

Software-based Art: Challenges and Strategies for Museum Collections

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Abstract

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Art museums are faced with how to implement policies and practices to acquire media-based artworks in the original formats while planning for potential maintenance, repairs and upgrades of technology. As Christine Frohnert and Martha Singer state in their 2010 American Institute of Conservation (AIC) News article, “incorporation of technology into works of art, whether visibly or covertly, serves to anchor a work to its historical specificity and to grant it a more full cultural identity. Therefore it comes as no surprise that artists increasingly use electronic media.”¹ This research explores the range of challenges museums face when collecting works which have software and describes the range of emerging strategies for collecting software-based artwork while planning for future exhibitions and preservation. Three research methods were used to collect data; an electronic survey regarding media-based collection, site visits to James Turrell Skyspaces and interviews with experts who work with media-based artwork. Results indicate that museums are interested in collecting software-based works despite concerns in the field regarding the inherent vice of the technology degrading and the lack of museum professionals with computer science expertise. In response to these concerns strategies for collecting software-based artworks are beginning to emerge such as internal museum workgroups, documenting software code and establishing digital repositories. These are strategies that may enhance the museum’s ability to exhibit and preserve software-based art. Digital technology has become a pervasive aspect of daily life for most individuals if we do not begin collecting, documenting and preserving this history we will lose those records of our cultural history.

¹ Frohnert, Christine and Singer, Martha. “Education in Electronic Media Art Conservation: Where We Are and Where We Should Be.” AIC News Vol. 35 No 1 (2010): 1, 8-12. Electronic.

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Ha! It certainly keeps us on our toes...

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Preface

Research for this paper began in fall 2012. Inspired by a internship in spring 2012 wherein I conducted research to create a conservation outline for thirty-three media works at the Seattle Art Museum. This led me to discuss potential thesis projects with Judy Sourakli, Curator of Collections, and Rachael Faust, Assistant Curator of Collections and Academic Programs, at the Henry Art Gallery (Henry). Judy, Rachael and I devised an internship project wherein I would review, update and create documentation binders for sixteen works in the media collection and conduct in-depth research on James Turrell Skyspaces to inform a conservation plan for the Henry's Skyspace, *Light Reign*, 2003.

Light Reign is an enclosed site-specific work open to the sky through an oculus which was cut into the roof; this is combined with a computerized lighting control system to create an atmospheric viewing experience. This work has two lighting systems; the interior has two sets of different neon bulbs controlled by manual dimmers and exterior LEDs (light-emitting diodes) which are turned on/off with a computerized lighting control system running software programmed by the artist's studio. During my initial research I found that there are few resources about cataloguing and condition reporting the software and/or artist written code for a work such as *Light Reign*. Additionally, museums rarely identify the computer processing equipment, software and/or artist written code in their collection management database nor do they make this information available to the public on the museum's online collection databases; making it difficult to identify the number of works with software a museum has in the collection. To that end, this master's paper investigates the challenges and emerging strategies for documenting acquisitioned software-based works while planning for future preservation and exhibitions.

Introduction

Art museums are faced with how to implement policies and practices to acquire and exhibit media-based artworks in the original formats while planning for potential maintenance, repairs and upgrades of the technologies. This topic is pertinent to the majority of art museums that collect and/or exhibit contemporary art because artists are continually creating works with analog and/or digital technologies. As Christine Frohnert and Martha Singer state in their 2010 American Institute of Conservation (AIC) News article, “incorporation of technology into works of art, whether visibly or covertly, serves to anchor a work to its historical specificity and to grant it a more full cultural identity. Therefore it comes as no surprise that artists increasingly use electronic media.”² As technology rapidly changes, the ability for museums to preserve and exhibit these works in the original formats becomes increasingly difficult because the field has yet to establish a written protocol of conservation for software-based works. Museums began researching and implementing preservation strategies for media-based art such as film, sound and installation art in the late 1990s. However, best practices for digital art are still emerging. This research explores the range of challenges museums face when collecting works which have software and describes the range and characteristics of emerging strategies for collecting software-based artwork while planning for future exhibitions and preservation.

In *Interface Culture*, Steven Johnson refers to the new emergence of digital artists, “The artisans of interface culture . . . have become some new fusion of artist and engineer--interfacers, cyberpunks, Web masters--charged with the epic task of representing our digital machines, making sense of information in its raw form.”³ Universities throughout the United States have begun to establish experimental media programs to develop and train these new artists; for example the University of

² Frohnert and Singer, “Education in Electronic Media,” 1.

³ Steven Johnson, *Interface culture: how new technology transforms the way we create and communicate* (San Francisco, CA: HarperEdge, 1997) quoted in Steve Dietz, “Gallery 9 - Walker Art Center,” *Gallery 9 - Walker Art Center*, accessed February 4, 2013, <http://gallery9.walkerart.org/>.

Washington's DXARTS program began as an undergraduate program in 2003 and added a post doctorate program in 2004, the Pratt Institute's Interactive Arts undergraduate and graduate programs began in 1987 followed by a name change to Digital Arts in 2007. These programs are designed to give students a comprehensive and multidisciplinary approach to designing and creating art with experimental media such as mechanics, electronics, software, fabrication and audio/video processing.⁴ Additionally the art world has continued to demonstrate an interest in working with these artists. There are several international art festivals, competitions and shows, such as the annual European Media Art Festival in Osnabrück Germany, Electrohype in Malmö Sweden and the Miami Basel Art Fair, which serve as meeting centers for artists, curators, distributors, galleries and an audience of experts to view experimental film, installations, performances, digital formats and hybrid forms on diverse personal and social topics.⁵ Additionally digital artists are exhibited and represented in New York and Europe by art galleries such as Bryce Wolkowitz, Bit Forms, Postmasters and Digital Art Museum (DAM) galleries.

The first large electronic art traveling exhibition, *Cybernetic Serendipity*, curated by Jasia Reichardt in 1968-69 was an "attempt to demonstrate all aspects of computer-aided creative activity: art, music, poetry, dance, sculpture, animation."⁶ The tour included the Institute of Contemporary Arts in London, Corcoran Gallery of Art in Washington D.C., and the Exploratorium in San Francisco, CA. Since this exhibition museums have continued to embrace artworks which have software through exhibitions, commissions and acquisitions. Currently there are varying levels of digital media expertise across the field. For instance well-known museums such as the Museum of Modern Art (MoMA), the Solomon R. Guggenheim Museum (Guggenheim) and the San Francisco Museum of Modern Art (SFMOMA) have conservators on staff who have sought special training in media conservation. While

⁴ "DXARTS," *University of Washington DXARTS*, accessed May 20, 2013, <http://www.dxarts.washington.edu/>.

⁵ "European Media Arts Festival," *European Media Arts Festival*, accessed May 5, 2013, <http://www.emaf.de/english/start.html>.

⁶ "Cybernetic Serendipity," *Media Art Net*, accessed May 5, 2013, <http://www.mediaartnet.org/exhibitions/serendipity/>.

many institutions do not have media conservators (or conservators at all) on staff some do have curators and/or departments dedicated to “media,” “time-based media,” and/or “new media” such as the Los Angeles County Museum of Art (LACMA), The Walker Art Center (Walker), and Whitney Museum of American Art (Whitney). Digital technology requires a special set of skills and training to understand the related preservation issues.⁷ The United States does not have any conservation or museum studies programs that specifically target digital art. New York University regularly offers elective courses in contemporary art and media conservation in their museum studies program. Determined museum professionals can attend conferences and workshops that are organized by groups such as the Electronic Media Group, a specialty group of the American Institute of Conservation, which provides continuing education on documentation and preservation of technology-based art.⁸

Artworks that utilize software vary in complexity. For instance the Henry Art Gallery’s James Turrell Skyspace, *Light Reign*, 2003, has two sets of written code that is run by a software program on a dedicated server to turn LED lights on /off and to change color in sequence based on specific time settings. In contrast is MoMA’s Jonathan Harris and Sep Kamvar, *I Want You To Want Me*, 2008, a work that is comprised of twelve components; such as two different operating systems and three customized components (C++ application, Java-based web crawler, and MySQL database). These components are programmed to perform multiple tasks. In brief, the work searches online dating websites for certain phrases, which are collected and stored into a database and then used in an interactive interface of five environments that run on a dedicated computer and are visualized on a custom touch screen that visitors use in the gallery.⁹

⁷ Frohnert and Singer, "Education in Electronic Media," 1, 8.

⁸ Ibid., 1

⁹ Barbra Mack and Glenn Wharton, "A Case for Digital Conservation Repositories," *The Electronic Media Review One* (2012): 24-26.

For the purpose of this paper the terms “media,” “new media,” “media technology” and “time-based” are interchangeable as definitions are similar and a standard term has yet to be adopted by the field. Furthermore, media-based works could be defined as works that require electricity, analog and/or digital technology playback equipment when viewed to encompass light and kinetic works.¹⁰ “Digital art” is a general term for a range of artistic practices that use digital technology as a tool to produce a singular work (such as Wade Guyton’s inkjet prints) and/or to present the work itself (such as Jim Campbell’s computer controlled LED installations/sculptures which show video imagery).¹¹ According to Christiane Paul, adjunct curator of New Media Arts at the Whitney Museum of American Art (Whitney), “software-art” is generally defined as instructions that can be executed by a computer.”¹² For the purposes of this paper “Software-based artwork” is defined as works that require commercial, open source and/or custom written source code by the artist or artist’s studio to create and/or operate (e.g. video, images, electronics). “Computer-based” is defined as works in which a computer processor and/or digital technology is used to make the work itself or the decisions to determine its form when displayed or distributed.¹³ This research looks at the software independently of the hardware used for processing. Electrohype, a non-profit organization in Sweden that promotes computer-based and technological art in Sweden and other Nordic Countries, defines computers as “machines ranging from workstations to cellular phones, or miniature control computers that can be implemented in art installations.”¹⁴

These terms were chosen based on the Documentation and Conservation of Media Arts Heritage’s (DOCAM) Glossaurus, Tate’s archived glossary and semi-structured interviews with tow

¹⁰ Christine Frohnert (Independent Media Conservator, Bek & Frohnert LLC) Semi-structured Interview. February 2012.

¹¹ Christiane Paul, *Digital Art*, (New York: Thames & Hudson: 2003), 7-8, 68.

¹² *Ibid.*, 124.

¹³ Ward, Gerald W R., *The Grove Encyclopedia of Materials and Techniques in Art* (Oxford; New York, NY: Oxford UP, 2008): 115-17.

