction of cultural memory. By the 2000s and 2010s, as the challenges of media art conservation became increasingly apparent, ZKM began to adopt a more explicitly historical and educational role. The institution's responsibilities expanded beyond exhibition and production to include the preservation of media-based works and the dissemination of knowledge surrounding their cultural and technological contexts. Through its early and sustained commitment to the collection of media art — as well as its exhibitions of both emerging digital practises and historically significant 'old' media works — ZKM positioned itself as a formative force in the historicization of media art. In doing so, it not only preserved artistic practises and transmitted social memory but also actively participated in shaping the historical discourse surrounding them.

The practice of collecting has emerged as one of the most effective strategies for the historicization of media art. In the absence of robust institutional frameworks, artists often

face significant challenges in implementing sustainable self-preservation methods. These difficulties are primarily due to the substantial financial and temporal resources required for the conservation of media artworks — demands that frequently exceed the capacities of individual practitioners. Within this context, the institution plays a critical role in the historicization process, as the integration of media artworks into institutional collections can alleviate the burden of preservation from the artists themselves. Moreover, collecting is integral to the broader process of documentation and interpretation, contributing to a more comprehensive and enduring visual and historical record of media art.

However, most contemporary art institutions have historically demonstrated an inability to incorporate media art into their collections. For instance, even the most cursory comparison between the historical trajectory of post-war art and the holdings of Tate reveals a notable disparity. Despite the institution's stated intention to comprehensively represent the artistic developments of the period, numerous forms of practice remain insufficiently engaged with — if not entirely absent — from its collection. Among these are Cybernetic Art, Robotic Art, Kinetic Art, Telematic Art, Computer Art, and net.art, each of which has played a significant role in shaping the discourse and evolution of media-based artistic practices (Gere 2004). For instance, one may cite Patricia Falcao's presentation at the 2022 in *Just in Time* conference[45]. It is noteworthy that time-based media constitutes a mere 0.01% of the Tate collection.

This is a primary rationale for the failure of media art to successfully traverse the acquisition process. Over time, this issue became further compounded by the growing awareness of the substantial costs and resource demands associated with the conservation of media art. A considerable number of institutions have cited concerns regarding the conservation of new media artworks as a significant impediment to their inclusion in collections. Even the regular exhibition of media artworks already housed within institutional collections often necessitates significant financial and logistical investment. Consequently, media art has come to be regarded as a high-value and resource-intensive domain within the broader landscape of contemporary art. Consequently, the artistic practice of media art has remained marginalised since its inception, despite experiencing a period of peak popularity in the 1990s and the fact that the genre has achieved a high level of global popularity.

ZKM was originally conceived as an institution dedicated to the collection and preservation of media art. Notably, acquisitions of media artworks began even prior to the official opening of the institution, during its initial phase marked by the launch of the *MultiMediale* festival. ZKM undertook the acquisition of highly complex technical artworks at a time when such a commitment was far from widely accepted within the institutional field. A notable example is the acquisition of *Tempo Luquido* in 1993 — four years prior to the full inauguration and official opening of ZKM in 1997 — demonstrating the institution's early and proactive engagement with technologically advanced media art.

The rationale behind this initiative by Heinrich Klotz, founding director of ZKM, was to affirm the principle that artists working with new media and non-traditional mediums should be granted equal recognition and inclusion within institutional collections[46]. At a

[45] *Patricia Falcao: Driven by the Art — New Practices in the Preservation of Software-Based Art*, 2023, https://www.youtube.com/watch?v=TSASj2LAMj0. (accessed 05.02.2025)

[46] This perspective is informed by a speech delivered by Heinrich Klotz on the subject of 'Die Künste sind anders geworden' ('The arts have become different'), which was presented at the MultiMediale 2 press

time when many contemporary art institutions and prevailing art theoretical discourses were actively questioning *is it art?* — particularly in the aftermath of *Documenta 10* — Heinrich Klotz was among the first to recognise the significance of institutionalising artistic practices that engaged with contemporary technologies. Klotz was expeditious in his recognition that media art is not merely the art of the future but is indeed the art of the present.

This development may be attributed to Heinrich Klotz's theoretical contributions, most notably his articulation of the concept of *Second Modernity* (*Zweite Moderne*), which provided a foundational framework for both the establishment and the institutional orientation of the ZKM. Klotz conceived of the ZKM as a laboratory for *Second Modernity* — a space in which artistic practice, media technologies, and critical theoretical inquiry would intersect. In his view, the ZKM was not simply an art institution but rather a cultural project emblematic of the shift from the aspirations of early modernism to a technologically informed, critically reflective cultural paradigm.

Heinrich Klotz, an architectural theorist and historian, developed the concept of *Second Modernity* as an extension of his reflections on the evolution of architecture beyond postmodernism. The term was introduced by Klotz primarily in relation to architecture, where he observed a shift beyond the formalist and functionalist constraints of early modernism towards more communicative, historically aware, and technologically integrated forms (Klotz 1999). However, Klotz later expanded the scope of the term, employing it to designate the broader cultural condition of the post-medial era. *Second Modernity*, as conceptualised by Heinrich Klotz, refers to a cultural and artistic phase that succeeds and critically re-configures the ideals of classical modernism, while "Modernism is by no means exhausted" (Klotz, Bredekamp, and Frohne 1997, 9). In contradistinction to postmodernism, which frequently adopts a sceptical or ironic stance towards modernist values, *Second Modernity* seeks to move beyond mere rejection. Instead, it revisits the foundational principles of modernism — such as innovation, progress, and engagement with contemporary conditions — while integrating them with the complexities and pluralisms of the late 20th and early 21st centuries. Klotz articulates this approach based on his conviction that the history of art does not unfold according to a linear logic of progress (Klotz, Bredekamp, and Frohne 1997, 10). Furthermore, he contends that postmodernism, despite its critical stance, cannot entirely negate or dismantle modernism.

In *second modernity*, tradition occupies a dynamic and recontextualised role. Unlike the radical break with the past that characterised early modernism, *second modernity* does not reject tradition outright. Instead, it re-engages with historical forms, symbols, and references, integrating them into contemporary artistic and architectural languages in a critical and often dialogic manner. Klotz viewed this as a *productive synthesis* — a way to transcend the binaries of modern vs. traditional or innovation vs. continuity. He writes: "The 'Modernist Project' a project that continues to this day, is in fact no longer devoted primarily to innovation. Modernism today is more truly associated with duration" (Klotz, Bredekamp, and Frohne 1997, 10).

Thus, Klotz regarded media art as a central expression of *Second Modernity* — a practice that assimilated avant-garde methodologies while simultaneously adopting a critical posture toward the notion of innovation itself. For Klotz, institutions such as the ZKM were emblematic of this shift, as they institutionalised art forms that reflected and

conference in 1991. The video is available for viewing at the following URL: https://zkm.de/de/media/videos/in-gedenken-an-heinrich-klotz (accessed 04.05.2025).

responded to the conditions of a technologically saturated society. Thus, ZKM was intended from the beginning to reflect the spirit of the *Second Modernity*: embracing new technologies, acknowledging the loss of grand utopian narratives, and fostering experimental, interdisciplinary approaches across art and science. At institutions like ZKM, this is reflected in the coexistence of cutting-edge media art with curatorial and collecting practises that acknowledge historical continuity and cultural memory. Thanks to Heinrich Klotz's vision, ZKM developed into more than just a site for production and research — a model that was widely embraced by media art institutions in the 1990s. Under his leadership, ZKM also became a museum with its own dedicated collection. At the time, this dual role was a radical and forward-thinking approach, positioning the institution not only as a laboratory for innovation but also as a guardian of media art history. By integrating curatorial, archival, and scholarly functions, Klotz laid the groundwork for ZKM to evolve into a comprehensive cultural institution that could preserve, study, and exhibit media art on equal footing with traditional art forms.

ZKM adopted a historical perspective from the outset by initiating the collection and preservation of media artworks, despite the inherently ephemeral nature of media art and the dominant discourse of novelty surrounding it. This represented a significant transition, whereby media art was recognised not solely as a practice orientated towards the future but also as a subject that could be examined through the lens of historical inquiry and be a subject of social memory. ZKM began collecting media art as early as 1989, positioning itself at the forefront of media art. This early commitment not only underscored the institution's pioneering role but also set a precedent for numerous other collections that followed. The existence of ZKM's collection played a crucial role in the early development of media art conservation practises. The need to care for the works in the collection necessitated the establishment of preservation strategies at a relatively early stage. This allowed ZKM to become the leading institution in this field and resulted in its worldwide success as an institution known for its media art preservation practises. The museum's rapid success in the field of conservation has led to a significant increase in the number of artists donating their archives to the institution and works to the collection. This is with the aim of preserving the memory of their works.

As early as the 2000s at ZKM, exhibiting works from the collection was conceived not anymore merely as a display of contemporary art but as an act of historicization, an awakening of social memory regarding the phenomenon of media art. Following the turn of the 21st century, the exhibition of works from the ZKM collection increasingly functioned as a method of historicising and periodising the trajectory of media art. This transition is exemplified by collection exhibitions such as *The Story That Never Ends. The ZKM Collection* (2025) and *Writing the History of the Future* (2019–2022) are indicative of a self-reflexive engagement with historical narrative and the legacy of media art, as suggested by their titles. As early as the beginning of the 2000s, ZKM initiated the process of historicization, establishing a tradition with its inaugural exhibition of the *Masterpieces of Media Art from the ZKM Collection* (2004). The exhibition included a comprehensive selection of media art from the 1950s, curated by Peter Weibel and Barbara Könches. The exhibition was subsequently enhanced through the addition of specially designed environments, which included three large-scale database installations. These installations were conceived to provide visitors with interactive access to the historical trajectory of media art, enabling a deeper engagement with its evolution.

In addition, ZKM's extensive collection and archival resources have enabled the institution to actively shape historical narratives surrounding the genre of media art. This curatorial authority is exemplified in projects such as *RECORD > AGAIN! — 40jahrevideokunst.de*

(2009–2010) — Teil 2 (en. *RECORD > AGAIN! — 40 Years of Video Art in Germany — Part 2*), as well as the forthcoming exhibition *Choose Your Filter!: Browser Art since the Beginnings of the World Wide Web* (2025). Both initiatives explicitly engage with the historical dimensions of media art, seeking to contextualise its evolution and transformations over time. Both exhibitions were consciously framed as historical retrospectives, underscoring the curatorial intention to position them as authoritative interventions in the historiography of media art. By adopting this approach, the exhibitions asserted their role in constructing and legitimising a historical narrative for the genre.

In this context, the project *RECORD > AGAIN! — 40 Years of Video Art in Germany* is particularly significant. It served as a critical continuation of the earlier initiative *40 Years of Video Art in Germany*, a project in which ZKM was involved primarily in a supporting capacity but which it did not fully curate or realise. *RECORD > AGAIN!*, by contrast, emerged as ZKM's direct response — an effort to expand and deepen the historiography of German video art through the institution's own archival resources. This shift in authorship reflects a growing institutional awareness of the archive and collection not merely as a repository of the past but as a generative tool for rewriting and pluralising art history. In his accompanying essay, *An (An-)Archive. The Abolition of the Present and the Archive of the Future*, Siegfried Zielinski interprets the project as emblematic of a new curatorial and archival ethos — one that legitimises the coexistence of multiple historical narratives. He asserts, for instance, that:

It required two opposing - and in the future will probably need more - alternative approaches to be able to write and exhibit the idea of a history of video art in Germany. The first part of the exhibition presented a collection of works that are self-evident, which are to be expected provided one is familiar with the most important actors in video art of the past decades. In the second part of the exhibition, that which had hitherto been pushed out to the periphery, had been consigned to oblivion, was shifted to the center of attention; further, it also factored in that a substantial part of the material was in especially poor condition and quite literally had to be rescued (Zielinski 2013, 94–95).

3.3.1.1. The Noah's Ark Principle: Collection Methodology at ZKM

In the context of an examination of collection practises, it is logical to enquire into the underlying principles and strategic frameworks that shape an institution's approach to acquisition and collecting practises. It is imperative to underscore that the primary focus of this chapter is the collection of media art. However, it is also important to acknowledge the significant collection of traditional artworks held by ZKM, acquired during the period in which the Museum of Contemporary Art operated as a part of the institution. Nevertheless, the integration of this collection into the ZKM collection in 2017 was subsequently mandated, as the separation of artworks according to media was found to be in increasing contradiction to contemporary artistic and curatorial practice.

The practice of collecting created under Heinrich Klotz was in line with his concept of the "*Museum aller Gattungen*" (germ. 'Museum of all arts'). Since its inception, the collection has acquired a wide array of works encompassing diverse genres and mediums, including video installations, sculptures, paintings, kinetic art, interactive computer-based installations, holographic stereograms, sculptures, early computer art, and so on for the Museum of Contemporary Art. Klotz wrote the following: "The integration of all the arts, allowing much greater scope for comparison, creates a much truer picture of the reality of

art than was ever achieved by the now outdated museum practice of displaying ‘selected highlights’ from the few ‘classical’ categories” (Klotz, Bredekamp, and Frohne 1997, 7).

Nevertheless, ZKM’s media art collection has predominantly focused on works that adopt a critical perspective on technology. As articulated in *Concept ’88*, one of the institution’s foundational documents, ZKM aims to ensure that: “The public can begin to comprehend the inter-relationship between new media and can develop a critical consciousness in dealing with new technologies” (Heck et al. 1988). This curatorial approach exemplifies the productive synthesis between postmodernism and modernism that defines Heinrich Klotz’s concept of *Second Modernity*. This synthesis is marked by the integration of innovation and technological engagement with a sustained attitude of critical reflection. This principle subsequently became foundational to ZKM’s collection strategy, which prioritises the ways in which artists have engaged with, adapted, and innovated technological tools for artistic expression. Rather than focusing solely on medium or form, the strategy emphasises the conceptual and experimental use of technology, reflecting the institution’s broader mission to explore the intersections of art, media, and science. For example, ZKM's focus on collecting is particularly pronounced in the domain of video manipulation and software experimentation, a period that witnessed a significant degree of innovation and critical engagement with the emerging digital tools of the time.

Concept ’88 provides a comprehensive list of potential collections that could be considered for inclusion in a *media museum*. These include media documenting printing methods and printmaking; handbills, caricatures and comic strips; media that represent the history of photography or film; modern media such as video, computer graphics and holograms; computer-aided design media (including those employed in architectural offices); media environments and computer simulations (Heck et al. 1988). In other words, the collection was to be assembled in a manner that would enable the museum to stage exhibitions which, in the words of *Concept 88*, “present the parallels between historical and modern media, but also a blatant break between the two.” (Heck et al. 1988). In other words, from its inception, ZKM’s collection was conceived to mirror the historical evolution of media itself. This meant not merely accumulating artworks that used media but actively documenting and preserving how media technologies have evolved over time.

In addition, ZKM as an institution was also designed to provide a platform for artists to develop their projects, which often required institutional support in terms of technological infrastructure and fundraising. Projects such as *The ZKM Music and Acoustics Institute* and the *Institute for Visual Media* exemplify this commitment, offering artists not only access to advanced tools but also collaborative environments in which experimental media works could be conceived, produced, and exhibited. The institutional framework of ZKM was designed to facilitate the development of technologically advanced artistic practises by providing artists with access to dedicated laboratories, technical expertise, and financial resources. These facilities supported the creation of works in a wide array of media, including but not limited to video, interactive installations, virtual reality, computer graphics, computer simulation, telecommunications, electronic music, and interdisciplinary practises involving dance and technology (Heck et al. 1988). By offering such comprehensive infrastructural and conceptual support, ZKM enabled the realisation of technologically sophisticated and conceptually ambitious projects that would have been difficult to produce outside an institutional context. Prominent examples of such projects include the aforementioned Frank Fietzek’s *Tafel* (Chalkboard); 1993; Agnese’s Hegedüs’s *Memory Theater VR*, 1997; and Jill Scott’s *Frontier of Utopia*, 1995. Many of these works were subsequently integrated into the ZKM collection, thereby reinforcing the institution’s role as a central repository and catalyst for media art. However, this approach has resulted

in the ZKM collection comprising a substantial number of technologically complex works — many of which entail significant conservation and exhibition challenges. The scale and depth of this commitment to media art preservation are unparalleled, as few institutions have demonstrated the willingness or capacity to collect such technically demanding works in comparable volumes.

With the appointment of Peter Weibel as director, the institutional trajectory of ZKM underwent some transformation, particularly regarding its collection practises. Under Weibel's leadership, the museum significantly expanded its video art holdings, reflecting his personal curatorial interests and theoretical orientation. The establishment of the *Laboratory for Antiquated Video Systems* and its popularity in the early years led to a considerable influx of requests for the digitisation of archives stored on obsolete video, audio, film, and data media. In some instances, archives remained in the ZKM's possession, while in other cases, the institution retained digital copies to which it had the in-house rights and which ZKM could use for research purposes. In certain cases, full usage rights are to be transferred to ZKM following a designated period after the rights holder's death. As a result, ZKM now maintains an extensive collection of audio-visual material, a substantial portion of which constitutes significant artistic works.

Peter Weibel subsequently developed a strategy that was eventually given the designation 'The Noah's Ark Principle'. In his text Das intelligente Museum (en. Intelegente Museum) Weibel draws a metaphorical parallel between the museum and Noah's Ark, suggesting that the institution serves a preservational function by safeguarding artworks, much like the ark safeguarded life during the biblical flood (Weibel and Szope 2020, 33–34). The museum, as the author suggests, fulfils a function similar to that of the ark in preserving works of art. Nonetheless, Weibel has expressed criticism of the principle of Noah's Ark, arguing that it implies categorisation and selection which consequently results in the loss of a substantial corpus of artistic works. Weibel writes: "Noah's Ark embodies a principle that says: Only a few are chosen and only some will be saved. It is therefore not a democratic principle. Noah's Ark is a platform on which only a few have a place[47]" (Weibel and Szope 2020, 31). Weibel's primary critique of other institutions pertains to their selectivity and the manner in which they assign historical significance to certain works while disregarding others. This practice, he contends, hinders the actualisation of the democratic principle in the realm of collecting practices. He states: "They [museums] made their judgements with the guillotine of history, discarded most of the art, rejected it, forgot it[48]" (Weibel and Szope 2020, 32).

Subsequently, Dorcas Müller, then head of the *LAVS* at ZKM, rearticulated Peter Weibel's "Noah's Ark Principle" as a foundational ethos guiding the Laboratory's conservation work. In her text *Asanas for Media Art Conservation* (Dorcas Müller 2023), Müller draws a significant parallel between Nam June Paik's *Arche Noah* — one of the first media artworks acquired by ZKM in 1989 — and the institution itself. She argues that Paik recognised the parallels between ZKM and Noah's Ark, foreseeing the challenges the institution would encounter in preserving the rapidly evolving forms of media art. Paik

[47] German original: "Die Arche Noah verkörpert ein Prinzip, welches besagt: Nur wenige sind auserwählt und nur einige werden gerettet. Es ist also kein demokratisches Prinzip. Die Arche Noah ist eine Plattform, auf der nur wenige Platz haben." (Weibel and Szope 2020, 31). The translation of this quote was conducted by the author.

[48] German original: "Mit der Guillotine der Geschichte fällten sie ihre Urteile, sonderten den Großteil der Kunst aus, verstießen sie, vergaßen sie" (Weibel and Szope 2020, 32). The translation of this quote was conducted by the author.

metaphorically entrusted ZKM with the task of safeguarding the “diversity of electronic media” (Dorcas Müller 2023, 103), much like the ark preserved the diversity of animal life. Müller’s interpretation of the Noah’s Ark principle adopts a more optimistic and inclusive stance than Weibel’s, emphasising the importance of preserving as many forms of media as possible. In an interview, she highlights that this approach also aims to maintain the democratic spirit that Weibel championed — ensuring that the preservation of media art is not restricted by rigid curatorial hierarchies or historical exclusion.

Figure 3.3. Nam June Paik, *Arche Noah*, 1989, Three-channel video installation ; 25 monitors, 2 laserdiscs, 2 laserdisc players, wood construction, 9 papier-mâché animals, 400 x 560 x 260 cm, ZKM | Center for Art and Media Karlsruhe. / © Nam June Paik ; photo © ZKM

Nowadays ZKM continues to uphold a relatively democratic approach to collecting practises, particularly in relation to early video art. It is possible to submit an artist’s entire archive to the ZKM in case the artist is aware of the work conducted by the Laboratory for Antiquated Video Systems (LAVS). However, this principle has not been fully realised across all categories of media art. The relative ease with which the institution has implemented democratic collection principles for time-based media such as video is largely attributable to the medium’s technological and industrial evolution. With the advent of digital formats, video has become more adaptable, and the associated file sizes, while increasing, remain manageable due to advancements in data storage. As a result, the long-term storage and accessibility of video works have become more feasible for institutions. In contrast, computer-based artworks (often perceived as ephemeral) pose more substantial challenges. Their preservation frequently entails high financial costs and complex technical requirements. Consequently, ZKM has been compelled to implement selective acquisition strategies, invoking what Peter Weibel once described as the

"guillotine of history": a necessary mechanism of curatorial selection that inevitably excludes certain works from acquisition.

As a result of this ambitious collection strategy, by 2022 the ZKM collection comprised approximately 10,200 artworks, including 214 computer-based works — representing roughly 2% of the total holdings[49]. While this percentage may appear modest, it is nevertheless significant, as it constitutes one of the largest concentrations of computer-based artworks within a single institution, particularly one operating with finite resources. In recent years, however, the rate of acquisition of such technologically complex works has markedly declined compared to ZKM's early years. As noted by Morgan Stricot, a computer-based conservator at ZKM, the institution now acquires approximately one to two such works annually. This shift reflects not only strategic prioritisation but also the growing complexity of the acquisition process. Drawing on its extensive experience in conserving and exhibiting media artworks, ZKM has developed more nuanced acquisition protocols that anticipate and mitigate the technical and logistical challenges inherent in the long-term preservation of these works.

In or around 2023, ZKM established a dedicated acquisition committee specifically tasked with evaluating media artworks for inclusion in the institution's collection. This interdisciplinary committee is composed of the head of the museum and key figures from several departments, including the head curator, the head of collection, representatives from the restoration team (such as Matthieu Vlaminck for Computer-based artworks), and members of the head of the *Museum and Exhibition Technical Services* department (MUTECH). The committee collaboratively assesses prospective acquisitions, drawing on their respective areas of expertise — curatorial, conservation, and technical — to ensure informed decision-making regarding the feasibility, sustainability, and significance of each work. This procedural framework reflects ZKM's integrated institutional approach to the collection of technologically complex artworks, balancing artistic value with practical considerations related to long-term preservation and maintenance. At ZKM, the acquisition process for media artworks involves a rigorous, multidisciplinary evaluation. The restoration team typically begins by assessing the resources required for the long-term preservation of the work. Concurrently, Morgan Stricot prepares a detailed acquisition report which is intended to provide a comprehensive overview of the contents of this work, identify any potential risks, and explore the prospects of recovery in the event of any issues arising with the aim to ascertain the resources that will be necessary to employ in this undertaking. While the MUTECH department (often involved in prior exhibition setups) evaluates the operational reliability of the work during its display period. ZKM's current acquisition strategy priorities work, which was previously exhibited at the institution, allowing the team to observe how they function under extended exhibition conditions. Based on these assessments, the acquisition committee deliberates. If the curators and the exhibition team recognise the work's preservation as feasible and significant, a final decision in favour of acquisition is typically made.

[49] The statistics presented in the talk '*Digital Art Conservation: the Post-Acquisition Marathon*' by Morgan Stricot and Matthieu Vlaminck at the conference entitled: *Just in Time: On the Status Quo and Future of Electronic Art Preservation*, which was held at ZKM from 7$^{(th)-8}$(th) October 2022. Link:https://zkm.de/de/media/videos/morgane-stricot-matthieu-vlaminck-digital-art-conservation-the-post-acquisition (accessed 07.05.2025).

3.3.1.2. An (An-)Archive: Archive at ZKM

Another significant institutional component of ZKM dedicated to the preservation of history is the archive. During the initial years of ZKM's institutional development, the primary responsibility for archival functions was assumed by the *Library* and the *Media Library*. However, with the establishment of the laboratory and, subsequently, the major institutional reorganisation in 2017 — which involved the merger of the *Museum of Contemporary Art* (MNK) and the *Media Museum* — ZKM formalised the creation of a dedicated archive. This archive now serves a dual function: on the one hand, it operates as an institutional archive, preserving administrative, curatorial, and operational records related to ZKM's history; on the other, it functions as a classical archive, encompassing both printed materials and a significant body of audiovisual media. This hybrid structure reflects ZKM's broader mission of integrating documentation, preservation, and historical research within the context of media art.

In the post-medial era, conceptualism and the popularisation of communication media have exerted a profound influence on artistic expression, as previously outlined. Consequently, the work of art has come to be perceived in diverse ways, as both a concept and a form of information, both of which are intimately associated with language. It is evident that the archive constitutes an ideal structure, as it is predicated on the premise that "language is its primary medium" (Zielinski and Winthrop-Young 2015, 116). In this way, the archive has come to represent an ideal structure for preserving the memory of media artworks by maintaining the contextual, procedural, and conceptual dimensions essential to their historical understanding.

One particularly noteworthy strength of the ZKM archive is its institutional placement within the Department of *Knowledge* (germ. *Wissen*), alongside the library, collection, *LAVS* and computer-based art restorers. This positioning integrates the archive into the institution's broader system of collection and knowledge production, where it functions not merely as a repository of materials but as an active site for research, interpretation, and the historical legitimisation of media art. This organisational structure reflects a conceptual alignment between archiving, collecting, and knowledge production — suggesting an integrated approach to the preservation, interpretation, and dissemination of media art and related materials. Consequently, the department has effectively established a unified infrastructure that also fosters knowledge formation among conservators.

The institution currently retains an integrated database comprising paper-based archival materials, audiovisual materials, and information regarding restoration and digitisation activities of time-based media. This system has been demonstrated to have a number of advantages. Firstly, it has been shown to streamline the work of conservators by centralising access to data relevant to preservation. Secondly, it has been demonstrated to enhance the possibilities for researchers, thereby facilitating deeper engagement with the materials. Thus, owing to its structure and its internal infrastructure, the archive is also capable of safeguarding knowledge about materially absent objects, for example, through testimonies, technical notes, drawings, and other forms of documentation.

In his essay *"Museums on the Digital Frontier,"* Friedrich Kittler highlights the critical role museums can play in the digital age by creating integrated digital collections that encompass not only the artworks themselves but also their broader cultural, historical, and technical contexts. This includes related artefacts, contextual documentation, and technical

notes essential to the creation and presentation of the works. Kittler advocates for a model reminiscent of early modern "wonder chambers" or *Wunderkammern*, where artworks, tools, and their schematics were preserved together. He argues that under contemporary technological conditions, the establishment of such comprehensive archives is not optional but necessary to prevent the loss of cultural memory (F. Kittler 1996). It may be of interest to note that the integrated archival and curatorial model which has been envisioned by Friedrich Kittler has been realised by ZKM.

A compelling example of this is the research project *Reconstructing Harald Bode*. Since 2019, Harald Bode's extensive archive — comprising numerous notes, construction plans, circuit diagrams, prototype documentation and audio materials — has been housed at ZKM. Drawing upon this archival material, company *SYNTH-WERK* Munich, ZKM, and the HfM | Karlsruhe University of Music collaboratively undertook the reconstruction of Bode's final completed instrument, the *Barberpole Phaser*, an effects device of which only three original units were ever produced. This reconstruction not only preserves a significant piece of electronic music history but also makes the instrument which was lost accessible to a broader public, enabling its use by artists and musicians worldwide — thus demonstrating the potential of the archive to preserve and reactivate knowledge of technological components as both historical artefacts and living tools for contemporary artistic practice. This project not only involved the technical reconstruction of Bode's pioneering electronic instruments but also integrated archival research, historical documentation, and curatorial interpretation. It exemplifies how ZKM brings together artistic production, technological heritage, and scholarly inquiry — demonstrating the institution's commitment to preserving both the material and conceptual dimensions of media art history within a unified framework.

In contradistinction to administrative archives, where records typically conform to formalised structures such as file plans, cultural archives often receive materials lacking any systematic or consistent order. This is especially evident in the case of personal papers, artists' archives, and private collections, which frequently embody the creator's idiosyncratic logic of organisation. At ZKM, the archival objective is not to impose an external or artificial structure but rather to reconstruct or document the original arrangement wherever possible. These original organisational systems are recognised as valuable sources for cultural-historical research, offering critical insight into the working methods, conceptual frameworks, and mentalities of the archive's creator. Within cultural archives, the distinctions between museum objects, library materials, and archival records are often blurred. Nonetheless, the archival principle of provenance — preserving materials according to their source — remains a guiding standard. This principle contrasts with the pertinence principle, which organises materials thematically and is largely avoided in ZKM archival practice (Mittelberger 2024).

For example, in the case of the Harald Bode archive, the material is organised according to the name of the archive's originator, thereby adhering to the archival principle of provenance. The archive's original internal structure is preserved through the assignment of object numbers and the documentation of any existing categorical systems previously used by the archive's creator. This organisational logic is further extended in a dedicated database, which facilitates access to the content of each item. Objects within the archive are cross-referenced with other materials based on shared references to individuals or places, enabling a relational understanding of the archival network. Navigation is further supported through a comprehensive tagging system, which enhances the discoverability of connections across the archive and reflects the ZKM's commitment to non-linear, user-driven engagement with archival materials.

This approach is not only a result of the ZKM archive having been established in the wake of the *archival turn* — a period during which critical archival theory challenged traditional notions of archival authority, linear temporality, and categorisation — but is also closely linked to the theoretical work of Siegfried Zielinski. By coincidence, at the time of the archive's formation at ZKM, Zielinski held the position of Rector at the Karlsruhe University of Arts and Design (germ. Staatliche Hochschule für Gestaltung Karlsruhe), which is co-located with the ZKM. His long-standing intellectual affiliation with ZKM, dating back to its inception, is reflected in his participation in numerous projects, including collaborations with Peter Weibel such as the 2015 exhibition *Allah's Automata: Artifacts of the Arab-Islamic Renaissance (800–1200)*.

Zielinski was instrumental in shaping the conceptual underpinnings of the ZKM archive through his formulation of the *An-Archive*, a theoretical model that emerged as part of the broader archival turn. Unlike traditional archives, the An-Archive resists closure, linearity, and totalisation, instead promoting multiplicity, fragmentation, multilinearity and speculative engagement with cultural memory. Zielinski specifically articulated this model in relation to ZKM in his contribution to the 2013 publication *Digital Art Conservation*, — *An (An-)Archive. The Abolition of the Present and the Archive of the Future* (Zielinski 2013). In the following definition, Zelinski sets out his conception of an *An-Archive*.

"In the wake of Derrida and Foucault it has been frequently emphasized that archeío(n) refers to the space, the official seat of the government as well as to its administrative buildings. By placing the prefix an in front of this construct, with its will to order and claim to leadership, we semantically unhinge the latter. The result resembles the simple opposition between collection (Sammlung) and cluster (Ansammlung). However, the prefix does not — as in German — serve to indicate a prior state; rather, as in Greek, it implies a counterdraft. It gestures toward liberating the archive from the most important institutional entanglements history has imposed in it. Anarchy — proclaimed the anarchopacifist and philosophical writer Gustav Landauer (1870–1919) — is the liberation of man from the idols of the state, of the church, and of capital. The way I view the arts, there is no reason for them to worship any of these idols, let alone all three." (Zielinski and Winthrop-Young 2015)

Figure 3.4. *Peter Weibel in His Office*. Foto: Thomas Meyer/OSTKREUZ/ZKM | Zentrum für Kunst und Medien Karlsruhe

Zielinski posited that Peter Weibel's office at ZKM constituted an exemplary manifestation of an An-Archive. He writes: "The extremely "individual methodology" with which Szeemann invented, developed, and arranged his exhibitions and artistic objects, has been dissolved into the general and universal order of a hygienically organized, representative cultural research archive. In even more extreme fashion than Szeemann, Peter Weibel switches between theoretical and artistic production, the organisation of museums and research undertakings, installations, and books. This opaque material chaos is, under his own supervision, currently being transferred into neatly labelled transparent containers, gigantic file folders, and digital storage systems" (Zielinski and Winthrop-Young 2015, 116–17). For Zielinski, a central aspect of the *An-Archive* lies in its departure from rigid systems of search and retrieval in favour of enabling *discovery*. As he notes, "In view of the hegemony of overflowing material, I am relying on the idea of successful discovery as an alternative to searching in vain." (Zielinski 2013, 99) This reflects a fundamental shift from archives conceived as systems of control and classification toward ones that privilege *serendipity, intuition, and openness*. For such discovery to occur, Zielinski argues, it must be accompanied by the creation of "a substantial degree of freedom" (Zielinski 2013, 99).

Crucially, for Zielinski, the *An-Archive* is not primarily concerned with preserving the past in the traditional sense, nor does it function as a site for fetishising historical remnants. Rather, it serves as a medium of the present — a dynamic framework through which the present is interpreted, contextualised, and actualised (Zielinski 2013, 91–97). The *An-Archive*, in this sense, is a tool for critical reflection on the now, enabling contemporary engagements with historical material that foreground relevance, resonance, and transformation over static preservation. At ZKM, this conception is materialised through a wide range of projects that activate the archive in the public sphere — whether through workshops conducted at the Karlsruhe University of Arts and Design (HfG), thematic exhibitions, symposia, or even the podcast initiatives. These activities position the archive not as an inert repository but as a living, discursive space that contributes to the ongoing negotiation of cultural memory and contemporary meaning-making.

3.4. Second Original: A Media Archaeological Approach to Media Art Preservation

As demonstrated above, ZKM has cultivated a distinctive and contemporarily relevant institutional approach to media art — one in which the institution plays an active role in the historicization of the medium. Aligned with this commitment, ZKM has also formulated a specialised strategy for the restoration of media artworks, particularly those that are computer-based. This strategy foregrounds the importance of historical authenticity and fidelity in the artworks' re-presentation, treating restoration not solely as a technical intervention but as an inherently curatorial and historiographic practice. Informed by the tenets of media archaeology, this approach aims to retrieve and resituate technological artefacts within the cultural, aesthetic, and technological contexts from which they originated. The following chapter delves into the evolution of this methodology and articulates its theoretical and practical dimensions.

3.4.1. What is Media Archaeology?

Media archaeology started taking shape as a distinct field in the late 20th century, particularly influenced by German media theory, and became more widely established in the 2000s. Media archaeology, though its intellectual roots can be traced back further. The seminal works of Walter Benjamin, Marshall McLuhan and Friedrich Kittler constituted the foundational influences on the subject, with their explorations of the cultural and perceptual impacts of media technologies, in addition to the material conditions that shape media, being of relevance. The field began to take more formal shape in the 1980s and 1990s, especially in Germany. Friedrich Kittler occupied a significant position in this evolution. His seminal work, published in 1986 is widely regarded as a foundational text in the field of media archaeology. Kittler's work emphasised the technical and material aspects of media, thereby challenging more content-focused approaches. During the 2000s, media archaeology gained wider international recognition, particularly through the work of scholars such as Erkki Huhtamo, Jussi Parikka, and Siegfried Zielinski. These scholars have been instrumental in shaping the field through their exploration of forgotten, obsolete, or overlooked media technologies and practises. Jussi Parikka's book *What is Media Archaeology?* is a significant moment in the development of the discipline, with the publication of this seminal work establishing it as a foundational text and a point of reference for future research in the field.

Media archaeology is a field that draws on critical theory and media theory. Central to this approach is Michel Foucault's concept of *archaeology*, which can be defined as a method of uncovering the conditions of existence for discourses. The utilisation of archaeological analysis was first employed in Foucault's 1960s works, notably *History of Madness*, *Birth of the Clinic*, and *Order of Things*. This approach was subsequently formalised in *The Archaeology of Knowledge* (Foucault 2012). Foucault's seminal work was to emphasise archaeology as a methodology for excavating conditions of existence. In this context, archaeology is defined as the process of examining the underlying factors that contributed to the emergence and perpetuation of a particular object, statement, discourse, or use habit within a specific cultural context (Parikka 2012, 6). Media archaeologists apply this by treating media apparatuses themselves as archaeological strata. Friedrich Kittler's work is a prime example of this shift, as he argued for the necessity of analysing media technologies as if they were texts, with the objective of understanding the way hardware influences cultural possibilities. Parikka observes that "Kittler wanted to look at technical media in the way Foucault was reading archives of books and written documents." (Parikka 2012, 6). In practice, this approach entails the examination of the technical and material determinants of media, including signal formats, algorithms, and institutional frameworks, rather than solely focusing on their content.

A significant approach that has also been adopted is Foucault's conceptualisation of historiography as non-linear, as well as his concept of "geneology". Much media-archaeologically orientated research is concerned with constructing counter-histories that challenge dominant narratives of media evolution. Rather than tracing linear progressions, this approach seeks alternative frameworks to understand how our present digital media culture has emerged. Consequently, a significant body of research has resulted in the formulation of counter-histories that challenge the conventional media history narrative. These studies explore alternative theoretical frameworks to comprehend the evolution of our current digital media landscape (Parikka 2012, 6). In this respect, media archaeology shares a fundamental objective with Foucault's archaeological method: excavations into the past are not simply acts of historical recovery but critical operations aimed at

elaborating and problematising the present situation. Accordingly, one might posit that one of the primary objectives of media archaeology is that of producing what might be termed a "History of the Present" (Parikka 2012. 10).

One significant concept that is pertinent to this notion is that of 'variantology', as proposed by Siegfried Zielinski in his work *Deep Time of the Media*. *Variantology*, as defined by Zielinski, is the archaeology of potentially different knowledge orders. The proposed approach involves the delineation of "deep time" genealogies of media, extending far beyond the conventional 19th- or 20th-century timelines of film, radio, or television. It encompasses the examination of archaic, enigmatic, or speculative media practises from diverse cultural contexts (Zielinski 2006, 7). Zielinski's concept of media archaeology investigates the "deep time" of media, encompassing diverse modes of perception, and offers an alternative temporality that disrupts the dominant linear conception of history. This conventional linearity, which frames time as a progressive trajectory towards improvement, reduces the past to a mere "lost present". "Zielinski promotes a more paleontological time for media: a time of development that 'does not follow a divine plan', and he insists that 'the history of the media is not the product of predictable and necessary advance from primitive to the complex apparatus' (Zielinski 2006, 7)" (Parikka 2012, 12)

A fundamental distinction between deep time and conventional history is its non-linear nature. Conventional media histories are characterised by an assumption of continuous progress, frequently measured as a transition from simplicity to complexity or from the past to the present. However, Zielinski (drawing upon geological analogies) contends that such metaphors are misleading. For instance, the author employs James Hutton's notion of geological "deep time" and Stephen Jay Gould's paleontological perspective to demonstrate that true history is characterised by punctuated and cyclical patterns, rather than a linear progression (Zielinski 2006, 5). Media archaeology is predicated on the rejection of the notion of continuous progress. It frequently explores dead ends, unsuccessful inventions and forgotten media to interrogate the prevailing narratives of innovation. In essence, Zielinski's Deep Time unveils "neglected constellations" (Zielinski 2006, x) of media innovation — that is, episodes and figures that have been disregarded by conventional historical narratives. The notion of media archaeology is predicated on a rejection of presentism in media studies, and a concomitant resistance to the privileging of the 'new' in favour of a more nuanced understanding of the ways in which past technologies continue to influence the present. "Thinking cyclically has been one media-archaeological strategy for critiquing the hegemony of the new." (Parikka 2012, 11), writes Parikka. As Zielinski argues, the contemporary capitalist era is characterised by a compulsive drive toward constant innovation, a condition he refers to as '*psychopathia medialis'* (Zielinski 2010). In response to this pathological fixation on newness, Zielinski advocates for *variantology* — a methodological approach that emphasises the heterogeneity of media forms and artistic practises to resist homogenisation and explore alternative trajectories in media history (Parikka 2012, 11–12).