¹⁴ "Electrohype," *Electrohype*, accessed May 5, 2013, <http://www.electrohype.org/sve.html>.

media conservators. Additionally several top institutions in the United States have adopted variations of the term “media” as an overarching category to describe specific internal departments and/or specific collections including the Guggenheim, MoMA, SFMOMA, Walker and the Whitney. Although the terms “media,” “new media,” “media technology” and “media-based” art will be used throughout this paper other media terms used in museums and existing literature include film, video, sound, electronic, technology-based, new media, systems art, digital art, interactive art, interactive installations, net art and web art.¹⁵ See the glossary for a list of related media terms.

Art museum professionals, particularly media curators and conservators, recognize that museums need to collect, exhibit and preserve media-based works. Across the field there is a lack of technical knowledge and awareness of the needs for artworks that have software to enable museums to actively collect these types of works. With media such as software, it is difficult to address every aspect of the topic as there are numerous types of software that can be used in various platforms such as websites, dedicated hard drives and microprocessors. Many media works must be managed on a case by case basis in collaboration with the artist. Nonetheless this paper will provide a description of gaps in the field pertaining to software-based works by surveying media collections, studying a selection of James Turrell Skyspaces and interviewing museum experts who work with media while also describing emerging strategies that museum professionals can implement for collecting software-based works. Artworks which incorporate technology such as software anchor the work in the culture in which they were created, if these works are not collected, documented, and/or preserved for future study and exhibitions there will be a gap in our historic record.

¹⁵ "Glossary," *Electronic Arts Intermix (EAI)*, accessed April 1, 2013, <http://www.eai.org/resourceguide/glossary.html?nearline>.

Chapter 2: Literature Review

To begin identifying and understanding the needs and challenges faced by museums when collecting software-based art this chapter analyzes existing literature relevant to software by prominent media curators, articles published by the Electronic Media Group (EMG) and institutional projects on collecting, documenting, exhibiting and preserving media artwork. This literature review begins with brief highlights of artists working with computers to produce independent works analog and/or digital and to program electrical components to create interactive or participatory installations. Section one also addresses the ways media such as software question the museum's practice of collecting. The second section highlights the lack of media training programs for museum professionals, specifically conservation and how the field has strategized to provide supplemental training through journal articles, conferences and workshops.

The third section highlights standard acquisition practices museums have adopted to document and track collections. The Rhizome ArtBase provides examples of policies and procedures that can be adapted into the traditional acquisition standards to specifically document the acquisition of software-based works. The final section focuses on conservation theologies and guidelines addressed by collaborative institutional projects. *Matters in Media Art* project has established guidelines and templates for documenting media-based works. The *Variable Media Initiative* and the resulting *Variable Media Network's* (VMN) website have identified behaviors and examined artist approved strategies for preserving media-based works. This section will also include a brief overview of other projects; *Electronic Arts Intermix*, *Inside Installations*, and *Curatorial Resource for Upstart Media Bliss* (CRUMB). There are several hundred examples of artwork created with computers over the past fifty years; for the scope of this paper the history

presented here is intended to demonstrate the breadth of artistic practice and not intended to be all inclusive.

Section One:

Early Computer/Software Art

An early precursor to artwork produced with computer programming is Desmond Paul Henry's drawing machines of the early 1960s. Henry was a British artist who constructed drawing machines from the components of analog World War II bombsight computers. He modified the machines to accommodate pen and paper. While the machines were not programmed they were operated electronically. The swinging motion of a pen attached to the machine's moving arm created the resulting image on paper.¹⁶ Shortly thereafter in 1963/64 artists A. Michael Noll (American), Georg Nees (German) and Frieder Nake (German), who were initially unknown to each other, began writing computer programs that automatically generated drawings with an artistic aesthetic rather than a technical purpose; they exhibited their work in *Cybernetic Serendipity*. Most of the resulting computer drawings were printed on mechanical computer plotters, on CRT displays with a light pen or from scanned photographs. Mathematical equations produced curves, lines or dots and programming techniques to introduce randomness were also common.¹⁷

The term cybernetics refers to systems of communication and controls in complex electronic devices like computers. A cybernetic device responds to stimulus it is programmed to receive, then responds by producing a programmed reaction such as a digital image, wired sound, light and/or movement.¹⁸ An example of an image generated by computer software on a computer screen is Noll's *Computer composition with lines*, 1964. The work was made using an algorithmic simulation created

¹⁶ "Desmond Paul Henry, Untitled, Drawing," *Search the Collections*, Victoria and Albert Museum, accessed May 5 May 2013, <http://collections.vam.ac.uk/item/O499536/untitled-drawing-henry-desmond-paul/>.

¹⁷ "Cybernetic Serendipity," *Media Art Net*, accessed May 5, 2013.

¹⁸ *Ibid.*

with pseudorandom numbers to mimic Mondrian's 1917 painting *Composition with Lines*.¹⁹ Shortly thereafter robotic artist Edward Ihnatowicz was commissioned by the Phillips Corporation to create *Senster*, 1970, a computer-controlled sculpture that could track the source of a sound made by the viewer, such as clapping, via microphones in its "head." Within a second or two the "head" could move to anywhere within a total space of more than 1,000 cubic feet. Sophisticated computer programming ensured that the movements were convincingly lifelike. The work was constructed of steel tubes, hydraulic actuators, four microphones, two Doppler radar units, Philips P9201 computer and punched paper tape.²⁰

Artists and Engineers Collaborating in the United States

Engineer Billy Klüver (Swedish-American) and artist Jean Tinguely (Swiss) created the collaborative work, *Homage to New York*, a self-destructing machine in the garden at MoMA in 1960. Klüver and his assistant Harold Hodges designed step relays that closed eight electrical power circuits over the course of twenty-seven minutes. Some of the functions the relays enabled include powering a radio on and activating a chainsaw that cut the radio in half. Seven minutes into the performance the work started to self-destruct. Robert Rauschenberg witnessed the performance and began to collaborate with Billy Klüver shortly thereafter with an interest in creating interactive environments for the viewer.²¹

By 1965 a group of artists and engineers planned performances at the 69th Regiment Army Hall in New York entitled *9 Evenings: Theater and Engineering – A Series of Performances by 10 Artists collaborating with 30 Engineers*. At the first planning meeting for

¹⁹ Ibid.

²⁰ Jennifer Mundy, "Lost Art: Edward Ihnatowicz," *Tate* (blog), August 27, 2012, <http://www.tate.org.uk/context-comment/articles/gallery-lost-art-edward-ihnatowicz>.

²¹ Christine Frohnert, "Heart Beats Dust: The Conservation of an Interactive Installation from 1968 and an Introduction to EAT (Experiments in Art and Technology)," *The Electronic Media Review One* (2012): 10-11.

the event each artist presented their questions and concerns about their technological needs. The engineers responded with ideas and solutions for the collaborations.²² *Open Score*, 1966, by Rauschenberg was the second performance at *9 Evenings*. The first section of the performance began with a traditional tennis match between Frank Stella and Mimi Kanarek on a tennis court in the armory. Each time one of the players hit the ball, contact microphones fitted onto the rackets picked up the vibrations of the ball hitting the racket strings. Antennas wound around the racket frames and custom FM transmitters attached to the handles relayed the vibration data to custom transistors connected to speakers hanging above the court. Each transmission resulted in a long “bong” sound out of the speakers and triggered a mechanism to shut off forty-eight ceiling lights, one by one, hanging above the court. The game ended when the court was in complete darkness. In the second section of the performance five-hundred people walked onto the court in complete darkness. Lights with infrared filters illuminated the crowd on the stage for live feed infrared television cameras to capture. The images of the five-hundred people standing on the stage were then projected onto three large screens hanging in front of the audience.²³

Recent Computer/Software Art

Over the past fifty years artists have continued to create works using computers; as experts themselves or through collaboration with software engineers. A few examples of notable works are by artists; David Rokeby (Canadian), Mark Napier (American), and Sue Lee (Korean-American). An early interactive installation is David Rokeby’s, *Giver of Names*, 1991-1998. *Giver of Names* is made up of a pile of toys on the ground, a plinth, live camera, computer, and monitor. The viewer puts toy(s) on the plinth, the camera looks at it and the computer processes it. The computer program analyzes the visual data collected from the camera, establishes links through an existing network of semantic parameters

²² “9evenings: theatre & engineering,” *9evenings.org*, accessed April 15, 2013, <http://9evenings.org/>.

²³ “Open Score by Robert Rauschenberg,” *9evenings.org*, accessed April 15, 2013, <http://9evenings.org/openscore.php>.

stored in a relational database, then a sentence is displayed on the monitor. The Langlois Foundation has been funding research to develop technological infrastructure of an updated version of Rokeby's work.²⁴

Approximately a decade later is Mark Napier's, *net.flag*, 2002. The work is made up of interactive networked code and commissioned by the Solomon R. Guggenheim Museum in New York. The work is made with Java applet, computer software accessed from the World Wide Web via a web browser which provides an interface to create a hypothetical flag for the internet. Internet visitors can create a unique flag using geometric elements from a wide variety of international flags. The visitor's flag serves as an emblem for the dissolution of national boundaries on the internet. Each flag is stored on the web server so other visitors can view prior visitor made flags, this also serves as an archive of the project.²⁵ Lastly another interactive work is Susie J Lee, *Rain Shower*, 2007. *Rain Shower* is an LED / sound installation made up of motion detectors triggering programmed audio and visuals and was exhibited at the Frye Art Museum (Frye) in 2012.²⁶ The viewer enters a seemingly dark gallery. Shortly thereafter patterns of light begin to fall around the viewer, followed by transitions of shifting sounds (whispers, singing and a piano playing). Sense of time and place become forgotten as the viewer becomes enveloped in the rain like sensory experience of interpretation and memory.

Collecting Media-based Artwork

Artworks which feature digital technology challenge museum's notions of collecting and maintaining the work, chiefly the risk that components will become inoperable and/or obsolete, which may limit and/or prevent future display. The half-life of a magnetic tape, the point at

²⁴ "David Rokeby: Common sense gathering and discursive structure for *The Giver of Names* project," *Foundation Langlois*, accessed May 1, 2013, <http://www.fondation-langlois.org/html/e/page.php?NumPage=4>.

²⁵ "Collections Online: Mark Napier," *Guggenheim*, accessed April 18, 2013, <http://www.guggenheim.org/new-york/collections/collection-online/artwork/10703>.