In summary, the theoretical foundations of this concept integrate Foucault's critical analysis with German media theory and even McLuhanian insights, all of which are aligned in their focus on the material foundations of media (Parikka 2012, 63). Media archaeology is an approach that foregrounds the material and technical infrastructures of media technologies, contrasting with analyses focused on content or symbolism. Parrika asserts that a fundamental objective of media archaeology is to investigate the material and hardware characteristics of media technologies, or, as they are also known, 'hardware matters'. He writes: "Emphasizing hardware matters in the midst of the increasing invisibility of consumer objects in digital culture is an important political task for media-

archaeological research" (Parikka 2012, 64). It is evident that the significance of media hardware can be perceived from multiple perspectives, including but not limited to design, aesthetics, politics and critical cultural studies (Parikka 2012, 65). The formation of this 'media materialism' (Parikka 2012, 84) was significantly influenced by the work of Friedrich Kittler and especially his work *Gramophone, Film, Typewriter*. Friedrich Kittler is renowned for encapsulating this perspective in the following statement: "Media determine our situation" (F. A. Kittler 1999). In summary, Kittler's materialist thesis posits that technical media possess their own agency and must be analysed according to their own terms — by examining circuits, devices, and data as opposed to solely cultural texts.

The materialist orientation of media archaeology shares significant conceptual ground with the principles of new materialism. Jussi Parikka explicitly acknowledges this convergence (Parikka 2012, 84), particularly its emphasis on the agency of material objects. Importantly, the integration of new materialist perspectives into media archaeology has facilitated a critical departure from the technological determinism often associated with Friedrich Kittler's work. This theoretical realignment has enabled more expansive and nuanced engagements with media ecologies, as demonstrated in Parikka's *A Geology of Media* (2015), which exemplifies the productive intersections between media archaeology, environmental humanities, and new materialist thought.

3.4.2. What is the "Second Original"?

The theoretical framework of media archaeology has had a considerable impact on the development of emerging approaches to the restoration and conservation of media art. In this context, the PAMAL (Preservation & Art — Media Archaeology Lab) group has played an important role, particularly through its involvement with media art conservation initiatives at the ZKM. By emphasising the material, historical, and operational dimensions of obsolete technologies, PAMAL advances a media-archaeological methodology that rethinks restoration as an act of cultural and technical reactivation rather than mere repair. The PAMAL (Preservation & Art — Media Archaeology Lab) is a research group and laboratory based at the École Supérieure d'Art d'Avignon in France. It is directed by Emmanuel Guez, and it offers a distinctive contribution to media archaeology by blending artistic practice, media theory, and the conservation of digital and media art. PAMAL Lab is a European artistic group composed of artists, media theorists, conservator-restorers and engineers, and it creates its own artworks based on disappeared or severely damaged digital artworks. Morgan Stricot is currently part of this group, along with the other members[50].

PAMAL's methodology is rooted in the concept of "retro-engineering," a process entailing the analysis and reconstruction of historical digital artworks within their original hardware and software environments. The objective of this practice is to identify alternative narratives and latent functionalities that are embedded within outdated technologies. By undertaking this initiative, PAMAL not only ensures the preservation of the technical intricacies of digital art but also embarks on an exploration of the cultural and historical dimensions underpinning the evolution of media. PAMAL adopts a hands-on, materialist approach, emphasising the importance of directly engaging with obsolete technologies and digital art. They regard the creation of media machines not merely as technical fabrication

[50] The group's current geographical distribution encompasses Avignon, Orléans and Paris in France, Vienna in Austria, and Karlsruhe in Germany. The group is comprised of the following members: Stéphane Bizet, Lionel Broye, Armandine Chasle, Emmanuel Guez, and Morgane Stricot.

but as a creative and epistemological act in its own right — an act that warrants critical analysis and preservation within the framework of media archaeology. They "show interface artists their contradictions. These artists think they are creating by using readymade software, whereas the true creators are those who have created the software, the operating system and the microprocessor" (Emmanuel Guez n.d.). Rather than focusing solely on historical narratives, PAMAL employs a multifaceted approach that involves the reconstruction or reactivation of both old media devices and digital artworks. This enables the exploration of their technical, cultural, and political significance.

Drawing on Michel Foucault's archaeological method and German media theory, PAMAL (Preservation & Art — Media Archaeology Lab) conceptualises media as cultural techniques — practises that organise knowledge, perception, and experience. In this framework, media technologies are not simply passive tools but function as epistemic agents that actively participate in encoding reality, mediating its transmission, and shaping its memory. As Emmanuel Guez articulates in PAMAL's *Mediarchaeologist Manifesto*, "media theorists generally assume that media are defined by their effects — first of all, effects on the sensorium, or the hierarchy of senses… mediarchaeologists assume the same thing but with a nuance: the effects on the sensorium (and on language) come from media devices" (Emmanuel Guez n.d.). This perspective reflects PAMAL's underlying conviction that "our media are our [human] milieu: our most inner self as much as our environment," (Emmanuel Guez n.d.) underscoring the ontological entanglement between media and subjectivity.

While scholars such as Friedrich Kittler emphasise the primacy of technical media and machine temporality in shaping cultural and epistemic conditions, the PAMAL group advances a more humanistic and aesthetically orientated approach to media archaeology. Although they maintain a commitment to the field's foundational interest in technological materiality and non-linear historical analysis, PAMAL extends this framework to encompass the preservation of media art, positioning conservation itself as a critical and creative act within the broader discourse of media archaeology. This positions PAMAL within a post-Kittlerian strand of media archaeology, one that incorporates art theory, curatorial praxis, and philosophy.

Nevertheless, the PAMAL group perceives its function not solely as archaeological and aesthetic but also as predominantly political. The PAMAL group articulates a media-archaeological practice that critically intervenes in dominant narratives of technological progress and obsolescence. In their *Mediarchaeologist Manifesto*, they advocate for a future-orientated engagement with the past — one that curates historical media technologies not as relics but as active tools for understanding and challenging contemporary digital culture. By foregrounding the materiality and epistemic value of obsolete machines, PAMAL resists the ideology of constant innovation and the logic of precalculated obsolescence. Their approach, rooted in *low-tech sensibilities*, values openness, modularity, and critical reuse over the proprietary and closed nature of contemporary digital devices. Central to their methodology is the recognition of the microprocessor as a foundational element — a "concrete base" upon which symbolic systems are built — around which their recursive and critical media practice revolves. Through such interventions, PAMAL not only preserves but reactivates media history as a means of critique and creative speculation (Emmanuel Guez n.d.). "Oui, mediarchaeologists, dig into media's deep time to bring forth alternatives to the misguided wanderings of our era — whose generic name is : Capitalism" (Emmanuel Guez n.d.).

The PAMAL group's theoretical underpinnings have given rise to an innovative concept in the domain of media art conservation, termed *second original*, which has been developed

within the confines of their ideological framework. The *second original* refers to a critically informed duplication of a lost or nonfunctional computer-based artwork, created for archival and conservation purposes. It aims to approximate as closely as possible the original material conditions of production — including hardware, software, and user interaction — thereby preserving not only the aesthetic and functional aspects of the work but also its historical and technological context (Guez et al. 2017, 2). The second original is not a mere replica but rather a critical continuation. This form of media-archaeological conservation aims to preserve historical media art by acknowledging its temporal, material, and conceptual conditions while also adapting it in a creative manner for contemporary and future access.

The concept of the *second original* was first introduced by the PAMAL group during exhibitions held in France between 2015 and 2016. On this occasion, the public was presented with a reconstruction of Eduardo Kac's *Videotext Poems*, which served as the inaugural realisation of the *second original* principle. This reconstruction exemplified a media-archaeological approach to digital art conservation, aiming to approximate the original material, functional, and experiential conditions of the work rather than merely replicating it. Eduardo Kac's *Videotext poems*, created in the early 1980s, are pioneering examples of interactive telematic art using now-obsolete *Videotext* networks and were lost precisely because of the loss of the network. The Videotexto system was established in São Paulo in 1982 and remained operational until the mid-1990s. A preliminary investigation suggests that the technology utilised by the terminals in question bears a striking resemblance to that of the French *Minitel*. As public *Videotexto* terminals have disappeared from Brazil, it was not possible for PAMAL to restore Kac's *Videotext poems* using a Brazilian model. In collaboration with the artist, the decision was made to reconstruct the work on a French *Minitel* terminal from the same period. This choice was guided by the aim of re-creating an experience that closely approximates the original media ecosystem, taking into account the historical, technical, and aesthetic conditions under which the artwork was first encountered.

Videotext Poems were the animations, constructed through the choreographed movement of geometric forms that formed letters and words in the *Minitel* system's eight default colours, unfolded in a left-to-right scanning motion characteristic of the *Minitel*'s grid-based display architecture. These works explored the poetic and communicative potential of networked systems before the rise of the Internet, allowing users to navigate and interact with poetic content in real time. As the original technological infrastructure became inaccessible, the PAMAL group (Preservation & Art — Media Archaeology Lab) engaged with Kac's work through the media-archaeological concept of the *second original*. PAMAL's objective was to restore the experiential and aesthetic encounter of viewing Eduardo Kac's *Minitel poems* on an original Minitel terminal, including the specific visual constraints and interaction logic inherent to the technology. The project was conceived as a media-archaeological reconstruction, structured around the layered materiality of the work. This included both the surface-level components — such as the terminal's display and physical interface — and deeper technological strata, including low-level programming languages and the audio signals that facilitated communication between the Minitel device and its servers. By methodically analysing and reconstructing the system layer by layer, the team was able to reassemble the *Minitel poems* in a manner faithful to their original operational and experiential conditions (Guez et al. 2017, 10).

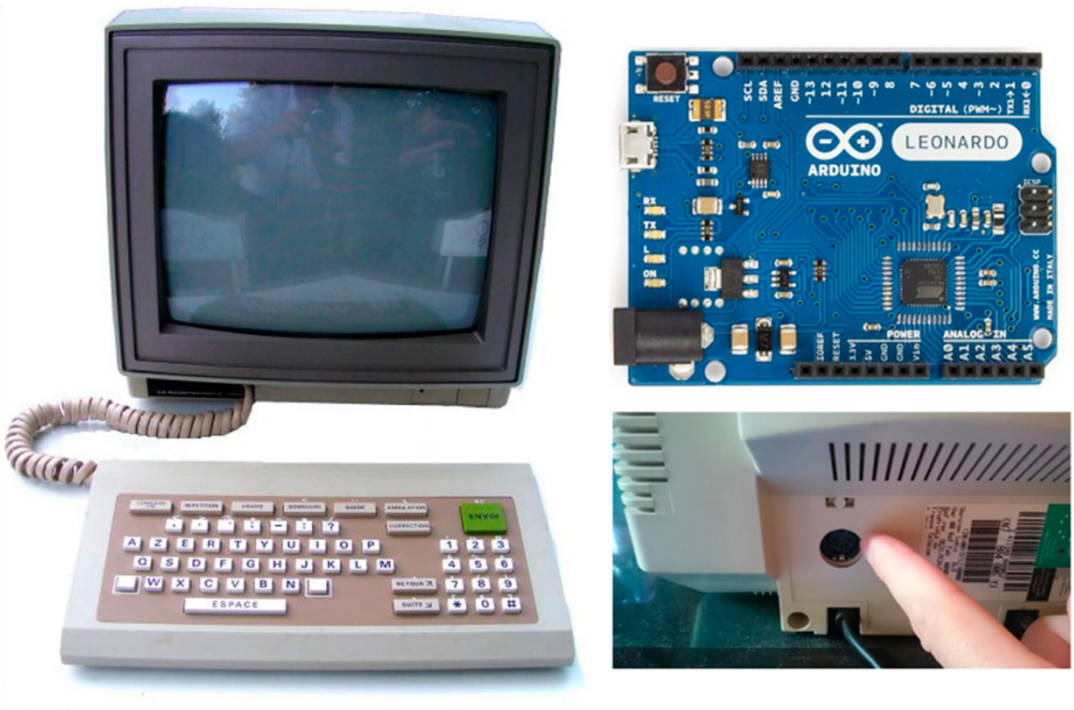

Figure 3.5. *System used in the second original:* colour Minitel 1, its serial port DIN and its Arduino card. © PAMAL. Emmanuel Guez et al., 'The Afterlives of Network-Based Artworks', Journal of the Institute of Conservation 40, no. 2 (4 May 2017): 105–20, https://doi.org/10.1080/19455224.2017.1320299.

Rather than attempting a literal restoration, PAMAL produced a critical and historically informed reconstruction that approximates the original experience, aesthetics, and function of the *Minitel* system. This process exemplifies their philosophy of preservation, which treats conservation as a creative act grounded in technological materiality, user experience, and historical context. The *second original* thus enables the continuation of lost or obsolete digital artworks while critically interrogating the conditions of their production and reception. This reconstruction illustrates how media archaeology can challenge technological determinism and restore alternative narratives of media history. Hence "experimental media archaeology allows a new audience to re-appropriate such knowledge [about Mintel] and in this sense, although the *Minitel* is a dead medium, creating the 'second original' has made it into a sort of 'zombie' medium, giving an archival life, or afterlife, to Kac's Poems" (Guez et al. 2017, 14).

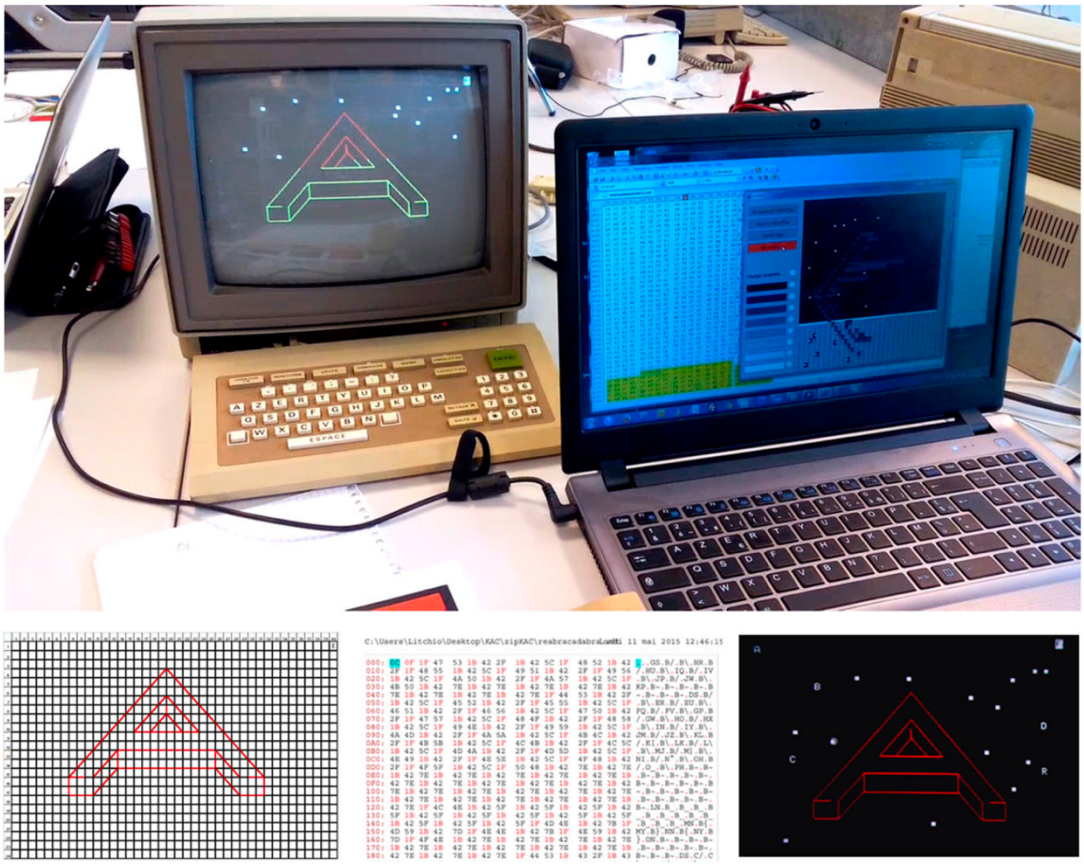

Figure 3.6. *Method for re-transcribing a frame:* manually re-transcribing the image, translating the image in a hexadecimal code, transmitting it to the Minitel, displaying the frame. © PAMAL. Emmanuel Guez et al., 'The Afterlives of Network-Based Artworks', Journal of the Institute of Conservation 40, no. 2 (4 May 2017): 105–20, https://doi.org/10.1080/19455224.2017.1320299.

Another significant effect of media archaeology is the rethinking of the traditional concept of authenticity. This rethinking involves a critique of the fetishism of authenticity that is inherent in many institutions, including contemporary art museums. The concept of authenticity is critically redefined through the media-archaeological notion of the *second original*, as developed by the PAMAL group. Traditional conservation practises often equate authenticity with the preservation of an artwork's original materials or technical components. However, the *second original* challenges this essentialist view by proposing that authenticity lies not in static material fidelity but in the reconstruction of the aesthetic, functional, and experiential dimensions of a work within its historical and technological context. By acknowledging the inevitable obsolescence of digital media and the instability of technological formats, the second original treats authenticity as a dynamic and interpretive process. It seeks to preserve the epistemic and performative essence of a digital artwork, rather than fixating on an idealised or inaccessible original state. This approach aligns with media archaeology's emphasis on technological materiality, user interaction, and cultural techniques and offers a critical alternative to both fetishist restoration and reductive emulation.

3.4.3. “Second Original” at ZKM

The practice of media archaeology aligns closely with the institutional and intellectual ethos of the ZKM, particularly due to its critical orientation and its deep affinities with German media theory. Moreover, media archaeology shares deep intellectual ties with German media theory, particularly through the work of Siegfried Zielinski, who has developed much of his theoretical output in close association with the ZKM. Zielinski’s exploration of variantologies and deep time has significantly shaped both the conceptual and practical engagements with media at the institution.

The ZKM has long articulated a nuanced understanding of media’s materiality, anticipating key concerns later taken up in media-archaeological and preservation practises. This is particularly evident in the work of PAMAL, whose approach aligns closely with that of ZKM. As Emmanuel Guez and collaborators note: “At PAMAL we thus recognise the need to preserve internet art by preserving the widest sense of the means of its production (‘writing’) including the means of its execution and decoding/reading. This approach is in line with that taken by others, including ZKM in Germany. and suggests that we need to not only preserve the writing devices with which the artwork was made, but those on which it needs to be read.” (Guez et al. 2017, 8) A detailed account of this shared approach can be found in Bernard Serexhe’s edited volume, *Digital Art Conservation* (Serexhe 2013), (of which Siegfried Zielinski’s and Jussi Parikka’s contributions were already a part), which outlines ZKM’s pioneering strategies for preserving the material and experiential integrity of digital artworks.

The arrival of Morgane Stricot and Matthieu Vlaminck at the institution marked a significant and intentional shift toward a media-archaeological approach to conservation, rather than an incidental development. With their expertise, this methodological orientation began to be actively implemented in the preservation of digital and media artworks. Importantly, this approach not only informed the treatment of existing works in the collection but also laid the foundation for a generalised conservation workflow, developed by Stricot, that could be applied across both legacy and newly acquired works. A key tenet of this workflow asserts that conservation must begin the moment a work enters the collection. As Stricot aptly states, “The answer to the question when we should act is simple: when everything is going well.” (Morgane Stricot 2013) This philosophy reflects the influence of media archaeology — particularly as practised by the PAMAL group — with its emphasis on technological materiality, historical awareness, and critical attention to the risks posed by proprietary software, market-driven obsolescence, and the erasure of hardware-specific knowledge. Such an approach foregrounds the need to preserve not only the digital files but also the technical ecosystems and infrastructural conditions that underpin media artworks.

At the core of this conservation methodology lies the principle of continuous monitoring and proactive intervention. Regular inspections and sustained technological vigilance are essential to assess the condition of the artwork and to implement timely actions — such as updating or encapsulating — whenever software or hardware components approach obsolescence. To preserve the behaviour and aesthetic integrity of a digital or media artwork as closely as possible to its original form, technological transitions must be kept minimal. Significant temporal gaps or periods of inaction pose a serious risk to authenticity, as they often lead to technological discontinuities. In such cases, incompatibilities between past and present technological ecosystems may compel conservators to emulate the artwork’s behaviour using contemporary technologies, rather than executing a true migration or reconstruction (Stricot, Vlaminck, and Heiss 2022, 190).

While updating processes are often necessary to ensure the continued functionality of media artworks, they frequently introduce subtle — yet consequential — alterations in the behaviour and aesthetic presentation of the works. Although such changes may be technically manageable, this strategy tends to overlook the historical and chronological specificity of media, thereby detaching the artwork from its original media-technical context. As a result, newer generations of artists and audiences are deprived of a direct engagement with the technological landscapes that shaped earlier media practises (Stricot, Vlaminck, and Heiss 2022, 192). Emmanuel Guez critiques these preservation approaches for prioritising the source code at the expense of the original code/material relationship. In his view, such practises risk effacing the material specificity of the medium, effectively erasing the embedded technical and cultural histories that the artwork originally inhabited (Guez 2019, 70).

With the arrival of Morgane Stricot at the institution, the practice of the *second original* was formally introduced, particularly as a strategy for addressing works that had become technologically obsolete or functionally lost. Her contribution marked a significant moment in institutional conservation practises, embedding media-archaeological principles into workflows aimed at reconstructing not only the content but also the original material, technical, and experiential conditions of such works. The ZKM has adopted the concept of the second original as a complementary conservation strategy, particularly for digital and media artworks that have become inaccessible or technologically obsolete within its collection. This approach is implemented in conjunction with other preventive and proactive measures (Stricot, Vlaminck, and Heiss 2022, 195). During their tenure at the institution, Morgane Stricot and Matthieu Vlaminck undertook the reconstruction of several historically significant yet technologically lost media artworks, applying media-archaeological principles to produce exact technological replicas. Among these are *Yuppie Ghetto with Watchdog*, *White Devil*, and *Border Patrol* by Paul Garrin and David Rokeby (1989–1995), *Wipe Cycle* by Ira Schneider and Frank Gillette (1969), *Track/Trace* by Frank Gillette (1972), and *Virtual Sculptures* by Jeffrey Shaw (1981). These reconstructions exemplify the practice of the *second original*, aiming not only to restore the functional and aesthetic dimensions of the works but also to preserve their original technical ecosystems.

The focus of this discourse will be an examination of the work of Jeffry Show as an exemplar of media archaeological reconstruction, with the aim of providing a more thorough analysis. Due to the theoretical under-representation of early computer-based and analogue video artworks in museum collections, many pioneering artists have recently sought to preserve their contributions by donating significant pieces to institutions. This was the case with Jeffrey Shaw, a key figure in digital media art and founding director of ZKM, who in 2018 donated five of his early milestone works, including the groundbreaking *Virtual Sculptures* (1981). This augmented reality installation, which merged the Pepper's Ghost illusion technique with early computer graphics and interactive design, had not survived in its original form. In response, ZKM initiated a media-archaeological reconstruction of the work, aiming not simply to replicate its surface aesthetics but to preserve its full technological and experiential ecosystem.

The reconstruction process was rigorous and multilayered, beginning with the acquisition and repair of an Apple II+ computer, one of the earliest mass-produced personal computers. Given the lack of surviving source code or documentation from the original installation, the team sourced the original subLOGIC A2-3D1 animation library — an obscure 3D graphics toolkit — through archival platforms such as archive.org. Using this library required advanced knowledge of space mathematics and programming in assembly

language. The manual for the software, consisting of 92 pages of mathematical routines, had to be studied thoroughly to recreate the original low-resolution wireframe graphics. Hardware restoration included salvaging functional parts from multiple vintage Apple II units to repair one fully operational machine. The team also sourced original Apple II game paddles to replicate the physical interaction of the piece and opted to use either original floppy disc drives or modern floppy emulators to run the reconstructed software reliably (Stricot, Vlaminck, and Heiss 2022, 224–29).

This media-archaeological project is exemplary of the ZKM's commitment to preservation strategies that go beyond mere documentation or software emulation. It emphasizes historical fidelity through meticulous reconstruction of obsolete technological environments, hardware-software interdependence, and user interaction. In the early 1980s, creating a simple 3D cube required artists to engage deeply with the machine — programming in assembly language and using specialised libraries like subLOGIC A2-3D1 on computers like the Apple II. This contrasted sharply with today's tools like Unity, where generating a 3D cube is as simple as clicking a button[51]. The reconstruction of early digital artworks, such as Jeffrey Shaw's *Virtual Sculptures*, highlights this shift and emphasises the importance of preserving not just the visual outcome but the technical and conceptual processes behind it. By recreating works in their original technological context, media archaeologists reveal how past constraints shaped creativity and underscore the need to preserve the material and epistemic conditions of early digital art. The *Virtual Sculptures* project thus reflects a broader shift in digital art conservation — prioritising technological materiality, and the integrity of the original artistic context. It also contributes to growing efforts to document the legacy of early computer art, including the works of contemporaries like Chris Marker, and builds a bridge between historical media practices and contemporary curatorial methodologies.

[51] The following text contains quotations from an interview conducted on 24 January 2024 with Morgan Stricot and Matthieu Vlaminck.

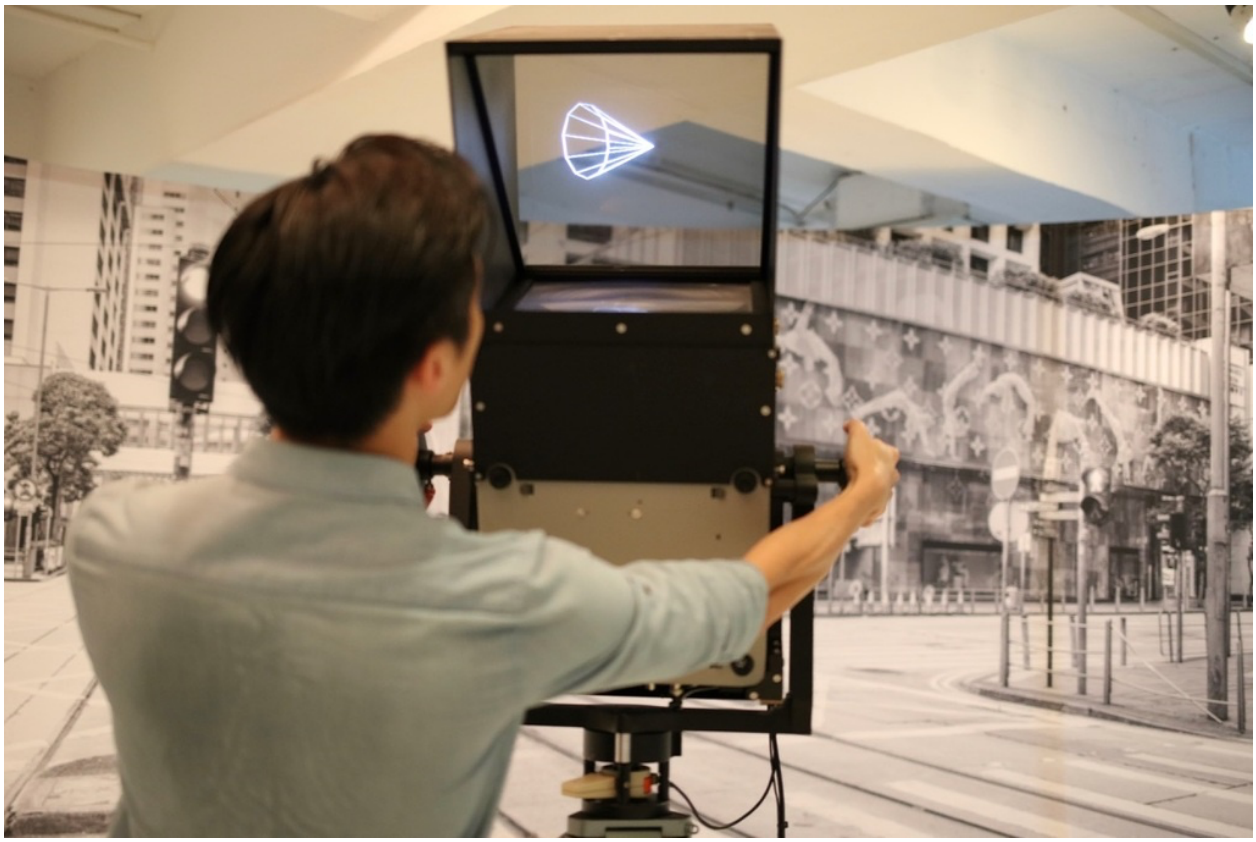

Figure 3.7. Jeffrey Shaw, Theo Botschuijver, *Virtual Sculpture*, 1981, 200 x 60 x 60 cm © Jeffrey Shaw, Theo Botschuijver / © Jeffrey Shaw, Theo Botschuijver

However, a notable limitation of the media archaeological approach lies in its significant demands on time, technical expertise, and financial resources. This presents a challenge for institutions — particularly media art centres and museums — that manage and exhibit a large number of technologically complex works each year. Reconstructing artworks layer by layer, using original hardware and obsolete software, often requires interdisciplinary teams and extended timelines, making this approach difficult to scale across large collections. Despite its value in preserving authenticity and historical specificity, the method's intensity limits its practical implementation in many institutional contexts.

Consequently, at ZKM, the media archaeological approach is reserved for works of historical and technical significance, rather than being applied universally. Conservators must navigate a careful balance between media archaeology and a more pragmatic, functional approach to preservation. The institution's primary mission is to maintain the memory of a work through its ongoing exhibition. Therefore, historical authenticity is often prioritised, but not at the expense of a work's visibility. If a piece remains functional, has undergone technological migration, and lacks critical historical significance — and if the artist agrees — conservators may choose to exhibit the migrated version rather than forgo presentation altogether due to the absence of a fully authentic media archaeological reconstruction. Morgan Stricot redefines the role of the conservator not as one focused solely on *preservation*, but on *perpetuation*[52] — a more dynamic and long-term

[52] The following text contains quotations from an interview conducted on 24 January 2024 with Morgan Stricot and Matthieu Vlaminck.

engagement with the life of an artwork. She acknowledges that this shift can be frustrating for artists and curators who are eager to exhibit works and embed them into social memory and art history. However, by deliberately slowing down the process to ensure thoughtful, historically grounded interventions, the conservation team at ZKM emphasises the importance of methodological rigor. This reflective and research-oriented approach, even if occasionally at odds with curatorial timelines, is seen as essential to responsibly perpetuate media artworks within cultural memory.

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Appendix I: Interviews

Interview with Morgan Stricot and Matthieu Vlaminck

Morgan Stricot – Media conservator and head of digital conservation ZKM

Matthieu Vlaminck – Senior digital and media conservator at ZKM.

24. January 2024

Anastasiia Bergalevich: What do you think should change in the curatorial approach to exhibiting media art, art and the way we talk about media art, building the history of media art?

Morgan Stricot: The first thing is the time frame. Usually, in the curatorial department, they think it's digital, so it's easy and fast. And the time frame is usually super short. And they think we can take an artwork out of the pool, build it up, and it works. They don't realize that we need some time to test set up, to put it in the workshop, test it, see if it's working. Even if an artwork was exhibited two years ago, we can't promise that when we set it up again, the computer is not going to fry it, or the screen is not going to die.

Matthieu Vlaminck: We had an artwork failing in the exhibition with no spare, and now I'm rebuilding it!

Morgan Stricot: So, this is always the question: You can have it working as well, but no spares or no strategy. And so, there is a super high risk with showing it in an exhibition. If it fails, we have no solution.

So when they are planning an exhibition, usually, they are asking ahead six to one year before which kind of artwork they want to show so we can set up, see if it's working, see if we have a solution for the future perpetuation.

Matthieu Vlaminck: Six months to one year, you said six to one year.

Morgan Stricot: Yeah, six months to one year. Six years would be perfect! [laughing]

Matthieu Vlaminck: [laughing] We would have time!

Morgan Stricot: But this is the kind of thing they are not thinking about. Like, right now, we have a loan of "America's finest", a Work from Lynn Hershman Leeson with an M16 rifle[53]. And I said yes to the loan, I said I'm giving you an answer January if I have it working and if I have a spare computer to loan it.

[53] America's Finest (1990–1994), Lynn Hershman Leeson, https://zkm.de/en/americas-finest-1990-1994

I said I don't feel comfortable loaning an artwork where I have only one computer, which is from the 90s, with no spares. I said if this one is breaking, I can't come to do something. There's nothing to do. So it's been two months. We are working on this, and now we have a second computer. The loaner is coming here to see the artwork understand the risks of showing artwork with legacy hardware. Because it's an IBM 486. We will talk about this with the loaner because, of course, other museums don't have the capacities to restore such computers because it's computers from the 90s. You transfer data only via floppy, so it's like a real complete difference of technology.

MV: I will do a backup this afternoon with floppies; it's going to take me a couple of hours just to copy some files.

MS: And we've been working for a couple of years to make a new version of this artwork. But, again, capacities in the museum are always super restrained because resources are super rare. So we don't have a solution now for this one. Only this spare computer – in case something wrong happens, we can switch out this computer.

MV: I have a third computer, also original, so we do have spares, but yeah, that's the original one.

MS: And it's only for the computer. If the screen inside the artwork breaks or if the camera breaks, I don't know what we will do.

MV: We have spares but not for the screen and the camera, which is, like, the most important part, actually.

MS: So this is the kind of thing people are not usually taking into account. This long time of preparation for an artwork. Then they should understand also why we need so much space, you know, to install it and test it, why we have three workshops, and now we are also going downstairs into the exhibition space.

MS: And also, to have the time for testing, like, just setting it up. Sometimes it takes one week. Making it work, it can take months. And then testing it for a long time. Because it's good if it's working for two hours, but we need to know if it's working for a month, a month in exhibition. So this is why each step of the restoration is long – because we do something. We test it for two or three weeks as a minimum. We see if it's holding well, if the computer doesn't need to restart all the time or if it's not freezing or if it's holding well during the exhibition, eight hours, five days a week, things like this.

MV: Digital art is super complicated, actually [laughing].

MS: Also, one thing that we noticed would be that they should build exhibitions around the works instead of trying to fill up the gaps with one of the digital artworks. Because usually when they have a corner which is empty, they come to us and say, This artwork, which is just a projection, can we put it there? And so our task as a conservator – and this is something maybe different from traditional art restoration, like painting restoration or sculptural restoration – is that we have a list of prerequisites for exhibition, and we are the only ones protecting them. And I would like curators to be more aware of those limitations of the exhibition space and not try to bend the artwork so it fits the space they want to fill up, but the reverse. And this is a question of respect. We will never do this for an installation, a contemporary art installation, where everything is very fixed. They know they need a room of three by four with this paint on the walls, this colour on the floor, and

this type of light. They will have a lot of respect for this. But as soon as it's digital art and projection or screen or whatever, they're like, "No, but you can adapt the projection or you can do ..." and this is the part where we need to say no. We don't want to adapt the work for you. You have to adapt to the work.

MV: There's still this mentality of digital is immaterial and it's not important.

Yeah: “it's easy”, “You just do that” – but it's not actually, it’s quite the opposite. Because the programme runs on something. You need hardware. So digital is never just the cloud stuff.

MS: So it happens that we say no for this kind of reasons, and it's also a difficult situation with curators and conservators. It's always like we are the people saying no, and actually for good reasons, but since the pedagogic between us is not set for digital art, we just have this reputation of just saying no.

We don't have always the time to educate curators. So that's why I told you about Annett. Because I know Annett Holzheid from when she made the Esch exhibition, which was part of the European Capital of Culture in 2022.

She built this exhibition, and we bought two of the artworks in this exhibition. and Annette involved us at the very beginning. So we went to Esch to see the exhibition, see the condition in what it was exhibited, contact the artist, because she had good contact with the artist. She introduced us to the artist. So everything went super smoothly because Annett was working with Peter Weibel for a long time. She worked with this kind of artworks, I think, since the beginning of her career. And so because she was educated on this, it the whole acquisition process and exhibition process is very good. Like, we now we are going to show "Captured" by Hanna Haaslahti downstairs for the AI exhibition[54]. And she involved me at the beginning. She said: "I'm planning to show this. Can we go downstairs in the exhibition space and we talk about it?”. And this is super new. Like, we are never involved. Usually, we are involved at the moment they made a decision. They decided how they want to show it, and they just ask us, can you put things together so it works? And here she came to me and said: "if we place the station here and can we put the projection there?" And I'm like, okay, you need space to go around, you need space to be able to be immersed in the work. And because we both knew the work very very much, we had this conversation that was very smooth, exchanging ideas, things like this.

But we don't always have time to educate curators. So when we have educated curators, it's really cool!

MV: And let's understand that miracle worker is not a part of our job description. [laughing]

MS: Yeah.

And she is listening, because she knows we are the keeper of the artist's wishes. Which was the role of the curator before? Like, the keeper of the work. Annette knows the artwork, the concept of the work. She knows kind of the specificities of how the artist wants to show it. But we did an interview with the artist, so we know exactly what she wants.

[54] (A)I Tell You, You Tell Me, 2024, https://zkm.de/en/exhibition/2024/05/ai-tell-you-you-tell-me

Like, she prefers, for example, that the station scanning your face is in front of the projection. So that's because, in the artwork, faces are scanned, mapped, and then put on a character on the screen behind you, and other characters start pushing your character as it appears. And to have this effect of pushing straightforward, it's super cool if the station is in front. And the projection should be as big as possible because, like this, you are really immersed in this generative film. It's a generative film with your face inside. So the immersion is really important. The way it's lit and also the light in the room, the space around it. So, yeah, she knew that because she had a good relationship with the artist. But usually, we are the only ones to know that. And this is why we made the media wiki. So when they're starting to plan an exhibition, they can go into the media wiki, look at the curatorial point that we made for them, and they can plan with the right information. If they want to change something and it's not written, or I wrote inside according to curatorial decision, because sometimes things are open for their decision, they know they can contact us and talk about those details.