²⁶ "*Rain Shower*, 2007," *Lawrimore Project*, accessed April 18, 2013, http://www.lawrimoreproject.com/Artists/Pages/Susie_J_Lee.html#17.

which it begins to show signs of deterioration, is thirty years. In contrast, in 2002 the average life span of a web page was seventy-four days, and software may change every six months.²⁷ Steve Dietz, who founded Online GALLERY 9 and the digital arts study collection during his tenor at the Walker Art Center, states, “Collecting a work of art brings with it the core responsibilities of research, presentation and preservation.”²⁸ Both Christiane Paul and Steve Dietz provide arguments as to why these mediums are not any more difficult than more “traditional” mediums such as painting or film. In her book, *Digital Art*, Paul states that “Bits and Bytes are more stable than paint, film, or video tape,” because as long as the “instructions to compile the code” are available “the work itself is not lost.”²⁹ Dietz goes on to examine the coded and conceptual similarities between software and Sol Le Witt’s wall drawings, works which do not fit into traditional art paradigms. When a museum acquires a wall painting they receive written instructions for how to execute the work when it is exhibited. The museum then contracts one or more draftsman and artists to create the visual representation of the work. The concept of the work lies in the written instructions.³⁰ This parallels software-based works wherein a computer processor executes the coded software instructions into a visual format on electronic hardware. Dietz suggests documenting the software, for instance printing out a copy of the code itself or the instructions the artist used to tell the software what actions to perform, and the context in which the work was created in order to provide a cultural and historical record of the work as well as the enable the possibility that the work can be made functional again in the future.

In 2004 the Guggenheim held an exhibition entitled “Seeing Double: Emulation Theory and Practice,” wherein artists worked with conservators and media specialists to create new

²⁷ Steve Dietz, “Collecting New Media Art,” YProductions (blog), November 5, 2005 (8:34 a.m.), http://www.yproductions.com/writing/archives/collecting_new_media_art.html.

²⁸ Steve Dietz, “Collecting New Media Art,” YProductions (blog).

²⁹ Christiane Paul, *Digital Art*, (New York: Thames & Hudson: 2003), 25.

³⁰ Steve Dietz, “Collecting New Media Art,” YProductions (blog).

emulated versions of their works. The exhibition paired a series of original art installations with the emulated versions. An emulator is a type of software that “fools” original software into assuming it is running on the original equipment. The exhibition gave artists, museum experts and the public an opportunity to decide for themselves whether the emulations captured the spirit of the originals. The following example from the exhibition was selected because it demonstrates an artwork that has custom software coding designed and written by the artist wherein the original hardware is preferred by the artist but would not be required when that hardware is no longer available. Other software works from the exhibition are viewable on the VMN website.³¹

The Guggenheim hung two original editions of John F. Simon, Jr.’s, *Color Panel v1.0*, 1999. *Color Panel v1.0* is made up of custom code, an altered Apple PowerBook 280c laptop and an acrylic frame. A re-created version by the artist, *Color Panel v1.0.1*, 2004, was also hung. *Color Panel v1.0.1* is made up of custom code, an altered Apple PowerBook G3 laptop and an acrylic frame. For the original versions the artist took the casing off of a 1994 Apple PowerBook 280c, removed the embedded screen and placed it in a white acrylic frame. “The custom software is based on five interrelated cycles of moving blocks of color.”³² The software runs on the PowerBook’s hard drive, “which is embedded into the back of the frame.”³³ The software program is coded to run random elements so the artist and the variable media team chose to hang the second edition of *Color Panel v1.0* to serve as a control in the exhibition. This would enable viewers to, “distinguish discrepancies in color and imagery introduced by the new hardware from discrepancies already inherent in different sculptures,” from the first edition.³⁴ John F. Simon Jr. created *Color Panel v1.0.1* as an experiment to test running his original custom software on

³¹ “Seeing Double: Emulation in Theory and Practice,” *Variablemedia.net*, accessed May 8, 2013, <http://www.variablemedia.net/e/seeingdouble/index.html>.

³² Ibid.

³³ Ibid.

³⁴ Ibid.

newer hardware. The re-creation is made from a 1998 Apple PowerBook G3. It was found that the original code ran “too fast” on G3 processor. As a result the artist “introduced “waitstates” -- commands to slow down the code--to reproduce the pacing of the original program more accurately.”³⁵ This alteration to the code technically makes the work a migration rather than an emulation even though the code is mostly left untouched in this instance.³⁶

The work references Josef Alber’ *Homage to the Square* which is a series of paintings with three or four nested squares and examines the relationships between the colors.³⁷ Simon’s work also examines this idea over time by interpreting color “rules” proposed by Bauhaus artists Paul Klee and Wassily Kandinsky into software; the complete cycle of the program requires seventy years to complete.³⁸ John F. Simon Jr. states, “The pieces are dedicated to a single system that evolves and never repeats.”³⁹ In an interview about the “Seeing Double” project the artist acknowledges that since the physical hardware will not last forever the first step would be to exhaust all supplies of Apple PowerBook 280cs to have re-creations as close to the original as possible. Eventually those will not be available so a new version with different hardware could be made so long as the screen is isolated; the visible circuit board on the original is a combination of how the 280c was designed and the artist liking the way it looks. Rather than trying to completely recreate the original the artist suggests finding a computer on the second hand market with a screen of similar size; in effect the spirit of the original would be the same. The essential nature of the piece is the way the code runs. Additionally variations can occur with

³⁵ Ibid.

³⁶ Ibid.

³⁷ Ibid.

³⁸ “Color Panel v1.0, 1999,” *Numeral*, accessed May 8, 2013, <http://www.numeral.com/panels/colorpanelv1.0.html>.

³⁹ John F. Simon, interview by Kristine Plough, *Articles net.works*, November 19, 2003, <http://www.artificial.dk/articles/simon.htm>.

numbered editions, so if a re-creation was a direct port (same features, same speed, and same color depth) the version would be something like the original.⁴⁰

Section Two:

Professional Training

As previously mentioned the United States does not have any formal conservation programs, instead electronic media conservation issues are learned through internships and elective courses at New York University.⁴¹ Currently there are electronic media conservation programs outside of the United States, such as University of Arts Berne, Switzerland, University of Applied Sciences Berlin, Germany, Modern Materials at the Cologne Institute of Conservation Sciences, and interdisciplinary media art courses at McGill University in Quebec, Canada.

Electronic media is susceptible to damage, loss and misinterpretation like traditional mediums such as painting and photographs. However, unlike traditional mediums electronic media is also susceptible to incorrect installation through misinterpretation and improper documentation due to specific relationships between “time, space and concept.”⁴² Rapid changes in technology heighten these risk factors, as obsolescence of technology is an inherent challenge. Software is not physically apparent without playback devices therefore it is not often documented in-depth by museum staff during the accessioning process, instead problems with software are usually noticed just before or during the installation process.

Electronic media conservation programs train conservators to understand and analyze preservation issues such as visual integrity through proper documentation of the technology and specific installation requirements.⁴³ Documentation includes; identifying authentic playback

⁴⁰ “Seeing Double,” *Variablemedia.net*, accessed May 8, 2013.

⁴¹ Frohnert and Singer, “Education in Electronic,” 8.

⁴² *Ibid.*, 8.

⁴³ *Ibid.*, 8-10.

and/or performance of the software vs. playback and/or performance with errors, hardware that is required for conceptual integrity, indentifying hardware that can be replaced and developing long-term strategies to preserve the work such as migration and/or emulation. EMG seeks to provide some training through continuing education programs and periodicals. The EMG is interested in assisting programs in the United States with developing appropriate curricula and facilitate alliances with international programs that have established electronic media curricula.⁴⁴ Some conferences that have provided continuing education include the AIC General Session in 2000 and EMG Tech Focus I in 2010 followed by EMG Tech Focus II in 2012.

Journal Articles

In 2012 EMG published its first volume of *The Electronic Media Review*, a biennial publication of session talks presented at annual AIC meetings. This publication was comprised of twenty-three talks from the 2009 and 2010 meetings. “Heart Beats Dust: The Conservation of an Interactive Installation from 1968 and an Introduction to EAT (Experiments in Art and Technology)” by Christine Frohnert at the 2009 meeting addresses the necessity for conservation programs which teach electronic media. She presents a case study of Jean Dupuy’s, *Hearts Beats Dust*, 1968, wherein an engineer had previously recommended that the owner completely update all of the technical components of the interactive installation. Frohnert explains that updating these components would result in losing the work’s integrity and “historically important technology.”⁴⁵

Instead Frohnert suggested that the technological parts be prioritized to maintain the highest level of integrity; this resulted in documenting all of the works components, opening electronic components and removing dust, cleaning electronic connections and removing

⁴⁴ Ibid., 10.

⁴⁵ Frohnert, “Heart Beats Dust,” 10.

corrosion, checking the condition of rubber membrane, checking acoustics with the original amplifier and the provided stethoscope, checking the acoustics with the original stethoscope and a different commercial amplifier.⁴⁶ The components were determined to be in good condition. It was also determined that the essential problem with the work was audio interference; to resolve this issue a pre-amplifier was needed. An appropriate pre-amplifier was acquired and connected to the original stethoscope and amplifier which resulted in a clear signal. After the conservation treatment an image of the artist holding a box which is now identified as the missing pre-amplifier.⁴⁷ This brief overview of conserving analog technology demonstrates the need for conservators with electronic media training to be involved in the treatment of works which would otherwise be unnecessarily modified and that with appropriate methodologies it may be possible to preserve a work's historical technology.⁴⁸

“A Case for Digital Conservation Repositories” by Barbara Mack and Glenn Wharton at the 2009 annual meeting addresses the necessity of working with the artist to document a software-based work in order to archive each digital component of the work so that in the future the conservator and software programmer can emulate or migrate a single component of the work as needed. The talk focused on the case study of MoMA's Jonathan Harris and Sep Kamvar, *I Want You To Want Me*, 2008 (described earlier). Each component has a distinctive role in maintaining the entire system. MoMA has the source code to the artist's custom C++ code which is required to work with the database application and data sources. The artist has approved removing the custom WebCrawler, which acquires data from the dating websites, in future iterations if necessary. The anchor to the cultural history is the data that has already been acquired. The artist states that “a closed data set could be used to represent this time period when

⁴⁶ Ibid., 10-11.

⁴⁷ Ibid., 1.