So we don't have this endless conversation on email or on phone to know what are the specifics, what is the framework for an artwork. The media wiki helped a lot with the communication with the curators and the planning of exhibitions. And since this year, we are also involved at the beginning of exhibition planning. So when they have one artwork from the collection in mind, we are included already, and they can have answers quite fast.

Anastasiia Bergalevich: Yeah. That's what I noticed when I looked through the Wiki, I thought you have a lot of curatorial information in it. You make a lot of curatorial decisions yourself. For example, where the artwork should be placed or how it should be exhibited to show it in the right way. So that's what I'm also curious about: What is in your point of view the ideal scenario in terms of the responsibilities that you have, and curators have on the other hand.

MS: The reason we are taking so many decisions is usually because of budget. They can't send everybody to set up the work. If it's in ZKM, usually, I'm letting the curators take most of the decisions. I'm just checking if it's respectful of what the artist want. If it's something nobody thought about before, we just contact the artist if he or she is still alive, to take this decision together and document if it's a good decision or not. Because sometimes you have to make a bad decision and the artist is like, “yeah, for this time it's okay”.

Like Justine Emard, when she showed her work in the glass room, it was not the ideal exhibition space. But she had an emotional attachment to this space. So she said, “I am accepting for this time that we do it, but it shouldn't be the preferred environment for this work”.

MV: Sometimes we even say to the artist: “Are you sure about that?”. So we can add it in the documentation or not.

MS: Yes. Because sometimes there is also pressure, I had these cases with artists that they are so eager to be exhibited that they accept everything.
They are like, it's a chance to be exhibited, so you should say yes to everything... And I'm like, no! [laughing], we talked about this! And this is why we're doing interviews with the artists beforehand, without pressure of exhibition, so they think about what is the ideal world where they can show their work in the perfect condition. And I'm writing that down. And you can make compromises, of course.

MV: And they realised actually that their artwork entered the collection. It was not just them. They need the money to live, you know, but now it's also part of institution, so we can have the institution's back to say no.

MS If it's not the right conditions, you should say no. But they still have this reflex of, "Do whatever you want! We want to be exhibited."
And I'm sometimes saying "Here, I feel like you are going too far in the modification of your work, and we should maybe stop the process there". And it takes some time psychologically also to do that.

MV: And even with us, because when we acquire an artwork, we cannot modify it. Like, we can modify the hardware if it fails, but it has to be the same artwork exhibited.
And sometimes, the artist is like "You can just change that to for this exhibition" or like ... No! Because it's not what we acquired. The artwork needs to be like that. It's part of the collection. It's not like if you need a new version, we need to acquire a new version then. We have several versions of the same artworks in the collection. But, like, we cannot modify that. We are not allowed to do it.

MS: Because here we are in a museum where we have the duty of also kind of keeping the history of the work, so it's another process that we also have educate artists about.

MV: That's something artists and curators tend to forget because of the digital side of it. You know? "It's just a program which you can just..." No! It's like, I don't do that on a painting. I don't repaint the red and blue to fit the work or something. It's the same with digital art.

MS: But if we answer the question, what is the ideal scenario if we had unlimited money and resources, it will be that with the first setup after an acquisition, a curator, a conceptor, a technician, and the artist are involved in the setup. And all of the decisions made are written down.
But like I said, when we are setting up an artwork elsewhere, like Justine Emare in Hannover, we don't have the budget to send also a curator. So usually only the technicians are going, or only conservators, or one conservator and one technician. So we have to make those decisions without the curators. And this is why we started to have more skills, like this analysis and decision-making for the curatorial concept. When it's well prepared, the curators already planned this with the host institution or here at ZKM before we set up. But sometimes we have to make a decision on-site. Very quickly.

This is why we are doing the first three setups with the artists. So I can observe their way of thinking and write it down. And I think the next setup for Justine Emard, we can do it alone.
It's already the second time we are setting up with her. So one dismantling, one setup. And I can send her pictures. Of course, during the whole process, we will take pictures, I will send them to her, saying "do you like the way I put the things together?", and usually, I'm sending her another picture when all the decisions have been made. I will send her a picture of the work, and if she tells me it's perfect then I can say our decision making was very good.
Or she's saying, "I would have put this there or this there", and I will write down this decision making in the wiki, saying "our feeling was not the same than her, and this is what she said, and this is what we should take in account for the next time". So it's a learning process, which is different from other artworks, I think, that we are never finished with the ideal representation of the work in exhibition.

Anastasiia Bergalevich: This is more of a rhetorical question, but is it possible to exactly know what art is going to say in every situation? I feel like there's such a huge variation of the aesthetical decisions, and you don't have to predict all of them, right?

MV: That's why we have to do it multiple times.

MS: Yeah. Until we reach the almost perfect state of mind to install an artwork.

Anastasiia Bergalevich: So do I hear it correctly that most of the communication of the artist is your responsibility, not of the curator?

MS: Depends on the exhibition. Like, because we are conservators for the collection, we are mostly in contact with the artists from the collection. Because we love when they only have one "Ansprechpartner" (contact person). It's less confusing for them. It's good for building a relationship. Like I said, the relationship with the artist is the most significant part of our job. I'm thinking if the relationship with the artist is bad, nothing is going good after that.

MV: If the relationship is not working, we cannot exhibit the artwork.

MV: So sometimes we decide not to. We cannot exhibit the artwork because we don't know properly how to do it, and we cannot communicate with the artist.

MS: So for when it's an artwork from the collection, yes, we like to keep it one person communicating with them. If it's an exhibition, like the Renaissance exhibition, for example, the curators are the main contact of the artists or the loaning institutions. They know what to ask, so they ask for a technical writer; they ask for plans and for setup guidelines, and those are stored on our servers for the technicians and us but we are not working on exhibitions anymore

MV: We only help with the collections. If there's an artwork from the collection in an exhibition, then we take care of that. But if it's not, we are not involved in the exhibition.

MS: But until the point of damage, the curators are the ones talking about the concept, the room, the specification, the concepts they want to show, and the whole history and storytelling of the exhibition.

MV: Because it's for an exhibition. And it's with us because of the collection. So we're also working on artworks outside of exhibition, when the curators are not involved yet. And sometimes we just do a restoration on an artwork outside of an exhibition, so we need to be in contact with the artist. So usually, that's why it's us, the contact.

Anastasiia Bergalevich: Then another question about the infrastructure: Who else takes care of the collection?

MS: we are working super close with "Museumstechnik" (MUTECH), which is a department of 20-ish persons with all specialists, so audio visual, light, computer, setup, art handlers, logistics, movement.
What else do we have? Programmers, TV. Yeah. All the different skills. And with them, we are working very closely because it's with them that we are setting up the artworks.
We can't do it by ourselves most of the time. A lot of them we do by ourselves because it's not so big, but as soon as there's a projector, for example, I have no knowledge.
So I'm calling Claudius [Böhm] or Gisbert [Laaber] and they are doing the projector science for us.
So these are the teams that are working together. And this is something we work on, but

we want to have more porosity with the curators. But the fact that we are in two different buildings is already not helping.

Part of MUTECH (Museums- und Ausstellungstechnik | Museum and Exhibition Technical Services) is here with Wissen, and the curators are on complete oversight. And the "Museumsdienst", so the people taking care of the exhibition on a daily basis, are also with them on the curatorial side, but, again, a bit at the end of the building. We are not physically in the same place. This is not helping.

This is the team taking care of the collection. And so before the "Wissen" department, before any of us, before there were conservators for digital art, only the "Museumstechnik" was taking care of the collection.
And they did it super great for twenty years. I'm not going to say something about this because they dealt with it. Most of the artworks were still running when we started working on them, thanks to them.

They gathered so much skills in old systems, and we are making this "Wissenstransfer" [transfer of knowledge] now between them and us because some of them are going into retirement, so we have to take their knowledge. But it shows that they are the most important team taking care of the collection. We are just here to help, I would say.

We are writing down in the media wiki everything they couldn't write because they were alone taking care of the collection. We couldn't ask them to do everything. They couldn't do repair, maintaining an exhibition, maintaining the depot, and writing documentation about it. The fact that we are here is just to help them. I'm doing this documentation for them, for Mathieu. And Mathieu is also learning all those capacities that they learnt for twenty years.

MV: And fixing what's already broken.

MS: We are just like an addition; we are helping them do what they were doing for so long and making them stronger in what they are doing.
But usually, they have had, and they still have, a lot of skills to maintain artworks. It's just that they have more time now to help us document because they have less to do in terms of repair because you (Mathieu) are here. So we are kind of the extra troops to help them. But we are feeling really humble about what they did for twenty years. I know a lot of conservators are coming to a museum and thinking, “oh, how we how could you do it without us before?”. And actually, when you see the situation as it came, you are thinking, You did it well. And with so few resources.

Anastasiia Bergalevich: And then two last questions about this structure of the ZKM: The first one is about the acquisition processes. What involvement do you have in it? How is the decision made? Maybe some examples of works that weren't acquired because of your decision.

MS: So, Matthieu is part of the committee for acquisition.

The committee consists of the head of the museum, the head of collection, the head of curators, the registrar, MUSCOM (Communication Department), and the head of MUTECH. And you (Mathieu) as a representative of restoration. Leonie [Rök] was also part of this. And we have someone from contemporary art, someone from digital art. Depending on the area. And we had a list of artworks a couple of weeks before the committee. Where we did both of us a very pragmatic analysis of “is it doable? Are we committed to preserve this artwork in the next ten years?”.

I reduced it to five years because ten years is too long now for digital art.
And we have this questionnaire or template where we answer all these different questions

MV: And a question is also: Is it relevant for the collection?

MV: Because sometimes you can have, like, very similar artworks. Or the concept is not interesting or, yeah, things like that. So we have to explain why.

MS: But this is done by Margit [Rosen]. So we're talking about the concept of the collection historically, like art historically.

MV: I'm doing the technical side [laughing].

MS: Matthieu is doing the technical side, and I'm doing kind of the assessment for the next five years after he made the assessment technologically. So I'm making a report, which is usually two pages, three pages. The report says what is contained in this work, what the risks are, and what the possibility of recovery is if something is wrong. And what are the resources we're going to have to put in.
So numbers, like real numbers, like if we need to buy another computer, how much it will cost, if we need to reprogram this artwork in the future, how much it will cost, so that you have an understanding of what it will cost in the next five years to show this artwork in an exhibition. Not to preserve it, but to show it, and this is different.

We put everything into a folder, and Matthieu is going to the committee to defend our pragmatic opinion. So no judgement of the value of the work, no judgement of the aesthetic or importance. And here, maybe you share your experience right away. Like, everybody's talking one after the other?

MV: Yeah, we share what we think regarding our job of maintaining the artwork, and Margit explains why she wanted to have this one, like regarding the importance of the work.

But I have an example of an artwork that I rejected, the problem was that this artwork was stored for a long time, and the artist was living very far away, so it wasn't checked. We actually didn't know if the computer was running or if it was, like, complete rust; we didn't have the condition. So I said that's a big no for me because of that.
I don't know if it's going to run, I don't know if we need to buy something or maybe even rebuild it from scratch, and that's going to be too expensive in addition to the price of the artwork.
So it's really not worth the effort of doing that because we already have, a lot of restoration projects.
We cannot acquire non-functioning artworks while already having non-functioning artworks in our collection.
So I voiced that, and they actually agreed in that case.

MS: This is kind of the only time where your decision was clear enough. Like the costs of bringing this artwork here from the country it was from without knowing the condition. We knew this artwork was also very custom-made. So if something were wrong, we would have had to redesign industrial components.
So it's really costly. All those costs altogether were too much when you balance it with the importance for art history.
For some of the artworks it’s different; for another artwork, for example, we had only a concept on paper which we got as a donation.

The artwork doesn't exist anymore. But art historically speaking, this was a key canon piece; it was augmented reality from the 80s

Anastasiia Bergalevich: You're talking about the work by Jeffrey Shaw?

MS: Yeah. Exactly.

This is something we should have said no to.
And actually, it was kind of a no because we would have to completely build it.
And we need to first acquire the knowledge of how to build it. So it's going to take long time, a lot of money, a lot of resources. It's a dead end. But it could be super interesting research-wise. But you need to be sure you want to commit to this and put in this money to rebuild the complete artwork. And those two opinions were balanced, and this was too important for the canon of media art, so we had to get this artwork in the collection.

MS: But yeah, it happens sometimes that everything inside you says no, but you see that from an art historical point of view, it's really important.
And this is why we are not the only ones taking part in the decision. It's really collegial. Everybody is taking the decision together. It's just different opinions.

MV: For this one, it was more like it's going to be a lot of effort and research, but that's actually really important. So, yeah, okay, we do it.

MS: And the reverse is true. If there is something that's really easy to restore, but has nothing to do with our concept for the collection, we are not going to say yes by default just by because it's easy.
Some easy things are not coming to the collection just because they are easy to preserve.

MV: We have limited space. We have a lot of space, but it's limited space. [laughing]

MS: Yeah It's important that we stay clear with the concept.
The ZKM concept for the collection is really about how artists developed technology for certain purposes. We have a really strong focus on 90s video manipulation and software experimentation.

MV: We have a very strict list now for acquiring an artwork because it really needs to be relevant. And that's why we have also the acquisition committee now.
Like, the one in September was the first one with all the representatives of the departments in the same room at the same time to actually focus on that.

MS: Because before it was more like a small email exchange. They were thinking about buying something or having something as a donation. We all received an email, the technical department and the restoration department, and they were just asking, What do you think?
We didn't have so much time to go deep, so we were just giving, like, a general super quick assessment of whether we think it looks okay.
And from there, they were taking their decisions. The technical department was also in this decision-making because usually the artworks were inside the exhibitions, so their opinion on the maintenance on a daily basis was really important. They were sometimes just sending an email saying, "this artwork is crap". "It's only prototyped, and we have to restart the computer every day". "We've already had to switch this artwork out three times", "It has to be further developed before we buy it". And so this is why also their opinion is super important because they have the experience of their daily maintenance.

MV: It happened a lot in one of our recent exhibitions, actually. There were a lot of prototypes and the "Museumsdienst" and "Museumstechnik" explained that this was a problem, and it was also the visitors who were annoyed, so they are the one seeing that. So that was a test. And then for the acquiring of some of the artworks, we realised, like, this one was one of the prototypes that was constantly failing.
So, no, we cannot buy an artwork to rebuild it.

MS: We did that for some. Because art historical perspective is important.

MV: But we realized that it's very, very complicated to do that.

MS: And they are not dedicating the resources for it. This is why we are insisting that it's going to be hard.
You're going to need a lot of money and a lot of resources. Are you committed to doing this?
If they say yes, they are, then it's their responsibility.
But in the end, we sometimes didn't have the money for it.

MV: And that's why we have the acquisition committee now. Directly having a meeting to talk about that.

MS: Less than just an email exchange, saying yes or no without too many specifications.

MV: Miscommunication can happen easily in an email exchange like that [laughing]

MS: So this committee is going to be twice a year?

MV: Yeah, two committees per year.

But I often ask you [Morgan] about the conceptual side of an artwork. Just to explain which roles the two of us have, you are more about the artwork, the artist, and the relation, and I'm really more of the technical side, regarding the computers and such.

MS: But you're building good relationships with artists that are actually programmers!

MV: Yeah, exactly.

MS: Because they need someone who is speaking the same language. And usually, they meet me first. Then when they meet Matthieu, they are like, Oh gosh, a geek, a nerd. You can talk. And usually, the relationship is good.

MV: Sometimes you talk to me regarding an artwork, like with the name of the artwork, and I don't really get it until I remember "Oh it's the one with that computer! Oh yeah!".

But yeah, definitely we have our share of artists who are also programmers, and in those cases I do the communication.

MS: So it really helps having both skills in the same team.

Anastasiia Bergalevich: I want to ask you about the concept that you mentioned several times in the text you wrote, the concept of second original from the PAMAL group. Because originally in the field of conservation we have the idea of the original, which is single. What does this kind of extension do to the concept of the original?
And another question about this, you also were mentioning that you sometimes duplicate works, and you're building an exhibition version of the works?

MS: Okay. So the second original is a concept we developed around a media archaeological approach.
So we are not talking about the original, a bit like Pip Laurenson.
We are talking about historical or initial work. This allows us not to be focused on an object per se, but on the type of object.
So we can replace an Amiga with another Amiga which is doing exactly the same.
We are not attached to the mere object. We are attached to the functionality of this object.
This is why emulation can be used sometimes to emulate part of the system. We are doing a lot of things like this, mixing old and new technology just to maintain part of the historical work. We like this; we can study it. So the whole concept around this is not to be materialist and be attached to a certain part of an object. More to be attached to how we're going to retain the knowledge associated with this, and also how we're going to understand which kind of technology the artist had access to and how they built the idea around this.
So it's really based on the concept that technology is not neutral

MS: Sometimes artists say that they use whatever technology they have access to build their idea. This is one way.
Or sometimes the position is: “What technology can I find to do what I want to do, and what can I build myself to do it”?.
So it's like envisioning what technology you want and how you envision future technology sometime. There’s always kind of what we call the “reading and writing machines”.
It's like defining the way they are thinking.
This is something we tend to forget when we migrate everything, when we do a new version of everything.
And I know artists usually say: “No, I use this computer because it was here and it has nothing to do with my idea”, but actually it does!
You have access to a certain mindset built by the technology you have around you.

I mean, if you read Kittler or theorists like this, you know, that you're not writing the same way if you're writing with your hand or with a typewriter or with a computer.
You think the idea is the same, but the machines you are using to build your ideas are also part of the ideas. And this is something we wanted to explore a bit more in the conservation field. And Margit, when she hired us, she said: “I give you this space because we are in a research department, not only in the workshop for restoration, but also in the ‘Wissen’ department”. "Forschung" (research) is a word in the title of our department. And so she gave us the freedom to explore this, and this is why we started making a second original for Jeffrey Shaw’s, virtual sculpture, even though a new version already exists.
Because the knowledge of how to build 3D applications in assembly language, how to repair an Apple II, how to set up an Amiga, how to create a mechanical delay with tapes, all this knowledge is lost, and nobody is taking care of this knowledge.
And we are the only place where we can do this.
Like, technical museums are not doing this. The industry is not doing this.
So where is this is going where is this knowledge going? And media archaeology was one of the first discipline that started also thinking about the use of media, the plural for medium, and the use of how they build our ideas, how they build the future we have now, how things were envisioned a very long time ago sometimes.
And, I think the best example is Phantasmagoria, the projection with magic lanterns, and there's a lot of if you want to read this, you have the book Media art histories by Oliver

Grau.
There's a beautiful chapter about Phantasmagoria[55].

MV: But here is an example: Today, if an artist wants to do a 3D visualisation of a cube for an artwork, they would use Unity, the game engine.
To create a cube in Unity, you just click the cube button, and you have a cube.
And you see on the whiteboard here all the code on the lower right?
That's the implementation of a 3D cube visualisation for an Apple II.

So it's using a special library for that, and it was just to make a simple cube, they had to think differently. So if they wanted to make a complex object…

MS: You had a different way of seeing things. Like, before interfaces. You had to think differently. And so we are thinking a lot in terms of limitation. You know, they were limited in what they could do in 3D. If we take the example of 3D on the Apple II in the 80s, you think immediately about limitation. But what we see after having this media archaeological approach is how broad the brain had to be to see a cube in these lines of code.
That today, you don't have these gymnastic of the head anymore.
You click on the cube, and you have a cube in Unity. So all of those layers go into the very basic layer of a computer, how it works, the electrical impulse from a computer, and everything like this is a way to build the way you are thinking and the way you design something.
It's not only limitation, but also mind space that was built differently.

Anastasiia Bergalevich: But how to transfer this knowledge, then?
Because I feel like now it is just transferred from technicians to restorers.
Sometimes restorers are writing the articles, but it's also only for the community, which is really small. Do you see any possibilities to transfer this knowledge?

MS: If Matthieu succeeds with the implementation of the 3D cube in assembly language, everything will be published on GitHub so that other people can learn about how to do an assembly cube for Apple II.

MV: And re-learn, actually.

MS: And the fact that he's rewriting the program means that we will preserve this program which otherwise doesn't exist anymore.

So the fact that we are doing software preservation in addition to the hardware preservation means also that this is preserved.
If another generation wants to dig into it, this code is open. It's not compiled. Like most of the things you have access today are compiled; when you are opening Photoshop: It's compiled. You are just opening the software. You don't have access to the source code of it. Here, because we are rebuilding or restudying or rewriting things, it's open.

MV: We are not a company.

MS: Source code is public, or we can share it. We can make it accessible, and we can make it accessible to a researcher of any kind. So this is also what is different.

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[55] Oliver Grau, ed., *MediaArtHistories*, 1. paperback ed, Leonardo (Cambridge, Mass.: The MIT Press, 2010).

MV: It's not the source code of the artwork, but, like, the way of doing the framework. The tools – we share that.

MS: And the other question was the duplication.

Anastasiia Bergalevich: Do you do this in-house? When do you do this? Any examples you could give?

MS: I know this practice was done a lot even before we came.

We just made a conceptual frame for this with the second original, because second original is rebuilding with the same technology, so it's different. The duplication, in our case, is usually making a duplicate of the whole hardware and software environment. So it's a very pragmatic thing.
The duplication we are doing for example for “America's finest” is this:
We have a computer that is going into the exhibition. We need a second computer, exactly the same, behaving the same. So if this one breaks, we just replace it. And we can study the broken one with no pressure.

MV: We don't need to put up an “out of order” sign in the exhibition that way.

MS: Yeah. Exactly.

MV: We can still run the artwork while I check what's the problem on the original computer.

MS: This is pragmatic. But the two versions they were building before, the "Museumsversion" or "Reiseversion" that was built by Bernhard Serexhe, so the head of Medienmuseum before.
This was a concept, also pragmatic, which was that we can't send a historical computer away.
We have no way to explain to someone how to maintain this computer, so we're going to do an updated version. The problem was that those updated versions were never really documented. Usually, they were done by external programmers.
We only had the compiled software, and there was no reflection around it.
It was a really functionalist approach. We needed to make it work in being able to travel, and it's easier to set up and plug and play. This is an approach we are trying not to follow anymore.
We want to have this time to study the original work, the historical work, and really think about how we want to make it sustainable in the face of time. So if you are migrating super fast and making new software very fast, you are not going to be able to migrate it easily in the future.
You're always studying to find an open source language with very good documentation. He (Matthieu) is trying to comment on his code, doing something that, more than ten years from now, will still be able to be migrated or workable, which was not the case before because they were following a functionalist approach. They were using licenced programmes. It was, like, fast and dirty. Like, it needed to work and to go into the exhibition.
It was also very good for the artist’s exposure because, of course, curators also want the artist to be exhibited and be viewed by the community. Because we are so slow in this process of wanting to study and wanting to make something really sustainable, it takes us two or three years sometimes to preserve an artwork or to perpetuate it. We are not using the word preservation anymore, but perpetuation. Because it takes some time, it can be

irritating also because they are thinking that we need to exhibit this work and we need to make it enter the social memory, make it enter the books and make it enter art history. And because we are retaining them a bit like this and retaining insight in ZKM, sometimes it can be frustrating for artists and curators. But we think this approach is really important, and we are very happy to be in the research department for this.

But usually, you have to be in between this functionalist pragmatic approach and still have this research done on media archaeology, historical technology, while being able to make a step into media art history.
We are not repairers. We're not there to make it work. We are here to study the material condition of an artwork.

MV: So we are not an IT repair shop; sometimes they tend to forget that.

MS: So these are the three practises.
And our second original or media archaeological approach is the third approach that we brought here with us.
But the origin of the two approaches that were still already here when we arrived was the duplication and "Reiseversion" so the quick and dirty migration for traveling exhibition.
Yeah. I would say this. And sometimes we love that everything lives together.
Like the original version, the historical version lives at the same time as this new version we are building. We can compare stuff. We can have one version exhibited here with historical material, and we can also loan something which has new technology in. We can take the time; if we have both versions working at the same time, we can compare and make them live together.
And they can see if they get along [laughing] and also if people see the difference.

Anastasiia Bergalevich: But you don't do it for all of the works?

MS: No.

AB: You just do it for some. that are, like, hard to transport, for example?

MS: Yeah, we do it for most of the 90s things. Because they are the most risky. They are failing. They are thirty years old.

MV: There's also some artworks that we cannot do that for because it's not possible to do, like, a travel version. But, yeah, mostly the 90s.

MS: We are focusing more on late 90s and early 90s artworks right now. And for the new acquisitions. Because they are going to fail at the same time, which is kind of horrible to think about. Things from the 90s survived until today, and things from 2015/2020 are already dying. What are we going to do? It's going too fast. It's too fast. I'm concerned.

MV: It's the consumer world. That's the problem. Most of this artwork is based on consumer projects. Computers – everything – they are not designed to last for centuries.

MS: And the repair capacities are lower and lower.

MS: This is why there's the right to repair community. And a lot of people fighting for being able to repair their devices.

MV: Thanks to Apple. Actually, that's the main problem. They are the perfect example of the total opposite of our work.

MS: They are making it irreparable so that you buy something new.
This is where we see technology as not neutral. Technology is always driven by political, social, and economic principles. And this is why we shouldn't forget this. It's really like watching a digital art outside of materiality is not understanding what digital art is.

Digital art, and I think Emmanuel Guez, my PhD advisor, said it super well.
He said, Digital art is just an artist who used consumer things or technology to explore the effect of those. It's a really good summary of what it is. And if you remove this part, you don't understand what it is. It's not natural.
Using paint was not natural as well, and we tend also to forget.
But it's when you say digital art is immaterial, it's only about the concept or what they thought about, it's completely wrong to think like this. It was completely built in an environment that we need to also document and to understand. Like "Gesichtserkennung" (facial recognition) from the 90s that influences AI today. It's important to know where we come from. And since we are tending to forget super fast in our new media world, it's important that there are some people digging into it. But we are very special here for this. And we should acknowledge this because a lot of museums don't have this capacity to have research made. And they just need to show something that works. And so we are in a very privileged situation here.

AB: A very unique project in these terms, the archives here.

MV: Yes. We have a lot of other museums that want to have this time or, actually, to start doing that.

And that's why we hold conferences. And that's nice because there, they realize that they need to have that, actually.

AB: We talked a little bit about open source and I've noticed that you really talk a lot about the necessity of Open Source. And I just wanted to ask about the problems that preservation of contemporary media artworks faces based on proprietary software or why open source is a great option for the artist to go with.

MV: It's simple because there's the source code. Open Source projects, actually are by definition, “Open Source”.
So that means that there's not only, like, one company or just one person taking care of that. There can be a community. And even if there's, like, just one person taking care of this Open Source project they can have help from outside, and that's also what I do.
So that's why I tend to prefer that because for the preservation and the perpetuation of the work, it's good to have an open source base to be evolving. Because, like with closed-source software, I have a lot of examples of artwork using that.
And then how can you make the software work in a more modern environment if you have no access to the source? And actually, artists – the new generation of digital artists – they realise that too. And they actually use open source directly. So when we ask for the acquisition, we ask for the source code of the artwork, that's part of the process. And we ask, like, what software do they use or whatever. And usually, when they say everything's open source, I'm happy. So it it's mostly for that to have the flexibility for the future to perpetuate the work.

The new generation of artists now are the programmers themselves.
Before, a lot of them were actually hiring external programmers.
They had the idea, they knew what they wanted to do, but they didn't know how to do it directly. So they were hiring a programmer to do that. And at the time, open source was

really limited. That was the beginning. And so they were using closed-source programmes. But now it's becoming more and more open, especially because they also had that problem outside of the art world. And now it's becoming like cultural learning if you want to do an updated version of your program, not even like an artwork program, just a program, it's better to have it be open.
And now you have GitHub and stuff like that, so you can share and have help, actually, from the community. And most of the digital artists now from this generation are coming from this community. So it's like by itself doing that. And also because I think, on the other side, the closed-source programmes are becoming more and more closed, actually.

Yeah, it's very much that. The openness. The possibility to have the code, to preserve it too with the artwork. There is an artwork from the 90s we are reconstructing because of a combination of hardware failure and using closed source software. So I'm rewriting it from scratch. And I use Processing [56] because it's open source. I can have the code. I also archive the source and the Processing version I'm using so we can, make everything evolve if we need in the future.
And I think that's going to be better. There's no perfect solution. I don't know what it's going to be like in fifty years. But I think it's better to have this open source base to be able to be flexible.

AB: And another last question I had: Morgan was mentioning the conference you made about hacking and how you use it in your practice sometimes.
What was this conference about, and how often do you actually have to "hack" something for you work.

MV: It was a conference in 2018. That was the first one, actually. I wasn't there. It was at MIT. We have the paper. I think I still have the text from the conference.

And, yeah, how often do I try to hack stuff? Often, actually, quite often. Each time there's some closed source software.

Actually, because mainly because we are working on old computers with old software and you cannot buy them anymore. Half of the time also the company closed. So we had one case actually with Max MSP [57] the software. It's used a lot in artworks using video or sound.
And we had an artwork make for an old version of Max on an old Macintosh. And we asked the company because they are still making Max MSP and we explained to them we need an old version of the software to preserve an artwork.
And, actually, they told us that they bought the old company which developed the original Max MSP and they didn't have the code for that specific old version.
But they opened like, their first old version, they opened that for free.
So that was nice. Actually, that was a step, but not for us, for the artwork.
I had to crack the software anyway because sometimes even the company doesn't have the source code anymore, which is a problem. And so yeah. It's very case by case. I do it often because of old software.

But it's as a last resort. If I can avoid it, that's better, of course.
But we talked about that with Margit because that was my first task.
That's why we have this paper and it was like, the first conference when I arrived because

[56] Processing, Graphics Library, designed by Casey Reas and Ben Fry https://processing.org/

[57] Max/MSP/Jitter, Visual Programming Language https://cycling74.com/products/max

my first task was to hack a software, actually. It's an artwork from Shane Cooper remote control from 1999, I think, with a 3D presenter.
Yeah. And actually running on an SGI computer. So that was very even, like the OS is closed source for everything, and it was using 3D software.
And I like to tell the story because that's the school case of, like, why do I hack the software? Because when the ZKM acquired the artwork, they were in contact with the 3D company, the company making the 3D software. Since it's an artwork, it's like cultural. If we needed to change the computer to preserve the artwork, they would give us a new licence for free. That was okay. So actually, I wish that every company today could do that.

But the problem with this company was that it closed in 2001.
So there was no way of giving us a new licence anymore. And I arrived in February. So it's been, like, sixteen years on the same computer with fingers crossed that it's not going to die.
And they told me the computer is showing a bit of fatigue. It sometimes doesn't boot, so we have a problem. And they asked me, can you crack the software? And yeah. Since I do that as a hobby also, I said, Yeah, of course!
And so I stayed overnight in my office to do it. And I had help from another person because mainly it was on an SGI computer. That was my first time on this computer. I didn't know anything. So I learnt how it was working, the licence system and everything. And, actually, I found that someone was working on something similar, like, a lot of years ago.
So I contacted them, and they gave me this script that I adapted because it was not for this special computer, so I had to adapt it.
Each time the software asks for the license, it’s tied to the fingerprint of the components of the computer, that's why you cannot just copy it onto another computer, because it's not going to be the same fingerprint.
And what this script does, actually, is it doesn’t touch the software itself. It's just a script that each time the software ask for the fingerprint, the script takes over.
It's a bit like a bribe, kind of. And so that means that we can copy it on all the computers we have. Like, now we have multiple copies of it, and it's preserved.
But actually, just before this paper and this conference, I told Margit, you know, it’s like pirating. it's not legal! So she was joking. I will be the one going to prison, not you. But she was totally okay with doing that because that was important. And we made the paper and the conference about that. And then Margit talked to a friend of hers, who is a lawyer, actually, in the highest court in Germany. They make the big decisions, slow decisions. And he was very interested, actually, because, yeah, he had never heard about that kind of problem. Someone tried to hack software that nobody cares about. And so, apparently, he had a discussion with all of our lawyers, and they realised it’s actually a grey zone. Technically, it's illegal, but it's not, because the company doesn't exist anymore.

It was really the perfect grey zone. There was actually a trial related to this, and they made a law for it.

AB: Oh, they did?

MV: Yes. In Germany. Now they have a law. If a company in Germany making software closes, they have to release the source code at least to institutions for future use of preservation. I wish this could happen in America because the US provides the most software. But copyright in the US is a very sensitive subject. But that was a step actually in the right direction in Germany. They want to extend that to the European Union. And

maybe in a few years; who knows? The US might think about that. I hope. And I really like that, actually. The subject of actually hacking, doing something illegal, but for preserving our work, preserving our culture.

Interview with Morgan Stricot. Part II

– Media conservator and head of digital conservation ZKM

30. April 2025

Anastasiia Bergalevich: I want to start with a question about the research collection. You once mentioned that you have works that are only for research purposes inside the ZKM and I'm really curious how that works. And as a researcher, what kind of access do you have to the works?

Morgan Stricot: This, we didn't deal with it yet because we only had one work, now two works. So one work is a virtual sculpture that is inside the exhibition right now as an exhibition version (Jeffrey Shaw). And we have the Apple II version that Matthieu is reprogramming. And this, I don't we don't know yet how to make this accessible. So the goal was maybe to bring in the community of Apple II programmers, because there are still a lot of people interested in Apple II, and make them come and participate in the reconstruction of the original historical version of the work. And like this, we also map the existing knowledge, what remains, you know, from the Apple II community. And the second version that we have for researchers is the Amiga version of the surprising spiral. The book in the exhibition, you know, that you can touch. And here, again, we don't know how to make this accessible. We have a solution yet. We know that we are conducting research on Amiga restoration and also on Apple II restoration. The only thing we can make available is what we found. It's much easier than we thought to restore an Apple II because you have the blueprints. We can make that accessible for example, the blueprints of the Apple II, we can show what we changed to make it work. Same for the Amiga. We have some very good solutions now to remove acid from the batteries. Matthieu also built something to put the battery outside. So if you need to remove it, it's easier for storage. So things like this, we can make accessible. But the work itself, I think we could make it work in front of someone that is asking for it to work in front of them. But so far, like, for example, the book is right now in exhibition so we can't just take the book into the workshop and make it work with the Amiga. Because now it's working with another computer.

Anastasiia Bergalevich: So you're still exploring the options, but your perfect idea of this that people can come to ZKM and also explore and research on the original technology.

Morgan Stricot: Yes, and this was the case with Ralph Michel, who won the prize of best conservator of Switzerland. He did his research in on Paul Garrin's "Yuppie Ghetto with Watchdog", and he first saw the work with the original last displayer, original computer, then he worked on the emulation with us. So it happens also that some of the projects are with researchers from other institutions or from universities. So this is maybe where the research can happen with the external researchers.

Anastasiia Bergalevich: Then I wanted to ask again about the concept of the second original. You told me a little bit about it before, but I wanted to ask more about what your understanding of it is personally. Maybe some kind of history of this, how you are involved with this concept, and also how you try to make it work inside the ZKM infrastructure.

Morgan Stricot: So for me, the second original was just making exactly the same duplicate. This was really material-orientated at ZKM. We did it for a work called "Die Tafel" (Frank Fietzek), we made a duplicate of it. So this was my understanding for a very long time, just a duplicate of an artwork. Using exactly the same material, same computer, same everything. And the original data, everything. And with my work in media archaeology, inspired by Siegfried Zielinski, but also by (Friedrich) Kittler and others, we started to say: Okay, the second original could be kind of a mixture of different material as long as you have the same result at the end. And so the second original became, like, whatever you do to show the work. And this is where it started to be a bit different during my PhD; it became this evolving practice. And this is my research now, that I'm doing this year. It's about the new role of conservators in making things exhibitable. Because there's really pragmatic things that we need to take care of. Like, we want to show artworks, meaning put them into memories of people. We have to modify them a little bit so they are exhibitable and robust in exhibition. And where is the limit, you know? Like, should we keep them in depot and not touch them and leave them in their historical environment so they are preserved but never shown? So nobody knows those artworks, or should we modify them a bit? Adapt them a bit for the public so we can show them, and people talk about them, and they are living in the collective memory in a way. And this is like the big thing we were confronted with in the last exhibition of the collection. There are a lot of things we changed just to make them robust for exhibition, and we were thinking, Is it worth doing this, modifying an artwork, or not? And this is the real question I want to have not only with conservators but also with curators and art historians. It's really the text of Latour actually about the facsimile. Sometimes the facsimile of an artwork is more famous than the artwork itself. And it travels and it goes and it's okay that it's a bit different, but it's helps to make the original known. And so this is more like where we stand now. With the second original, I'm coming closer to the idea of Bruno Latour and Adam Lowe (from: "The migration of the aura or how to explore the original through its facsimiles"). Now we are close to this, but it's difficult to go back to this because I was really in my media archaeological perspective. And I'm not saying it's not a good perspective, it's just that it's a complementary perspective for a museum. Maybe for a research facility like a lab, a research lab, or a PhD lab, they can go very deep into media oncological things. But as soon as you are in a museum and you want to show something, the pragmatic has to be your driven horse.

Anastasiia Bergalevich: But as I understood it last time, you sometimes make duplicates of the artwork, and you can potentially just have the original for research purposes and storage and use the duplicate for exhibition purposes.

Morgan Stricot: Yeah, and there's also the travel version, sometimes we are making multiple versions so that they can be here in another museum if the artist is okay with that. And this is really the nature of digital, actually, being able to be copied multiple times without changes. And this is something we are just exploring more and more into museums, research, and it's just possible! So let's do it and see what happens. Nobody ever says that this is the only solution: to port something, or to emulate something, or to migrate

something, or to make an exact duplicate with the same computer. It's just all of those are possible. Let's explore that and see. And ZKM is the only place with a collection as big as this that we can explore all of those solutions and see if it works.

Anastasiia Bergalevich: So you're still kind of trying to find this? That's exactly one of my questions because last time you were saying that you always need to find this balance between this historical approach and a functional one. And are you still kind of in the process of finding this balance and understanding when you reproduce work to the really original state and conserve it like this?

Morgan Stricot: But we always try to do it. It's really complementary. Even though for the book the surprising spiral, we have three working versions of this artwork. One with the original Amiga and Laserdisc, one with an original Amiga and an emulation for Laserdisc, and one with a new computer. The three of them are working. There's a moment where you have to be like, okay, which one are we showing in the exhibition? We are showing, of course, the new computer because if it breaks, it's easier to replace. But the other versions are working, and someday we can maybe show them or have researchers come and look at it with us. And we documented the process and also took pictures of how long it takes to start an Amiga computer. You know, it's a long process. We changed it to an SSD. It goes faster. But, yeah, it's like all of those tacit knowledge that we are trying to gather around technology, that happens for all the projects. It's not an option. If the original historical version is available, we are doing it. If it's not available, then we are not. But if it's originally available, we are doing it.

Anastasiia Bergalevich: And in what case are you doing this kind of in-depth historical reconstruction of the work, only when there is a necessity for exhibitions, or also based on your interest, or for purely historical reasons?

Morgan Stricot: The way we choose artworks to work on?

Anastasiia Bergalevich: Yeah.

Morgan Stricot: One part was the exhibition, and the other part was, like, the general assessment of the collection we started in 2017. It's when we came back with Matthieu. And here, we started to target artworks with nothing on them. Like, just a database number, you know. And we targeted the artworks nobody knew about. So, like, the hidden things. We started with that, and then we started with artworks that the guys from Museumstechnik said were nice, or this one we exhibited once in 2004 and never again because it had this problem. So those were the target works. Why? Because the people from Museumstechnik are going to retirement. And I needed to target the artworks they know about, and they are happy to work with. So we targeted those ones after. So this is how the surprising spiral came about. And some others from Paul Garrin as well. These were some of the first targeted artworks without documentation or with the need for a knowledge transfer. And then we will go to the 2000s. But so far we've kind of done the most important works of the collection from the 90s, even though there's still a lot to do. But for those, we have more documentation, so I'm less stressed. As for the things where we had not so much documentation and the guys were still here, I just jumped on them and said, Tell me everything you know about this artwork and the historical environment. And this has been the case for a couple of years now. But there are still things we don't we don't find or we don't see, also some things enter the collection and they are not so important. So we are not going to spend so much time on some of the artworks that already have a second version or the artist already updated them. Because some artworks were updated with time by their own artists. So for those, I don't think we have the resources, there's also

a balance to find with the resources we have in our department. So at one point, we had to make choices, and those artworks, they were already taken care of by the artist. Most of the artworks from (Christa) Sommerer and (Laurent) Mignonneau, for example, they are still making new updates of them, so we don't put so much energy in it anymore. But Nanoscape, the artwork with the magnets in the current exhibition, was a lost artwork. And even the artist did not have so much documentation, so we spent a lot of time on it. So this one, we spent a lot of time on restoring it because the lack of documentation was crazy.

Anastasiia Bergalevich: Then another question I have about duplication of works, because you said that before you came to ZKM, they already were doing that, but it wasn't really clear were they mainly migrating them or were they actually making copies of the works.

Morgan Stricot: They were doing the what they call the "Reiseversion". So many artworks in our collection have been duplicates just for loans.

Anastasiia Bergalevich: And they used original hardware?

Morgan Stricot: Yeah, exactly, mostly. Like, we have two versions of "remote control". We have four versions of "legible city", for example, because it was really asked for a lot, this artwork. And so they used different parts and different computers, but it was always the same software. "Bubble" has four versions too, the artwork in the gameplay exhibition where you move the bubbles with your shadow. So it was something really normal to ask the artist, can we make a duplicate? Because at the time, all the software, all the artwork, everything was available so they could do it. I think we can do this with our artworks from today, like "Skin" the work that was inside the foyer for a while where you were wearing different textiles and things. This exists in four versions too because we are asked a lot to send it away. And at the time as well, the Kinect Azure was easy to get, so we bought four of the Kinect Azure. We duplicated the computer, and it's good if the artist is okay with us doing it. It's just when I came and I started to theorize around this, I thought, it's great that ZKM did this because we have multiple version of artworks now and it's really strengths in numbers, we have multiple, so more possible ways of keeping these artworks alive because we have spare computers, we have spare everything. So this very pragmatic decision of making the "Reiseversion", to make it travel the world, making the artworks more accessible to a lot of people was also very beneficial for restoration purposes. This is why I'm always saying everything is complementary, because what we do now with historical computers, maybe it looks a bit like only the nerds are going to be interested, but we don't know. We can, so we do. I'm always thinking maybe in the future, some people are going to be like, "Oh I wish we could have an Apple II to decode this code coming from space", we don't know, whatever! [laughing] But then we have the computer somewhere. I would say, if you can, you do. And this is what they did at the time. They could copy artworks, so they did. If you have the resources of ZKM and the people, the skills in ZKM, you just do it; you explore different ways. And this nature of digital being able to be copied, this is something we can't let go. We can't make copies of anything else than just that. It's a perfect copy. You can corrupt it of course but... [laughing]

Anastasiia Bergalevich: Interesting, I got a little bit confused because you said you started making your copies, and then you were also mentioning there were already some copies at ZKM.

Morgan Stricot: Yeah, we just started to theorise around it, but all the practice I was doing before I came to ZKM – when I came to ZKM – I saw they used the same practises but for different goals. So our practice was just making duplicates so you have a second

version in case the first one breaks. And for Bernhard Serexhe, who was the head of Medienmuseum, it was really like, I need my artists to be famous all around the world, so I'm going to make duplicates of their works, so they can be seen everywhere. And in the end, it served the same purpose, which is making those artworks visible. Whether it's visible in the world, in the case of Serexhe, and for us, visible in the time. So it's like space and time continuum here and we are mixing both now because we have multiple versions we can show because they were preserved, but also because we are confident enough to send it around, because of course, historical artworks, you can't. So it's good to have a second version with a new computer so you are confident to share it with another institution. So it's a mixing of those two.

Anastasiia Bergalevich: I have a question about Net Art, because I really didn't find a person who's responsible for Net Art in ZKM, so now you're kind of taking this over, or not really?

Morgan Stricot: We don't have anybody. Volker Sommerfeld is doing part of it, but just hosting them on our service. And now Marc Schütze starts to get really interested in this. So maybe he will be the one taking care of our collection for the network-based artworks. But so far, we did not have the resources to do it. Because it takes time to explore those things. Mona Urich, made a big, survey of our collection, so now we have more information about our own collection that we didn't know so much. So because nobody has taken care of it, of course, you're missing some things. But, yeah, we did not have someone specific for it. Only Volker was just hosting them and taking care that they were all accessible and still running. Felix is also trying to make, like, a survey of what we have and what's still working, what is not. Also, surveying artists' archives on websites. So he's doing kind of a survey also. I remember we talked about it. But again, it's about time. Like, if I could go on each of the websites, look what it is, which language it's using, is it accessible, is it broken, it's a lot of time. And because of the Choose Your Filter exhibition, Marc Schütze, our IT engineer, started to get into those topics, and maybe he will then take care of the next artworks that will be acquired. But since I'm here, I only acquired one artwork on the Internet, and it's not even network based. It's just a video game hosted on a website. It's not characteristic of net art. It's more like application artwork.

Anastasiia Bergalevich: I also talked with Olia Lialina and she was also really pessimistic about ZKM in terms of, like, they don't really do preservation of websites.

Morgan Stricot: And this is why a lot of people are asking us about hosting websites and so on, and I'm always saying no because nobody is doing it and nobody is taking care of it here. So we just stop pretending and ask Rhizome to take care of those because they are specialised in this. So we are working a lot with Rhizome on different projects, like, on Choose Your Filter we worked with Rhizome. And Mark learnt a lot from them, so maybe he can also bring this knowledge inside ZKM. But when we started the project Choose your Filter with the KIT, they asked Matthieu and I to do the restoration of the artworks, and we were like, no. We can't spend a year doing this. It's a lot of work, and we have other artworks to take care of. So it's been clear since couple of years that if we want to take care of some more specific net art works, we need more people. Because we don't have the time. Already taking care of the complex, computer-based artworks is taking us a very long time. But there was a point where everybody thought that ZKM was also rescuing Net Art, and it's not the case anymore.

Anastasiia Bergalevich: But at least you host it yourself. Because Olia also told me that the only work she lost was from Ars Electronica because they were supposed to host it on their website, and they just stopped at some point. So, it's already not bad.

Morgan Stricot: Some of the artworks are not accessible anymore, but they are still here. Like "Netzspannung" from (Monika) Fleischmann and (Wolfgang) Strauss is here. The servers are here. It's just that we are not putting them online because we are so afraid of incompatibilities. But, yeah, some are just hosted and not online anymore. Some of them are online but broken. So, it needs a lot of technological watch to support those. It's not, like, a complex digital or computer based artwork, where you start the computer and you assess. Here, you have to assess all the time, like, is it working? They changed something on the web browser – oh, you need to do this now – and so the pop-up is not working anymore. Like, it's so dependent on the third party industries that are so big that it's super hard to keep up. Even for computer based, which is already super dependent on industry, it's very hard to keep up. But it's when it's online, it looks like you can't do anything about it. Like, when they stop Flash, they stop Flash, and you can't say anything. For hardware, you can find second-hand things on eBay, or you can make a newspaper announcement that you need those kinds of computers, and people come to ZKM with those computers. But if Adobe decides to stop Flash, there is nothing we can do.

Anastasiia Bergalevich: Can you maybe shortly summarise what would be your workflow from the point of acquisition to preparing an artwork for storage?

Morgan Stricot: This whole workflow is on the Wiki, which is publicly accessible. [Going through the steps on the Wiki] And what's missing maybe here is that it takes some time to know the artworks as well as the artist does. So, the last step will be to set up the artwork without the artist, once or twice. Let them check if it's good, and then you are free from the artist. But you're never really free from the artist. And what we try now to do also is to ask the artist to make a description of their artwork. Like, if someday we can't have screens anymore, if someday a mouse just doesn't exist, or if we all go to the museum directly in VR glasses and we are not going physically anymore, like in some Science Fiction movies where sometimes people are not going out of their home anymore. Like, if that happens, we need to have a description from them of what the core of their work is. What needs to remain so it's still the same work. I know for some artworks, the mouse, the clicking is important. If it's not there, we don't show the work anymore because touching the screen is not an option. In their work. So, things like this. We did this a lot, like for the new acquisitions here, (Nicolas) Bernier, the long light artwork. It's light based and has a very deep sound. This one we acquired was never exhibited here before. So, we tested the documentation. We did the documentation with the artist in Canada. We set up the artwork without him, and he came at the opening. And we were like, Is it okay? Is it good? And he was like, it's perfect. So, we know now that this documentation is enough to set up the artworks without the artist, and it's really like the perfect check proofing of an artwork and its documentation. Like, can we do it without them (the artists)? If we can, it means we did our job properly.

Anastasiia Bergalevich: How did you set up the questionnaire for artists, how did you develop it, and how did you do this documentary kind of workflow?

Morgan Stricot: Part of it is from (Rafael) Lozano-Hemmer. Like, the pre-acquisition is from Lozano-Hemmer because he really nailed the description of what an artist needs to prepare before acquisition. Because sometimes the artists think, okay, I'm going to enter a collection, they will tell me what is needed. And when we ask what is needed, they are overwhelmed. Because this you need to think through more in advance than at the moment of acquisition because if you never did a test of a couple of months of your artworks, you never did a video documentation of your work and we're asking this, they are like, no, it's in a depot somewhere in New York and we don't have access now and so we can't give you

this information and they are super sad and overwhelmed and it's stressful for them. So having this pre-acquisition thing where I'm sending the text from Lozano-Hemmer, they can prepare themselves if not for this work, then for other works after. So it's really cool for them. But then the whole documentation template is based on the "Matters in Media Art" project that happened between SFMOMA, Tate and ZKM, I think. I don't know if ZKM was involved, actually. But they made different templates for pre-acquisition, acquisition, documentation, and it was so well done.

Anastasiia Bergalevich: But for time-based media mainly right?

Morgan Stricot: Yes, for time-based. So some of the things are not adapted to us. This is why I did it in the wiki. I put everything into the wiki, and people can compose, like, a score of the documentation, and they adapt it to the work they are documenting. Like, if it's a video installation, of course, you don't have to say which computer you're using. So this is why the wiki is so cool because you can change things, remove things, take categories, remove categories, which is not really the case with a word document or even text documents where it's more difficult to make a table of contents. This and the workflow come from all the experience of the guys coming. Like, I've come to ZKM and they just taught me all of those steps and I just started to write them down. To see the efficiency if we change this, if we change that, if we start by asking questions to the artist before we acquire, maybe it's going to be better. So a lot like this. This was really the summary of five or six years of experience in acquiring artworks. And also giving classes to you at the HfG and also to institutions in Colombia during COVID, we gave classes and so on. And so I had to summarise the way we were doing acquisition. So this is where it stems from, this workflow. But it doesn't come from nowhere. Like, it's really inspired by many projects, research projects that happened before. This is why I didn't have the need to do something new because I saw there are very good templates on other websites, so I was thinking, okay, I'm just going to use something they spent months to develop. I'm not going to develop something just for the sake of making something new. So it's really the template from "Matters in Media Art" that we adapt to our needs. And Tate is using also the "Matters in Media Art" templates. SFMOMA as well, MoMA as well.

Anastasiia Bergalevich: But not variable media, or do they also have, like, a questionnaire for that?

Morgan Stricot: I worked with Jon Ippolito during my master's degree, and the Variable Media questionnaire is a very good idea. I did it for many artists because I did the French version of the questionnaire. And the problem that we never really thought about is that we can't foresee what technology is going to be there in the future, and it's still very hard for artists to imagine their work if the computer is not available, if whatever is not available. So the questionnaire is good for them to ask themselves the question of what is important in the work. But it doesn't need to be a questionnaire, I think. Sometimes just a discussion and asking them to describe their work in a way that technology is not involved, just to show what is important for them. What Jon Ippolito and Richard Rinehart did with the questionnaire was just to trigger this importance of asking the artist about their work without technology so we have a guideline for the future. Now I'm not using the questionnaire anymore. I'm just having a very intense conversation with the artists, a real conversation, not email. It can be on Zoom, of course, but I'm not asking them to write anymore because sometimes they are just discouraged if they need to write something. It's a lot of work to put this on paper. Sometimes we're just discussing and throwing around ideas, like "and if there's no screens anymore", "oh, I didn't think about that", you know, like that. And they are talking about it. And sometimes, like Ken Feingold, for example, he

thought about it during the interview. And then he wrote me, I think, 10 pages and said, Okay, I thought about it after you asked me during the interview, and now I have a real thought. And he gave me 10 pages of his thoughts on this because he needed some time to think about it. But anything that comes to me, it's good. Either it's in interview or paper or whatever. But this is what triggered Jon, I think, with the Variable Media initiative and the Variable Media questionnaire. Starting to ask artists what is really important about their work.

Anastasiia Bergalevich: Then the last kind of big question: why do you personally think that this historical approach to conservation of media art is important?

Morgan Stricot: I think for a long time, I was interested in historical machines because nobody advocated for those machines. And experimental media archaeology from (Andreas) Fickers in Luxembourg or the exhibition made by Zielinski, or I think it's Bauman who did experimental media archaeology on computers too, they started to advocate for machines. And it's not an anecdotic that we live with those machines and nobody cares about the knowledge they are bearing. Like, all of this history is linked to machines, and, like, we all have stories with those. And if nobody advocates for them, even in the industry, nobody cares. Even the technological museums are showing plastic. They are doing some research, but it's like, I'm thinking about all the tacit knowledge, like all the things that we are doing now, not thinking about it. And today, we are in front of an Amiga computer, and we are like, How do we access the operating system? We don't know. Actually, you need a floppy disc with the operating system on it to start the computer. If you don't know this, you think the computer is not working. So all of that knowledge that looks normal for the elder generation needs to be transferred. I really think we did this for a lot of different areas of the world, like carpentry, where we were able to transfer knowledge from one generation to another by doing. And painting even! We still do oil painting. We know how to do it. We can reproduce the big masters and so on. But I think my sister can't even make a call on a rotary phone. All of this knowledge is just lost in one generation, and this is kind of scary because it's changed the way we live and it changed the way we think. As we always say, knowing is, like, archiving the power. And I think this is something that needs to be preserved in a way. And those artworks are just an excuse for preserving those too. Not only, but also, like, it's complementary. I don't know if it will be useful, but we are the only one doing it. And by mistake, like, it's not meant that museum for art where we'll be preserving technology, but it's the way it is. It came from here. And I think this came from all of those media archaeological theorists that started to think about this.

Anastasiia Bergalevich: Yeah, I mean, I'm writing now about the history of ZKM a little bit, and I think it was actually in ZKM already from the very beginning, like from Klotz's idea of second modernity that now we're combining postmodern and modern elements and we're historizing all of this. And it was really from very beginning, and I think it's a really unique project in those terms. And it's lucky that you put your kind of, like, optic gut into it because I think it's a really good fit.

Morgan Stricot: Yeah. I think this is what Margit saw when she started. I just started my PhD. She saw that, and she thought, Okay, maybe we continue this way. And I know Margit was also really into some of the parts of the more kinetic artworks and the first cybernetic artworks. So it was kind of in the same line. There's so many things to read or to think about, regarding technology and the way it changed the world. This is the pit here of this thinking.

Anastasiia Bergalevich: Then a bit specifying question: I wrote that the department before you came to the institution maintained work only for exhibition purposes. Is that right?

Morgan Stricot: Yeah. And this was where the sadness was coming from, and this is why for the collection exhibition, we started taking things that had not been shown for long because there was no groundwork on the collection because of the lack of capacity. It was one technical team for all the museums, and Peter Weibel was doing exhibitions every three months. We had no time to do anything else. I mean, when I started here, I was doing only setup and then dismantling of exhibitions. I'd have one or two weeks in-between, so I could take a look at something, but it's never been enough time to focus. So when an artwork wanted to be restored, we were just fighting for it to be in an exhibition so we could have the time to restore it. But it's the same for most of the museums. They can make resources available only for works that are going in exhibition.

Anastasiia Bergalevich: Because, I mean, I'm researching now a little bit in about how MUTECH before worked, and it's such a black box. I mean, you just don't know what they did and whatever the process was and so.

Morgan Stricot: But it was the one I described. I think I just put in writing what they were already doing. Because when I arrived at ZKM, I was just a small "concepteur" knowing nothing about technology. And Martin Haeberle was the head of MUTECH at the time. He was already doing documentation, very detailed documentation of artworks with Mirko. And both of them really took me as an apprentice and taught me everything for two years. And after those two years, because I was in a master's degree and I had time, I could theorise around it and write about it. And this is how we started to have real guidelines that we could tell the world because someone was writing them. But those workflows have been here for a very long time, in a pragmatic way. Martin was just sick of not having information about an artwork and having to travel to go to install an artwork by himself or ask the artists all the time. And this is how we started, I think, to gather documentation because he understood super fast that documentation is the key for preserving those artworks. Mirko had knowledge of those systems to do backups; he started doing backups of all the artists. Because I read all those emails where they are asking the artist to send the copy with all the data because they lost everything because a computer broke. So I think they learn by doing. They had problems, found a solution, and applied it to every other work afterwards. Like, as soon as they lost their first data, they started to do backups. As soon as they lost their first computer, they started to buy spare parts. As soon as they had an artwork, no clue how to set it up and the artist was already dead, they started to gather documentation. So when I arrived in 2012, it was already almost twenty years of experience with those artworks, and they just taught me what they were doing, and I just prioritised all that. So it's not such a black box anymore because I just wrote what they were doing.

Anastasiia Bergalevich: I see! It wasn't really obvious for me.

Morgan Stricot: Yeah. But it's just because they never they were just living in the moment and being in the moment because of having to set up exhibitions, dismantle exhibitions etc. all the time.

Anastasiia Bergalevich: I don't understand how they were managing everything, to be honest.

Morgan Stricot: We don't know either. They had big brains, I think. Because even now, when we are looking for stuff, because some stuff, it's just lost in the house, we ask them and they remember where it is! This is why, when some of them are starting to go into retirement, we are super stressed. Because a lot of information is still in their head, and they know a lot of things about the house. We always say nothing is lost at ZKM, it's just hidden somewhere. It's true. We never lost anything. Each time we find it, even if it's five years later, we find it. And this is why it's important that the team always stays the same because this knowledge transfer can happen.

Anastasiia Bergalevich: I wanted to ask about the work "Tempo Liquido" that ZKM has, with the rotating wheel. I'm kind of kind of curious what happened because I heard there was a lot of trouble with this preservation? Do you know what exactly happened to this work? And was it planned to be always exhibited at ZKM?

Morgan Stricot: I don't know, but it was in the first exhibition of the collection. And it was kind of an urge from the public, like, everybody asked about this work. We put it back into the exhibition against everybody's wishes because we knew it would be broken after a month because the TVs are not supposed to be upside down the whole day. I mean, any apparatus of any electronics – if you start doing this for eight hours a day, something is going to go wrong. So after maybe the first three weeks, we started to have monitors failing. So the solution here was to make it easily repairable by changing the chassis of the CRT. So those were CRTs from the consumer world. Meaning the one you have at home. So the spares, they are not so much available, and they are not meant to be repaired because of planned obsolescence. They needed people to change their TV all the time. But in post-production, like television and newspaper productions and all the industries that were using TVs, they were using what they call professional TVs and 'professional monitors. And those were meant to be repaired because they were so expensive and of such good quality that you needed them to be repairable. So here we have a lot of spares to repair. So what they did was they used the tube from a Philips consumer monitor, and they took the chassis of a Sony (professional) monitor. So if it's broken, it could be repaired more easily. So it was kind of a Frankenstein of a tube from the consumer world and a chassis from the professional world. But even that, it was too much repair. We had to repair all the time. So at one point, we just stopped the movement. So they might work longer.

Anastasiia Bergalevich: Yeah, I think this is how I've seen it last time.

Morgan Stricot: So only the monitors that were facing front were on, and everything that was on the other side was not on because they were upside down. And then the solution of a flat screen was, like, evoked. The problem is the 4:3 (aspect ratio). We don't have 4:3 three monitors bigger than 21 inch, and those monitors are 25 or 27 inch. So we started to contact companies in Germany that are doing custom-made LCD panels. And it costs €5,000 to €8,000 for just one. You can have a better price if you are doing, like, a real production, so you need 500 or more pieces to start to be competitive. But we needed, like, how many? 25, I think. So we were like, Okay. So we can't do this. So we were like, Should we wait for flexible LEDs? Because they can maybe match also the way it looks. Too expensive. Still. Because with those, I think in the future, it will be easier. You will cut them yourself, the LEDs, It can happen. I think it will happen – those kinds of things, like you can choose the size or the curve or whatever. When they started to the foldable phones, I thought maybe something is coming, but it's still too early. So we started thinking of projecting inside the tube. Instead of the tube, you put those super small Arduino projectors. And if you put them in the tube instead and project inside the curved

area. I thought maybe we could have something. The problem with that is the heat. It's heating up too much. And so you need ventilation, and we had no time to do experimentation. But this could have been a solution, to project from inside. But then we thought of projecting on the surface, but it would be transparent that we do this, so we stopped there, and we just show it fixed, like, not moving. And so when we started the new collection exhibition now, we were like, Maybe now...? [laughing] But enough, it's a real problem. Those CRT screens are very difficult because nothing can replace the lights they are producing. So even with LEDs, I don't think we will succeed to do something. I started to do replacement of LCD screens from the 90s with new LCD today, and the difference is also big. So already between LCD it's difficult. So between CRT and LCD...

Anastasiia Bergalevich: I mean, I think Dorcas also doesn't want to do it because of the kind of ethical reasons, because she says that you lose half of the image.

Morgan Stricot: Exactly, It's difficult. It's a very difficult topic. ZKM is doing research now on this for a big conference in December, I think it is. Where they want to map a bit in the world knowledge regarding cathode ray tube technology. See if there's other people than just Colorvac doing this. And if it's only them, they need to teach each others because then we are stuck and this knowledge is gone if he dies tomorrow.

Interview with Dorcas Müller

– Head of the *Laboratory for Antiquated Video Systems* at ZKM.
– Media Artist

16. March 2025

Anastasiia Bergalevich: Could you please begin by introducing yourself and explaining your role at ZKM?

Dorcas Müller: My role at ZKM is to care for all kinds of video media that entered the building somehow on different ways and occasions; some are bought officially and are in our collection; some came to ZKM; some video media came via exhibitions; some came via artists in residence; and then some came just for viewing purposes but just stood in the building somehow. Media arrived in different ways in the building, and as ZKM is planned as a museum for contemporary art in the first place, the archiving of all this material was not planned in the beginning. There was a certain point where it was difficult to handle all this stuff because it was not quite well put in a database and it was not well digitised; some of it was historical video media that could not be digitised because all the gear was obsolete already.

It was around the turn of the millennium, or 1999 when Peter Weibel became director of the museum, and already in the year 2000 it was clear that it was kind of chaotic – the video media handling at ZKM at this point. I was at the ZKM organisation before that in minor roles, but then my role emerged as a caretaker for all kinds of video media in the house. It was set up from scratch, and also there were different departments that were busy with video at ZKM, but they were not really connected with each other, and there was also no centralised information system. The *Mediathek* existed, but there were also other convolutes of video, for example, of the Video Studio. They documented all the events at ZKM from the beginning, but their archive was not connected with the Mediathek in-house. So there also were different collection areas; like, for example, the *Museum für Neue Kunst* had a separate collection, which included video, and also the Media Museum had a separate collection of video media, and this also was not really connected with each other – information-wise and so on. So this was my role – to care for video, and in the first place to set up a team, set up an infrastructure to digitise media, that has not been digitised until then, and to set up somehow an information system to find the video again, and taking care of the long-term storage was very important.

In the beginning, it was not quite possible because the storage media were still too expensive. The space on contemporary storage media around the turn of the millennium was still too small to store uncompressed video. So it was still sometimes hard to digitise it. Then you rendered viewing files, and you had to throw away the uncompressed masters because there was no affordable digital space to store them. So in the very beginning, like the first two or three years, when the electronic marketplace developed digital cartridge systems which were available (and not too expensive) and proposed a lot of space for data — we chose the same system that was chosen by the film industry: digital cartridges. They

were affordable, and we set up a system in 2004-2005, which was managed in-house on an open-source basis, so an open-source, Linux-based server system and open-source data management. This was a very important turning point at ZKM, because only if you can store your digital masters are you able to really seriously restore and digitise video from analogue video media.

So, I was part of it. I was a founding member of this digitising facility, which is called *Laboratory for Antiquated Video Systems*. All the other departments around the Laboratory, which already existed, were also integrated with the laboratory: Material of *Medienmuseum* or *Museum für Neue Kunst,* was digitised there, the Video Studio then joined the long -term storage we set up. And since then, all their productions, also from the beginning of ZKM and the forthcoming productions, were stored in long-term storage. So it was made sure since 2005 that nothing would be lost. Nothing that had been produced, nothing that was produced and nothing in the future. So it is quite a hidden place, the laboratory. But it is the neuralgic point for the long -term storage philosophy of ZKM, which is homemade, and not very expensive, but very effective, because we can find everything since then and we don't lose anything, that has been produced. So it is important for researching and so on.

So, yeah, this is my role, and I started here just as a scientific researcher who joined the group. There were different forces in the beginning, and the biggest force was, of course, Peter Weibel, because, first of all, he wanted to found a place to digitise his own artist archive. So, he was very motivated to do it, and this was important because it formed my job also. This job didn't exist before, and I could join the group, so good for me! Another force were the Vasulkas; they were artists in residence at that point, and they brought a collection of old video gear for the obsolete formats. Also Christoph Blase (the son of Karl -Oskar Blase), he had the collection of video documentation of Documenta 5 and 6 in the form of analogue tapes from his father. And he had a collection of obsolete machines, which also went to the laboratory. So, we had the stock of old machines. And Christoph Blasé was then the head of the Laboratory for Antiquated Video Systems.

Also, there were very important technicians and IT specialists from Jeffrey Shaw's team at the *Institute for Visual Media*, and they helped to build up and set up the technical environment of the studio and the long-term storage server. So they formed the group, a team, because you cannot set up something like that alone or with knowledge about only one field. Everything has to get together. The obsolete analogue video machines, the computer side, the digitisation process, and the long-term storage. So it's more or less three different technical areas, and they had to merge in a team.

Also we got in touch with Friedrich Sambs at a very early stage, (who is still with us today), he's an expert in repairing the old gear from the 60s, 70s, 80s. And this is very precious knowledge because without the old gear, there is no digitising, of course. So he's one of the most important technicians joining the team.

Somehow, even though Christoph Blase had to leave in 2011, we managed somehow to keep the laboratory alive, although there were a lot of difficulties. And it was possible because we got one big funding project after the other. Because there is a huge need in Germany and worldwide to have digitisation projects for media art related to art research. There is a need for it! So we had one project after the other; they were all funded from non-profit funding.

AB: So the laboratory does not receive financial support from ZKM?

DM: ZKM has a budget which goes towards every project we have at ZKM. But huge projects like that needed extra funding. A row of major projects appeared one after the other, and mostly all of them were funded by non-profit German-wide funding, and maybe this is also a reason why the laboratory could exist all those years, even though there was a lot of trouble, also political trouble, and so on. So we just kept on doing one project after the other. The last big change was when our CEOs changed two years ago. It was also difficult, but the projects obviously go on. At the moment there's also an application for funding and probably we will get it in summer. So the laboratory will still go on existing and cooperating with institutions worldwide and restoring, digitising, and setting up exhibition projects.

In 2011 I became the head of the laboratory. The staff minimised then because before I had my colleague, Christoph Blase, who was the head of the laboratory, and I was the research assistant, who did all the work. And when he left ZKM, it was only I left. So I had to do both there: do the work, be the head of it and manage the freelancers who are involved. For example, like the IT person, who manages the long-term storage, and also Friedrich Sambs, who manages the restoration of the old equipment. So I had to manage everything and do the practical work, and it's like this today.

My colleague Christian Haardt works at the laboratory two days a week, but his main job is in the Archive, obviously. We are getting so many archives that he's really busy with that. If there is a political change again, maybe it will reward what we are doing here, and maybe there will be a few more resources and jobs. We don't know about it, we just keep on going. This is my role in all of this.

At the moment we are collaborating in the *Emergence of Video Art in Europe* project with Université Paris-8, ÉCAL Lausanne, and at the moment the FMAC Museum in Geneva; they have the opening in the first venue of this exhibition, and the opening will be on the 20th of February. So we prepared also all the video players for their exhibition, and we restored their complete archive as well, here at ZKM, during a phase of two years from now. And the next thing will be the big collection exhibition which opens on April 4th. Some videos in the collection are still not in the optimal state, so I'm working on this as well at the moment. So, obviously, it just goes on and on and on.

AB: If I understood you correctly, ZKM is still unable to fund the Laboratory's work from its own resources. So, external funding is necessary and must be applied for on an ongoing basis?

DM: Well, the laboratory is not very expensive, so ZKM would be able to finance it itself. However, the work of the laboratory enables ZKM to get further funding, and from the funding of the laboratory projects, also the other departments benefit, because those projects are usually related to publications. For example, the [Ulrike] Rosenbach exhibition had a catalogue, which was made in the publications department. This exhibition was made possible with the restoration process of the laboratory as well. And Ulrike Rosenbach gave her historical archive to the ZKM in 2018. She made a deal with Peter Weibel for her major exhibition — her retrospective — she didn't have an exhibition of this size before. And it could be produced at ZKM, because obviously we have departments with video experts, which other museums don't have. So, the exhibition of Ulrike Rosenbach got funding as well, from which ZKM also benefits. A lot of the production was made at the laboratory as well. For example, for the catalogue, we made, like, several hundred video stills. So the laboratory is like an occasion to get even more funding.

Also, *Emergence of Video Art in Europe (1960-1980),* now we have an application for the funding for the exhibition and the publication. So the curatorial department benefits from it; the publications department will benefit from it as well. So it's more like a magnet, a magnet for projects and a magnet for artists and other institutions. The institutions which are not able to digitise historical archives are also interested. They want to do exhibitions, but they are not able to initiate the evaluation of certain archives with a manageable budget. So they try to collaborate with ZKM, and then they can use all the material they dream of.

Yeah, the ZKM has no general funding for this service, so we are not funded by the "Bund" [federal government of Germany] in Berlin, we have only funding from the state Baden-Württemberg and the city of Karlsruhe. The funding is only for projects and exhibitions, not for the general service of restoring and digitising. And that's a little bit of a problem, because the work of the laboratory is dependent exhibitions of budgets and other collaboration projects. And we did applications for general funding, but the problem is if we get general funding from Berlin, the same amount of money has to be added from the state and the city. So if we got general funding from Berlin, it would be expensive for the city and the state, and they don't have the money to blow up the service of ZKM, somehow. So it's a political discussion as well. So, we have to go on like this. It's a little bit of a "Purgatorium" [purgatory] or something in between. We do general restoration projects, but our museum's funding is only for exhibitions and projects. But we do collaborations, where we do general restoration for other institutions as well. And therefore, we have to apply for non-profit funding in addition to our own in-house budget.

AB: At the same time, while working here, I noticed that the laboratory is participating a lot in exhibitions, which is also a good thing. And research work is sometimes the main part of exhibition-making for example for exhibitions like Rosenbach (2023), (you already mentioned), or the upcoming collection exhibition, or also *40yearsvideoart* (2006).

DM: Yeah, we had *40yearsvideoart*; *part one*. Then the heads of Buffalo, which is Steina Vasulka and her group, it's all media-based works. Then *40yearsvideoart;* part two, RECORD > AGAIN! (2009) took place.

We had a guest exhibition from Pompidou — *Video Vintage* — and we had to restore half of the exhibition anew for Pompidou, Paris, because their quality was so poor. After we got the exhibition at ZKM and at Pompidou as well. So, we got the exhibition for the restoration work here at ZKM — it was an exchange.

And then we also did the Joseph Beuys edition [publication of *Joseph Beuys. Aktionen 1963–198*]. We also did the *Aldo Tambellini* exhibition (2017). His archive was shipped from Cambridge, over the Atlantic, to ZKM. We got the *Raindance Foundation* exhibition (2018). The Raindance archive was shipped from MoMA New York to ZKM.

We also had collaborations which have not resulted in exhibitions. For example, MIT Boston, CAVS (Center for Advanced Visual Studies). The whole archive came over the Atlantic to ZKM; we digitised it and shipped it back. After, they set up their media homepage with the materials. So this was a lot of work, but we didn't do a project out of it.

The Joseph Beuys edition and then the Rosenbach archive were centres of attraction; they got funding from Kunstfonds Bonn. In the Rosenbach exhibition, 140 artworks were shown. Half of them were objects and flatware; half of them were video installations. 70 video installations, and 20 of those video installations were of poor quality. So 20 of them had to be restored anew at the laboratory, from the source of the historical Ulrike

Rosenbach archive, which was sent to us in 2018. So the exhibition made it possible to digitise these works in good quality because of another effort of restoration. The artists often care a lot for their more important pieces, those which are sold everywhere, to all museums. These works are normally restored. Julia Stoschek buys them and so on. But another 80 % of their work is normally not in a very good state. So this we enabled for the exhibition. Rosenbach was finished in March last year. And now we are working on *Video Art in Europe* at the moment.

And besides those major projects, there are a lot of other archives we are working on. For example, I'm working on Antoni Muntadas at the moment. He lives in Barcelona and sent his archive to us. It's several hundred media. Some are forgotten, some are very visible again, and some were in collaboration with Goethe Institut and travelled and so on. So just one thing happens after the other, and a lot of them got funding, also for the benefit of other departments at ZKM. The laboratory is very small; nobody thinks about how effective it is for catalysing projects.

AB: You also mentioned this collection of hardware and playback machines that ZKM possesses. I wanted to ask when exactly this started. Also around the 2000s?

DM: At the moment when ZKM was founded in 89 they got a lot of money and bought a lot of gear: video gear, lighting gear, the whole equipment of ZKM. That all was bought in the beginning, when we had a lot of budget. Also, a lot of video equipment was bought in the 90s by ZKM: analogue gear like Betacam SP, Umatic and so on; time-based correctors; and editing suites. The whole laboratory rooms here were full of Betacam editing suites. Around the year 2000 video became digital; nobody worked with this old gear anymore. So, this laboratory room was like a storage: it was dark, nobody was working in it, and all the old video equipment was stored in here, which was collected from the early years of ZKM. So, nobody used it anymore. There was dust on it. So we had this stock of video gear with a lot of wires and so on.

Then came the Vasulkas with their collections and Christoph Blase with his collection. And every archive we received from other artists came with some video gear because the artists also wanted to get rid of their old machines. So every archive was a donation, let's say, and included not only the videotapes but also video gear. Also, in the years 2004 and 2005, eBay was big. So you could also find and buy video gear on eBay if you were looking for special machines. So, we could complete our collection via eBay.

Then came a phase where all the official institutional video studios closed because there was a paradigm change. Everything switched to digital editing. So they wanted to get rid of their equipment, and the ZKM was well known for the laboratory. So people from the scene basically knew about the laboratory and then they called and said, "Ah, we want to throw away our technical gear, just come by and take all the stuff. We don't need it anymore." And this is what we did a lot. We just took the transporter car and drove to the different cities everywhere over the country, sometimes also Switzerland or wherever. And we got the gear from those studios which were closed or which were changing their infrastructure.

Also, universities got rid of their equipment, for example, from the University of Heidelberg, the pedagogic department. We have a very early, historical one-inch video recorder, the very first edition of portable one-inch video recorders from 1963. This we got from the University of Heidelberg. So we really drove everywhere and carried all this heavy gear and brought it to Karlsruhe. This was a lot of work. We were sweating a lot. So it was really a personal engagement in getting all this before it goes to the dump.

Also, our technician, Friedrich Sambs, had deals with dumps, the dump close to Frankfurt and so on. So in the year 2006 was the FIFA World Championship. And there was the paradigm change from 4:3 video to 16:9. So everybody threw out their monitors on the dump. And we had deals with the dump in exchange for cigarettes. We got a lot of monitors and a lot of video equipment because if they got something, they put it aside for us. And if there was a veritable amount, they called, and we drove there. And in exchange for cigarettes, we got the technical equipment. So this was the time of collecting. Nowadays in the storage outside of Karlsruhe, we have several pallets full of equipment, a lot of video equipment. And there was also one major buy of a collection of video equipment that Peter Weibel did. He bought a collection of video gear from television stations. For example, the SWR television station got rid of all their 423 monitors, and we took some part of it. So there were several activities of collecting gear for the future of the restoration at ZKM.

AB: It was mainly video equipment, not like old computers, for example, or software?

DM: Sometimes also software, also computers, but also a lot of video equipment. I think we never had a historical computer art exhibition until now[58], which really took this content in the title. For example, there were also a lot of Apple performances, in music, but we never titled an exhibition "Historical Computer Art Exhibition". We never had this, but we had several historic video art exhibitions. So, it was very well known that we are collecting this video gear. We also have a huge collection of computer gear, but it's outranged by video. And then there was a certain point at which we had to stop it a little bit, because we ran out of storage space. A lot of consumer video gear was offered to us, but we were lacking of special semi-professional kind of gear, which was not in private households. The living room television monitors, we cannot use a lot of those in exhibitions. We need more studio CRTs. So we had to stop a little bit the donation business [laughing] because we ran out of space and it was too much.

AB: Can we talk a little bit about the restoration of CRT screens?

DM: I'm not involved that much in it, but I have been involved in it in the past. We had several exhibitions where we were using television sets contemporary to the era, in *40 Years of Video Art: Part 2* and also the *Video Vintage* exhibition at Pompidou. The complete Pompidou exhibition was in the style of the 60s, 70s and 80s. They even looked for furniture and tapestries and everything from the era. So, the whole exhibition was like travelling to another era of media. At that time the only technician we had was Friedrich Sambs, and he had to repair all the gear for the exhibitions. It was important that the television sets were in a perfect state, and we had to carry a lot because this gear is very heavy. We also collected design pieces from Brion Vega, Braun, and Wegavision. We have a collection of all these monitors but since then it wasn't used that much anymore.