⁴⁸ Ibid., 10-11.

people used online dating websites via computers.”⁴⁹ One component, MySQL which was a free open source software, is now owned by Oracle and may require MoMA to obtain expensive permissions to update or alter the software in the future. In this instance MoMA would consult the artists to approve a software programmer to replace the current software with new software that can perform the same functions.⁵⁰ This brief overview demonstrates the need for museum staff to understand and document the specific software of a work, how software affects the work’s integrity and to what degree specific software can be altered or replaced.

Section Three:

Museum Documentation Standards

There have been several publications about museum standards of practice for the management and care of objects entering a museum’s collection. For instance *Museum Registration Methods* explains in explicit detail protocols of preventative conservation, cataloguing, photographing, condition reporting and conservation reports for museum objects ranging from leather to silver nitrate. These standards are intended to track and protect the collection while slowing down the process of degradation. Software-based artworks are also recorded and stored to these standards when they enter the museum’s collection. However, because of the inevitability that hardware systems and software will need to be repaired or replaced as they wear out from continual use during exhibitions and the inherent vice that technology becomes obsolete, software-based works require additional awareness and consideration when the work is documented.

Rhizome ArtBase

Rhizome is a non-profit organization dedicated to the creation, presentation, preservation and critique of emerging artistic practices that engage technology. The organization was established in 1999

⁴⁹ Ibid., 24-27.

⁵⁰ Ibid., 27..

as an online archive of new media and open platform for exchange and collaboration of artists, individuals and groups working with these mediums.⁵¹ The ArtBase is a component of the organization that actively collects projects from artists around the world who employ materials such as software, code, websites, moving images, games and browsers towards aesthetic and critical ends. Rhizome works to ensure the longevity of works in the artist's intended forms and as accurate records of the period of creativity and technical culture.⁵²

Software-based works are programmed with commercial/open source software and/or custom source code to function offline on computer equipment (server and/or hardware), or on the internet. Therefore Rhizome's policies and procedures can serve as an appropriate policy guideline for museums collecting and exhibiting software-based works. Rhizome's collection management policy defines the organization's mission, scope, acquisition, submission, acceptance, rejection, execution of ArtBase agreement and artist questionnaire, commission, removal of objects, removal procedures, distribution and copyrights, records, inventory and access to the collection. The entire policy is available on their website.⁵³ It is important to note that because Rhizome is web-based all artworks in ArtBase must be accessible via a live Universal Resource Locator (URL) on the internet.⁵⁴ This paper will focus on the acquisition, collections care, and records subheadings of the ArtBase collections management policy.

Rhizome Acquisition

ArtBase acquires artworks by artist submissions, annual commissions and special invitation. The collection consists of "linked objects," accessible on a non-Rhizome server via a URL and "archival copies." Archival copies are art objects that have an "archival copy," referred to as a "clone"

⁵¹Ben. Fino-Radin, "Digital Preservation Practices and the Rhizome Artbase," *Rhizome*, last modified August 5, 2011, <http://media.rhizome.org/artbase/documents/Digital-Preservation-Practices-and-the-Rhizome-ArtBase.pdf>.

⁵² "Rhizome: About," *Rhizome*, accessed April 1, 2013, <http://rhizome.org/about/>.

⁵³ "Rhizome ArtBase Collection Management Policy," *Rhizome*, accessed April 1, 2013, <http://rhizome.org/artbase/policy/>.

⁵⁴ "Rhizome ArtBase Collection Management Policy," *Rhizome*, accessed April 1, 2013.

on the Rhizome server in the permanent collection and are subject to documentation, exhibition and preservation by Rhizome. The “clone” serves as a backup in the event that the original becomes inaccessible or obsolete. “The artist is required to complete the Artist Questionnaire, which documents the artwork’s technical profile and establishes the artist’s intent for preservation strategies.”⁵⁵

Rhizome Collection Care

As technologies continue to evolve Rhizome anticipates that all works in the ArtBase will face obsolescence. Artists are encouraged to actively participate in the preservation of their works. The “Artist’s Intent” section of the artist questionnaire determines the most appropriate preservation strategy as detailed in the technical profile of the work. ArtBase outlines four primary preservation approaches; documentation (artist or rhizome created text descriptions, still images, moving images or audio recordings and the artist questionnaire), migration (translation of data written in an obsolete format to a currently supported format), emulation (use of emulators to run obsolete software) and reinterpretation (recreating the original while keeping the artist’s conceptual framework intact).⁵⁶

Rhizome Records

Each artwork in the ArtBase has a set of metadata that provides a technical profile, keywords, documentation and administrative data when it is accepted. Rhizome staff reviews the metadata as determined and assigned by the artist and the collections staff is responsible for ensuring that the metadata is correct before the art object is publically available on the ArtBase. Rhizome attempts to combat obsolescence by creating comprehensive documentation of the archival copies. To capture the essence or concept of the artwork when it cannot be experienced due to inactivity of the work Rhizome provides a detailed description of the behavior and technical properties, links to commentary, critiques

⁵⁵ Ibid.

⁵⁶ Ibid.

or discussion of the work on Rhizome or other credible websites or publication and documentation as described in the collections care section (images and recordings). Documents are updated as needed.⁵⁷

“All data for the ArtBase and Rhizome.org is currently stored by Rackspace Hosting in San Antonio, TX and maintained/overseen/managed by Rhizome’s current Director of Technology. Backups are conducted on a regular basis by the Director of Technology and Rackspace and are stored both at the New Museum and Rackspace.”⁵⁸

Section Four:

Media Conservation

During the past two decades museum professionals who work with media-based art have faced several issues with existing media collections regarding how to exhibit and conserve works of various technological mediums such as film/video, sound and installations while maintaining the artistic intent of the work. Some of these challenges include identifying the proper playback equipment, aesthetics of installation, determining whether or not a technical component should be repaired or replaced and the migration of media to new digital formats. Each type of technology e.g. film, video, audio, digital, lights, mechanics, computers and internet each have a unique set of challenges. As a result institutional research projects and professional groups have established theologies and methods to collect, exhibit and care for past and future media-based acquisitions to be better equipped when planning conservation.

Matters in Media Art

Matters in Media Art is an ongoing collaboration between SFMOMA, MoMA, Tate in London and the New Art Trust (2003-2015). The research project has brought curators, conservators, registrars and technical managers together to establish best practices guidelines for

⁵⁷ Ibid.

⁵⁸ Ibid.

“time-based” media (e.g. video, film, audio and software-based installations). The field recognizes that effective stewardship of media-based works requires blending established museum practices with new methods to deal with their complex nature. Currently two phases of the project (loans and acquisitions) are available on the project’s website.⁵⁹ The website includes thorough descriptions of each phase and associated templates (process diagrams, budgets, condition reports, facilities reports, installation documents and loan agreements).

Acquisition

Following the standard acquisition process museums also need to consider the following when acquiring a media-based work:⁶⁰

- Pre-acquisition: while this time frame is often short, it is important to understand the conceptual (a non-technical description of what the viewer experiences) and technical elements that comprise the work in addition to the costs associated with future viability and authentic presentation. Identify what the master format is and who owns it. A set of installation instructions should determine essential vs. desirable exhibition conditions for the space and playback quality, identify threshold of variability. Coordinate a team of all or some of the following staff: curatorial, conservation, registration, exhibitions, IT, A/V, legal to gather information about the work.⁶¹

⁵⁹ “Matters in Media Art: Collaborating towards the care of time-based media,” *Tate*, accessed February 3, 2013, www.tate.org.uk/about/projects/matters-media-art.

⁶⁰ “Acquisitions: Acquiring time-based media works of art,” *Tate*, accessed February 3, 2013, <http://www.tate.org.uk/about/projects/matters-media-art/acquisitions>.

⁶¹ “Pre-acquisitions,” *Tate*, accessed February 3, 2013, <http://www.tate.org.uk/about/projects/matters-media-art/acquisitions/pre-acquisitions>.

- Accessioning: the legal transactions takes place (e.g. purchase agreement, copyright, and deed of gift) and the museums receives everything that was agreed on as part of the purchase.⁶²
- Post-acquisition: create a record for the work in your collection management system (images, cataloguing, labeling). Media-based works also requires artist interviews (e.g. artist, studio technicians, owners, gallery staff and others familiar with the artwork) to gather information about technical specifications, installation specifications, artist intent, and how to deal with technology obsolescence.⁶³

During the post-acquisition phase it is important to consider developing a conservation plan to anticipate storage specifications, equipment (maintenance, repair and/or replace), media migration, future strategies and associated costs.⁶⁴

Loans

Before lending and/or borrowing a media-based work identify who is responsible for the associated costs, identify status of components for insurance and shipping (mass-produced, dedicated/non-dedicated, artist modified, obsolete) and lender should include written installation specifications (technical requirements for audio/video playback, artistic intent for space) borrowing will provide written log of art checks and maintenance throughout exhibition.

⁶² "Accessioning," *Tate*, accessed February 3, 2013, <http://www.tate.org.uk/about/projects/matters-media-art/acquisitions/accessioning>.

⁶³ "Post-acquisitions," *Tate*, accessed February 3, 2013, <http://www.tate.org.uk/about/projects/matters-media-art/acquisitions/post-acquisitions>.

⁶⁴ *Ibid.*

Following the standard loan process museums need to consider the following when loaning or borrowing media-based works:⁶⁵

- Equipment list: equipment available for loan, equipment condition, what is borrow and/or lender responsibility for maintenance and/or repair, associated costs.⁶⁶
- Exhibition format: will it be delivered as part of the loan, does it already exist or need to be produced, associated costs.⁶⁷
- Space: is the required space available, associated construction and costs.⁶⁸
- Acoustic: audio interference from other works, audio from this installation interfere with other works on display, special sound insulation (carpeting, panels), artist requires certain acoustics, experts, associated costs.⁶⁹
- Installation: expertise in-house to install, artist or artist's technician involvement, design and/or fabrication experts, associated costs.⁷⁰
- Maintenance: requirements during exhibition, experts in-house, associated costs.⁷¹
- Conservation: required before lending, equipment needed, associated costs.⁷²

Computer/Software Documentation

Documentation focuses on technical functionality of computer equipment and media/software which is important archival information for IT, A/V, Conservators and contracted experts when the work requires maintenance, repair or upgrades. The project website

⁶⁵ "Loan process guidelines," *Tate*, accessed February 3, 2013, <http://www.tate.org.uk/about/projects/matters-media-art/loan-process-guidelines>.

⁶⁶ Ibid.

⁶⁷ Ibid.

⁶⁸ Ibid.