The videos from a certain era obviously often look best on the monitors contemporary to them. For example, black and white open reel video looks really good on black and white CRTs or black and white Braun monitors. We realised that for some exhibitions, it was very nice to see the works on their contemporary gear in the exhibition. It’s something special like a “delicatesse” and you don't have this very often. I don't think for the collection exhibition it's planned and I don't want to suggest it, because it would be so

[58] The exhibition *Choose Your Filter!* (2025), opened several days before this interview.

much work and so much discussions. However, we did it in the 2010, and we did it other times.

AB: Ulrike Rosenbach was also shown on the old CRT screens right, wasn't she?

DM: Well, I mean, one part is the old CRT screens, but I mean also old-*design* CRT screens from the era, which give that special spaceship enterprise feeling or space age feeling.
Very few works were shown on those typical design screens from the 80s in the exhibition of Ulrike Rosenbach. But most were CRT monitors. CRTs were always this black cube. The ones which were used for Ulrike Rosenbach were the typical CRT cubes that also were used for installations in the 80s.

AB: What are the main struggles with conserving time-based media art and specifics of working with them?

DM: There are two major things, and there is a misunderstanding because of the difference between classical or also modern art and media art. So media art is always a processual art and it's always a little bit related to concept art. The most important thing is the information. Media art is very strictly related to the technical gear. So the medium is the message. The gear and the information are intertwined and in a very strong dependency on the products of the electronic industry. And the electronic industry is always designed for the contemporary moment and then it becomes obsolete and is not produced anymore. When you have an information-based processual art form, which is dependent on the gear, it can also be extracted and moved into the next generation. It can be updated. So you have the dependency but also the processual characteristics, which can jump from one update to the other.

And this is very difficult to understand in the theoretical reception of modern art and classical art, because it's kind of vivid. You can not combine it and it's like almost the same discussion that you have between chemistry and biology. So I would say that like the classical art forms, modern art is like chemistry because it is material art, materialistic art. And media art is more the biological art, because it's the information. Information that artists want to transport and they pack it into technical gear to distribute it. This is a vivid thing, because the most important thing is the poetry that is transported. Let's say, the art is like a shape of a thought: you have a certain idea and you shape it into a thought, into an information; then you put it in a technical gear to distribute it, and the distribution part is very strongly limited by the products of the electronic industry, and the electronic industry is only a marketplace. They are not interested in the restoration or keeping up their products. No, they have the planned obsolescence. Their plan is to make all the gear obsolete and to sell new gear because it's a market.

An artist that knew very much about it was Nam June Paik. He also made it into the content of some art pieces even. The mortality of electronic art is very often transported in the artwork of Nam June Paik. And one of the most important pieces is *Noah's Ark*, where the CRT monitors are transported and the videos are transported on an ark, because everybody knows soon the gear will be obsolete and then how will the art survive? You have to build an "Arche Noah" [Noah's Ark] to transport it to the next technical era or whatever. He did this work in 1989. So it was in the middle of an era of 4:3 video, 4:3 television. This era existed very long time, over 50 years. But he already knew that there would be a change, and he put this bad news into the work. And we could only understand, 10 or 20 years later, what he meant with this message. So it is a very interesting piece of art.

So, in the first place, we have information-based art pieces. The information is also time-based, so you always have to stabilise and correct the signal of this art in time. So this is very difficult on a technical level. And you are dependent on gear that becomes obsolete. The media art of today is even more short-lived, because I work with 4:3 video which is 50 years old and it's still possible to show it and restore it, to work with it. For example, computer art which is 10 years old is much more difficult to restore. And the gear of today: the mobile phone based art or net art — it's so short-lived, you already almost have no chance to rescue the work as it was for the next 10 years, because all the gear will not be produced anymore and you cannot replace it, you cannot repair it. So how to transport this artist's thoughts that are in the shape of electronic impulses? How to transport it into the next generation of hardware? It's very difficult, you need emulators, you need to interpret these electronic signals in a new software on a new computer. It's almost impossible.

So the laboratory is so successful because video art used such stable hardware. You can repair it; you can replace pieces. I profit from that and also from the fact that video art looked not so perfect. From the beginning it looks a bit trashy, so it doesn't have to be perfect, to have a reception in an exhibition. I'm very thankful you can update it and transport it into newer forms, like the digital code of video, or contemporary players like let's say CF card players, USB sticks or now even stream directly from a cloud or Amazon, Netflix does it. So I'm very thankful. You can update it very easily. But is the look still authentic? That's another discussion on a theoretical level. There are a lot of different positions. But on a technical level it's more easy to transport video to the next generation of gear.

AB: What is the ethical approach to conservation taken by the laboratory? For example, the question of authenticity – how is it answered? Do you post-produce videos or not?

DM: The centre of the ethical approach at the laboratory is to supply the people with material. People who are still highly interested in this medium and, first of all, the artists that are still alive. They are the pioneers, so they are around 70-80 years old now, and they still are activists, media activists, and they still want to use their materials. They also struggle from an economical part. Media art was never very well paid, or it was never very well supported. So those artists need to be supported in order to rescue their work. So in the next era it can be researched, acknowledged, and still shown, and also their products should go into circulation.

The media artists are those artists who didn't care that much about selling their artworks, they were more interested to reflect the contemporary issues, political issues, artistic issues, aesthetic issues and also how all people are living in this progress of electronic media,

how electronic media is an invasion in the private life, in the working life, in the financial life and so on.
For example, Antoni Muntadas was very much into how popular mass events were adopted into media events. For example, bullfights or soccer games: how they went into media events, went into television, and became commercial events. How they became events that sell out whole cities suddenly, like the Olympic Games suddenly sell out the whole Paris, so that the inhabitants don't own their streets anymore, don't own the place where they live in, because it's commercialized by a huge company. So how did the electronic media become a commercial multinational company suddenly? How it suddenly controls space, money and even your home, where you live in. It's just like hooligans, who every Friday just go through the city, and you can't use it anymore. And it's a commercialization and media artists are interested in issues like that.

What about the historical side of it? You can research all the artworks that media artists did from the beginning until now. So I think this is a very valuable collection of observations they made. They were observers, and they documented it. They made media art pieces out of it, which they showed in exhibitions. And this is an art form that is not very much supported. And I think non-profit institutions like museums should be related also very strongly to art like that even more than to art that is collectible and sold by Sotheby's, Christie's.
And it’s something very interesting because it's so expensive even though it's only a painting. This art is more like art which leaves us very amazed, it’s like winning a lottery, it's interesting, but it doesn't show our history it shows our commercial history. It shows the commercial side and also how people are impressed by something like money. However, on the other side are all other artists, who were really working in the grassroots.

Also, media art therefore is related very strongly to political activism. For example, the Raindance Collective video group were also involved in a festival called Earth Day, which was one of the first ecological festivals that raised awareness of ecological issues, and it took like 60 years to make this issue a topic for everybody. And they were pioneers in this field.

So I think it's very important to restore and digitize this material, put it in the archives and make it available for everybody, who is interested in it, for them to know more, and to do the research. It’s important to know more about the roots of those movements. I think the commercial art maybe became commercial later on; like Van Gogh was also an activist, but it has been made into commercial art. Always when you study the history behind those artists, which didn't receive anything for their art during their lifetime, then you see all their engagement, their activism. This can only be made visible when you have the possibility to research all this material and therefore it's very important that the institutions put money in the restoration and storage and so on. This is the major motivation to do it.

From the ethical point concerning the issue of aesthetics and so on. At the laboratory we don't do post-production. We did it only very few times when it was wanted or ordered. For example, by Pompidou, because their archive was in a very bad shape, we removed here and there some dropouts on a technical level, but this is a lot of work. Also video art never has been perfect, so it doesn't make sense to remove dropouts because the dropouts were there from the beginning of media art, Media art doesn't have to look perfect, so at the laboratory we don't do post-production on a digital level we only care for the mechanical, electrical possibilities.
All restoration of videotapes happens only on a mechanical level: like cleaning the tapes and also doing thermic treatment. If the tapes have problems, like sticky shed syndrome or polyester dust, we make sure that the tape is in the best possible state to play it back. Then we digitise it; we digitise it uncompressed. This results in a digital master. And we do a long-term storage of this digital master. And in this digital master is the most possible information you can get from the analogue medium. And you can do with this master everything you want afterwards on a digital or post-production level. But we don't manipulate this master. It is the starting point for all the other activities. Later on, maybe you can use artificial intelligence to restore it, or you can restore it like in a film post-production. You can blow it up for HD for a 16:9 beamer [projector]. You can do everything with this master, but we make sure that this master is not changed anymore. It's like a reference.

And also the fashion of compressors changes over the years. So in the beginning you had MPEG-1, then MPEG-2 for DVD production, then you had MP4 for YouTube and

Facebook and so on. And soon it will be something else. But you need to go back to the digital master to calculate a compressor, a new compressor. Then it looks the best. You cannot compress it and then, from this compression, jump to the next compression; you lose information each time you recalculate the video. You lose information, and this results in videos of very poor quality.

We suffer from it, and all the archives suffer from it. Now and when we do video exhibitions and get the material from abroad through a loaning process, sometimes we get very poor digital material, because everybody recompresses, compresses, changes the aspect ratio, changes it into progressive files so you lose half of the information, because all the half frames are lost and people don't think about it. They don't know anything anymore about 4:3 SD video, so they lose all the quality by recalculating and recompressing and so on. This is very dangerous for archives because the electronic archives lose information through that process, and at ZKM we try to be very orthodox with the data files in order to not lose the information.

AB: I read your text in the second part of *40yearsofvideoart*. You described all of the workflow at the laboratory. Is it still the same? Is there something that changed or that you would add?

DM: Not much has been changed in this process. Some gear has to be modernised. Of course the long-term storage has been updated and migrated because we do this every 10 years, and the catalogue is more than 10 years old now. So the long-term storage, of course, is updated constantly, but media-wise only. So yeah, until now we have migrated once. So the technical environment of the long-term search, of course, changed a little bit. But we kept the same media, the same medium: LTO (linear tape open), which can be managed with open source software. We kept this philosophy very strict, we still digitize SD uncompressed, we didn't change containers, because you can do it anytime. As you know, if you have a file, you can change it any minute to whatever you want. And we try to keep our digital archive as homogeneous as possible. Because if one day we really have to change something, all the data will be in the same state, and we can change it automatically at once. The most horrible thing is when you have a digital archive and the files are different.

AB: And how is the work between MUTECH and the laboratory coordinated? Because you are currently putting together the exhibition *The Story That Never Ends*, but I really don't understand from talking to people, how responsibilities are divided.

DM: At ZKM, there are those separate workspaces with the specialists, and they are very aware of the workflow and what they have to face and what they have to do to reach the product. In the end for the opening, everything has to be ready. So I know what I have to do. Friedrich knows. Morgan knows what she has to do and so on. And normally, usually, there should be a management. And usually it's the producer of the exhibition, who does the management.
So you have the team of curators, and then you have the producer of the exhibition. And the producer of the exhibition should be aware of the plans of the curators and should moderate between all those departments and make clear that everything is in a flow.
But this manager level practically does not exist. And also the curatorial management now is very thin at the moment because the curatorial team is too little for that amount of projects we have at the moment. So we have to self-organise, because we have to start now. 30 monitors — we need several months to repair them, check them, and make them secure because of fire — they have to be proven for exhibition run, so we organise ourselves.

It's like a self organizing organism, because there is a weakness in management at the moment. And we can do it, we just produce everything for the technician team and they will start setting up the exhibition and in two weeks from now they will already start setting up all the installations and I'm also communicating with them directly, with Claudius Böhm and Werner Hutzenlaub, they are setting up the projections and the CRTs in the exhibition. So we were communicating. And I communicate directly with Andreas Bremer, who is checking all the files and who makes the CF cards for the players, which he gives to Claudius. So we are self-organised technicians, and the production manager starts getting in the thing when half of the exhibition is already set up. Then they go around, and they are very excited and are helping where help is needed but is not existent at the moment. So by the time we start setting up the exhibition, everything has to be clear already. So, yeah, this is a problem. It would be nicer with a project manager who is moderating.

AB: This is exactly what Morgane was also saying, that she always facing the problem that curators don't really understand how long it takes to set up the media art exhibition, because they think that devices are really fast and easy to set up and it's never the case, even for contemporary devices. So they don't have this time awareness at all and this is a big problem, especially when you bring some works out of ZKM, because in ZKM people more or less build this awareness, but then you set up some installation outside of ZKM it's always a big problem.

DM: Yeah people don't know anything.
Also the video distributors outside of ZKM, they forgot what 4:3 SD is about. They don't even know, you need the half image data file for CRT, they send an MP4 progressive file — it's a viewing file, a poor quality viewing file.
They send it as an exhibition file and you go and say: “Oh listen, uh, we are doing an exhibition. Yeah, we need a proper file”. And they go: "What is this?", "What does it mean?", "what shall I send?".
It is difficult because it is forgotten. So we are self-organised, and not everybody wants to give this kind of motivation to the thing [restoration] and we have to tolerate that.
And there will be also a change in the generation and this is a little bit difficult, because in modern times, I think, it's forgotten that the exhibition is not something on the internet — it's real, with really heavy things to carry and real stuff that needs to be finished, because it cannot be shown when it's not really finished. So it's not a process thing, it has to be finished at a certain point and to be set on. It's difficult, because everything is digital, but the exhibitions are not digital at all. It's like a film set, it's very real and the people have to work there and to sweat. When it's set up in the end it's like a ballet, in the end it looks very light and nice and fine. However, to set it up is really a lot of work, and you have to be present, and you have to talk to all your colleagues and so on. And the same is for the technical team the head of the department, Martin Mangold he's not very present at the moment as well, but his team is very good and they are also self-organizing a lot.

AB: Do you think there's some theoretical texts that were important for you, for forming conservation strategies or were important for your work generally?

DM: So, this theoretical part of media art conservation? I'm very aware of it and also what is happening and what is discussed and so on. However, ZKM is a museum and not a university — and the museum is more like a factory, where the practical side of it has to be practised on a daily basis. For example, for the FMAC exhibition in Geneva, I had to prepare 60 players with 60 videos. Part of it came from abroad and was in a desolate

condition, so part of it I had to restore and digitise myself in a year. It was also very complicated.

At the laboratory we digitise around 1000 media in one year. So I'm digitising some of it, Andreas Brehmer some of it, Hans Gass is digitising audio files, some of it Christian Haardt. 1000 media that's a lot, but we have to do it, because 1000 media a year is two to three art archives and behind those archives are institutions and artists, who are waiting for this material, and they want to do two or three projects based on this materials and they want to finish it. So I'm aware of the theoretical discourse concerning media art preservation, but in this factory-like environment with deadlines, with catalogues, with editions, with exhibitions, — I cannot do the same bureaucratical amount of documentation that is wanted in the theoretical field of restoration.

There is a standard set at the academic level, but that is wishful thinking, I would say. And on the practical level of a museum, there are real people, institutions, artists and so on. And the artists, for example, they don't care about your documentation. They care about the quality of the video you produce and about what they receive — like the digital masters and the viewing files, which they can distribute to their galleries and other institutions in order to make exhibitions in order to make some money to go on progressing. So I have to fulfil all of those wishes.

For me, for example, the most important part is the long-term storage. So I sacrifice the documentation for the proper long-term storage because I want to make sure that in five or ten years (when the artist comes again and wants digital master, for some editing or for a television station, for using it or their inheritance; or a museum, which owns a piece of this artist, when they come and want the material), I am still in possession of the proper digital master and can provide it again for further circulation of the work. So I'm aware of what the aspects and the needs of proper restoration are, but I am in the museum with these daily practical projects, and I focus on the needs of that.

But whenever I have a problem and want something I need, I go back to the publications and have a look. How is this problem manageable? Or what are the guidelines? How to do it? How shall I do it? And so on. So I am criticised a lot as well, or ZKM is criticised a lot at symposiums. However, if you are restoring five video art pieces a year, you can make a proper documentation for each work, of course. But if you digitize 1000 videos, it's not possible, especially if you don't have colleagues who are working full-time. and I don't have a single full-time working colleague for restoration.

So I am aware of and I appreciate all the research that is done, but sometimes I'm also disappointed, because very often we get files from restoration centres in Europe, and the files are progressive, although the people know, I want to show it on a CRT.
So other restoration centres send me files that are progressive, the aspect ratio is not right, or it has, like, 23 frames per second… What is this? Yeah it's not NTSC it's not PAL it's not film it's just wrong. However when I open the metadata of the file it's done really perfectly — on a level of academic needs it's perfect — ,and even the name of the restoration centre is put in the metadata of the file, but the file itself it's crap. I know exactly, that everybody says: "Yeah ZKM, this is not really how it should be and not professional documentations", but the files are really in a good condition and the artists can even sell them.

I'm not against documentation. If it's ordered and it's paid or it's part of the project we do documentation, but if it's not planned in the budget, I don't have the time for it. I don't do it so it's a problem. But I can handle it, because I'm an aficionado, I'm really focused on the

videos: how they look, and if they look good in the exhibition. Sometimes it's possible, sometimes also the quality of the video is poor and I cannot reach a good quality myself. I have to bear the fact that it's not always perfect. This is all about video art, — video art is not perfect on so many levels. Also it's not funded perfectly…And I have to bear all those deficits. This is part of the job, which is very important.

AB: And how does ZKM differ so much from other institutions, in your opinion?
Why do artists trust ZKM with their works, like Raindance for example?
What is so drastically different between ZKM and other contemporary art institutions or restoration centres?

DM: That we sacrifice so many bureaucratic details for having access to the works in a time frame that makes projects possible. So exactly, our deficit is our quality. For example, Ira Schneider and the Raindance Foundation had their archive at MoMA, New York, and years went by and nothing was done with it. This is not attractive for the artists. Then they shipped the whole archive over the Atlantic here and we digitised it, so they could use it, sell it and an exhibition could be produced at ZKM. For the exhibition even some Interactive works like "Wipe Cycle" were remade on a technical level. Remade with contemporary hardware, so they could sell it again.

This is very attractive for the copyright holders because they can circulate the works again. And we do it in a time frame that is realistic. And also the accessibility. For example, when you sell your archive to the Getty institute then it's in a process of being put in databases, registered and so on. And you, as an artist, if you want to get your hand on your stuff again, you will be rejected, because the works are then in the hands of the registrars, So you can't have access. If you are waiting for the digitised stuff, you wait for years, maybe until you are dead…

At ZKM, when we get an archive, of course we cannot guarantee that the whole archive will be finished in a certain time frame. We cannot guarantee it, but if the artist says: “I want to prioritize three major works out of this archive, and I need them in two months”, we can make it possible. So they can talk to us about their needs and why they need it so quickly, and then we can make it possible. We cannot do it for all the 200 pieces of artwork. But anytime they need something really urgently, we can talk to each other.

Another example was William Forsyth, who brought his archive to ZKM because his company wants to go on working with it. His archive contains over 5,000 pieces of different media, and they need access, they need prioritisation, and they need to process dialogue. That is important.
And William Forsyth had the impression that this is possible at ZKM and not possible in other archives.

Margit Rosen sometimes points out that as an archivist you sometimes need some criminal energy to process certain workflows. Because it should not be a grave for media, it should be like a warehouse, where you can go and take what you need, and you can work with it again.

However, this is completely against all the ethics of restoration, of course [laughing]. Because the ethics of restoration also say you should not prefer a certain work or a certain artist, like in medicine [laughing]. However, sometimes you need a certain kind of triage in media art restoration because there is an exhibition, and media art has not so many chances to be seen or presented. You sometimes prioritise a work that's very important for the artists and also the curators. So it is more like a zoo than an archive: we treat it like

vivid entities and not like dead artefacts. Because behind every art piece are people that are still alive, also institutions and funds that need to be spent and so on. It is integrated into a vivid process a lot.

AB: I have a small remark. I was also interviewing Olia Lialina, and she was saying that she thinks that the best conservators are the artists. So I think it's very valuable that the laboratory really has the artist's interest as a priority. I think it's very important.

DM: Yeah, I practised as an artist for over ten years. And for me, the most important is the video quality. That it's the way I would like to have it and I would like to have the maximum [laughing].

My own work is in the ZKM archive as well. And I became aware that it's not granted, that it remains in a good state there. There have to be single persons that are interested in keeping it in a good state. And who should this be? So I will do it myself. I'm in this archive and I care for this archive. And with this I make it relevant. I do it as long as I can, and this was my contribution to the scene.

Especially in media art, a lot of media artists also took very important functions in the whole media scene. For example, Lynn Hirschman had an institute. Peter Weibel was a media artist. He was involved in the university in Frankfurt. He was also director of a museum. He was a curator a lot. So he was also working a lot in this area, contributing, making budgets possible, helping other artists and so on. And this happens a lot in a media art scene. I thought I also wanted to have an impact not only for myself but for the whole field.

AB: I just want to get you back to Paik. You mentioned Paik and Fluxus, and for Fluxus, it was sometimes important to show the object in the face of obsolescence in time.
They played with food, for example. So in the field of conservation, it creates the big question: Should we preserve it? Should we exchange this monitor? Should we keep it running or should we show it in this constant kind of state of death until it's completely dead? So how do you think the laboratory answered this question?

DM: I'm not very dogmatic about this question, I think all the positions are possible. Especially in Morgan's work you see that a lot of works cannot be rebuild in the original state. I told you I see media artworks more like a process anyway. And also, setting up an installation again or showing a video again is more like a reenactment. So it's like a playground. And the situation is new every time you show it. Also in exhibitions.

The situation was also the same for the artists themselves. For example, a work of Barbara Hammann now is restored. And the problem is also that Barbara Hammann during her lifetime showed it in different kinds of versions and ways, dependent on how much budget she had, and how important was for her within the exhibition, and how much space she was given to show her work. So she also changed equipment, the amount of equipment, and the size of the installation. Also, the quality of the hardware depended on how much budget she had. So even the contemporary use of their own artworks was processual to the media artists.

Also, there were very strict artists who had a concept that this work was only to be shown with this projector. It is possible. But it also limits the work. It can be obsolete earlier. But afterwards, you can still show the work and show the documentation of how it was planned. And then show the video just for research purposes on a flat screen. So if you think processual or encyclopaedical, everything is possible and it's a playground. And I

think if the concept of the curator is really good, everything can be good also or informative or interesting. The most important thing is that it's interesting somehow, the presentation.

However, everything is possible. It's also possible to show an obsolete art piece. It's also possible. Paik himself did it with his candle in the monitor. He showed very different possibilities to show obsolete... or he did a performance destroying a television set. So, everything is possible, I think.

And at the laboratory everything that is possible can be made until it's not possible anymore. so, the laboratory will be open until something isn't working out anymore. If the knowledge is not there and the technician is not available anymore the computers for professional 4:3 procession also not available, or we don't have spare parts one day, or the political environment will change. As long as it's possible on a technical level and people make it possible, then it will exist. So, I'm not dogmatic about it. I personally think that it's all about experience and how you feel it. I think an experience is also worth something.

Interview with Christian Haardt

- Employee at the *Laboratory for Antiquated Video Systems*. Employee Audiovisual Archives
- Media conservator and head of digital conservation ZKM

18. December 2024/ 19. December 2024

Anastasiia Bergalevich: I will ask you to introduce yourself and talk about your position at ZKM. What are your responsibilities?

Christian Haardt: I'm Christian Haardt. I'm doing half of the time media conservation, media preservation, which is time-based media conservation, restoration and digitization of old analogue video, sometimes also audio tapes, but most of the time video digitization. This is two days a week and the three other days of the week I'm working as a scientific associate in the organization and infrastructure of audio-visual media at ZKM, analogue audio-visual media but also digital audio-visual media which are part of the archives and of the collection of ZKM. So, this is not really separated between archives and collection. I'm in-between because audio-visual material is both in the collection as art pieces, and also as archival material in the archival estates.

if it's about an artwork, an installation with audio visual parts I'm not really involved. This is what the colleagues at the "Museumstechnik" department called MUTECH are doing. If it comes to preservation of digital files of this artwork, then it is on my desk, and I will also work on it.
But normally, I'm, not involved in building and installing an artwork, but preserving and conserving it.

AB: So that means that if you're preparing for example a video installation for an exhibition, then the installation part would be done by MUTECH and the video part would be done by this department?

CH: Yeah. And there's also a colleague who is involved in the preparation for the installation, but this is very fluently separated. I'm doing a transformation of the video, or the saving on LTO, on a long-term storage system. But just a naming process. So this is then, it could go on my desk, I'm not necessarily involved in all the exhibition and artwork processes.
I'm really mainly involved in what comes as an archival estate to ZKM.

The ZKM was not founded with an archive, an audiovisual archive but with a video collection and an audio collection. A huge collection built up in the 90s.
And then following up in the 2000s, it ended a little bit, and then they invested more into installative, interactive, computer art.
And video art as it is, as a one channel video clip or video installation was no longer in the interest of the ZKM collections policy. So, we stopped at certain points. We have 1,500 videos in the video collection and about 5,000 audio titles in the so-called audio collection, which is a collection of "Ars Akustika", contemporary music, electro acoustic music, new music, sometimes called "Neue Musik". So, this is really part of the audio collection which is also part of my job to be close to this but I share this with my colleague Hartmut and the

position I'm holding it's really coming out of the audio-video collection and later when the ZKM archive was founded in 2016 all the steps of indexing, of cataloguing was added to my job.

AB: I see. And is there now some differentiation between collection and archive? For example, you mentioned this "Neue Musik" collection. Did it automatically become an archive?

CH: Intellectually yes, it is very close, but collection means in that case that we buy artworks to be able to exhibit them here at ZKM. So, we have the rights, the in-house rights, to use these artworks anytime we want, to show them here at ZKM, in some cases also on the Internet or other locations but in comparison to archival estate we don't automatically have the rights to use them for our exhibition purposes. In most of the cases we can use them for scientific purposes.

AB: And can people also use the collection for scientific purposes?

CH: Exactly, yes, that's also possible. But yeah, of course, intellectually the collection itself has an archival function as well in that it tries to preserve artworks for us, for the sake of a of a narration, of a kind of storytelling. For conservation of some kind of artworks which maybe otherwise would also be lost.

Nam June Paik was selling the “Noah's Ark” to ZKM, which is one of the examples which maybe shows very picturesquely that we are kind of an ark, a boat which is fighting against the floating of time. And what he showed in this artwork is a lot of monitors, and these monitors represent electronic art, electronic artworks and ZKM is the place where these electronic artworks could be saved. No matter if they are just archival goods or if they are already an art piece, I just make also a good differentiation between collection and archive. In archive we have all different states of records. A complete edit of an artwork, a channel for installation but also the raw material of an installation of a film of a video clip, found footage recorded by the artist or by the archival holder, and collection is automatically a so-called artwork. So, it has a literal description, it has a reputation in the art world, but this is really also showing us a lot about concepts of art collections and so it's very good to have an archive to spread this definition a little bit.

AB: And can you tell me more about how the archive of video and audio materials was established? You said it started in 2016; how did it happen?

CH: It was established in 2016, but ZKM had a lot of estates of artists before that already, video estates, audio estates.
This means this also corresponds to the laboratory for Antique Video Systems where I'm working too as a media conservator because this lab was founded in 2004 for the purpose of digitizing and maintaining old analogue video formats, and to have this lab means that a lot of artists, friends of Peter Weibel, friends of ZKM came to digitize their tapes because it was a point where a lot of players, analogue players were about to break.
But then we had a lot of tapes here. And for all the publications, we also ordered more tapes than we used at the end. So, archives were automatically created.

AB: So, the artists kind of left their archives here?

CH: They left them, or they sent a copy, or they knew about us and then they sent the whole archive. This has sometimes been done for an exhibition of an artistic collective or an institution and then they sent us their archival estate for their exhibition preparation. That's how it began but in 2016 it was finally formed or founded in the department

"Wissen" (knowledge), which is the collection, the archives, the lab for antique video systems, the library. And this is in a way maybe also an answer to a development in the art scene which we talk about, an archival turn in the 90s. So, this is also maybe a response that to deal with archives, artistic archives, an institute was founded in a in department of ZKM.

Before, we had a "Mediathek" where my job really belonged to. We had the lab for antique media systems as proper units within ZKM at the library. But we also had a lot of depositories and a lot of stuff in the depositories, there was not really an indexing process or a process of opening it for research.
This was really what happened then in 2016, with the founding of this department, and building up a structure, also an asset management system and server structure.
This was the main idea in 2016. But this is just a side fact to the fusion of two different museums. There was the "Museum für Neue Kunst", MNK, it was a proper museum founded by the state of Baden Württemberg, and there was the ZKM. From the beginning on it was clear that the president or the CEO of ZKM is also involved into the "Museum für Neue Kunst", but Peter Weibel at the end "fusioned" them, and since 2016 there is no Museum von Neue Kunst.

AB: It was also here in the same building?

CH: Yes. It was in "Lichthof" 1 and 2[59] originally. And the collection of this "Museum für Neue Kunst" was brought into the collection of ZKM.
So, this this was also an important part just to understand because MNK was not founded in 1989 when ZKM was founded but a little bit later, I think in '95 also by Heinrich Klotz and ZKM was planned for atrium 6 and 7 and 8 and 9. HfG[60] for 3,4 and 5. "Städtische Gallerie" for 10, the last atrium, but 1 and 2 was not sure.
But the city and the state were thinking what to do with this 1+2, the first atriums and it could have been a supermarket, could have been a lab for some scenography department from Museum für Musik, the University of Music of Karlsruhe, "Opern Lab", opera lab but at the end Klotz thought that it could be a place for the collectors from Baden Wurttemberg.

[59] The building in which the ZKM and other institutions are located is divided into ten numbered atriums, referred to as "Lichthof" in German, see: https://zkm.de/en/architecture

[60] Staatliche Hochschule für Gestaltung Karlsruhe, Karlsruhe University of Arts and Design

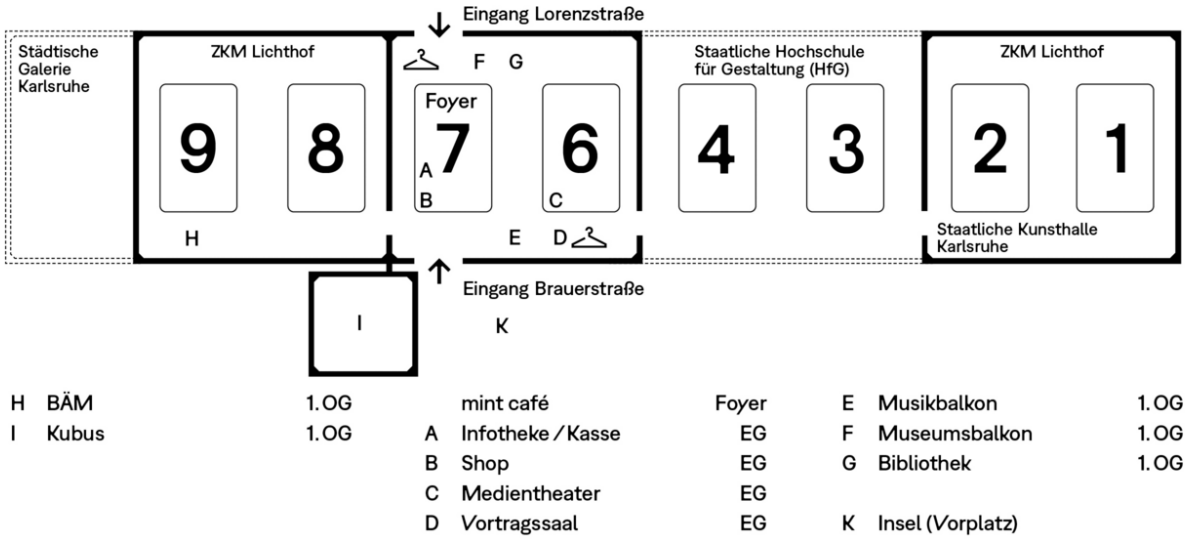

Figure 4.0.1. *Zkm Plan*. 2025. Graphic: 2xGoldstein & studio +fronczek

And this was really a good idea at that moment. Later, they left and then went to The US with all their artworks. But this was how these two museums were built and this “Museum für Neue Kunst” had a huge collection of media art which was brought together in 2016 as well.

AB: Let's talk about the legal rights behind this archival material that is sent to you. From what you said, artists started to send their archives to be digitized at some point. And after 2016, you started to build the archive based on these materials. Under what kind of legal background can you use these materials? And what are the agreements?

CH: Before or after an archive estate arrives, we're doing an agreement with the artist or the institution or the archive holder.
Sometimes that is the heirs of an artist, but in a lot of cases, we are talking about artists' archives. We have an institutional archive as well, which is documenting all the exhibition exponents like objects. This is just a little part of our work. In fact, we are working with these so-called acquisitions of archives, but we stopped buying archives. It's not necessary on the one hand and the other hand we don't have a budget for buying archives, but there were some cases where we bought archives for a lot of money. Also, not just audio-visual archives, but also, archives of paper documents and ephemera. So, we do an agreement with the artist or the institution in a way of a collaboration, that we digitize, that we restore the tapes and digital files and in some cases the tapes itself go back to the artist, the artist can use these tapes or at least these digital copies of the files.

AB: So, do you also send the tapes back?

CH: In some cases, if the artist wants. For example, MIT, the MIT University Research Center wanted to have their tapes back, but the digital files stay here at ZKM. We also offer long-term storage. This is also a thing which is not so cheap to do. As we have a long-term storage system, we're digitizing, restoring digitizing and saving the files here for free. This is part of treatment of the deal and what we have as an option is to use all the videos in house for public presentation. And this is a special option we have in a lot of cases but sometimes it's just the option to make the digital files accessible for researchers to build up a huge net of "Wissen", of knowledge by having a lot of different sources and that's the deal more or less, that we can keep the digital files here, we can use them in a certain way.

AB: You can use them for exhibition purposes?

CH: In some cases, we have these so-called in-house rights, we can use all the videos, but we still have to ask the right holders for presentation.
This is not just as easy as it's said, but it’s easier than not having the in-house rights, and we can't publish them on the internet easily. We have to ask more carefully about rights of all the persons on the tape or in the digital file. We can offer them for researchers who want access, all the metadata on the tapes we can also publish if we want. So, this the job and this makes it also interesting for the artists because we are supporting them by doing this job, but at the same time, we are also building up a huge net of different sources, which is I think the most interesting part of this archive in ZKM. So different sources can speak with each other. This would be the main idea, that different sources of the same art world start a dialogue with each other. But that's why we're doing these agreements, also to save us a little bit from responsibilities just to be sure that we're not responsible for all damages which could also happen to tapes by digitization, by restoring. So, there's what we call in German "ein Haftungsauschluss" (exemption from liability), we're not taking responsibility for all damages which could happen. This is how we do these agreements. At the beginning there were no agreements and later we did it retrospectively.

AB: Learning through mistakes?

CH: By learning, and through the archives that already arrived here because of an exhibition project. Yeah, this is maybe an example would be Aldo Tambellini, an Italo-American artist, there was a ZKM exhibition about him, Black Matters it was called and that was the reason why he sent his archival estate, about 405 tapes. Film reels have been already digitized in the US they are stored at the Harvard Film Archive. So Harvard Film Archive already digitized a lot of tapes, lot of video film reels but videotapes, open reel and U-Matic tapes have been sent to ZKM to be digitized here within some kind of four or five years project and also on request of the curators of the exhibition, then in 2017 the exhibition opened and in 2018 or 2019 we digitized all the tapes. Not all of them have been used for the exhibition, but we have we digitized all of them and sent them back to the US, now as an irony of history they returned to ZKM again for long term storage but not in the digital way but for the analogue tapes with all the documents by Tambellini. Now in the meantime he died, and his widow gave us all the documents. We don't have film reels; think they're still at the Harvard Film Archive. So, this is how we are dealing with archives and there's an agreement with Aldo Tambellini about what we do and what the purpose of it is. Now we have a second agreement about a permanent stay of the tapes at ZKM in Karlsruhe. But and in fact the tapes are all digitized already from five years ago, so we are storing the tapes and don't need them immediately for an exhibition purpose. So, we have the digital files already and that's enough.

AB: Based on what you said, I have a couple of questions first. You said that you might need these tapes for exhibition purposes, which means that for exhibitions, ZKM prefers to use the original tapes rather than digitized versions?

CH: Yeah. If it's possible, we like to digitize ourselves.
Sometimes the artists are also delivering already digitized files which are in a very good state so we can use them as well. What happens in video art is interesting, because artists have on the one side always been interested in new technology and recording and making videos and films on the latest technology possible. So, they also jumped from one technology to another. Also, they copied some of the old technologies to new or contemporary technology. So, from one tape format to another tape format, losing quality, sometimes also saving the content because the old tape was at a certain point not possible to read anymore.
This could be also seen as a saving method and at the same time artists also were constantly showing and presenting their work, so they needed files and formats which are good for presentation and not good for archiving. Archival formats are sometimes not really handleable or not affordable for exhibition purpose. So, they always used DVDs for example.
The latest technology to easily show video art was then DVD, later digital files, but the last analogue technology was DVD and this was a bad quality but sometimes the only copy of a version of a film or video artwork we have, is from a DVD and then what we're doing here is we try to find out on basis of the DVD quality what is the video about and we digitize different sources of original master tapes and can build or rebuild the video artwork out of the tapes.

This is happening in some little cases for example the Rosenbach exhibition we did two years ago, where together with Ulrike Rosenbach, the video artist, we digitized and really restored the artworks because her own exhibition versions were not in a sufficiently good quality.

AB: And what formats were they?

CH: DVDs. Then, I don't know if she now has a has a computer or some kind of file system, but she came with kind of a DVD box, a lot of DVDs and it was interesting because this is a kind of an artistic economy we have to talk about because artists need to feed the institutions where they want to exhibit. On the other hand, they also need to be aware of how technologies are changing rapidly. So, if you go on a bad quality format as DVD at the end it's more difficult to show them on a contemporary media player in an exhibition and you will see that the quality is not proper. Also, DVD is really easy to break and lose quality. But this is what makes this media art or electronic art so interesting because you always have a very economical thinking. Maybe you have this also in painting and other visual arts of the last centuries, but in media art it's really close to an economy of the artists who need to be present but also need to preserve.

AB: I think the main difference is that artists constantly need to maintain their own works, which is a lot of work itself. You can't just make a painting and put it in storage, forget about it for twenty years, then take it out and sell it or show it. No, you need constantly maintain your work.

CH: Exactly. Maybe there are also different life stages of artists where you're producing more contemporary work but later you have a retrospective and then you want to show one

of the first works you did and then it's difficult to get a version of it, of an early artwork. But this may be also interesting because it's about old artists we have here but still living. So, the video artists were present in the 60s, 70s, 80s, and are now in the moment that that they want to give us their archive

AB: About the storage: How is the digital and analogue storage organized

CH: So the digital files are huge, and we're saving them on LTO, which is a long term storage non-proprietary system. We program this long-term digital system on our own. We have an IT programmer, software engineer who is also maintaining the system. It's important not to rely on some big company. That's how we store huge files, huge master files from the digitization. For delivery and usage we do delivery copies, meaning an mp4 for example from a video which is a really handleable affordable video we can easily share on the internet. This is then saved on a server system. So, we have the server system for delivery copies and the master digital files are on LTOs. Storage is economically low, so it's cheap and scalable. We can scale it very easily. We can make it bigger without a huge need of resources. That's very good for us in LTO. But it's a very conservative system, LTO.

AB: And do you have a couple of copies?

CH: Exactly. We do a double copy in different places. One LTO tape is saved here. The duplicate of the same LTO tape is outside of Karlsruhe. So that we can be sure that in a case of an unimaginable catastrophe regarding the ZKM building, we could copy the same content from the tape outside of Karlsruhe.

In case of video and magnetic tape, all the tapes are going from digitization into storage without access. That's why we have a huge storage, which is more like an artwork storage, not a typical archival storage where you still have access to all the tapes. This is more like packed into packages and then brought into this room which is a little bit climatized but it doesn’t really have the best conditions. It's more of a stable condition than we have there but not below 18 degrees. It's 50% relative humidity, but I think it's 20 degree still so this is not the best condition but it's the best condition we have here for the possibilities of ZKM and we are thinking that most of the tapes stay there and won't be touched in the future. That's how we have to deal with the resources. ZKM is a museum most of the time and we have to deal with that. That's how we deal with the analogue storage and the digital storage is on LTO. On LTO we are saving a tape for ten years and then we are migrating the tape to the next generation or we're introducing a new generation of LTO tapes. We started with LTO generation three and ten years later we upgraded to LTO generation six so we jumped four or five to six. And we copied all the tapes from LTO 3 to LTO 6. And now ten years later again, this is happening next year, 2025, we're going to LTO 8.

AB: For ten years you use one type of LTO?

CH: Exactly. And yeah, it's kind of a safety measure. We know that these tapes could be also used thirty years long, but we're not sure about this. So, we do a migration every ten years. Now in the step from LTO 6 to LTO 8 we don't copy the LTO 3 tapes again on LTO 8 but the LTO 6 tapes which have the copy of LTO 3 tape, so this is how it goes.

AB: And you store all the versions also.

CH: Exactly and we do a hash checksum process not to lose any bits because in digital copy processes, we could also damage digital files which we have to keep in mind, but we can do this checksum process to see if after a copy process if all of the bits have arrived on

the new storage location.
That's a kind of possibility we have. And this is also not really our own secret to do this like this. I think in IT or in computer science archival this is all already developed but we can use all these tools and all of the knowledge for long term storage.
And we have a good rate of success, we are not losing a lot of files.
Some files we already have lost at least in one copy of the LTO tapes so there were some corrupt bits, some corrupt file but this is very little so we are very proud that a lot of tapes and digital files can be saved and can be brought back in the future as well. This is amazing but it's very conservative, we don't have a lot of metadata on the tapes. We have just technical data and all the metadata which are on the tape like the artist's name, the duration time, artwork's name is saved in a separate database, which is the database of the archive of ZKM. And this has to be in a dialogue, which is maybe one of the most difficult things. And that's why ZKM is also investing in digital managers, people who are trying to connect different digital tools to work together.

Because we have different tools which are independently working, a FileMaker database for all the content on the metadata, LTO which has also their own database, a digital asset management system, MARS it's called. So, all these different entities could go together. The website is also a huge entity we have, and all these four or five entities could communicate together which is one of the tasks the digital manager is then doing. To have this in mind this is also part of digital conservation in a way.

AB: And do I remember it correctly they do it with (Apache) Kafka? There was a presentation on this.

CH: Exactly. This is what Andreas Kohlbecker is doing. This is interesting, how it's focused on analogue restoration work which is working and could be also improved but this is not really what we're doing. We're trying to get into the digital files we have already. It's difficult to say how many, we have around 30,000 or 33,000 tapes registered in our database in the archive, and film reels as well. There are also some data sets in it, and I think half of it is already digitized. So, there should be even more digital files. So that's about 50,000 items of records. So, to manage all the data is now one of the main aims we have at ZKM in the next years. That's interesting because at the same time we're also doing digitization, but it's also about getting access and to not to lose knowledge or not to lose the vocabulary to describe this knowledge. This is all informatics and computer science. It's really the next part of conservation we're trying to face.

AB: What are the specifics of the work that are time-based art for the restorer and what are the main problems that occur?

CH: This is a huge topic. We have maybe two or three areas where we are engaged in. One is to make the tapes playable again. That means they are in a bad condition when they arrived in ZKM. In a lot of cases, not in all cases, but in a lot of cases, we have to deal with restoration methods to clean the tapes, to also, treat the tapes in a manner that they could be readable again in the analogue machines. This is one big part which I'm not completely involved in, but which I'm doing a part time job. Dorcas Müller, the head of "Labor" is doing most of it and is also giving me advice how to work on this.

Then we have the problem that we don't have all the infrastructure. We are losing machines as well. We are losing also computers which are necessary to digitize and to play back the tapes. So we need to find new workflows, find new pipelines, and also to repair machines. This is also a big issue, but not my main task.

There's a third area as well, which is the digital file. We have to find a way to make the digital file, which is the copy of the analogue tape. So, it's very important. We call it a master file. The best digitization we can offer at the moment has to be stored on a long-term storage system, with proper name, with a signature, and has to be documented in the database so that we can really archive it and maintain this work of art or this tape record. This is really what is, in that way, very obviously problematic, but to go into detail, then we see in a lot of cases what is the best format, what is the coding we need, how is the naming, what is the long-term storage program so that it's really copied twice. So, this is a lot of attention we have to give to the digital file and also to document what we know about the problematics of this digital file. This needs a lot of time.

In the meantime, we need a lot of time just to check the digital the digital file. This also refers to digital archives arriving at ZKM. And we also have digital estates. They're already file based, and we have to check how is the version. Do we need delivery copies from these digital files because they are too big or they are not in a in a codec, which is really a codec for archiving. I call this “forensics”, because we have to find a way which corresponds to ZKM's needs and possibilities to maintain or to preserve these digital artworks or artifacts. This this is the third area.

And sometimes it's also about documenting the knowledge we have on restoration, on preservation, and to present this knowledge in guided tours, but also in conferences or lectures. This is also a fourth part of our job. To stay in the community and to exchange with colleagues about this. Oh, I forgot completely about this. It's also important to talk with institutions and artists about the possibilities of digitization and long term storage and to make contracts and to make specific agreements on helping each other. So, this this is not only just about restoration. On the law side and also on the digital side, it has those aspects as well.

AB: Another question about the workflow, because you were mentioning in the previous interview that you sometimes just restore the tapes. And how is the decision made whether a tape will be restored? And do you do some general maintenance of the tapes from all of the archives that you receive?

CH: First of all, I have to say or maybe I said this already in the last interview that our work is based on projects in a lot of cases, and that this guides us through an archive, through an estate. So, we maybe have an archive from an artist who wants to show some of their analogue videos again in a current exhibition. And then we are especially looking for some needed videos or some needed media the artist wants to show again, and then we'd not digitize all of the tapes or all of the media. This is the main part, and this is really based on a dialogue with the artist or the institution. What are they looking for? What do they want to do with it? And in that case, we are not really a restoration centre, but we are more like a production centre. We really help with the tools of restoration and maintenance and digitization. We're helping to produce a new exhibition, to produce a next exhibition for artists who have estates. So, this is maybe important, but then in a lot of cases, we have still time to digitize also archives which have no project.

And then we are digitizing sometimes some format from the first tape to the last tape, and we are doing this to get done with an archive. So, because if an artist archive is digitized, we could easily store it in our depository, which is also a problem of infrastructure. We can't really have all the archives present and accessible. We need to digitize them, and then they go into the depository. So this goes together, but the focus is, of course, a project-based interest. And then when there's some free time, we're digitizing archives systematically from first tape to last tape. That means also for example, at the moment, I'm

running here an archive, and this is about 100 tapes all in the same format, all in good condition. So this really goes well.

Then, I just do a little checkup of the tape, sometimes I'm cleaning the tape just in case that there is one that it is delicate. It could be delicate, and I don't know it by paying it back. I have to put it in the cleaning machine to have at least the assurance that it runs well. But then normally it goes very easy, these archives really go very easy, I can do a half an hour of BetaSP in one day I can do four or five tapes, naming, sending it to a program to do a delivery copy. So, this is a workflow which is really easily going. But in a lot of cases, we also have different formats in one archive. We need different workflows, pipelines. And we need also time to restore the tapes and to clean them. So, this is a decision we are doing together in a team to say what kind of archive we could work on easily and what kind of archive needs more time to restore.

And then also, what is the prioritization of ZKM or of the lab? Where are we helping some artists or an institution? This is a very good example as well: Currently, I'm doing this tape archive of an artist with his 100 tapes, Digibeta (Digital Betacam) and BetaSP. Dorcas is doing preparation for an exhibition, which takes place in February next year, and she's really doing the checkup of digital files and digitizing some old tapes. And she's in dialogue with an institution who's preparing an exhibition. So, this goes together as we can share some tasks and do things together, set different tasks separately.

AB: So you mentioned that you have a lot of different formats in ZKM with the video and audio materials. What formats are you specializing in, at the laboratory of antiquated video systems?

CH: The earliest formats video artists or artists were using or activists, not institutions or broadcast stations, were half inch open reel tapes, and therefore half inch open reel video tapes is the format we are we are specialized on. Later, as in video history and video technology, all the formats were also used to copy old tapes to the contemporary formats. So we have all formats ongoing from half inch open reel present at the laboratory, but not all pipelines or environments to digitize a tape in this particular format are prepared.

So, we do this then just only in the case of a project. But we have a half inch open reel always present. We can easily work with these formats. We can easily work on U-Matic. These are the two most popular formats of the estates we have here. And what I am actually doing is the BetaSP and DigiBeta format. This is also very common in a lot of archives, but this is not a specialty of ZKM because this could be also done commercially, there are still companies digitizing DigiBeta and BetaSP tapes or VHS or even MiniDV. VHS is also present here. Mini DV is also a station present and could be easily worked on. Hi8, Digital8, video 8 is also a station all the time present. I think these seven to 10 formats are easily handleable and affordable to work on.

And if it goes into Video2000 or it goes to one inch open reel, we have also one inch open reel, then we need some time. And we collect tapes we want to digitize on these special formats, and then we do this in a special moment of the year when it makes sense to digitize one inch open reel or VCR tapes. So there are these 10 formats we are we are working every day on, and then there are a lot of other formats we can do in the context of a project, for example. And the specialty in comparison to other labs or other companies is half inch open reel and all the different standards of half inch open reel formats. Because the tape itself is the same for different formats. So there could be PAL, NTSC, standard. There could be AV. So, CV was first, Consumer Video, but later came the format called AV. They're different. They can't be played on the on the same machine, so we need

different machines. There is Japan standard one, Japan standard two. So there was no standardization at the end of the 60s. There were several different formats within one magnetic tape, the half inch open reel tape. So this is already a lot of different details, in one in one carrier, in one in one media. This already needs a lot of knowledge and a lot of machines to handle, and that's what we are specialized on. U-Matic is also a format which a lot of people, or even companies could still do. Some of the formats are more vulnerable, and we see that other companies are not easily able to digitize them. U-Matic, for example, is also a vulnerable format. So that's maybe also a kind of specialty that we can easily work with U-Matic tapes and have different players, but it is not as unique as the half inch open reel format. And half inch open reel has the connection to video art history that this was the first format video artists were using. Nam June Paik was using this in '63. Already, we can call this maybe the first video art record. So this is important for us also as an art institution. But, of course, before half inch open reel, there have been one inch and two inch open reel tapes for broadcast stations and or military or academia. So this is not really our interest, our expectations that we that we can digitize all formats. We can do a lot of formats, but we are really also connected to art, video art, history.

AB: You mentioned companies, so I have, two questions about that: First, does ZKM sometimes ask some companies for digitization of some archives? And second: Why not delegate all of the digitization? I mean you mentioned open reel, but why does ZKM not delegate all of the digitization to companies, but have their own lab inside the institution.

CH: First question, we are delegating tapes not video tapes, but audio tapes sometimes to a company in Berlin to digitize. But we have also an audio lab in house, so this has to do sometimes with the human capacity of the associates, if you're giving an audio tape archive to an external company. And most of the time, we are giving film reels, like 60-millimetre, eight millimetre, or 35-millimetre film, which we have a small amount in the archive.
We gave them to an external company to digitize them there or to do what is called a scanning process. This is a very specialized technique, and we don't have a machine at ZKM to do this. And we don't have manpower either to digitize film in in at ZKM. VHS, I think first of all, it's cheaper to do VHS, DigiBeta and BetaCamSP in house because we have the machines, we have the people, the manpower to do it. The special formats, it's still cheaper because we can do this with the help of our television technician. He can help us in some special cases. He's a freelancer, and he works from time to time for ZKM to repair machines, but also to digitize some special formats as VCR, for example. VCR, we are not digitizing every day, so after a year, we're doing a digitization pipeline just for VCR, and then we are collecting from different needs, different archival estates we have. We take the VCR tapes we wanted to have digitized. But this is a really dirty job because it's such a vulnerable and fragile format. You need a lot of patience, and the results are not very good.

I'm realizing while I'm talking that we are holding archives at the ZMK and try not to give them outside also because of the unique tapes we have here and of the unique artworks that are on the tapes.
So this is in this in in some cases necessary for film and for some audio reels, but we try to keep them in house also for the value of the tapes have for us. This is sometimes not possible to realize for all formats, but in a lot of cases. Film reel is the best example to do this, not in house because we can't afford to have a film digitization lab. Let's think about DigiBeta, BetaSP. I'm not sure about the prices of a digitization. I think it's one per tape; it's 10€ to 20€. It's not so expensive. But we have now, for example now this 100-tape archive of the artist I'm just working with at the moment. This would be €2,000 for example. It would be still possible to do this outside, but maybe it's cheaper to do it with

the resources we have here at the ZKM. And we don't need to formulate all the bureaucratic steps we should do then. For example, to spend the money on an in an external company means all the time we have to do the proper steps of finding the best offer on the market. This is important as in public institutions you have to find the best offer in a process of electing three different offers. This is just the way a public institution is running, and we have to do it all the way like it is. And the effort is a lot for just the digitalisation of 100 tapes. And then also, we receive, let's say, 100 digital files and have to bring them into our long-term storage backup system. So this is all inclusive if we digitize in house. This may be also a reason to not give it out.

AB: As far as you mentioned, you restore digitize or maintain works based on the project needs of the different institutions including ZKM and others. But for example, imagine the artist becomes big after twenty years. Nobody was interested before, but as it just happens in art history, they just suddenly became big and everybody remembered, and everybody goes to the archive. And will they find the materials in ZKM, or there's the big chance that the tapes will decay by this time?

CH: Until now, we have the experience that a lot of tapes are still restorable. They are decaying, but we can restore a lot of tapes. I can't predict if in twenty or thirty years, the tapes will be still readable. It could happen that we don't digitize tapes of artists who will be famous maybe also after their death because we have a lot of old artist's archives. So in a lot of cases, they already have had their artistic life, and they are now maybe famous, but maybe they were famous, and now they're not so important anymore. So this still possible that they could be famous in the next twenty, thirty years, but we don't digitize the tapes. So then we would take the tapes out of the depository again, and we would be very sure that we can digitize it still or restore it still. And, yeah, it's also important to say that video was one format. A lot of important artworks, key works are already digitized or already available on a better format. So I in some very few cases, the video tape is the only reference we have or the only manifestation of an of an artwork.
I wouldn't say that that there is any artwork that's just existing on the tapes we have here. So a lot of artworks are around the world, in the different collections, in different possibilities to share on YouTube as well. So the uniqueness of an artwork on tape is not really high.

But we sometimes had the possibility to find artworks or documentations of artworks because some other artists have recorded a performance or some kind of artwork. So it is then possible to find pieces. And we did this with Yoko Ono, "Silent Piece". A performance she did for the memorial of Ken Dewey, an American performance artist, died in '76, I think. There was no other reference on this artwork than just two pictures, two photos. And then we found a half inch open reel tape by Aldo Tambellini as part of the archive, and then we digitized the tapes for an exhibition on Tambellini. And now we have this artwork of Yoko Ono.
The documentation of this performance, we have now here, and we found it.
And it's also of course, a valuable video. And it will be even shown in the next collection exhibition. So we are even now at the moment in touch with Yoko Ono or her agency to ask about the rights to present the video. And they are open to talk about exchanging this video file and to give us the rights to show it.

AB: And does ZKM have some ethical approach to the conservation? What is the ethical approach to conservation that ZKM has in mind?

CH: First of all, the digital file for us, the digital copy is as good as the analogue copy. So we don't play back the original tapes in exhibitions. We just play them back in the

digitization process, and hopefully, just one time and not a lot of times. It could happen that the original tape is breaking and that that we lose it. It could happen, but this is part of the game. But we try not to give it out or to give it to exhibition.
So the digital file is as good as the analogue file.
Maybe this is already a kind of ethical idea. You can criticize this because, of course, this is not the original way to present the artwork in some cases. For example, in a video installation, we present them not by laser discs or by BetaSP tapes or VHS tapes, but on the base of digital files. This means also to understand that in video art history, artists were always using contemporary formats to show the artwork and not to stay on one aesthetical format. I think the open reel aesthetics are different to the U-Matic aesthetics. But this was not the interest of the artist. A lot of artists were just interested in the maintenance or in the preservation of the artwork, and that's why they changed the formats, and not so much about the aesthetics. I know this discussion from film. In film history or in film preservation, there is the ethical idea to present films on the original format, which is 35 millimetres in a lot of cases, and not digitally. And there is a huge discussion about this. In our understanding of video, it is not really existing, and the digital video format is as good as the original format.

A lot of decisions could be also criticized. Why we don't go into engineering of the machines to not have several machines, but just one machine for every tape. We're not doing this. We don't have time to do this. Long-term storage as well why we don't use other kind of metadata on the long-term storage system. But this is maybe now going too far into detail. But, yeah, a lot of decisions are made on technological aspects and also on institutional aspects as well. To change a format of long-term storage, for example affects the whole archive. It affects the whole workflow. And then and thereby also the time. And as archives always consist of work in time, it means we would produce a lot of new work and also a lot of possibilities of mistakes that could happen when we're introducing a new format, for example, or new technology or even a new associate.

So this is this interesting, the interesting aspect of an archive is that it's moving, but it is not allowed to move at the same time. Because if it's moving, it also creates problems, mistakes. But it has to be, because it's digital, it's so fragile, the material we have to move at the same time. We have to think about a new generation of long-term storage every ten years. So it's a difficult and also maybe intriguing situation we have.

AB: Short question: And what about the exhibiting? Because I've noticed ZKM sometimes tries to, like with Ulrike Rosenbach for example, to exhibit on the original monitors. And then you play it with some kind of video station or adapter from digital file back to analogue right? This is kind of the workflow. And how important for ZKM is to exhibit it authentically, just from your perspective?

CH: That's a good point because CRT monitors are really, at the moment, in the focus of the presentation of video art, which we can also discuss. You can also discuss if this really makes sense. Of course, the CRT monitor is in its properties the closest reference for analogue video. For analogue video, it's important not for digital video. Oh, no, I'm wrong. The question is also when digital video begins because in the DigiBeta, you have a magnetic carrier, but the signal is already digital. But okay. So, the SD format, 720 pixels to 567 pixels, the PAL format, could be presented very well on a CRT monitor, which has the same resolution, which has also interlaced method of image production. So, the image is not consisting of full frames but of 50 half frames. This is really also important when you come from analogue video. And then at the moment, this is really important for a lot of restorers and conservators in the contemporary art field that you use CRT monitors. You

could also use LCD monitors, but the aesthetics are different because really working with a cathode ray tube, the technology is different and has another kind of aesthetic. I would also be open not to use CRT monitors. I think this is also a kind of a fetish, which we maybe also have to discuss, but the actual policy of ZKM is to use CRT monitors in a lot of cases. What we don't do and what is also maybe possible is to scale up the video image to 4k or two 2k via artificial intelligence, which is already technologically possible, but we don't do this.

Interview with Felix Mittelberger

– Chief archivist of ZKM

2. February 2025

Anastasiia Bergalevich: So let's just start with an introduction. What is your role in ZKM?

Felix Mittelberger: My role has been being the head of archives since 2016/2017. Before that, I was a student employee. I built up the archive at ZKM together with Margit Rosen. There were no archives yet at ZKM, or no function, no professional archives in that sense. The archival estates were already here, but it became institutionalised in 2016-2017. And this is when we started. We actually began in 2011 to build up this archive, but we institutionalised it in 2016. Margit Rosen back then was the head of archives or the founder of the archive.

Anastasiia Bergalevich: And what do you mean by institutionalised?

Felix Mittelberger: Since 2004, the laboratory for Antique Video Systems has been digitising video archives and creating video archives, basically. And this happened all the time, a thousand tapes a year. But nobody was in charge of indexing, you know, really like archive indexing or description writing of that. It was a Mediathek. Mediathek is kind of like the same as a library, but it's based on media. It was a concept from the 90s to separate books and media. It's very typical for ZKM also. Because at the same time libraries got Mediatheks, and the ZKM was founded, but that's another study. So there were already archives. There was also a collection, but there was only a Mediathek who was in charge of the video archives. Then, beside the video archives, we had archives of EAT, for example, which is Experiments in Art and Technology. That group of artists was very connected to ZKM, so they collected this archive. There were some other archives over here. The publisher Merve, for example, from Berlin. This archive was also here. Some people took care of that, but there was no institution which was responsible specifically for that. That was what I meant by institutionalised. That changed when there was finally someone who said, "Okay, you dedicate this to the archive." And after the laboratory, for example, is digitizing the archives, then it goes to the archive where it's going to be described, indexed, and then made accessible for researchers. This is another important point. There was no real person who was in charge or institution where researchers could go to and say, "Okay, I want to do research on that archive." 2016 was an important moment. You were not here yet in 2016, right?

Anastasiia Bergalevich: No.

Felix Mittelberger: And it's important because ZKM reshaped in general and changed its structure. Both museums were closed and became one department. Both museum techniques became one museum technique. And that was when Wissen was founded, the department. Wissen was founded because suddenly you had a collection – before that, both museums had their own collection. As they were closed, there was a need for a place where the collection could be housed and organised. This is where Wissen was created, as the idea of one department where you have the library, the collection, the archives, the

research, and all the restoration under one umbrella. It was Peter Weibel's idea, and Margit Rosen became head of that. She was, of course, also part of the concept for this department. But she can tell you more about that, I think. That was when the archives were formally created.

Anastasiia Bergalevich: And nowadays, what exactly is the archive? What different archives do you have? And how do they get into ZKM?

Felix Mittelberger: Currently, we have about 250 archive estates. Some are very small. Some are quite big. I'm speaking about a couple of tapes and 30 meters of documents in comparison, or 40 meters of documents. This shows the variety. A lot of our video archives are from the period before the archive was founded. So often these archives only consist of videos. We don't have any context material for them. You only have the tapes, the digitized tapes, but you don't have any letters or supporting materials. This is different from the document archives, or what we call the other half, which is not media-based or tape-based but document-based or photographs and so on. So there is the difference. And there we have about 800 metres of documents. We have 30,000 tapes and 800 metres of documents. This is the current extent of the archive. And the variety is such that we cannot say we have 250 estates of equal size; some are much bigger. Those archives contain what I always call "context material" to the art. They're not so much artworks themselves because artworks usually go to the collection later. If you can define something as an artwork, then what remains is material which tells you more about the artwork – about how it was constructed, how it was conceived, and so on. This is what you will find in the archives. So our stakeholders are not only researchers and artists but also conservators. Because in media art restoration, you can't preserve an object, an archival item or a media art artwork without changing things. It's different from paintings and other forms of art - you have to change things. And to know what to change and how to change it, what was the thought process behind it - This is where you need an archive. Or if you have an archive, you have an easier job to do because you can look at the diaries, the letters for example, and say, "Okay. This was the thought process." And often, media artists were not financially very successful in the past and still aren't today. But the technical equipment was quite expensive. So they often shared things and reused things. So in media art, you often have cases like, for example, with Walter Giers – he had one laser, but he had three laser-based artworks. So those artworks never existed at the same time. So if you want to know what the artwork looks like, you have to look at the archive to see where the laser was placed and so on. This is why as a conservator, it's a good thing to have an archive as a backup. And if you can't talk to the artist because they have died or they're not available anymore, then you can consult the archive. And for researchers it's the same, of course, to write a text about an artwork and understand the history of this artwork. It's good to have the thought process and the history of that in the archive as well.

Anastasiia Bergalevich: And what is the differentiation between the collection and the archive? And do some works that happen to be in the media part of the archive sometimes get exhibited?

Felix Mittelberger: Yeah, so the simple difference is artworks in the collection and archival objects in the archive. Of course archival objects are also works sometimes. And in Germany you have the "Urheberrecht" (Copyright Law), and this defines if something has a "Schöpfungshöhe" which means it has a meaningful creative height or artistic level. You have to define if I write you a text; is this already a work of art or just a note? So there's a difference. Or if you make a scan, for example, if you take photographs of the tapes, is the photograph you are creating a form of art or not? And the court would say no,

because your purpose is not an artistic purpose and your perspective is not creating art with it. But other photographs can be art, right? So there's a difference in how you make this distinction. And it's the same with the archive. The archive could have a lot of artworks in it, but the threshold of something being considered an artwork is lower than with the collection, or you would say, Okay. I have a letter. A letter can be a piece of art, or it can be a text with an authorship and so on. But it's not considered - it would not go to the collection in that regard. But then in those letters, we also find some drawings, for example. Especially with concrete poetry, for example, with specific forms of concept art and so on. And the boundaries are very thin. It's sometimes a little bit random also. It's like: should it go to the collection? Should it go to the archive? Where does it belong? But in general, you can say this is more context material, not artworks, but there are artworks too. Take a poster, for example – what is a poster? If a poster is signed, is this an artwork, or is it still an archival object? And with video art archives, it's the same. I mean, you often have artworks in it, which also exist as copies in the collection, so it doesn't make sense to have too strict a difference between them. But so, a long answer to a short question: artworks are also in archives. But archival objects are never in collections or should not be in collections. This is perhaps better to look at it this way.

Anastasiia Bergalevich: So you do make a decision. For example, you receive the estate, you see this is clearly an artwork, and then you send it to the collection.

Felix Mittelberger: Yes. This is what we do. So recently, we got the archive of Douglas Davis, for example. And we saw, okay, there were artworks in it. Obviously artworks. So we took them and brought them to the collection. But there are also some notes and some diaries in it and some sketches, and this content is varied. In the end it doesn't matter really, as you want to have accessibility to both for researchers. But the difference is also that an archival object will always stay in a structure. If you're creating an archive, you're building a structure. So there are two values in archival objects you want to keep. One value is the information value. This is just what information you will find on the object, what is written on it, and so on. So this is the information value. The other value is the evidence value, which means how it is formed. Evidence value means, Why is this photograph on top of this letter? Why is there another letter on top of that? And why is everything a pile of stuff which all relates to Marcel Duchamp, for example? So if you just grab all the stuff and separate it into different boxes, you will never know that originally, the archive was one pile and there was an idea behind that arrangement. Everything has some meaning. Even chaos has a meaning. As a researcher, you will find it in the archives – you will see the structure of the original material, and you can draw conclusions from it. You can say, "Okay, obviously this person collected all those letters and the connection between all those letters is Marcel Duchamp. So he was interested in Marcel Duchamp." That's a conclusion you can make - this is the evidence value. The evidence value means how it is structured. And you will keep it. In a collection, you don't have that anymore. And another principle and difference between collection and archives is that archives are always based on provenance. So it means where it is coming from. That does not mean that it was created by you, but it means it's coming from you. That means your archive would also contain stuff from other people. Because you collected that, or you wrote letters to others, and you received letters and so on. So your archive contains a lot of work, which is not your work. But it's all your archive. And as an archive, you will keep that as one unit. The collection, on the other hand, is always defined by a theme, an idea, or a concept. For example, the ZKM collection. But it's not based on provenance in that regard. It's not everything coming from the same person. So this is the difference. The provenance principle is a very important principle for archives. And so it's often also based on persons or organizations. That's the nature of archives of artists and theorists, but there's also the

other half of the archive, which is the institutional archive. And I have two archives under my belt, so to say. One is the institutional archive, which is ZKM publications, ZKM exhibitions, ZKM projects - I'm also taking care of that. And then the other one, which you are more in contact with, is the artists' and theorists' archives, and those are based on persons. As an archivist would say, this is a collection because it does not have a connection to a specific person but more to a specific theme. This is the difference at ZKM, as I see it - more or less it's whether it's an artwork which can stand alone, or it's an archival object which has to maintain its structure within the archive structure. Archival work is always based on administrative work. Like how offices or state institutions work. How they're structured and what files and records they create. So from an archival science perspective, everything is based on records. This does not always make sense with our archives. I mean, look at video archives. You could consider and say, Okay, the tape is a kind of record. Right? You have a record, a record in the sense of a kind of file, a folder. You have one thing, a convolute of things, because on the tape there could be multiple objects on it, right? It could be film one, film two and film

Felix Mittelberger: So it's similar to a folder where you have an object which is in a folder, and the folder is in an archive.

Anastasiia Bergalevich: The next question is going to be about the acquisition of archives. How does that happen?

Felix Mittelberger: For acquisition, we are not doing active acquisitions in the sense that we are looking for people who are going to die or whose archives are available. We get our archives always through personal connections or existing connections to the artist already. Often through an exhibition or because of personal friendships, which was viable in the past also. So some personal connections, for example, William Forsythe. We are a media art institution. We are not specialised in dance, right? So he's a choreographer. So why is Forsythe here? We did a project with him in the 90s on a CD-ROM where we tried to link virtual reality with choreography. This was in 1999. Then years later, Forsythe remembered, "Okay, there was a nice project and ZKM is a kind of house where all art of twenty-first and twentieth centuries is housed." So he said, "If I have to give my archive somewhere, I don't want to be only in a dance archive, because I'm not only a dancer, not only a choreographer. I'm an artist. I create sculptures, I create concept art and so on." And this is the reason why - then we talked about the CD-ROM, the project from the nineties, and I said, "Okay, nobody has a CD-ROM anymore, nobody can open it anymore, how do we make it available again?" So we created a website and during this process of recreating the CD-ROM as a website, we talked with Forsythe and he said, "Yeah, I have an archive. I don't know where to put it. Is ZKM interested in it?" And we said, "Okay, let's think about it." And then we meet and we speak, and then we find a possibility or not. This is how it often goes. This is also the case for most of the archives. The video archive acquisition is similar, people contact us saying, "I have a video archive, I can't access it anymore. Can you digitize it?" because they heard about the laboratory, for example, or they know what ZKM is, so they ask, they come and connect with us. Or we do an exhibition with them, and during the exhibition some material gets digitised at the laboratory. So they always say, "Oh, okay. This could be a perfect place for all my archive." This happens often, but it's never the case that we see something and say, "Oh, let's contact them." This very rarely, or basically never, happened. In the past, it happened sometimes that we also bought archives. This is also not the case anymore. We are not spending money on the acquisition, we're spending money on the description and the processing and so on. For transport, we still pay money, of course, like the Douglas Davis archive, which cost €20,000 to bring from the US to here. The Aldo Tambellini archive

also came for a couple of thousand euros here to ZKM, but to buy the archive would be impossible. I mean, what is the value of that archive? It's a couple hundred thousand euros. ZKM has a budget of around €100,000 in total for the whole year to buy art. It's better to not put exact numbers, but you can't buy an archive for €50,000 or a hundred thousand euros because then we can't do anything else with the budget. We have to buy smaller artworks. Often from exhibitions we are doing, we also buy an artwork out of the exhibition at a good price because the artist is interested in being part of the collection and so on.

Anastasiia Bergalevich: And do you take all of the archives that are offered to you? I guess there are a lot of people who don't want their work anymore. Do you take all of them, or do you also reject some?

Felix Mittelberger: We have to reject some. And that's happening more and more that we have to reject offers. And also institutionally, often it's other institutions, especially with the laboratory - they come and say, "Okay, we have a collection of video tapes, we can't do the digitization, can we do it here," etcetera. And we have to really be precise and think about if we really can manage and want that. Sometimes the artists or the institutions don't want to give us usage rights, like the copyright or the right to use those materials. We can only take archives if we are allowed to at least make them accessible for our researchers, which is our minimum requirement.

Anastasiia Bergalevich: And what is the legal aspect of this process? When are you allowed, for example, to make exhibitions? When are you allowed to make it public for the researchers, and how does this work from the legal aspect?

Felix Mittelberger: Okay. First of all, we are closing a contract under private law. So it's different from the institutional archive, there is no law which forces the artist to give up this stuff. This is different with our institutional archives, where we are forced by law to keep our own organisational archives. So you and all the other colleagues are forced by law to give their documents to the archive, because there's a law governing this. So you can't say, "No, I don't want to give my emails to ZKM." You are an employee, so you have to share them. This is different with our external archives because we are in a situation where both parties agree. "Yes, we want to take over the archive. Yes, I want to donate the archive." And this is just a contract. In this contract we can include basically anything. You can just find a compromise and say, "This is what we agree on", and that forms the contract. There are no real limitations or fixed structure, but we have a standard contract that involves specific rights that we get from the archival donator. And this is, for example, always that we are allowed to make it accessible to researchers. Sometimes, there are optional rights. Is it allowed that ZKM uses it for exhibitions in-house? Is ZKM allowed to create merchandise out of it, to make it public that it's there? And so there are about 10 different levels of what you can do with it. What we'll never do, what is not part of the contract, because copyright is not something you can sell someone or give someone, is that we take care of the copyright. We only can take care of the objects, but if another institution wants to show the archive object, then they have to ask the artist if they are allowed to do that. We can provide them with the object, but we can't give them the permission to use the object. This will always be the artist's right. So the contract covers these aspects and establishes how it works.

Anastasiia Bergalevich: What about digital copies, for example?

Felix Mittelberger: It's the same with digital copies. So the digital copy is also something that we can provide, or we can take it into the archive. It's just something you can take over. And there's usually a kind of list of all the components which are going to go to the archive, but often it's also very vague. Like with Douglas Davis, for example, we just noted it down – I can just show you the contract at some point if you want? It's interesting. We just wrote down, "okay, 20 boxes of documents." So there's no - if we find a Mona Lisa in there, for example, this is also part of the donation then, because it was part of the 20 boxes. But you don't have the time to note down every single object and say, this is part of the donation or not. Then there are some other parts which force us to limit our accessibility of the objects. And this concerns personal rights regarding personal information. In archives, there is a lot of personal information, and we have to balance if we can make it public or available to researchers or not - if it's too intimate, too private, too sensitive or not. This is the main task of the archivist – to make this decision. And if not, we seal the document or close it for the public, so you can then say, Okay, in 30 years when this person has died and all the relatives have died also, then you make the diary public or just part of the diary public. Until then it's closed to the public, nobody can see it because it's too sensitive. I have an example. Heidi Paris, she was the editor of Merve Publishing. Heidi Paris committed suicide. So there are some letters between her and an author, and those letters are not available to the public. Unless someone is coming and saying, "Okay, I'm researching on her life," and makes a clear case. There are two constitutional rights which you have to balance. One is the right to science and the freedom of science, and the other is the right to protect your own personal information. You have to balance those and make a decision, saying, "Okay, this value is higher than that one at this moment." Günther Grass, for example, won a Nobel Prize in literature, and an archive made it public that he was part of the NSDAP. So he was a member of the Nazi party. And then the relatives said the archive had no right to publish that. It's too private information. And then they went to court, and the court decided no, the public interest is higher than the interest of the private person. But as an archivist, you always have to be aware that at some point, people can question your decision. And then you have to explain: "I made this decision on these principles." For example with Heidi Paris, I can say, "This was for a biography. And it was important that this aspect of her personality was also researched, so we made it available." And then it could happen that the court says, "Okay, you made a mistake," and then I have to live with this mistake. This is the so-called "Bewertungshoheit" (evaluation sovereignty). And this is what we have to take care of: that we do not publish anything which is sensitive. It's also difficult because you have to work through the material like with the video archives. You are documenting it with photos, but nobody's watching the full content yet. So perhaps there are some shots where someone's walking naked or talking about their ideas and their thinking process in sensitive material. And if that's the case, and you give access to that to a researcher, but you don't know that it's part of it, then we have a problem. People can say, "I never agreed to be viewed on the tape," for example. For instance, there might be some shots where there are naked children. And this is something you could not publish anymore. Also, those children never agreed – those kids who are now adults, for example, never agreed to be published. This could sometimes be difficult.

Anastasiia Bergalevich: In Raindance, I also saw, like, they made some videos in the strip club, for example, or some stuff like that.

Felix Mittelberger: I mean, you can always argue with the right of art, art freedom in that sense. But you have to make that argument. With the court, with law, there's nothing which is one-to-one true or false or right or wrong. You have the law, and you have the situation;

you have to say, Does it work? Does it not work for this specific situation? So we always have to consider these things carefully.

Anastasiia Bergalevich: Now I wanted to ask about this research infrastructure around the archives and what is accessible for the researchers and where they can come to access it.

Felix Mittelberger: Researchers need to make an appointment, and then they can come on-site, because due to copyright issues, 99% of our archival objects are only available on-site or in restricted areas. If we put it on the website, our website becomes a publication, and we don't have the right to publish it. Even if the artist agrees to that, the artist does not have all the rights for all the materials they give us for the archive. That's what I meant in the beginning. An archive doesn't only contain artworks from the specific person, but from different persons. So people have to come on-site or they have to ask, "Can I have a look at this tape?" And then we send them a digital copy, which they have to erase afterwards. This is the current situation. We are working on a catalogue for the archives and the collections in the library – a combined catalogue – but this will be released at the end of this year. So we're not there yet. And when they come on-site, they can have access to the archive; they can use the video database and so on, and they can work through that, or they work at the archive on-site and in the shelves and can look at documents and so on. And sometimes we also give access to material which is not completely processed or indexed yet. We do not allow them to take photos of anything which is unpublished. They can only take photos if the material is published already. So if they want to publish that later on, they have to ask us. And then we have to check, can we publish this photograph? Can we publish this letter or not? You have to ask the authors.

Anastasiia Bergalevich: But is there some infrastructure that allows researchers to know what exactly is in the archive?