⁶⁹ Ibid.

⁷⁰ Ibid.

⁷¹ Ibid.

⁷² Ibid.

has two downloadable templates for acquisition of computer-based works.⁷³ For example computer templates, see appendix A.

Variable Media Initiative and Variable Media Network

This project was initiated by in the Guggenheim (1999-2004) to pair artists with museum and media consultants to identify behaviors and artist approved strategies for preserving artwork of ephemeral materials such as performance and media with the help of an interactive questionnaire.⁷⁴ The current version of the Variable Media Questionnaire (VMQ) can be demoed on the VMN website, users can request a private account be created for the user to create questionnaires. Case studies, artwork comparisons and conferences were conducted in order to “define acceptable levels of change within any given art object and documents ways in which a sculpture, installation, or conceptual work may be altered (or not) for the sake of preservation without losing that work’s essential meaning.”⁷⁵ A key aspect of this project’s approach is to analyze the materials independently from the definition of the artwork’s meaning; for example a video work is not tied to the format it is currently on such as Betacam or DVD. This enables the work to be translated to a new format when the current format becomes obsolete. Identifying and listing the associated components and materials is useful for mitigating and resolving future technical questions. Museum professionals can establish the artist’s intent and the ephemeral qualities of the work by identifying “the work’s behaviors (contained, installed, performed, reproduced, etc.) and “strategies” (storage, emulation, migration, and reinterpretation), artists,

⁷³ “Templates for acquisitions,” *Tate*, accessed February 3, 2013, <http://www.tate.org.uk/about/projects/matters-media-art/templates-acquisitions>.

⁷⁴ “The Variable Media Initiative,” *Guggenheim*, accessed February 3, 2013, <http://www.guggenheim.org/new-york/collections/conservation/conservation-projects/variable-media>.

⁷⁵ *Ibid.*

conservators, and curators can proactively plan for preservation of new-media art.”⁷⁶ This information is commonly established through an artist interview, documentation of each installation and dialogue amongst museum staff members involved in the hands-on aspects of the work’s installed iterations such as curators, installers, IT departments, collections management and in many cases the living artist.⁷⁷ (For a list of “VMN Behavior” and “VMN Strategies” terms related to software-based works, see appendix B). A complete list of terms is available on the VMN’s website.⁷⁸ Four strategies are suggested to tackle obsolescence of a particular medium, the categories range from traditional to radical preservation techniques.⁷⁹

Electronic Arts Intermix

Electronic Arts Intermix (EAI) is a non-profit arts organization advocating distribution and preservation of media art founded in 1971.⁸⁰ From the EAI website a user can access the *Online Resource Guide for Exhibiting, Collecting & Preserving Media Art*. The guide has detailed modules for channel video, computer and installation art on the following; collection, exhibition and preservation.⁸¹ Each module includes; an introduction of each media type, guidelines for best practices, basic questions about the specific media, planning for exhibitions, agreements/contracts with appropriate personnel and institutions, budgeting (acquisition, installation, conservation and contractors), interviews with experts in the field, case studies,

⁷⁶ Ibid.

⁷⁷ Ibid.

⁷⁸ “Variable media network: terms,” *Variable Media Network*, accessed February 3, 2013, <http://www.variablemedia.net/e/index.html>.

⁷⁹ “Strategies,” *Variable Media Network*, accessed February 3, 2013, <http://www.variablemedia.net/e/index.html>.

⁸⁰ “Electronic Arts Intermix: Mission & Activities,” *Electronic Arts Intermix*, accessed February 5, 2013, <http://www.eai.org/aboutEaiFaq.htm>.

⁸¹ “Resource Guide,” *Electronic Arts Intermix*, accessed February 5, 2013, <http://www.eai.org/webPage.htm?id=22>.

articles published on Curatorial Resource for Upstart Media Bliss (CRUMB) and user friendly explanations of equipment and technical issues.⁸²

Inside Installations

Inside Installations is a three-year research project on the care and administration of complex installations and provides detailed recommendations based on case studies. The associated website includes guidelines for arranging and managing paper and digital files to enable accessibility to all members of the staff who work hands on with media based works. The project also gives detailed instructions on how to record the installation with video.⁸³

CRUMB

Curatorial Resource for Upstart Media Bliss (CRUMB) was founded by Beryl Graham and Sarah Cook in 2000 and is supported by the University of Sunderland with funding from the Arts and Humanities Research Council, The Leverhulme Trust, Arts Council England. The website covers a range of activities but primarily research, networking sources and professional development for curators of new media art. Other website resources include interviews with international media experts, articles written by media experts, seminar transcripts and discussion lists.⁸⁴

A recent workshop presentation by Caitlin Jones, a curator and media theorist based in New York, entitled “Documenting New Media Art” addresses how and why documentation of installations and performances provides important perspectives on the history of art beyond the text book because it is evidence of what actually happened, what it was like to be there, and from

⁸² “EAI Online Resource Guide for Exhibiting, Collecting & Preserving Media Art, Electronic Arts Intermix, February 5, 2013, <http://www.eai.org/resourceguide/>.

⁸³ “Inside Installations,” *Inside Installations*, accessed February 25, 2013, <http://www.inside-installations.org/home/index.php>.

⁸⁴ “About CRUMB: Biographies,” *Curatorial Resource for Upstart Media Bliss*, accessed February 18, 2013, <http://www.crumbweb.org/getBiosContacts.php?id=4&sublink=3&ts=1369900673>.

a conservation perspective can provide professionals with “insight on how to re-install, re-perform, or preserve a work in the future.”⁸⁵ Documentation can include diagrams for technical setup (e.g. sound inputs, outputs, speakers, and stage), interviews (e.g. artist, technicians, installation crew, computer programmers, and visitors), photographs, film and audio. Jones proposes that artist, curators and museum professionals all need to be invested in documenting work. She states that “the most seemingly uninteresting detail becomes interesting.”⁸⁶ She also gives a brief overview of institutional research projects that have produced documentation models, those I have addressed in this literature review as well as Documentation and Conservation of Media Arts Heritage (DOCAM) and The Langlois Foundation (which has also funded V2’s, Capturing Unstable Media (CMCM)).⁸⁷

Chapter 3: Methods

This research explores the range of challenges museums face when collecting works that have software and describes the range and characteristics of emerging strategies for collecting software-based artwork while planning for future exhibitions and preservation. Three research methods were used to collect data; section one is an electronic survey regarding media-based collection, section two is site visits to James Turrell Skyspaces, and section three is expert interviews with museum professionals who work with media-based artwork.

Section One:

Survey

Survey questions addressed terminology used to identify several different types of media, whether or not museums are collecting software-based works, documentation strategies and

⁸⁵ Caitlin Jones, “Documenting New Media Art,” (CRUMB Seminar transcript, presented May 3, 2008), accessed April 27, 2013, <http://www.crumbweb.org/getPresentation.php?presID=44&semID=9&id=9&op=4&ts=1369900799&sublink=3>.

⁸⁶ Ibid.

⁸⁷ Ibid.

professional expertise. For example, key questions in the survey were; “Does your institution collect computer based artwork? *Requires computer to operate specific program or written code to function when exhibited. “What categories apply to your media-based collection? Does your institution utilize a documentation model for acquiring, preserving and exhibiting media-based artwork? Who on staff is responsible for caring for these works? What is the top challenge your institution has in collecting media-based art? (For a complete list of survey questions, see appendix C).

The survey was sent to 50 museums in the United States that collect and/or exhibit media art and met one of the following criteria: 1) museums which use the word media or time-based media to describe a specific collection, 2) museums which have a searchable online collection wherein the term “media” provided search results, or 3) museums which had an exhibition in the past two years that feature media-based artwork. The survey was e-mailed to one professional in collections, registration, conservation, or curatorial at each institution. The position title varied slightly between institutions to accommodate department structures and staff titles. If a specific “media,” “new media,” or “time-based media” department was identified then a staff member in that department was contacted.

The Curator of Collections and the Assistant Curator of Collections and Academic Programs at the Henry reviewed the survey instrument to provide suggestions on clarity and scope of the questions. The survey was sent embedded in an e-mail to the recipient along with a hyperlink to the web form. Both formats were tested to ensure that results would be saved in the Google Doc excel spreadsheet connected to the survey. The final survey was e-mailed between March 25th and April 29th. Eleven museums responded to the survey, constituting a response rate of 22%. Results are skewed due to the low number of respondents and vast differences in the size of media collections amongst the institutions. Ten of the respondents were collecting museums. One of the collecting museums stated they did not have any media works in the collection, but did exhibit media-based works one to four

times per year and stated that their goal is to diversify their contemporary sculpture and “include new media as a component of stylistic/medium based diversification.”

As this paper focuses specifically on collecting, exhibiting and preserving works with software, a sub-category of “media,” the data analyzed only includes the responses of the collecting institutions. The non-collecting institution provided valuable information about exhibition budgets and formats. Questions nine through eleven are also not addressed in this paper as they pertain specifically to exhibition budgets, exhibition formats, and do not specifically apply to artworks with software. The survey was comprised of 33% multiple choice questions with a text box for “other” wherein respondents could type an alternative multiple choice response. The other 67% of the questions were open ended with a text box for respondents to explain their answers. A text box was provided at the end of the survey for respondents to provide additional comments wherein several institutions referred to media documentation models. The technique used for coding data was finding key words and concepts about collecting management practices, exhibitions, and preservation. Topics were-cross referenced amongst all responses for the basis of analysis and findings.

Section Two:

Site Visits

Three James Turrell Skyspaces were chosen based on the following 1) commissioned in the early 2000s, 2) exposure to moisture and 3) a computerized lighting control system. The works are a sample of site-specific works that are collected and cared for by diverse types of institutions. *Light Reign* (2003) is the most robust case study and located in the Henry’s sculpture court at the University of Washington. Data at the Henry was collected during observations, conversations with museum staff and documentation review over the course of a five month internship. UIC Skyspace (2005) is located in a public park on the University of Illinois Chicago campus in Chicago, Illinois. The case study

included a one-day site visit, a set of interview questions answered by the Assistant Director of Facilities Management, a semi-structured interview with the Assistant of the Dean of Architecture, documentation review and observations. *Sky Peshier* (2005) is the final case study located in the sculpture garden at the Walker Art Center in Minneapolis, Minnesota. This case study recounts the details of a one-day site visit, a semi-structured interview with the Head Registrar, documentation review and observations. (For a list of methodological limitations, see table 1).

Skyspace	Computer System Viewed	Wiring Viewed	Light Bulbs Viewed
<i>Light Reign</i>	Yes, partially	Yes, partially	---
UIC Skyspace	---	---	---
<i>Sky Peshier</i>	Yes, partially	---	---

Table 1. Limitations of Site Visits

One set of questions was designed to establish the acquisitions process, relationship with the artist’s studio, collection management identification, maintenance, conservation budget planning and top challenges while caring for the work. The second set of questions was designed to establish maintenance schedule and procedures, history of repair and/or replacement and security protocols. (For a copy of site visit interview questions, see appendix E). The research trip took place in April 2013.

The questions allowed for organic conversations with professionals on-site and in-person. As a result, the conversations were relatively long (~ 1 hour) and included historical context regarding the impetus for acquiring the work, explanations of the structural and electronic components of the work and information on planning future preservation. Being on-site enabled review of sensitive documents that would not have been made available otherwise and provided the opportunity to visit the Skyspace. Notes on the documents and observations of the space were recorded within a (~2 hour) visit, serving

as reminders of the research trip and are used to inform the data. Analysis and limitations show that observations are contextual and subjective.

Section Three:

Expert interviews

During February, April, and May 2013 semi-structured interviews with two media conservators, one manager of documentation and cataloguing and a senior assistant registrar of a permanent collection were conducted. Museum professionals were chosen based on one of the following 1) experts who have published on conservation of media-based art 2) responsible for documenting and/or cataloguing media-based works in a museum collection. Interviewees were contacted via e-mail in winter 2013 and spring 2013 in order to request an interview. The interview format was semi-structured and open ended, which gave the experts a chance to guide the conversation and for more natural dialogue to occur.

Interview questions addressed interviewee's professional background, roles in collaborative partnerships within art institutions, research projects, documentation practices and preservation strategies. Key questions from the interview included "How did you train to become a media conservator? How do you suggest museum professionals become media conservators or develop knowledge about media? Why does terminology about media lack standardization? What are challenges museums have when collecting media? What strategies is the museum adopting to document software-based art? What preservation strategies is the museum adopting for software-based art?" The technique used for analyzing data was finding key words and concepts in the notes of the four interviews.

The goal of these interviews was to explore the range of ways professionals develop expertise in media conservation, how software is documented and to illuminate strategies for preserving software.

The questions allowed for organic conversations with professionals in-person, via Skype, and via phone. As a result the conversations were relatively long (~ 1 hour) and included discussion on the lack of programs for training museum professional about media, the lack of standard terminology, explanations of how museums are beginning to document software and explanations of how museums can begin strategizing to preserve software-based works.

Chapter 4: Results and Discussion

Section One:

Survey: Collecting software-based works

The findings indicate that museums are interested in collecting media-based works. All of the respondents stated that their museums are expanding their media collections either “actively,” when the acquisition “opportunity arises,” or are currently creating an acquisition “policy.” Few resources specifically use the term “software” in the acquisition, exhibition and/or preservation of media works. Instead works with software are referred to as computer, internet and technology-based. Two museums stated they have one computer-based work and one museum stated they have two and are acquiring a third. A fourth museum does not have any computer-based works but “future acquisitions of this type are being considered.” Artworks in media-based collections are often placed into subcategories of media. Six museums use “technology based installation” as a category within their media-collections and five museums use “computer.” Three of the museums that use these categories use both categories. While more research on the specific works in these categories would need to be conducted, it is likely that many of them have a software component.

Documentation Methods

The survey suggested that the field has a number of concerns regarding how to collect, exhibit and preserve media-based artworks. Respondents answered an open ended question, “What is the top challenge your institution has in collecting media-based art? For example, having enough staff, documentation, exhibiting, preservation, or conservation resources?” All respondents provided qualitative responses that were coded into seven categories. (For results to this question, see figure 1). Installation specifications/requirements and preservation tied as the second highest concern. There is an inherent risk that components of a software-based work will need to be repaired, upgraded or replaced in the future. Detailed documentation of the artwork’s components and the degree to which those components can change for future iterations will prepare staff for how to handle future installations and preservation of the work.

One respondent stated, “We don't do anything special to catalogue or document our new media works apart from other works of art, and I really feel we should be doing this.” Two museums use documentation beyond standard accessioning documents. One museum uses a custom artist questionnaire. The other museum uses the *Matters in Media Arts* (described earlier) documentation model. According to the *Matters in Media Art* most of these concerns are addressed when documenting the work during the acquisition phase using specific forms such as the computer-based acquisition form in addition to an artist questionnaire regarding artistic intent and future iterations.

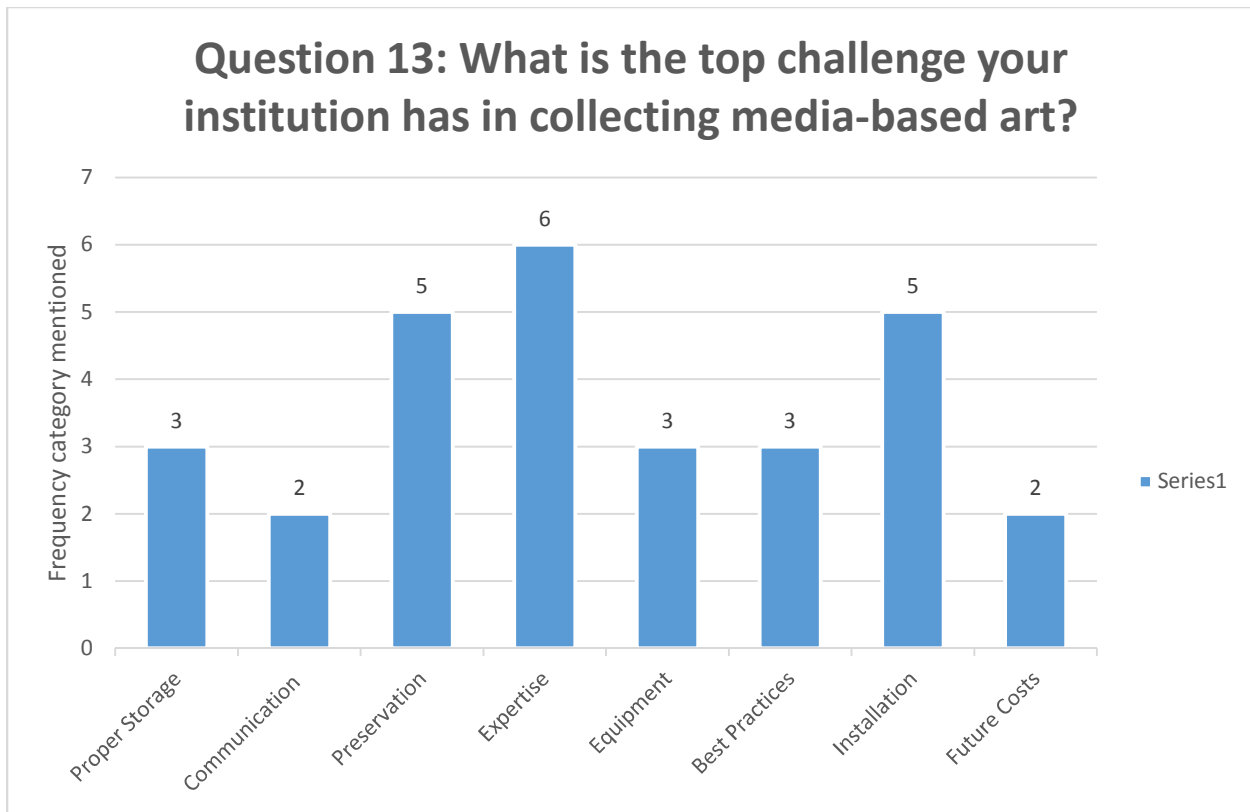


Fig. 1. Top challenges of collecting media-based artwork.

Expertise

The number one concern amongst respondents is having museum staff members who have expertise in media. (For these results, see figure 1). Software-based works vary in complexity as exemplified by *Light Reign* and *I Want You To Want Me*. Complexities can refer to the type of components a work has as well as the number of components; including but not limited to hardware, software, playback equipment, lights and electronics. It is essential to have museum staff members who understand the complexities of these works to conduct research and make decisions regarding how to care for the work. For instance, how integral is it for the museum to keep the artist's code running on the original microprocessor and/or operating system? How should these materials be stored? Will staff be able to recognize if visible components of the work are no longer functioning correctly because invisible components (software) are not being processed correctly?

The survey also indicates that several departments are involved in caring for media works. (For these results, see figure 2). Eight museums have two or more departments involved in the care of their media collections. *Matters in Media Art* recommends museums establish a dedicated team of curatorial, conservation, exhibitions, IT, A/V, and legal staff members to commit time and expertise to complete the documentation process. While maintenance and/or replacement of media components will most likely be done by the artist’s studio or contracted specialists such as software engineers; museum staff members need to be able to communicate how the work is supposed to function and what is happening when it is not functioning correctly. This will enable the museum to ensure the integrity of the work and accurately assess associated preservation costs.

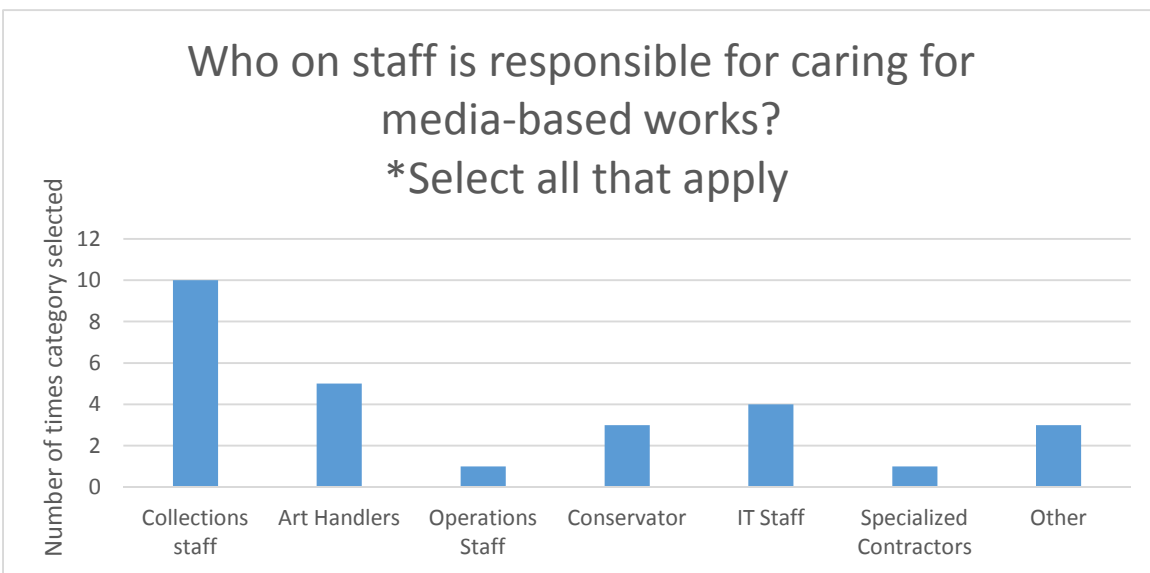


Fig. 2. Museum staff members who care for media-based collections.