Felix Mittelberger: You can't access the metadata if you're not an employee of ZKM. I can do that for them. If they ask, "What do you have on Aldo Tambellini at the ZKM archive," then I can send them a list, an export from the database where they can find all the tapes or what's written on the tape with the photos and so on. This is what I can make available to them. But there's nothing the researcher can do on their own. And this is still a problem because people will find only some information on the website. They know we have the Aldo Tambellini archive and they know also what's the general content of the tapes and documents, but they then have to come here and look for themselves or they have to write and say, "I'm interested in this part of this," and then we can look and say, "Okay, there are some folders on it and some tapes on it." But this is a difficult situation at the moment as we can't outsource research. We often have to do that for them. So they ask us for something, and we have to check the archive if it's there or not. But we need more time to describe and index all our archives so people can use a virtual resource to research it. Look at the videotapes with Raindance, for example. What you worked on - you only know what is written on the tape, but you don't know the content because nobody worked through it yet. So as a researcher, you hope that what is written on the tape is what you're looking for, or you have to look through all 700 tapes. But it's also important for you to know that archival work is not there to substitute research, but more like to help with research, to shrink it down, narrow down what you'll have to look through. So if you're interested in Raindance, I don't tell you to come and sit down and look at random stuff. I can tell you, "Okay, there are 200 tapes on Raindance. There are some documents on Raindance. Come here and look at that specific material, and perhaps you will find what you need." I will never create a database where you don't have to look at the objects anymore. It's about finding the objects and not about duplicating the objects or creating

duplicates in the database. It's about findability, accessibility, addressability, making it addressable, making it portable and so on. But it's not about "ersetzen" [replacing].

Anastasiia Bergalevich: But there is some information on the website about what is more or less in the archive.

Felix Mittelberger: For some, I think, 60 archives out of 200?

Anastasiia Bergalevich: Another specific question is: I was talking to Christian already, and he was referring a lot to the fact that they don't collect metadata and they don't record it on the LTO, but they rely on the database for digitization and all of this capturing process. So can you tell me more about the structure of the database?

Felix Mittelberger: There's technical metadata, and there's content metadata. I'm first talking about the content metadata. So we describe objects and records with four entities. And from our experience, those four entities are also the entrance points for the researchers: persons, events, works, and keywords. So to those four entities, this is where we try to link the objects. Those entities on their own also are interacting with each other. You know about it. You did that for me, right? So this is our main principle, and we avoid writing lengthy descriptive text and putting too much effort on titles. Often, you can create a title out of the different entities you linked to the object. And we have, of course, years and creation dates and so on – we have those things linked. This is the most important content metadata for us. But creating this information takes a lot of time, so we can't provide it for everything or we have to work on it gradually. As the laboratory is constantly digitising material, we skip a lot of this content metadata until we have time to do it at some point or until we have a specific project for it. This is different from the documents archive. With the documents archive, we don't digitize at all. We only do description and indexing. We concentrate on that part. And you only digitise on demand. If someone comes to the documents archive and says "I need a copy of that," then we can scan it for them. Until then, it only exists as a physical object. And then there's technical metadata, and this is where we need to do more automation because at the moment we are entering everything manually. But of course you could just look at a digitised object and extract technical information, putting it directly in the database. There's a lot of room for improvement in automation, using automated protocols to gather information. But the biggest problem and also the biggest possibility is that our database is based in FileMaker. FileMaker is very easy to understand. I created this database and its structure, but it's very limited in its ability to connect with other systems or to create APIs to, for example, extract technical information and other data. This is something that we need to work on – we need a new structure, a new database system, and new software. To be more flexible with that. But this is something we're going to address after the COSMOS catalog, which is coming this year. And while we work on this catalogue with the library connection and the archive, we will also work on the infrastructure – looking at how the LTO storage works and how the whole process of the laboratory and the archive could be more automated. But this is something for the near future. We do track technical information about the objects as well. And everything gets a number – a number to be identified and to be quoted. And the persons and entities we are linking to the objects are also often defined by authority data. Authority data are shared identifiers for persons, for example, so that every person receives a specific number. And worldwide, there's a specific number for Douglas Davis. And we are tracking these authority files – they are important to us in our structure to be more connected with other archives. This is how we connect our data to others through those authority files.

Anastasiia Bergalevich: Okay. All of the serious questions are over. Now a few fun questions. What is your favourite archive from all of this time you've worked here? What archive did you love to work on the most?

Felix Mittelberger: At the moment, my personal favourite archive is the Harald Bode archive. He's one of the fathers of the synthesizer. And we have this nice project, which is an atypical archival project where we're not creating a text or doing research, but we are recreating an instrument which was destroyed or never fully existed, using information from the archive. This is what we like and find fun. I'm working at the moment on the publication for that. There's going to be a symposium and so on. There's a lot of stress and a lot of work at the moment, but still the archive is so rich that it was always fun to work with it. Yeah, I like that. In general, I would say I like the connection between the art and the growing connections between archives. This is what keeps me working - it's kind of like Tetris, the idea to build something out of chaos or out of entropy, to create something structured. And then use the structure to find things and help others. This is what keeps me working with archives.

Anastasiia Bergalevich: And the last question is, during the time I've been here, I noticed a lot of projects going on between the archives and exhibitions. For example, I recently saw a couple. So how much freedom do you have to do something with the archive? Can you tell me more about your projects?

Felix Mittelberger: Too much freedom at the moment. And I'm trying to bring that down to a better balance. There's a growing interest from ZKM's side to embed archives into exhibitions. Over the last couple of years, with the higher visibility and better structure of the archives, this has increased more and more. It's also true for the collection - works in the collections are more represented in the archives and exhibitions. Also outside of ZKM, I think we have four or five loans a year from the archive to other places, other exhibitions. So this is a nice thing. But I have the freedom and the possibility to create my own projects. And one of my main interests is to bring young students, young art historians, to the archive. So my last projects were always in cooperation with universities. If you study classical history, you would start your studies by going to an archive and working with archives. But if you are studying art history, you will likely never see an archive until you're doing your PhD. So this is what I wanted to change – so that students have more interaction with archives during their studies. This is why the projects often gather around students. Also with the exhibitions we did - I'm not so much interested in just having archival exhibitions from a curator. I would prefer to have students working on that. Do an exhibition out of the archive; work with the archives. And I don't want to be a curator at all. This is the benefit – these students can be curators. That's why I want to be here. I chose archives for a reason as an art historian, not just by coincidence.

Anastasiia Bergalevich: Are there a lot of students that come in to write their theses about the archive?

Felix Mittelberger: It's getting more and more. I'm completely open to it. It would be better if the number grew. At the moment I have one PhD student, for example, who's working full time only with the archives, coming from Budapest. And there's a shared archive here from Budapest also - it's a Hungarian archive. But this is sometimes the case. I mean, one PhD student a year working on a specific archive is not enough. And then sometimes someone comes for a PhD, bachelor's or master's thesis, which is also good to have. And this happens from time to time. Some of the projects, like the Bode project, are the result of a bachelor's thesis from three years ago. Someone was interested in the

archive, found out something interesting, and somehow this project emerged. This is nice to have.

Interview with Olia Lialina

- Net artist and theorist
- Course director at the *New Media pathway* program at Merz Akademie, Stuttgart

29. October 2024

Anastasiia Bergalevich: I wanted to begin with more general questions regarding your experience with preservation. Are your works preserved? What works are preserved? Which institutions have your work in their collection? And what institutions do you have experience collaborating with?

Olia Lialina: My experience with the institutions. I think I have works in private collections. Is it also of interest, or are institutions more important?

Anastasiia Bergalevich: Private collections are also of interest.

Olia Lialina: Because with institutions now, when I think about it, I immediately then recall an early bad experience with an institution, and it was Ars Electronica. Which is a big institution and an important festival. And in 1997 we I mean, I don't remember how many now, probably around 10 net artists were invited to contribute to the online part of the festival. It was the 1997 edition of the festival. And our works – we created online works, and they were stored under a subdomain. This is my only work that completely disappeared. I have a list of all my works in my CV. And the only work that does not exist at all anymore is exactly this one, which I gave to the institution.

Anastasiia Bergalevich: And how come it disappeared?

Olia Lialina: Because they removed it. At a certain moment now I can't say when it happened exactly, maybe after ten years. Before preserving net art became a topic, they just removed it.

Anastasiia Bergalevich: And it was only available on their domains?

Olia Lialina: Yeah. Of course, one can say "Olia, why didn't you save it yourself?". But we are now talking about institutions. Why didn’t I save it myself? Because actually in this case somehow I thought that it will stay there forever because it's Ars Electronica and not just some files on my private computer or on my server. Then you also can probably ask now "But maybe it's on the Internet Archive?". But it's not on the Internet Archive, because the Internet Archive is a best effort service. They never guarantee that they go everywhere. Maybe they went there; maybe the homepage for this exhibition is on the Internet Archive. But the projects are not there because these were quite complex projects because it was net art, so everybody tried to make something special, something that is not really capturable. So I think that's an important thing maybe about my things. In private collections, I have the works that I started to make around 2004. It was the moment of Web 2.0. So there was all this platformisation and social networks at that time, and I had a feeling that I wanted to go out and I wanted to make works about the internet, and not online. And so in these

works, which were prints or some installations, they are works that are made on custom screens. They are in some private collections. They are not in institutions. I can't really say how well they are preserved there. I don't see them appearing in the exhibitions. Maybe fifteen years ago there was something, but not now so I can't say how they are there. So in 2016 "My Boyfriend Came Back from the War" was 20 years old and there were several exhibitions and events around it. This is when, together with Dragan, my husband, who is also one of the most known specialists for net art preservation and works at Rhizome, we started to make emulators for the work. "My boyfriend came back from the war", it's not just files of the works it became a package. The console, the operating system, the browser, the work itself and also a fake server-client connection so it slows down the connection speed. So, things appear gradually. This is what we deliver to the exhibitions, and they have to provide also a low-resolution screen because this resolution is important. [Showing documentation of the work] So this computer here is fake, it's just the decoration. This mouse is real, it's connected to a contemporary computer.

Anastasiia Bergalevich: Ah so it's running on new computers but using old screens and such?

Olia Lialina: Yes, using the old screens.

Anastasiia Bergalevich: And how important is it for you that it's exhibited using the original technology, or not at all?

Olia Lialina: At a certain moment it became very important for me. It is online as it is. Online, these are the old files, and they are shown on modern browsers with high-resolution screens. All this works, but it looks as it looks. It does not look good because it was made for something else. And I think it's fine, I still get some feedback and I think students who see it, so people seem to enjoy it and even respect it because also it's old now. But I think if showing the work in a real space in the museum, this is exactly the effort that galleries and museums should make to show the work the way it was when it was made. Because otherwise, why show it there at all? It's online anyway. So this is what I expect from institutions: that they facilitate these things. At this moment it's a means for them to make a bit of an effort because these CRT screens, they are disappearing. You know, like ten years ago, they were everywhere in the street, or you could get them for €5 on eBay, and now they have become real treasures. They are not produced anymore. And they are also not getting younger, and they can't work forever so I don't know what will happen there. So like this, "My Boyfriend Came Back from the War" is going to the exhibitions, it's in no collection like this. Another work "Agatha Appears", which I have is from '97 it's not as well known as "My Boyfriend Came Back from the War" but it's also a story, but more like a theatre play. And it's quite a complex work which was made in C³ (Centre for Culture & Communication Foundation) in Budapest. It was at that moment a very, very important institution to produce media art. And they also keep a lot of works, so this is a good example. Everything which was made in '96, in '97 and later on their servers it is still there. They maintain it. With this work at that time I worked with a lot of features that don't exist anymore from the Netscape browser. This work was also restored once in 2008 by a Polish restaurateur. And in this restored form it is on C³, but also now it exists also in a capsule, in its original form. So yeah it's shown like this also, and it is in a very good collection which I can only recommend to pay attention to. It's in Belfort, Espace multimédia Gantner. They have quite an impressive collection, I would say, of media art, and they keep it, and they send it to exhibitions. They also have equipment. It's a very good institution. It's sort of, I would say, in the middle of nowhere. Belfort. I don't know if you know where Belfort is, near Colmar, and in some small village there is a house and some

artist died and said that there should be such an institution there, and then it was made an institution.

Anastasiia Bergalevich: Another question about "My Boyfriend Came Back from the War. I've read that you have 37 different versions of it, and that several of them are lost. And I just wanted to ask more about this. What kinds of different versions do you have? And I wanted to know more about your own kind of practice of preservation on the example of this.

Olia Lialina: This is that schizophrenic part of me and my work. There really is a huge contradiction. Because on one hand, I'm also preserving not just the art but I put effort into my work of preserving the early web culture. So the early web, GeoCities archives, these things – how to preserve them and to keep and to give back. So here I'm trying, I'm really the one who would make copies and keep like everything. But when it then comes to my own net art practice, there you can, of course, see another attitude. So in the time then I made the "Last Real Net Art Museum", which is a museum about "My Boyfriend Came Back from the War", and the versions that other people made of it. So these are not my versions; these are what other people made. Yeah, I didn't make all those versions. There were a lot of remixes. I only made one; everything else is made by other people. And then when I wanted to put them all together in the museum, for me it was important as a gesture at that time, as a gesture of net artists, that I, as a museum, only link to things. I don't grab them. Because at that time, around 2000, at that moment museums started to be interested in net art, but they wanted to either grab files or to link to something and not to show where it comes from. They didn't want to have to preserve it at all. Now I would also see it differently, but at that time it was important to me to link to things rather than grab them. So this museum was a gesture of that, that's why I wrote that all the works belong to the artists and can be removed and changed at any moment. So this 'live' thing was important to me. And yeah, it's called "Last Real Net Art Museum" because at that moment I wanted to state, that it's very important if you're online, that you make links. And these museums were not making links. And of course, some beautiful things were lost. Some I could recover. Some not. I regret this, but I still made it like this. Also, I have to update it some time because there are some works already, newer works, but I didn't find time to link to them. I also have works, like my other network performances, there. Very difficult to preserve those. They are quite challenging. But with emulation, you can do it. So actually we do everything with capsules. If you want to preserve something, there would be a capsule where everything would be visible. Also, it would have internet, could be a fake Internet connection or real Internet connection, but it's in fact not real.

Anastasiia Bergalevich: So I understand you do emulation for all of your works. Do you have some documentation practice? For example, for the more performative works?

Olia Lialina: I have documentation. Do I have documentation? I think still quite sloppy. The documentation that I have. I have instructions for exhibitions. But like that, I can't say that any of my work is properly documented.

Anastasiia Bergalevich: So when we were talking about "The Last Real Net Art Museum" you mentioned that you thought before, that the link is the best way to preserve because it's kind of as far as I understood really speaks to how the internet works, but now you think differently and you lean more toward emulation practices?

Olia Lialina: At that moment with the museum I didn't think about preservation at all. It was not important for me. So, for me it was important that there are links and that content online stays distributed. And for me in a lot of things it's also very important, that

something just does not work at all anymore, if you switch off the internet. But it is the net artist talking in me, not somebody who preserves the digital folklore. There I have another logic. But with emulators, I really think that this is the solution that I found at this moment for my works. Because I want things to be preserved like this. In a capsule, with everything which belongs to it – the operating system, the browser, and the files. Another thing for me is that there are some works of mine that are interactive online. And I don't want them to be interactive when I show them at the exhibitions. In fact, there is not so many, but I don't show interactive projects in real spaces. Because my works are online, they are made for people to interact with on their own computers, but if showing it in a real space, then I make it so that you just look at it. It is live, but the interaction happens automatically. Because I don't believe in clicking in a real space. I mean I believe that it's a completely different type of art. I'm not able to create an elegant interactive installation. It's another type of work. And my works, they are made for screens at home, and then there are versions that would be for real spaces. It is different with these two early works, "My Boyfriend Came Back from the War" and Agatha, there is a mouse because it's object where you also deal with this old hardware and so on. But these newer works, like "Best Effort Network", "Hosted", they exist as automatic versions shown on big projections.

Anastasiia Bergalevich: So then when you think about preservation of your interactive works, it is not really important to you to preserve it as a kind of 'live' interaction, it can be automated also?

Olia Lialina: It's not about preservation. It's about exhibiting. I actually don't know how they should be preserved. I have a work, it's called "Hosted", I have to update it every several months myself because it very much relies on distributed content, and it breaks all the time. So I don't think anybody will update it after I stop to update it. It would be, of course, nice to give it to some institution and make them update it, but then they would also have to make some decisions. So then it's not my work anymore. So that's why there is a version of it that exists as it was when I made it. Where everything there works, all the 70 servers that are inside this work; they function as they did before they all crashed. So this is something I would sell to somebody if somebody wants to buy it, and this is what I exhibit, and this is what I would give to some collection, I think, in this form. But also at the same time, a big part of another life of this work, as it is now online, is that it is partly broken or very much broken sometimes. But how to preserve this brokenness, I don't know. This you can only enjoy. Maybe once you are the director of some institution that preserves things like this, you can do that [laughing].

Anastasiia Bergalevich: [laughing] I'll write it down. I think in ZKM they have this practice that the institution inherits a lot of estates from artists. So if you really want it to be preserved but you definitely don't have resources for this and you understand that your children are not going to do it or you don't have children or a lot of people just give it to them free and then they make a decision, is it valuable historically or not? And then they can host it, potentially. So what are your feelings about the loss of your works? And your relationship with this, like when an artwork is dead.

Olia Lialina: As I said, I have this work that was dead because of Ars Electronica. Everything else is more or less there. But not always in the best shape because browsers change all the time, and some things can stop working. Some things stop to work because they just don't age gracefully. So not technically, but maybe conceptually. I have a work called Midnight. It's also in some collections, by the way. And it was made in 2005. And at this moment Google Maps was very new. And the navigation of Google looked completely different from how it does now. So I wanted to use this in 2005, this navigation slide bar of

Google was in contrast to the earlier navigation elements of the early web, and for me, this contrast was important at that time. Now if you look at this work fifteen years, almost twenty years later, this Google navigation and these elements, they are all just old. So the point is lost. So this is the case with my works that were about old and new. That their impact is somehow lost. What's important for me in my newer works, I'm not very much actually so concerned that my works would really disappear. I am concerned that the web would disappear, that the browsers would disappear, and then also that my works will disappear. So when I make net artworks, I try to make them as browser dependent as possible just to highlight the browsers. And this is also just in general to attract the attention of people who look at them through the browser, but also, in case that institutions are preserving it, the browser would have to be there. None of my works can be shown just in full screen without seeing them in the browser. The newer works. So this is an essential part for me.

Anastasiia Bergalevich: So it's always it's always a bit of loss for you because of all the changes of the browsers.

Olia Lialina: This I work with self portrait. It exists in three different protocols. So there should be three different browsers. So if somebody wants to look at it, the person should also install Tor and another P2P browser and not only Chrome or something. The question is, of course, if people really do it. But this is what I tried to do.

Anastasiia Bergalevich: But is there a moment that you stopped to acknowledge the work as yours? Where you feel like the work changed so much that you can't really relate to it as your work anymore? Do you have this feeling? And when does it happen?

Olia Lialina: It is I have this absolutely with the online version of "My Boyfriend Came Back from the War". It's completely alive, it's functioning but this screenshot of it in this book is for me more my work than what I see. Like, without exaggeration. Because it is the browser, the connection speed, the resolution of the screen, they don't belong to it. Mainly with those early works, otherwise I don't have this feeling.

Anastasiia Bergalevich: Do you think the museum is a good infrastructure for keeping net art, or should there be some other platforms which should be responsible for this?

Olia Lialina: I know only one institution that's Rhizome that is a proper platform for net art. I know that there are some net art works in collections; also, my works as files are in some museum collections, but I have absolutely no idea what happened to them and what they would do with them without the emulator if they would want to show it. It's sometimes quite uninteresting. Some museums have some works but they don't have a lot of works. There is no museum with a big enough net art collection that they would have people who would really take care of it. So that's why there was nothing interesting happening, and these people then when it comes to exhibiting something which was acquired in '97 they don't know how to do it, so they would ask Rhizome. To restore it, to emulate it, to bring it back to life. So this is how it happens. There is something in Guggenheim, something in Tate, something in MoMA, but it's always the same story. My work is at some Spanish museum. But at this moment, I don't see something big happening. It's mostly video art, or everybody is busy reinterpreting Nam June Paik's installations [laughing].

Anastasiia Bergalevich: [Also laughing] That's true. And what do you think? Whose responsibility is it to preserve the work? Should it be the artist's responsibility, or should there be some institution that would do it in an ideal scenario?

Olia Lialina: I don't know if there are ideal scenarios. I can imagine that the works that were commissioned to be online somewhere have to be preserved by these institutions. I think it's a clear case. But that's also a question of the willingness of artists maybe. I or other artists, we are completely irresponsible. But we can allow ourselves to be irresponsible. I can now delete everything just as an artistic gesture or something, and no one can say anything to me. If you really want to preserve something you can't count on artists. At the same time, there is something else. At the same time, I truly believe that artists are the ones who do much better work when they want to, in preserving things, than any institution. I very much like to work with "And/Or Gallery" in in Los Angeles because the gallerist is also an artist, a former musician and media artist (Paul Slocum). And preserving and bringing back old computers to life is also his artistic practice. And in this case it works like a wonder. He has solutions; he has ideas. And also there are some other cases where you can see that artists, they come to more interesting solutions, or that just because they care, they keep something. So, if you were to observe it now, you would say that artists do a better job at the moment. Of course, Dragan now became a professional in all this, but it came from an artistic gesture. And also what we do together with Dragan for preserving GeoCities. These are also not institutional but artistic strategies. But it's because you are more also free in what you can experiment with. If something doesn't work, we're not an institution, so it's okay. Nobody gives us a budget for this. Nobody will ask us what we did with the budget.

Anastasiia Bergalevich: I have another question about your experience as a curator. Because I've read this text of you, "All you need is link". And you were really critical of curators, you said that it's mainly just big ideas of curators that dominate the artist's intentions. How is the situation now, and what do you think curators should, at this point now, change to be more sensitive to media art and net art?

Olia Lialina: I don't know what I would have answered maybe three years ago, maybe something else. But I think at this moment, we had a very strong revival of traditional art, though it's when NFTs started. It completely swallowed media art, net art, and digital art in general. Like, people now see digital art as NFTs. And so it becomes quite simple, very often it's just JPEGs that are exhibited. And connected to this is this idea that there is an original and of this power or aura of the original. And this dominates the market now so much, so I don't know. In addition to that, of course, the generative art. So at this moment, in general, I withdraw myself from exhibiting, I don't exhibit or talk at conferences where crypto art or art on the blockchain is a topic because even if you say something against it anyway, it is feeding this machine. I'm asked all the time to give interviews to some online magazines now that are glorifying crypto art. And when they want to talk to non-crypto artists, they want a way to legitimise the NFTs. I put myself back, but I also see that I'm sort vanishing. I'm losing. I don't know if or how I'm going to come back, but at this moment, I took myself out of the scene and the scene is fine. [laughing] It's good that I have a job here. I also think it's quite annoying because NFTs, they position themselves as something revolutionary and new, but it's very old fashioned logic. Conservative, I would even say, logic. And it's difficult to be in this situation. I wonder what will be the next trend. But you asked about curators; you asked something a bit different. You wanted to know something else.

Anastasiia Bergalevich: Yeah right, the reason I'm asking is because what I'm feeling is that the theoretical discourse around media art is very wrong somehow. It has this kind of idea of the ephemeral. That technology is ephemeral, that it's moving really fast, that it really doesn't take any time to produce or install works or something like this. And that's why I was curious, because I've also felt it in your text that you have this discontent of how

curators see your work, how it's perceived by people who are putting together theoretically framed exhibitions.

Olia Lialina: Now I remember what you asked and that's sort of what I meant, at this moment I don't know what to say about it because everybody is busy with something completely different. It's not even theoretical. Also when it comes to some conceptualizing something, it's to legitimize this.

Anastasiia Bergalevich: Another question I have, also from the same text of yours I've read, "All you need is link". It seems like you all also oppose net art to an object because you started to talk about this old-fashioned view of the artist coming back. So if it's an object, how do you think a digital artwork should be perceived?

Olia Lialina: It's this old text right? And it refers to this situation at that moment, that there was interactive art that was made for real spaces. And then there was also net art that originally was made for personal computers, and when it comes to the real space next to the interactive installations, it starts to look pale. Because it's not some exciting object or installation. And that's why there were also sometimes quite cheesy attempts to make something special out of it, to make an attractive object out of it although it is not an object. It is for the screen. I still think it is for your own screen and for being seen on computers. Later I was writing and I think it's also in this text that when we're in 2007 or something like this, all people who come to the galleries, they already have their mobile phones and mobile devices, and they are already very good. And computers were already do present, that you wouldn't put a computer at all in the gallery anymore, as a computer. A lot of things also became projections at this moment. And also for me, here I don't mean it ironically or negatively in this case, this is why I prefer to show some of my works as non-interactive projections. So you can see the browser there. You can see what's happening, but there is no computer and no attempt to make it an interactive installation. I'm not against installation or interactive art, but it's a completely different type of art practice.

Anastasiia Bergalevich: A last question: I was very curious because I also read your essay "Turing Complete User" in which you describe the disappearance of the user experience. You also describe the disappearance of the computer, and I find it interesting because I see this problem a lot in conservation, because a lot of museum workers who acquire works, or even artists, stop to see the computer behind the artwork. They see the artwork as a kind of performance, but they stopped to see the hardware. And I was just curious, do you feel that this kind of disappearance also influenced your practice?

Olia Lialina: Not my practice. I very much don't know about hardware and the computer, but to show the browsers is like the core of my works. And to show the old settings for those, the old computers and Internet connection, not opening things in kiosk mode or anything. What you describe it's not only about art, it's now everywhere, especially because of the web. The web is behind everything. Everything, like in my car the navigation, which like some custom made software and so on, but it's actually web page. Without an address, but it's all made with web technologies. And everything that you see, the beautiful things, mostly they are HTML, JavaScript, and web technologies. Almost everything is a web page but you don't see it because it's opened in kiosk mode. You don't see the browser. I'm a big fan of browsers because I think the web is the best thing that happened to us. And to the internet.

Appendix II: Further Reading and Additional Documents

Dorcas Müller “From Analog Restoration to Digital Master”

portable included Grundig, Siemens, Nordmende, and Universum. The mechanical problems are sometimes even seen today when a cassette is firmly stuck in the old equipment.

55 Engel et al., 2007, p. 490.

56 VHS 0.19 Deutschmarks, Betamax 0.16 Deutschmarks, Video 2000 0.15 Deutschmarks.

57 *Video*, 1, 1979, p. 23; translated from the German.

58 *Video*, 1, 1983, p. 113; translated from the German.

59 One is still missing: in terms of image quality, probably one of the worst video cameras of all time, which nevertheless achieved cult status. In 1987, the U.S. toy manufacturers Fisher-Price introduced a children's camera, which looked as if it was made for a 1970s science fiction film: the Pixelvision PXL 2000 (see ill. 50, p. 346) could record for twelve minutes on a standard audiocassette and cost 99 USD. The envisaged target group were apparently fearful of the results, but in Californian clubs the camera rapidly became a favorite party toy. Somehow Fisher-Price had miscalculated and quickly withdrew the toy from the market. On U.S. American eBay one or two Pixelvision models can be found for around 300 USD. And one can watch one of these nice Pixelvision videos at: www.arte.tv/de/La-Nuit-_2F-Die-Nacht-_2395/3072480,CmC=3070532.html (August 2010).

From Analog Restoration to Digital Master

by Dorcas Müller

The Artist's Archive

The video material from artists' archives – particularly that of the video pioneers from the 1960s and 1970s – possesses technical characteristics that derive from the particular working conditions in which it was made. Artists began to work with video when the first affordable mass-produced systems came on the market in the mid-1960s. These video machines were not conceived for generating broadcastable material, but were intended purely for domestic use, for recording television programs or for private recordings, which were then played back with the same device. Artists rarely had their own equipment; rather, they shared it in working groups, worked with rented machines, or were invited by institutions to do productions as guests. There were often problems when videotapes recorded on one machine were played back on another with the same format. Manufacturers did, of course, promise sufficient compatibility, but experience, then as now, shows that this promise was – and is – often not kept in practice. The production methods were unable to maintain constantly the fine mechanical tolerances that were necessary. To be able to play a videotape without any problems, in those days you actually had to set – or rather "reset" – playback devices so that their settings corresponded to the settings of recording devices at the time of recording. This resulted in many devices having faulty settings because the tape guides were open and accessible, and it was possible to adjust them without using any special tools.

With regard to restoration, we have to say that a tape runs best on the machine it was recorded on. However, there are very few occasions when this exact machine is available to the restorer. And even if it is, it is unlikely to be in the same state as it was at the time of the recording.

The Copy of the Copy of the Copy

If one wants a copy of a particular work in digital quality, then the first question that arises is: where can one find the best possible analog tape of this work? Several copies of a work often exist in one archive, yet the best version for restoring is not necessarily on the master tape. For restoration, the ideal case is when one has different cassette formats from different manufacturers from various sources and storage regimes available for comparison. Fortunately, the holdings in public archives around the world duplicate each other as regards content, so that when we are looking for the best cassette, one finds enough material, or mostly even an embarrassment of it. And it is frequently worth asking the artist for their master tape, too.

In the case of Claus Böhmler's *Wir malen mit dem Rot des Kohls* [We are Painting with Red Cabbage Red] (this volume, pp. 413f.), we had various tapes: a one-inch tape from Montevideo / Time Based Arts, NL, a Beta SP and a U-matic tape from the ZKM archive, a U-matic tape from the collection of the Ludwig Forum für Internationale Kunst [Ludwig Forum for International Art] in Aachen, and also the artist's original U-matic tape. When we compared them, the condition of the artist's tape turned out to be the best; it became the basis for restoration and individual sequences were supplemented by material from the other tapes.

In the case of *Objekt zur teilweisen Verdeckung einer Videoszene* [Object for the Partial Concealment of a Video Scene] by Reiner Ruthenbeck (this volume, pp. 477ff.), a one-inch tape from Montevideo / Time Based Arts, a U-matic tape, and an open-reel tape from the Ludwig Forum für Internationale Kunst in Aachen were available. The open-reel tape contained the better version, and, after checking with Ruthenbeck personally, it even turned out that he did not even have this longer version anymore.

After intensive research, we managed to locate a brilliant version of the work *Sue Turning* by Wolfgang Stoerchle (this volume, pp. 487f.), which the ZKM | Laboratory for Antiquated Video Systems knew about from the stocks of the Vasulka archive, in the collection of the Getty Foundation, USA.

Cleaning

When people think about cleaning in connection with restoration, they think first of detritus from outside which built up on an object over the course of time. In the case of video, however, the main problem results from the composition of the medium itself. The bad news is that almost all magnetic tapes sooner or later fall victim to chemical processes of deterioration, which is why, particularly in recent years, people have become alert to the fact that this material needs close monitoring and above all that a digital heritage archive needs to be es-

tablished in addition to the physical videotape archive. There already exists a body of scientific literature on the chemical deterioration of videotapes.[1]

On the subject of deterioration, the biggest scandal in the history of video happened very close to the time of production, when the adhesive substance of the coating on the reverse side of the Sony Open Reel "High Density" tape began to disintegrate in the mid-1970s and made the tapes so sticky that they could scarcely be played any more. At the time, Sony provided a free copying service from open reel to U-matic to save customers' archives. We still come across such tapes in our restoration work even today. In these cases, too, it is still possible to rescue the contents, even though it takes a great deal of time.

To make elderly videotapes playable again, the cleaning process is decisive. For more recent formats like U-matic, Beta SP, or VHS, there are cleaning machines from the firm RTI. For all other formats, the ZKM | Laboratory for Antiquated Video Systems has developed its own cleaning machines.[2] If videotapes are still sticky and not playable even after mechanical cleaning, the "thermal process" is used. The tapes are literally baked by a heat source, a process for which each video restorer has their own secret recipe. There are various references in publications, but these are not reliable, as in the following: between 50 and 65 degrees for five to ten hours. What precisely takes place chemically and physically in a videotape during the baking process, and why it then can be played, is so far not sufficiently understood scientifically. Thus at this point, we shall leave it at that and close with the remark: incorrect application of the thermal process can very easily result in you destroying the tapes!

The Sequence of Digitization

If a videotape is fit to play, then we can start looking for the appropriate player. At the beginning of the open-reel era, each supplier of consumer goods video players still had their own video system. It was not until 1969 that all the leading producers agreed on a uniform video format, which was called "Japan Standard I." However, this agreement did not last; many technical innovations followed, together with the battles we all now about for market shares. From the 1960s to today, there have been well over hundred different video formats. The width of tapes or the reel and cassette forms already indicate the direction the search would take. Knowing the origin of the tapes also permits quite a few details to be cleared up in advance. Yet, it is only when tapes are actually on the machines for testing that we can really determine what they are, for each tape has further sub-categories: if it is half-inch, then which one of the *n* number of different systems? Japan Standard I from Sony or National or a skip field machine, which only records a half-frame and then scans this twice when playing it? Which of the world's standards should the machine use: PAL, NTSC, SECAM? Or do we need an American 525 lines machine with appropriate frequency converter for 110 V / 60 Hz? Is the tape actually black-and-white, or does it have to be played only on a special and rare color machine? These are questions that have to be answered for each and every individual tape in the process of converting it to pristine video images. "Today this means that professionals doing bulk restoration of videos must first of all solve the question of the myriads of devices, or to put it another way: we quite simply need a museum with old video technology that works."[3]

Video is a time-based medium. This means that a particular (half) image sequence plays in a given time frame. The analog signal coming from the player has to be recognized in real time by the analog-digital converter, encoded digitally, and passed on to the computer for storage — all processes that handle very large amounts of data. To stabilize this process, all timing errors in the digital signal have to be eliminated. That is why in most cases a time base corrector (TBC) is employed for digitization. And here, too, it is a matter of having to find the appropriate TBC for each tape—player combination. The choice of TBC depends on which one is attuned to which player, or which machines were used to record the tape. Then again various sections of a work can be digitized well with one particular TBC, yet not with another — and vice versa.

That 1960s and 1970s open-reel half-inch tapes in particular can only be very badly synchronized is a consequence of the technical specifications of the machines from those days. For example, in the video camera recordings of some early 1970s models, the sync signals (H and V) were not linked to each other. This results in vertical interference (jerky images) occurring when digitizing via a TBC. The intensity of the interference depends on the manufacturer as well as on the type of time base corrector used. An additional source of interference is that recorders using either of the two video formats (Japan Standard I and Sony CV) do not have the capacity to synchronize via the TBC the head servo, which regulates the tape speed and the phase of the video head disc. A further significant disadvantage of many early video formats is the lack of a phase-regulated tape servo, which governs the speed and the phasing of the tape run (capstan). Today we have the technology to rectify these deficits through modifications.[4]

Because there is as yet no universal solution, which allows the setting of ungraduated parameters, it is important to have a wide selection of TBCs that differ in manufacture and design. Like the players themselves, each TBC offers a large number of settings, which sometimes even include the possibility of digitizing a signal that was considered lost. Additionally, the ZKM | Laboratory for Antiquated Video Systems has developed its own video signal stabilizing devices, which are hooked up between player and analog-digital converter. Thus, the matching digitization array of specific equipment has to be found to digitize a video with as little interference as possible. In our case, the last devices in the array are the analog-digital converters from AJA (model Io or Io LA), which are connected via a Firewire IEEE 1394a (400 Mb/s) to an Apple Power Mac G5. The digital signals are saved on the G5 computer's internal disc in real time. In the laboratory we use for video the format uncompressed / 8 or 10 bit

PAL with Quicktime conversion. File size with this process is around 1.2 GB/min of video.

A typical restoration and digitization sequence can be described like this: Urs Lüthi, *untitled*, 1973, Trigon Archive

► Tape CV open-reel, cleaned several times on a cleaning machine. Moderately dirty.
► Player SONY CV-2100 ACE, serial no.: 48757.
► Signal output was on HM3[5]. Setting CV, drop-out compensator (DOC) not significant.
► TBC Video International, 4-field digital standards converter, model: 2604, serial no.: 264105.
► The audio signal (mono) was sampled at the line-out socket of the video player with a Sonifex Redbox, converted into a symmetrical audio signal (XLR output), and split into two-channel mono. Regulation of the audio level with a Eurodesk MX8000A mixing desk at +4 db analog.

The Grey Mass or the Remembered Image

The contrast in video images from the 1960s and 1970s is weak. This deficiency was often "remedied" by artists subsequently turning up the contrast knob of the monitor at exhibitions. Documentation or reproductions in catalogs mostly demonstrated that even this had its limits and that at that time the videos already looked distinctly hazy. The argument that "we would have done it better in those days, if we could have" does not justify cosmetic reprocessing of the works during restoration. That is, not from a scientific viewpoint without documenting the process and labeling the new version that emerged from this process. It would be disastrous to increase the contrast during digitization. As with black-and-white photographs, we would restrict the existing palette of grey tones to such an extent that information about image details would be lost. The creases in a white shirt would be replaced by a sheared-off area; backgrounds in poorly lit locations would disappear into blackness. A video image that has been digitized in this way has likely lost the original's wealth of information forever. The same phenomenon appears when older analog videos are simply copied on new formats, for example, Mini DV Tapes, or when copies are made with a DVD recorder. The technical equipment of newer image media records with a higher signal level and therefore with more contrast, something which corresponds to contemporary viewing habits, but which means a loss of information when playing old videos. The zone system, which was developed in the 1930s for black-and-white photography and became known primarily through Ansel Adam's photography, offers a good theoretical orientation.[6] This is a method, which aims to utilize the full potential of the information in black-and-white images. The situation is similar with black-and-white video: if the digital copy produced has the maximum possible spectrum of information, then there are no limits on the digital reprocessing of images, and in the distant future as well.

In order not to make videos something they are not during digitization, the analog video image is constantly compared with the digital end product during the process of digitization in the laboratory. We watch video images next to each other on two identical Sony studio monitors: on one monitor is the version taken directly from the player's video output, and directly next to it is the digital version being generated. This optical check offers reliable safety, as it is unfortunately the case that, particularly with unstable open-reel signals, a good result measured on an oscillograph does not guarantee the best possible picture on the monitor.

The Digital Master

Anybody who thinks there are no masters in the digital world anymore is hugely mistaken. We call digital masters the uncompressed video files resulting from videotapes that have been restored by hand with the greatest possible care, with the most suitable machines, and digitized with the greatest possible differentiation in information. More complex, however, are the extensively edited tapes. When recording on a videotape, even within a section on the tape, the editing has usually been done on only one recorder but with several source devices. In particular titles have often been added afterwards with completely different machines. In this case for the individual sections different settings of the equipment used have to be utilized, or even totally different arrays of machines. Additionally, the possibility exists that a part of the work might be much better preserved on another cassette copy. In such cases, reconstruction of the work uses the best sources to produce a digital master.