Section Two:

Site Visit

Site visits to James Turrell skyspaces demonstrate different staff expertise levels and documentation methods amongst different departments. An overview of each skyspace visited including the year built, operating hours, basic structural design, dedicated lighting and an overview of the computer system which is programmed to operate a specific lighting sequence

designed by the James Turrell's lighting programmer. (For this summary, see figure 3) . Due to the scope of this paper only questions related specifically to lights and the computer system which controls the lights will be discussed.

Skyspace title	Year Built	Public Access Hours	Structure Type	Lights	Computer System
<i>Light Reign</i>	2003	Interior accessible during museum hours (Wed-Sun 11-4, Thursdays and Fridays until 9) Exterior is viewable 24/7	Fully enclosed structure, doorway is left open during museum hours.	Two sets of interior cold cathode tubes (manual dimmer); 20mm neon around oculus rim (100% on when dome is closed), 18mm above bench seating (light level is on 100% when dome open, 20% level when dome closed). Exterior L.E.D. lights behind translucent glass.	Emphasis 3D server on Dell computer running Windows XP, and WYSIWYG software which is programmed to run exterior L.E.D. lights (one program begins at sunset, other program begins at 2 AM) Server communicates to DMX nodes wired to L.E.D. lights in Skyspace via Ethernet
UIC Skyspace	2005	open 24/7	Semi-open structure. 4 open walkways to enter center of space, curtains of water fall between entranceways behind stone benches.	L.E.D lights behind translucent glass encircle the upper portion of the structure below the oculus.	Philips IPlayer 3 containing programs running the LED shows. A DMX signal sent to PDS150 power supplies and Dimmer Light Panel. Automation Direct Interface Screen and PLC controls times the shows run and what shows run. Sequences controlled by the user and will have an I/P address that can tie into the existing local network for a WEB address and remote control. Water is turned off during winter months. one program for sunset and one program for sunrise.
<i>Sky Peshier</i>	2005	Open 3:45 am until midnight	Fully enclosed subterranean structure, doorway is fully open during operating hours.	6 sets of 8 cold cathode neon tubes.	Dedicated Vantage systems software is installed on a dedicated server stored in a cabinet in the registration office. The server is wired to DMX dimmers in the skyspace. The dimmers control 4 transformers which power the neon

					lights. Qlink software on a dedicated Dell lapTop updates sunset/sunrise times on server. One program begins at sunset and one program begins at sunrise.
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Fig. 3. Overview of Skyspaces visited.

Henry Art Gallery

The Henry’s James Turrell Skyspace, *Light Reign*, 2003, was installed in 2003. Since February 2011 the work has had ongoing functionality issues with the exterior LED lights, wherein the LEDs on the panels do not appear in the correct color schemes. Notes provided by the Manager of Operations state that a new Emphasis 3D server, a dell computer with a Windows XP operating system, and one new DMX node were installed by a contracted specialist from PNTA in July 2012. However, the LEDs continue to have intermittent color scheme errors. The specialist determined that the wiring between the LED lights, the DMX nodes and the server are not insulated and have become brittle. The work will need to be re-wired eventually and this might resolve the intermittent LED issues. As of October 2012 the Curator of Collections has developed a outline for routine structural maintenance of the work and will develop a list of recommendations to conserve the entire work including rewiring and updates for the neon and LEDs as necessary.

The computer server and remote trigger station are housed in a secure room within the museum. A set of trouble shooting instructions for the Emphasis 3D lighting system hang next to the server and another set is in the work’s documentation binder. The first page instructs a museum staff member on how to “reset” the computer as recommended by the original installer every 30 days and after a power outage. The second page instructs a museum staff member on how to check the status of DMX nodes (in the Skyspace cabinet) and to reset the Emphasis

server when the LED lights are not functioning correctly. The instructions state that if resting the system does not correct the problem then the staff member should contact the appropriate museum supervisor who will then contact the appropriate contractor for help. A set of troubleshooting instructions for the “remote trigger station” hangs next to the station and another set is in the work’s documentation binder. The remote trigger instructions correspond with the “system reset instructions” to reset the “Day” or “Night” software program. The specific instructions programmed into the software on the Emphasis server that tell the LEDs what color to be and when are not documented. The museum has a back-up diskette of the computer program which was provided by the artist. The Curator of Collections stated that the museum will contact the studio if needed regarding the computer program.

“The Emphasis server communicates with two DMX nodes (relays)” the nodes tell the exterior L.E.D. lights when to turn on/off and the sequence of color schemes as written in the software code. The software has two program codes, one which turns on at sunset and one which turns on at 2 AM. While it is not documented, museum staff believes the sunset/sunrise times are based on the Dell PC’s clock and follow daylight savings time. The interior neon lights are controlled with a manual dimmer, turned on/off each day by the museum’s Gallery Service Representatives (GSR). The hydraulic dome is operated by a manual switch, also operated by the GSR. The dome is open/closed based on weather conditions, if there is less than 50% chance of rain the dome is opened otherwise the GSR must check with a supervisor. There have been ongoing functionality issues with the dome since May 2011.

University of Illinois

On April 5, 2013 I conducted a one-day site visit to the University of Illinois (UIC) Skyspace. Prior to meeting with UIC staff I photographed and documented the condition of the

site. The computer system is not visible and the neon lights are installed in the structure behind glass several feet above the ground. A water feature creates a curtain of water behind the benches to minimize the sound of passing traffic. After visiting the skyspace I met with the Assistant to the Dean of Art and Architecture. The purpose of this interview was to understand the University's methods and challenges of acquiring and caring for the work. The Assistant Director of Facilities Management stated that the "Water feature, Lighting and the Finish" were the top challenges of maintaining the skyspace. The Assistant Director of Facilities Management stated "We are presently reviewing the need to replace the computer programming." I was not able to establish why the computer program needs to be replaced. However, new system will control the lights as follows; A Philips IPlayer 3 will contain all the programs that are written and will output a DMX signal to the existing PDS150 power supplies and Dimmer Light Panel. The program schedule will be contained in Automation Direct Interface Screen and PLC, this will control the times the programs run and whether it is the sunset or sunrise program. Sequences will be controlled by the user and will have an I/P address that can tie into the existing local network for a WEB address and remote control. The system is designed to run one program at sunset and a different program at sunrise. Sections of the water jets occasionally get clogged but they can usually be cleared with the remote control system. The water feature is turned off during the winter months. The LED lights are "embedded" behind the glass which makes them difficult to access when they need to be replaced. Documentation of the computerized lighting control system and the software code was not located in the files I reviewed.

Walker Art Center

On April 9, 2013 I conducted a one-day site visit to the Walker Art Center (Walker) Skyspace. The Head Registrar oversees the maintenance and conservation of *Sky Peshier*. The

purpose of this interview was to understand the Walker's methods and challenges of acquiring and caring for the work. The dedicated Vantage Systems software is installed on a dedicated server stored in a cabinet in the registration office. The server is wired to DMX dimmers in the Skyspace. The dimmers control four transformers which power the neon lights. Once every thirty days one of three trained staff members updates the sunset/sunrise times in Qlink software on a dedicated Dell laptop running Windows XP. One program turns on at sunset and the other turns on at sunrise. The museum has not had any issues with the computer system since the work was installed. The museum may consider replacing the plexiglass which covers the neon lights in the skyspace because when a light needs to be replaced one must be very careful not to apply too much pressure on the plexiglass or the bulbs will break. Following the interview I photographed and documented the condition of the Skyspace. The DMX nodes are not visible. The neon lights are installed behind the back support of the bench seating which is several feet tall and angled such that the viewer's head is tilted back to look up at the aperture (an opening cut into the ceiling). A staff member from the registration department performs a daily art check and security guards check on weekends to document any problems which are reported to the registration department. During the site visit I took notes on the work's documentation files. There file documents I reviewed do not have written instructions on how to update Qlink. Trouble shooting instructions or the specific code written by the artist's lighting programmer were not in the files I reviewed.

Site Summary

These three site visits provide insight into the complexities and challenges of collecting a work with computer software. Due to the scope of this paper these narratives focus on the computer lighting systems and the relationship with the lights, which are complex in themselves. Even though the

Skyspaces were all commissioned by the same artist who utilizes a similar visual aesthetic within the space (ceiling opening, angular benches, lights with custom sunset/sunrise computerized lighting control systems, custom programming written by the artist's studio), each site is built with contactors hired by the institution. Additionally each site is built to specific designs approved by the artist in coordination with the institution. For instance the hydraulic lid for *Light Reign* is not a universal Skyspace feature, nor is the "curtain of rain" at the UIC Skyspace. Each work has a unique structural design.

Despite each site being commissioned within two years of each other, the lights and lighting control systems are different in each work. These variations limit the institution's ability to share relevant troubleshooting, maintenance or conservation information for software, hardware and lighting issues. Each institution has different amounts of documentation on the work and the associated computerized lighting control system. The code is written by the artist's lighting programmer and runs on different software and hardware at each site. It cannot be predicted how these systems will degrade as a history of conservation for the computer hardware, software and/or artist written code has not been established. For example, written instructions to reset the *Light Reign* lighting control system state the importance of "not saving changes" as this will alter the original file made by the "designer." If a staff member were to accidentally "save" while troubleshooting, the museum would rely on the back-up diskette working. Without a copy of the original code to reference an IT staff member at the institution or a contracted software engineer may not be able to correct the change(s) without contacting the Turrell studio's lighting programmer. Lastly, each site had various staff members who had varying levels of expertise regarding the operation and maintenance of the Skyspace, but did not indicate an ability to repair or replace lighting control equipment or software if needed.