Restoration and digitization sequence: Michael Geißler, *Nico, Nationalgalerie Berlin*, 1974, Geißler Archive

► Tape Japan Standard 1 open-reel (AV), cleaned several times on the cleaning machine. Moderately dirty, tape was already digitized earlier.
► Player: SONY AV-3670 ACE, serial no.: 10160.
► Signal output on HM3. Setting AV, drop-out compensator (DOC), only slightly.
► TBC FORTEL, DHP 625.
► Each scene had to be digitized with a different tracking setting. Tape more unstable in first quarter.
► The audio signal (mono) was taken from the line-out port of the video player, converted with a Sonifex Redbox into a symmetrical audio signal (XLR output), and divided into two-channel mono. The audio level was set with a Eurodesk MX8000A mixing desk on +4 db analog.

This digital master is now designated as such with an automatically generated identification number and a description of its content; it is then saved to a long-term storage medium. The technical form of long-term storage is both a philosophical question as well as, not least, an economic one. At this point it is appropriate, for simplicity's sake, to present our existing solution which is effective in everyday workflows. At the beginning of 2005, the ZKM | Laboratory for Antiquated Video Systems decided on the LTO-Ultrium3 system, which at

the time it was purchased offered the largest memory of 400 GB per tape.[7] The digital version is copied from the computer's local hard disc onto a general server. Data transmission is via a Gigabit Ethernet connection; at the moment, all the technical components together permit transmission of data up to 45 MB/s. Thus, a sixty-minute video can be copied onto the server in around twenty-five minutes; the data is then deleted locally, and the computer's hard disc is freed up for the next digitization.

As a less expensive alternative to commercial, proprietary control systems, control software for saving digital copies on LTO media adapted to the laboratory's special requirements was developed at ZKM. The so-called "backup tool"[8] was programmed in the program language PHP. It uses standard UNIX commands (star, mt) to navigate to LTO hard drives and can be comfortably monitored via a web interface from every connection to the Internet. In the background is a MySQL database, which controls the identification numbers as well as ensures that all working processes remain transparent, and in this way permits access to the digital masters at any time. For security, every digital copy is stored on two different LTO media, which are kept in separate places. Altogether 100,000 GB of video material is now secure on LTOs; that is equivalent to a good 1,400 hours of uncompressed video material.

If a digital master is needed for a new edit, or if one wants to work on it again on a computer, then a copy is called up from the long-term storage. The file is transferred again to the general server by means of the backup tool and from there can be copied onto a local computer. Any ensuing revised version gets a new name and the changes are indicated; then it can go into the archive. Routine compressing is constantly changing; software changes and improves year by year. This means that one has to be careful to maintain access to the original digital master with these improved tools to be able to deal with flaws perhaps better and more flexibly than before. For processing a video file with a particular software, the same rule applies as for analog processing of a video signal: once you have deleted information from an image, you cannot get it back again out of the newly created file. It is lost – unless, that is, you have hung onto your digital master.

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1 Fenna Y. Tykwer, *Untersuchung des Degradationsverhaltens von Videomagnetbändern-Suche nach geeigneten Monitorparametern-Vorbereitung eines Langzeitversuchs*, unpublished diploma thesis at the Hochschule der Künste Bern, Bern, 2006.

2 Developed by Christoph Blase and Friedrich Sambs for the ZKM | Laboratory for Antiquated Video Systems.

3 Christoph Blase, "Vom magnetischen 'Altbild' zum digitalen 'Neubild,'" in: *AKMB-news*, vol. 11, no. 2, 2005; translated from the German.

4 Source: Friedrich Sambs.

5 Developed by Friedrich Sambs for the ZKM | Laboratory for Antiquated Video Systems.

6 John P. Schaefer, *The Ansel Adams Guide: Basic Techniques of Photography*, Book 2., Little Brown & Co., Boston, MA, 1998.

7 Reseach and development by Torsten Ziegler and Manfred Hauffen for the ZKM | Laboratory for Antiquated Video Systems.

8 © Torsten Ziegler, programmed for the ZKM | Laboratory for Antiquated Video Systems.

9 The following sources for further reference are taken from Tykwer 2006.

Morgan Stricot and Matthieu Vlaminck “Acquisition workflow (computer-based artworks)”

From ZKM Werke Wiki

Contents

Pre-acquisition assessment (be prepared to make hard choices)

At ZKM we have an internal policy for acquiring works of a technological nature. Before acquisition, conservators and technicians are consulted to evaluate the feasibility of the long-term conservation of the work but also of its maintenance in exhibition, in dialogue with the curatorial team.

Step 1: contact the artist to gather information

As you will see throughout the entire acquisition process, the artist will be your primary contact person. If the artist is not the one who programmed the software of the software-based artwork, then the second primary contact person will be the programmer. If the artist is dead, the heirs (who feel concerned) are a great help in some cases, as well as assistants or people who have been in contact with the work in question (curators, gallery owner or friends).

You can find below a text by Rafael Lozano-Hemmer called “Best practices for conservation of media art from an artist’s perspective”. You can send this text to the artists during the pre-acquisition process so he or she can gather all the necessary information that the conservation and curatorial team would need to make a decision about the acquisition. I find it very useful.

https://github.com/antimodular/Best-practices-for-conservation-of-media-art

As advices Raphael Lozano-Hemmer gives to artists in this paper, you'll find for example:

- Make a video of the project, ideally with you speaking over it and explaining proper functioning.
- Install the project in a variety of computers, operating systems and/or devices and test for any software or hardware dependencies.
- Prepare one or several flash drives with all the source code for your project.
- Write a manual.
- Set your computers to perform uninterrupted for a long time.

So, the first step is to contact the artist and/or the programmer to ask him/her/them if he/she/they can send some basic information about the software-based artwork (which hardware, software, how does it work, what will be provided, what you should provide etc…) and access if he/she has already or must prepare a manual, a video, make some tests etc, like Lozano Hemmer advices. It's a good first step because you need to see these documents first before making any assessment. Sometimes, the artist will tell you that he/she will prepare them after the acquisition, this is where you say NO. I know that this is non-paid work for the artist but it is also a lot of work for the institution to make a pre-acquisition assessment. And if the pre-acquisition assessment is not made properly, the amount of work to maintain the artwork in the future would be significantly higher. Both sides must work together to make a good acquisition.

Step 2: make a pragmatic evaluation of the artwork AND your institution's commitment

Then, after contacting the artist and asking him or her all the necessary questions and documents, the restorers should develop a preservation concept for this artwork. The question you need to ask yourself here is:

Is it doable to show this artwork in the next 3 to 10 years in my institution in terms of obsolescence, manpower, costs, knowledge etc.)?

Here is it a very pragmatic evaluation of the artwork but first and foremost of your institution's commitment. Before acquiring this type of artworks you must be prepared to take care of this work over a long time and give yourself the financial means and manpower to proactively maintain the survival of the work.

Key issues include:

- access to source code: Does the artist have the sources? Which language? Does someone still have the knowledge, in your institution, elsewhere?
- use of open source or commercial software: Has the software a license? Can you make an agreement with the software company for support and updates? How much the license cost?

- availability of hardware: Is the material rare? Can you find spare easily? Is it easily repairable? Are there any specific devices used in the artwork? Hand-made or custom-made? does the artist have access to the schematics?
- in-house knowledge/skills available to setup and maintain the work on display: Do you have the skilled people in your institution or do you have to hire these skilled people at each setup?
- hardware/software interdependencies: Does the software compatible with other or newer computer, output devices?
- dependency of external resources: is there any dependency to external resources (websites, data stores on external servers, updates and support for external software etc.) or is everything running locally on the computer? Can I store these data in my institution instead? How long can these external resources be available? This is very important. If some part of the software operation is located somewhere else, then you cannot control the availability of this resource.

From there, the conservator writes a recommendation to the curatorial team. The curatorial team should take in account the conservator's point of view but not be too much disturbed by it. This is a collective decision-making: the decision should be based on a balance between conservation and art historical significance.

So the question is kind of: Is it worth investing time, people and money in the preservation of this work?

Tips for pre-acquisition:

- Don't forget that most of the artists do not make their own software. Always ask the contact of the programmer, it is paramount.
- Ask the artist to send documentation about the artwork including the software installation and operation. Like this, you can assess if there is already a documentation and how complete it is.
- Ask about external resources: the best is to have everything locally in the museum/institution and be dependent on nobody else.
- Also, ask the artist if he|she has experience of how their software-based artwork behave during long time exhibition periods. Because often artworks are shown only one or two days during festivals and the artist doesn't know if it will last during longer period of time in exhibition.
- If the artist is dead or not available (if you are buying through a gallery for example and the artist is not interested in helping), the procedure remains the same. If we don't have enough elements to set up the work and maintain it, or if we don't have access to the source code or spare components, it will be very difficult to give a positive recommendation to acquire this artwork in your collection.
- The best pre-acquisition evaluation is to exhibit the artwork in your museum prior acquisition during an exhibition for example, that way you can evaluate how good it is coping during exhibition (how many restart of the computer, maintenance work, failures, repairs, costs). If the artwork is not already exhibited in your museum prior acquisition, I would suggest to make a test

setup at that point in your workshop or in the artist's workshop if it is possible. If you are not sure that you have the capacity to exhibit, maintain or preserve the artwork in your institution, if you are not sure to understand everything, this might help.

Acquisition process (be prepared to be unprepared)

Once the contract is signed with the artist(s), you are going to prepare yourself to be unprepared. It means that you are going to gather as much information as possible, what you think is important but also what you think may be less important. You never know what you are going to need in the future.
So, during the pre-acquisition process you already made sure that the documentation is available, you might also have it already, that the source code is available as well as the material you need (provided by the artist or to be bought). But now, you are going to complete the documentation to have enough information to setup and maintain the artwork by yourself and gather every pieces of software and hardware to store it in your institution in order to preserve the artwork in the near future (with softwarebased we cannot make long-term plans).

Step 1: the contract

Normally, in the contract the following paragraphs should be included:

- When the Work has been provided and installed, a testing period of 14 (fourteen) days or longer shall begin, during which the artist may make the final adjustments and ensure the proper operation. During this period, the artist shall be available to [the institution] to set up features or to rectify defects in the course of the following working day, if requested by [the institution].
- Seller shall provide [the institution] with written information required for the installation, maintenance and, repair of the Work. He|she is willing to supervise the repair, if requested by [the institution].
- Seller shall provide [the institution] with the source code and development documentation of the software created by him|her in such a condition that will allow an expert to further develop the software. Unless provided otherwise, [the institution] may use the source code and the information contained in the development documentation for software maintenance only, unless it was granted exclusive rights to use.

This requires the artist to provide you with the source code, documentation and to help you in the future. This is important that it is stated in the contract so that once the artwork is acquired by your institution, you are not finding yourself without the necessary components to preserve the artwork.

The contract should also specify the list of material that would be provided by the artist. It would be important when the artwork actually arrive at your institution for the first inventory.

Step 2: Start to write the documentation

For this, you contact the artist and/or programmer again after the contract is signed.

Non-exhaustive list sent to artists:

1. please specify the model of any standard electrical/mechanical/hardware components, if possible with supplier for spares, manual and datasheet
   In case of programmed electronics, please provide the firmware
   In case of programmable electronics (Eprom for example), please provide de data
   In case of custom-built electronics/hardware, please provide a BOM (Bill of Material with designation and supplier of all the components) as well as blueprints.
   In case of custom-built circuit board, please provide the CAD for the PCB, list of components on it and the options for production - layers, material, thickness, spacing, solder mask, surface finish etc…
   In case of 3d-printed parts please provide the STL files with material and preset specifications
   (layer height, model of the printer used, profile used etc.)
   In case of use of Arduino board, please provide the code to be flashed
   In case of use of ESP modules, please provide the code to be loaded
2. Please provide us with a wiring diagram of the system
3. Please provide us with a block or logical diagram of the software ecosystem (UML deployment diagram for example) as well as all the necessary files (source code and development documentation of the software) created in such a condition that will allow an expert to further develop the software.
   Please specify the minimum specifications of the computer or specifications of the last computer used to display the work.
   Please specify the OS or compatible OS (if multi-platform compatibility) for the software environment
   Please specify the software dependencies (with license provider if there is any third-party software), the drivers (and hardware dependencies) if any, the libraries, etc.
   If the computer is not provided (or if you think it is necessary), please provide us with a setup guideline for the software with screenshots (if no GUI, provide the necessary command lines) Provide the exectuable(s) for exhibition with scripts for startup or troubleshooting/Log if existing.
   In case of self-written software, please provide us with any source code (with all necessary files/dependencies to recompile the software, please specify the compiler name and version). If possible provide a ReadMe file along with the source code to explain the structure and compiling steps or a commented code so that it can be further developed in the future. In case of authoring program, please provide the source files or source project, as well as the version of the program used and potentially export specifications. Please provide the installer for third-party software if still available.

TEMPLATE OF DOCUMENTATION is based on the model created by the project Matters in Media Art, which we adapted to our needs.

Step 3: Reality check

At this point, your documentation is theoretical. It is only a retranscription of what the artist/programmer says. Now you have to test the theory against reality: it is the reality check. Because the artists know their works, they tend to forget things that they are doing automatically without even thinking about.

Now, you'll invite the artist to come to your institution for the first assembly in exhibition or a test assembly in your workshop with your technicians to explain precisely the steps of assembly/disassembly but also the problems you might encounter in the exhibition in a transparent way. This test setup allows to evaluate again the completeness of the documentation. You can also ask the artist for a certain availability during the first exhibitions of the work (From experience, it can take up to 3 setups for an artwork to be fully documented and installed without the artist's supervision).

Step 4: gather the sources and make a backup

During the reality check, this is time for the artist to provide you with any source code with comments of any self-programmed piece of software, or sources with the corresponding editing application, which are necessary for the operation of the work. Don't forget that there is code not only in the computer, but sometime elsewhere like the components in the interfaces etc.
While providing the sources, the artist can explain everything, which part of the software does what, what are the necessary drivers or operating system specificities, the auto-start script or the startup script, the configurations etc.

On your side, this is very important that you do a backup of the Hard disk of the computer, it means a complete copy of the all system, also called DISC IMAGE, not just the software executable but also the operating system, drivers, software libraries, scripts, etc. An IT engineer can do this.

Here is the type of files produced for long-time archiving at ZKM:

- "Unmountable" disk image: made with , for example, Clonezilla. Non-readable: accessible only by writing the image on a physical support (HDD, SSD, USB...), often using it's original imaging software. Useful for temporary exhibitions and secondary backups (Clonezilla can directly generate MD5/SHA1 checksum). >> Useful for fast and secure backups.
- "Mountable" sector-by-sector disk image: made using a standard (and most of the time open-source) format. Can be read by most of the software for the open-source (.img) format OR it's dedicated software for the proprietary format (example: .tib for Acronis) by emulating the original physical support. >> Useful for archival consultation.
- Extracted software: only in case of high risk of future incompatibility. Example: software can run on both Windows XP and 10 but we don't have any Windows XP-compatible machine anymore cloning the HDD would not work in this case. Extracted software MUST include their dependencies (installers, libraries,

drivers, etc...). >> To be used only if the two previous methods are not possible (mostly used for migration process)

A md5 hash is made only the sector-by-sector image.

At ZKM the original data carriers (Hard disc, Floppy disc, DAT, ZIP, USB key, SD cards etc.) are stored in an archival storage. These carriers are duplicated and imaged on servers and LTO tapes before being stored for archival purposes.
The original software environment (disc Image) + executable, source code, etc, constitute the reference for the next versions of this environment. All the versions are stored together with appropriate comments, date, exhibition and decision-making of the software changes (we needed to change such or such peripheral device or utility, the computer broke down, etc).

All the different timestamped backups are archived on servers and LTO for reversabilitily purposes (we should always be able to go back to the origin of the artwork).

Step 5: gather spare parts and store the material

In addition to the backup strategy, we create ready-to-run computers. Instead of keeping the backups on our servers and magnetic tapes, we additionally implement them on spare computers in order to create multiple, identical, and functional examples of the entire hardware-software environment. Since we often have situations we need to setup a computer quite fast after a break down, we store the whole computer. Especially if it´s a computer with extra breakout cards, or specs only needed for that special artwork.

You should also gather spare parts. The purchase of spares, either it is equipment dedicated to an artwork or part of your exhibition equipment pool, is paramount for the short and middle-terms conservation of the work. You should purchase first the devices that are the most obsolete, expected to fail or rarest to find. The spares can consist of the whole equipment (same year, model or equivalent) or parts of the equipment (hard drive, graphic card, tubes, components...).

ZKM is gathering since its opening spare parts for computers, CRT monitors, backups of old systems, equipment etc.
If a piece of equipment is not available in our storage, Ebay is our Best friend! And lately it became easier and easier to find spares for material of the 90s. Also time goes by and we have now a better understanding and overview on each devices possible failures and troubleshooting. The team has 20 years of experience with these old computers and their possible reactions, this knowledge is more then valuable for the whole community.
Recently, we started purchasing spare parts equipment before any obsolescence phenomena appears (technological watch). When a work is acquired, even if the equipment is recent, we either ask directly the artist to provide us with spare or we wait till the prices go down and buy certain models one or two years after their release.

All the complex digital artworks should be stored with their dedicated equipment to avoid dissociation (Computer, cables, peripherals, interfaces, mechanics, touch

screens, tactile surfaces, sculptural objects etc.). Exception is made for non-specific projectors, monitors (CRT or TFT), light and sound equipment that are stored in the museum exhibition equipment pool and use for other artworks and exhibitions.

At ZKM, each equipment has a bar code which is linked with an inventory database. In this database all the specifications of the equipment is indicated (Brand, Model, serial number, location etc.) as well as part of an artwork group. On the artwork entry, a tree structure allows to see all the equipment dedicated to this artwork and which piece of equipment is currently use by the artwork in exhibition. With this database, we can follow all the equipment used years after years, exhibition after exhibition, for a piece of artwork. These spares as well as the original equipment are stored together.

Certain precautions have to be taken before storing a computer to avoid it to be damaged in storage:

- Remove the batteries
- Remove dust clogging the vents
- Remove the capacitors
- Wear gloves when handling electronic components (static electricity)

Step 6: Make an interview

Since 2012, the head of ZKM conservation department, Nahid Matin Pour, understood the paramount importance of artist's interview. She created the first interview in 2013 in order to gather all the information for the conservation and maintenance plan during the exhibition. Since then, it never stops to be improved, in particular when the conservators start to use the Variable Media Questionnaire, an online tool dedicated to artist interview.
Since the end of 2013, each new acquisition of time-based media artwork has been followed by the interview of the artist.
These interviews are then transcript (when they are made by skype or in video) and analyzed. The various information coming out of this interview should appears in the conservation plan as well as in the installation documentation and are fully part of the decision-making process.

Step 7: make the artist proof-read your documentation and interview

At the end of this acquisition process, the documentation/manual is sent to the artist for proof-reading and corrections.

Post-Acquisition marathon (be prepared to be proactive)

To exhibit is to preserve. Do not hesitate to exhibit the work as often as possible as a form of technological watch. Surround yourself well and ensure the conservation and

transmission of the documentation and knowledge associated with an artwork. In the event of a breakdown, call on qualified art conservators who often have a network of specialized technicians who are aware of the problems of digital art. Make multiple copies of the data, on different supports, geographically distant.

Update your documentation during all steps of the artwork's life. Document each decision, each repair, each exhibition etc.

ZKM is using MediaWiki software like you saw during this presentation. Our wiki is hosted on ZKM servers and accessible online for collaborative documentation with the artists and external experts.

ZKM also created an issue tracking system to monitor the artworks during exhibition time (history of failure, troubleshooting, workflow and knowledge management features). This tracking system is also linked to our database. All the artworks currently exhibited in the museum are added to the system in order to be monitored by the different teams (service technicians, restorers, IT etc). Basically, when something wrong happen in the exhibition (something is out of order or broken), the technician or restorer open a „Ticket". Then, the investigation as well as the troubleshooting with pictures are entered in the ticket. Once the problem solved, the ticket is closed and archived. Meant at first to improve the communication between the teams (the weekend team and the week team in particular), it became a real source of documentation for revision history/operational failure etc. of individual artworks of our collection. A summary of all the artworks' tickets is added to the Wiki documentation.

To finish, don't forget that with this type of artworks, reacting is not an option. As Bruce Sterling already pointed out in 2001: "When a piece of software decays, it does not degrade like a painting, slowly and nostalgically. When a software fails it crashes; it means the Blue Screen of Death." Conservation of media technical artworks knows only one rule: the proactivity. It is just basic computer forensics common sense: if there is too much time between two conservation efforts, the technological gap will be too huge to fill in to make the artwork operate again: the knowledge, the skills, the people and the machines are gone. The answer to the question When should we act is simple: when everything is going well. To maintain the behavior and aesthetics of the artwork the closest to the initial version, the technological jumps have to be as smallest as possible. The loss of the initial version resulting for long period of inaction makes any conservation effort risky. Indeed, this inaction increases the risk of technological discontinuities: the incompatibilities between the two technological ecosystems constrain the conservation professionals to imitate the behavior of the artwork with contemporary technologies rather than migrate it.

Retrieved from "https://werke.zkm.de/wiki/index.php?title=Acquisition_workflow_(computerbased_artworks)&oldid=31793"

This page was last edited on 15 May 2025, at 11:11.

ZKM Werke Wiki

This wiki runs on a modified version of the Citizen Theme

ZKM'S Purchase and Sale Agreement

ZKM | Zentrum für Kunst und Medien Karlsruhe, Stiftung des oeffentlichen Rechts (a public law foundation), Lorenzstraße 19, 76135 Karlsruhe, Germany

– ZKM –

a n d

... – Seller –

... enter into the following

Purchase and Sale Agreement

§ 1 Subject Matter of the Agreement

1.1 Seller hereby agrees to sell to ZKM the art object

...

(hereinafter "Work"),

1.2 She shall transfer the original to ZKM, convey title to the original to ZKM, and grant ZKM the rights to use set forth in §§ 5 and 6.

1.3 The Work is a unique copy/exists in a limited edition of .... copies.

Seller agrees not to create any Work or have any Work created that is similar to the Work sold and purchased under this Agreement as regards to form and contents. In order to avoid any conflicts of interests, the parties agree that Seller shall contact ZKM prior to the production of a Work that potentially violates the exclusivity agreement in order to reach an amicable agreement.

1.4 The software ... will be provided including development and user documentation as well as source and machine code of such a scope and quality that enables an expert to adapt the code.

1.5. In the event that the Work is linked with a certain domain, Seller shall take the necessary administrative steps to transfer the domain to ZKM.

§ 2 Description of the Work

2.1 The Work consists of the following components:

...

2.2 A description of the Work as well as a list of the exhibitions in which the work has been presented so far is attached to this Agreement as Annex 1.

2.3 An assembly instruction for the artwork is attached to the document in Annex 2.

§ 3 Purchase Price

3.1. The purchase price is € ... (in words: ... Euros) including/plus statutory value added tax (VAT). Seller shall inform ZKM in a timely manner whether she is subject to turnover tax (VAT) and shall provide evidence for its turnover tax liability. If Seller has her place of business outside Germany, ZKM shall pay the applicable value added tax directly to the fiscal authority.

3.2. The purchase price will become due for payment within 30 days from the handing over of the Work / upon execution of this Agreement and upon receipt of a comprehensible invoice. The advance payment of € ... already made by ZKM will be deducted from the purchase price.

3.3. The purchase price covers any goods and services, deliveries, material, travel expenses and allowances, and rights granted under this Agreement.

§ 4 Delivery

4.1. Alternative 1: Seller shall deliver the Work at her own expenses and risk to ZKM. She shall hand over, transfer ownership rights and title in and to the Work and install it there.

Alternative 2: ZKM will arrange for the transport at the expenses and risk of Seller. Seller shall package and have the Work ready for pickup on the agreed pickup date. ZKM shall notify Seller of the pickup date and time no less than 3 (three) working days prior to pickup.

Alternative 3: ZKM shall arrange and pay the transport. Seller shall package and have the Work ready for pickup on the agreed pickup date.

Alternative 4: The parties mutually agree that the Work has already been handed over to ZKM.

4.2 Alternative 1: Following the installation of the Work, Seller and an employee designated by ZKM will check the Work and draw up a report. At this time, the statutory warranty period shall commence.

Alternative 2: When the Work is provided and handed over, ZKM shall inspect the Work as regards to completeness, operability of its components, and shipping damages. ZKM shall notify Seller of the inspection results within 14 (fourteen) days in writing. At this time, the statutory warranty period shall commence.

Alternative 3: When the Work has been provided and installed, a testing period of 14 (fourteen) days shall begin, during which Seller may make the final adjustments and ensure the proper operation. During this period, Seller shall be available to ZKM to set up features or to rectify defects in the course of the following working day, if requested by ZKM. Upon the end of the testing period, after the rectification of malfunctions, if any, which occurred during the testing period, and provided that the Work operates properly during the subsequent 14-day-period, Seller and a person designated by ZKM will draw up acceptance minutes. At this time, the statutory warranty period shall commence.

§ 5 Copyright

5.1 ZKM acquires an irrevocable, exclusive, indefinite, world-wide right to use, not restricted with regard to content, with a scope that is necessary to exhibit the Work and to display it to the public with all of its functions (e.g., sound, image, and video elements).

5.2 In addition, ZKM has the right to archive the Work and/or representations or images of the Work, and to communicate them on any type of storage media and in electronic networks. For this purpose, Seller grants ZKM – for the term of the statutory copyrights and ancillary rights, including any extensions of copyright protection periods, if any – any necessary exclusive world-wide rights to use, not restricted as regards to content, including, but not limited to

- the right to store and archive the Work and/or representations and images thereof on image/sound storage media and in electronic documentation systems, including back-up copies;
- the right to make them available for viewing on computer screens at the ZKM Medialounge and/or on the intranet;
- the right to reproduce, distribute, make the Work and/or representations or images thereof, publicly available to any number of users on individual demand, in whole or in excerpts of any length/in excerpts of a length of up to three minutes length, in physical or non-physical media of any kind (e.g., CD, CD-ROM, DVD, e-book, apps, on-demand services [offline and online] in any kind of edition and number of copies, in the German, English or in any other

language, to broadcast, or to communicate them to the public in any other manner;

- this shall include the public availability in databases and data networks (internet and social media), including any type of transmission mode (cable, radio frequency, microwave, satellite) and technology (GSM, UMTS, etc.) and including any kind of protocol (e.g., TCP/IP, https, WAP, HTML, XML) to receive and display it/them on any type of stationary or portable terminal devices (text, audio, video and interactive communication) as well as in search engines;
- the right to grant users the right to download, store and print the contents for their own use, excluding the permission of any further processing for commercial processes;
- the right to produce derivative Works (e.g., thumbnails and previews, meta data and abstracts, descriptions of the Work and biographies) and to use them at their discretion and without any restriction whatsoever;
- the right to make reproductions and arrangements within the scope required for the contractual use, including, but not limited to the right to adapt the Work and/or the representations or images thereof to the corresponding format, size or technology (*Format*), or to combine these with other works.

5.3 ZKM is authorized to transfer the rights mentioned in this Agreement to third parties, either in whole or in part, and to grant sublicenses.

5.4 To the extent that new copyrights arise based on future technical developments or based on a change in legislation, or that existing copyrights are modified, Seller hereby grants ZKM the respective rights in accordance with the terms of use set forth in this Agreement.

5.5 ZKM may exercise the rights to use set forth in para.1 to 4 free of charge for non-commercial purposes (information, promotion of the Work or ZKM, documentation, research and education, etc.), unless the claims to compensation are administered by copyright collecting society. The distinction between free non-commercial use or commercial use subject to compensation will be drawn based on the main area of use. The presentation within the scope of exhibitions and events, in print or electronic publications of ZKM, or the representation of the Work on postcards, posters and in catalogs, or in or on merchandising products of ZKM shall not be considered a commercial use.

5.6 ZKM may rent, lease, and lend the work. In connection herewith, ZKM may grant the users the rights indicated in para. 1 through 5 for the period of time during which the Work is provided to third parties.

5.7 To the extent possible in the respective countries, in which protection is sought, ZKM hereby acquires the right to attach a copyright notice pursuant to the Universal Copyright Convention.

§ 6 Third-Party Rights

6.1 Seller has acquired any and all copyrights or other third-party rights that are required for using the Work within the scope set forth in section 5.

6.2 Seller warrants that the Work is free from third-party proprietary rights and that there are no other rights that would preclude or restrict the contractual use by ZKM. Seller warrants that she has the exclusive right to dispose of the rights to use in and to the Work set forth in this Agreement and that she has not made any conflicting arrangements with regard to the rights granted under this Agreement. Upon request, Seller shall answer questions about such rights and submit evidence for the freedom from third-party rights.

§ 7 Credits

ZKM shall attach information on the origin of the Work in a manner that is customary in the international art and museum business.

...

When referring to the Work, Seller shall always state that ZKM is the owner of this Work and that it is located in Karlsruhe.

§ 8 Repairs and Maintenance

8.1 Seller's warranty obligations are governed by the statutory provisions.

8.2 ZKM has the right to repair and maintain the Work at any time (including and upon the expiration of the statutory warranty period). If required or feasible due to technical progress, ZKM may install different technical components in the course of this Work, provided, however, that the meaning of the Work is not modified or altered. In this regard, ZKM shall take any conflicting moral rights (e.g., right to the integrity of the Work) into consideration.

8.3 Seller shall provide ZKM with written information required for the installation, maintenance and, repair of the Work. She is willing to supervise the repair, if requested by ZKM. If this work is carried out following the end of the statutory warranty period, ZKM will assume the customary expenses (including travel expenses as permissible under law and value added tax, if applicable).

8.4 Alternative 1: Seller shall provide ZKM

– with a backup of all necessary operating systems and application software (including all license numbers) on an appropriate storage medium for backup purposes;

Alternative 2: Seller shall provide ZKM with the following components for the purpose of making backup copies:

– ..... (software);

– ..... (database);

8.5 Seller shall provide ZKM with the source code and development documentation of the software created by her in such a condition that will allow an expert to further develop the software. This shall also apply in the event of a premature termination pursuant to section 2. Unless provided otherwise, ZKM may use the source code and the information contained in the development documentation for software maintenance only, unless it was granted exclusive rights to use.

8.6 Seller hereby assigns to ZKM any statutory warranty claims she may have against third parties. Upon request, she shall provide ZKM with all necessary information that ZKM may need to enforce its claims. Unless provided otherwise, ZKM authorizes Seller to enforce its claims on behalf of and for the benefit of ZKM.

§ 9 Final Provisions

9.1 There are no verbal collateral agreements. The Annexes form an integral part of this Agreement. Modifications of or amendments to this Agreement must be made in the written form; a waiver of the written form requirement must also be declared in writing. The written form requirement shall be deemed to have been complied with when communication is sent by facsimile and/or e-mail.

9.2 If any provision of this Agreement is or should become invalid or if this Agreement is incomplete, the remaining terms and provisions of this Agreement shall remain in full force and effect. The invalid provision is deemed to have been replaced with such a provision that validly and most closely matches the purpose and intent of the invalid provision. The same applies to a gap in this Agreement.

9.3 The laws of the Federal Republic of Germany shall exclusively govern all legal relationships between the Parties, and the UN Convention on the Sale of Goods is excluded. The venue for all legal disputes arising out of or in connection with this Agreement is Karlsruhe, Germany.

Karlsruhe, this	..., this .....
.....	.....
Alistair Hudson	...
CEO ZKM	

ZKM'S Contract of Donation

ADDRESS

- hereinafter referred to as "NAME" -

and

ZKM | Zentrum für Kunst und Medien (Center for Art and Media) Karlsruhe, a public law foundation, represented by its Board, Lorenzstr. 19, 76135 Karlsruhe, Germany

- hereinafter referred to as "ZKM" -

enter into the following

Contract of Donation

TEXT TEXT TEXT

DONOR intends to donate the archive of Artist X to the ZKM. Artist X, born in [place of birth] on [date of birth], has made significant contributions to [artistic field] and influenced the development of [contemporary art]. His work, which spans the period from [start year] to [end year], has had a significant influence on [specific art movement or style] and has thus secured a prominent place in the history of art.

The archive of Artist X, consisting of materials such as [list formats such as drawings, manuscripts, photographs, videos, etc.], enables a deeper understanding of the artist's work in the context of his time.

Through the acquisition of this archive, ZKM reaffirms its dedication to the preservation of media art archives. ZKM's objective extends to the safeguarding and democratization of access to these significant collections, thereby enhancing academic and public understanding and fostering an enriched appreciation for the

multifaceted legacy of media art. It is a privilege for ZKM to be the custodian of Artist X's legacy and to contribute to its enduring resonance.

§1 Subject matter

1.1 DONOR is the owner of the archive of ARTIST X (hereinafter referred to as the "archive")

1.2 DONOR conveys full ownership rights and title in and to the components and of the archive as specified in the inventory list (attached as exhibit A) to ZKM and hereby grants ZKM the rights to use the components as set forth in §3. ZKM accepts the transfer of ownership and the grant of rights. The rights on all intellectual property of ARTIST X remains with ARTIST X or its legal successors.

§2 Transfer and transport

2.1 DONOR will make the components available for dispatch by ZKM. The ZKM assumes the costs for transport.

§3 Copyrights in the components

3.1 The copyright to the works of ARTIST X remains with ARTIST X, or in the event of the artist's passing, with its legal successor.

3.2 ZKM is granted a non-exclusive, indefinite and irrevocable right to use the components not restricted as to time and/or territory, including:

- to store and archive them on any storage media, in databases (off-line and on-line) and on server systems (digital, interactive);

- to present them to employees, e.g. at electronic desks, and make them available to them in the ZKM intranet and ZKM VPN (Virtual Private Network); - to exhibit them in any mode and to present them in all functions;

- to present them to artists, students and researchers as well as visitors of the ZKM, e.g. at electronic reading desks;

- to make them publicly available to these persons in the ZKM intranet and inhouse VPN (Virtual Private Network);

- to make them publicly available on the internet on the ZKM website (and on other websites) and in social media;

- to use excerpts of the contents (e.g. images) world-wide for advertising the contents, the archive and ZKM and to reproduce these excerpts in advertising information and brochures that are made specifically for this purpose and to communicate them and make them available to the public without fee online and offline (in particular in press, radio, television and the internet);

- to use them for hitherto unknown kinds of use

The kind of use referred to above may only occur for non-commercial, in particular, documentary, educational, research and artistic purposes, provided, however, that the collection of usage fees and admission fees for viewing any of the components shall not be deemed a commercial use to the extent that these amounts do not exceed the costs for digitization and long-term archiving.

3.3 In exercising the rights specified in this section, ZKM is granted the right to translate, rearrange, shorten, modify or reformat the components in any other manner, in particular, by technical means, provided, however, that the integrity and statement and meaning of the contents is maintained. ZKM has the right to encode representations and copies of the components for the purpose of protecting them against unauthorized reproduction or to attach any other readonly mechanism or locking device to them.

3.4 For the duration of the copyright period, with prior written permission of DONOR, ZKM may loan the components and may grant the borrower the rights set forth in this section for the period during which the items are provided to the borrower.

3.5. DONOR may borrow the transferred material at any time and without additional costs or fees from ZKM.

3.6 DONOR does not receive any remuneration for the granting of rights of use by ZKM unless the remuneration claims are collectively administered by collecting societies.

3.7 ZKM is prepared to grant DONOR and third parties that are closely related to DONOR (especially relatives of DONOR/ARTIST X) access to the archive to a reasonable extent within ZKM's capacities for their own non-commercial purposes.

3.8 To the extent that new copyrights arise or existing copyrights are modified due to future technical developments or changes in legislation, DONOR shall grant ZKM the rights required based on the rights to use set forth in the preceding paragraphs.

§4 Third party rights

4.1 The parties are aware that DONOR may not hold all rights of use in the components necessary to grant ZKM the rights set forth in §§ 1.2 and §3. The grant of rights described above will only be valid in the event and within the scope in which DONOR is authorized to grant these rights. DONOR warrants, however, that it has not entered into any other agreements or made arrangements that conflict with the rights granted in this agreement.

4.2 DONOR shall give prompt notice to ZKM as soon as it becomes aware of the fact that certain components are subject to any third-party proprietary rights that preclude or restrict the contractual use or the transfer of full ownership

rights and title to ZKM. Upon request, DONOR shall provide detailed information on such rights and shall support ZKM in obtaining the respective rights from the holders of such rights.

§5 Credits, copyright

5.1 When referring to the archive, DONOR shall mention that ZKM is the owner of the archive and that it is located in Karlsruhe.

When the works and documents of the archive are exhibited and/or published, ZKM shall credit the archive as follows:

ARTIST NAME Archive, ZKM | Center for Art and Media Karlsruhe ARTIST

NAME Archiv, ZKM | Zentrum für Kunst und Medien Karlsruhe

alternatively:

ARTIST NAME Archive, ZKM | Karlsruhe ARTIST

NAME Archive, ZKM | Karlsruhe

§6 Evaluation, indexing and usage

6.1 If parts of the donation are assessed as not suitable for archiving, the ZKM will offer them to *NAME* for return. If *NAME* does not declare its willingness to take them back, the parts of the donation offered to ZKM may be destroyed by ZKM with *NAME* 's consent or given to third parties free of charge.

6.2 ZKM undertakes to make the archive accessible and to permit their use in accordance with the archive's user regulations and the applicable archive laws,

provided that no rights of third parties, in particular copyright and other personal rights, conflict therewith. Documents which concern the private, intimate and/or financial sphere are provided with blocking terms. They will only be made publicly accessible under the conditions stipulated by archival law (LArchG-BW) and only for those individual cases in which scientific interest outweighs the protection of personal rights.

6.3 ZKM shall store the digitized materials on data carriers and in data formats in compliance with appropriate and customary archiving and documentation techniques and incorporate them into its archive. In doing so, ZKM may make slight changes to the digital copies that are technically necessary in order to reproduce them publicly on the Internet (e.g., format changes). The content may not be distorted in the process. Considering that the digitization is free of charge for *DONOR*, ZKM does not assume any warranty. The ZKM will inform *DONOR* regularly about the status of the digitization and will hand over volumes of the digitized materials at regular intervals.

§7 Final provisions

7.1 There are no verbal collateral agreements. All modifications of or amendments to this Agreement must be in written form to be effective; a waiver of the written form requirement must also be declared in written from. Compliance with the written form requirement shall be deemed to have occurred in case of transmission of communication by facsimile and e-mail.

7.2 If any provision of this Agreement is or should become invalid or if the Agreement is incomplete, the remaining terms and provisions of this Agreement shall remain in full force and effect. The Parties agree to replace an invalid provision with a provision that most closely matches the intention and purpose of the invalid provision and is legally valid. The same applies to a gap in this Agreement.

7.3 The laws of the Federal Republic of Germany shall exclusively govern all legal relationships between the Parties, and the UN Convention on the Sale of Goods is excluded. Place of jurisdiction for all legal disputes arising out of or in connection with this Agreement is Karlsruhe, Germany.

Karlsruhe, _____ _____,_____

Alistair Hudson
(ZKM)

DONOR
(*DONOR*)

List of donated material

Exhibit A

...