Section Three:

Standardization

All four professionals interviewed acknowledged that the field lacks standard terminology for media as addressed in the introduction of this paper. Instead each institution tends to adopt their own set of terms based on various media research projects. For instance the Whitney has an institutional classification system of terminology that is used in their collection management database. Rather than using overarching categories such as “new media” which does not encompass analog technology, lights or kinetics, it is recommended by a media conservator to break terminology down into categories and go through them systematically such as “slides” or “16mm”. The field needs to “clarify the terminology that we use and come up with something which guides us to make use of the same terminology.”

Museum Work Groups

An emerging trend amongst art museums which exhibit and/or collect media artwork is to establish internal museum work groups or task forces. Both professionals I interviewed onsite in New York, at the MoMA and the Whitney, stated that they have established or have begun to establish internal work groups comprised of departmental representatives who meet approximately once per month to discuss developing institutional policies and practices for media. MoMA’s Media Work Group (MWG) was established in 2005. Thus far the group has developed their own artist questionnaire based on the *Matters in Media Art* model and an official collections management manual for media-based art. The Whitney is currently defining the appropriate roles and responsibilities for each representative in the group as many of the staff members have to take on multiple roles within the museum and are in the final stages of approving institutional standards for how things are catalogued in the collection management

database. There is a need to standardize “the terms used, what sort of files are kept, what server the information is kept on, and who is responsible for maintaining the server.”

During my research I also corresponded with the Los Angeles County Museum of Art who began their current work group, Time Based Media task force, approximately two years ago. Thus far they have instituted acquisition procedures that include obtaining the artist questionnaire based on the *Matters in Media Art* model and request the artist’s installation specifications before the deed of gift is issued whenever possible. These work groups facilitate institutional dialogue about creating and implementing policies to address the challenges of collecting media art and to plan for future collecting, exhibitions and preservation. Each institutional group is configured slightly differently. (For an example of a possible work group configuration, see Figure 4). Work groups demonstrate the variety of institutional departments that can be involved in an institutional media work group.

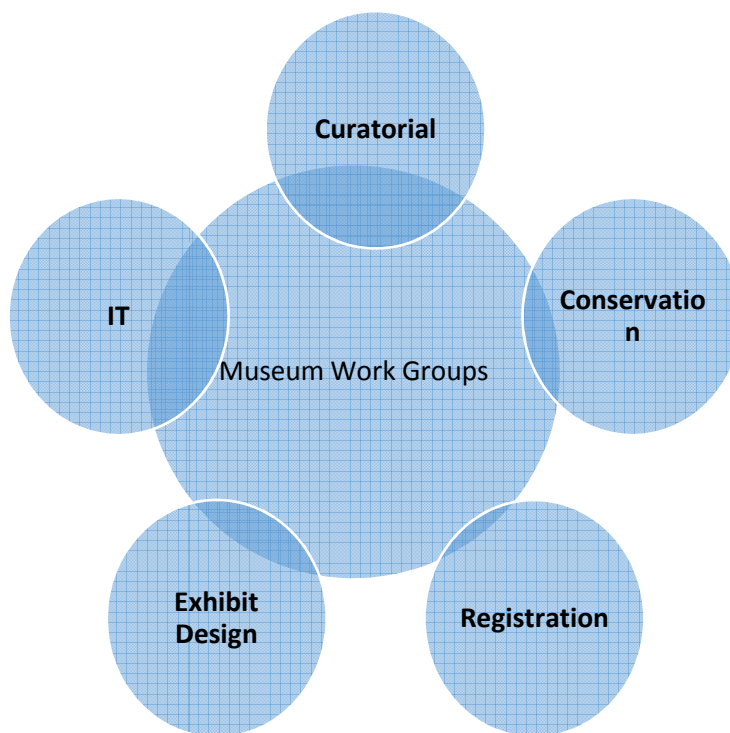


Fig. 4. Model diagram of a Media Work Group.

Documentation

As previously mentioned when a museum acquires a media work such as video or a software-based work it goes through the same standard best practices for acquisition and cataloging in the collection management database as other art objects such as paintings and photographs. This is important. However, an emerging practice is to review and document the software when it arrives at the museum. If software is not viewed or run until it is installed in preparation for an exhibit opening, the museum runs the risk of the work not being operational or the condition being unacceptable, which results in the museum rushing to get a new copy from the artist.

While it may not be practical to assemble multiple components and install hardware of a complex digital work in order to thoroughly assess and document the work, staff can review CD, Hard disk, and/or USB drive to document the condition of the files and metadata. One professional stated that when a work is acquired the files are verified using checksums before it is ingested into a digital repository; “checksums verify the file, then the structure of the file is verified and catalogued.” This is a method that is applicable to software as well as other digital media such as digital video.

Another professional stated “If the artist has written the code or their programmer has written the code we request they give us the code. Then we have a technical writer or computer scientist go through the code and provide us with a text description of what each chunk of the code does” This provides an “archival record for a conservator to work with a computer scientist to recompile the code or emulate the work.” It is important to note that it may not be possible to acquire the code for various reasons such as the artist does not want to provide the code, in which case the institution does the best they can to “assure the artist they will not do anything

with the code without consulting the artist and/or consulting the artist questionnaire.” The questionnaire states to what degree the work can be changed to maintain the artist’s concept. Secondly, the artist may not be able to acquire the code if it was provided from another source and they do not have the rights to provide the code, in which case the technical and functional properties of the software are still documented.

Digital Repositories

Lastly, some museums are beginning to research and implement digital repositories. MoMA is currently working with Archivematica, a company based in Vancouver Canada, to implement a Digital Repository for Museum Collections (DRMC) which will enable the museum to micro process and manage the digital assets of the museum’s digital collection objects. A digital repository is an archival system for bit preservation of the digital art object and associated metadata to ensure integrity of files. The server uses custom archiving software that “verifies the fixity of objects and metadata while checking for viruses and creating checkpoints at the time of ingestion and annually on the anniversary of ingestion.” The DRMC will communicate with MoMA’s collection management database, The Museum System (TMS), on a “high level to share information such as artist, date, and medium.” Additionally when an object is entered into TMS it assigned a unique identifier that cannot be changed, unlike an accession number which is a sequential number assigned to the object when the work is acquisitioned and can be changed later if the registration department changes collection management organization methods or the work is deaccessioned. The unique identifier assigned by TMS will be the same number assigned to the object in the DRMC.

The Whitney is in the early stages of researching the implementation of a digital repository using the model of Open Archival Information System (OAIS), which was developed

by National Aeronautics and Space Administration (NASA). While OAIS is not intended to be an implemented model it does serve as a model for the terminology and processes necessary for the archive including; ingestion, archival storage, data management, administration, preservation planning and access. For instance, it was explained that access to the DRMC is controlled by IT systems and identified museum staff such as conservators and contracted computer programmers. MoMA's repository will be component based wherein each digital component of the work is archived so that "in the future the conservator and programmer can emulate or migrate a single component of the work as needed."

Interview Summary

While the field currently has few professionals who have expertise in technologies such as software, the experts interviewed repeated how important it is for museum professionals, especially those who are responsible for cataloguing, documenting and caring for artwork to systematically familiarize themselves with the categories of technology. When a work is acquired it is essential that all components, visible and invisible, i.e. hardware and software be identified as components of the work and thoroughly documented. A step that some museums are taking towards standardizing documentation is to implement internal media work groups comprised of representatives from the departments who will be involved with the software-based work at some point during the acquisition, exhibition and/or preservation process. These work groups are beginning to identify and implement standard media terminologies for the institution when cataloguing and documenting a work. Digital repositories, while not capable of ensuring the functionality of a work in perpetuity, will provide bit preservation and a historical record of the original technology as well as any changes to the technology. These repositories do provide a means of maintaining the integrity of the digital file whereas something like a diskette or CD is

more likely to become corrupted or an obsolete format that cannot be played back after the specific playback hardware is no longer available. Technology is rapidly changing but professionals are beginning to recognize and understand these technologies using some of these outlined documentation and preservation strategies.

Chapter 5: Conclusion/Recommendations

In a recent article, “Digital Divide,” Claire Bishop questioned the lack of digital artwork in the art world, both by artists and institutions, in the comparison to the seemingly abundant representation of obsolete technology.⁸⁸ Research demonstrates that digital artwork such as software-based work is being made and is being acquisitioned by museums. Albeit, a lack of proper documentation of components such as software may be a reason for the seemingly lower representation. Steve Dietz also states that it will take time for museums to develop large digital art collections because these works have not been made or available acquisition for as long as other mediums such as painting and photography.⁸⁹ Another factor is that museums may need to accept the discomfort of collecting software-based artworks that may not be executable on existing platforms such as computer servers, cell phones or microprocessors, if at all. Museums have encountered this in the past with works made from other materials such as plastic. For instance, Eve Hesse’s, *Expanded Expansion*, 1969, was made with latex rubber and fiberglass poles. Hesse was aware that latex was unstable, that it would oxidize, become brittle and discolor over time. By 1970 the latex was already starting to show signs of deterioration. The Guggenheim acquired the work in 1975. This work has not been shown in an exhibition since 1988 as the deterioration is such that it has been determined that it no longer exists as the artist intended. Hesse passed away in 1970. Meanwhile, conservators and curators have regularly

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⁸⁹ Steve Dietz, “Collecting New Media Art,” YProductions (blog).

discussed whether or not to recreate the work using the original fabricators who created expanded expansion.⁹⁰

Museums can proactively address the future iterations of digital work by first being aware of the software components of the work, followed by documenting discussions with the artist regarding the maintenance of the work's conceptual and aesthetic intent. Artist discussions include identifying how the code achieves the intended presentation and to what degree the code and hardware can be changed. While in depth documentation of software language may not be practical for most museums, museum professionals can begin by asking for archival printouts of the artist written code in the event that a software programmer will need to work with the museum when the artist or artist's studio is not available. Software coding needs to be given the same priority as the physical hardware associated with the work.

Currently museums have a tendency to narrowly define works into singular categories during the cataloguing process, this may not be an effective approach in this modern era of technology. Many artists working today incorporate multiple mediums in their work such as paint, found objects and electronics. Steve Dietz states:

One of the ongoing debates in the institutional art world is whether new media should be thought of as a distinct field or whether it is best to consider it as "just art." There are valid points of view on each side of the debate, but the point of this process-based definition of new media art is that for the purposes of collecting it doesn't matter.⁹¹

Just as Picasso questioned the "traditional" painting aesthetic with his guitar sculptures, artists working with media are questioning "traditional" aesthetics such as sculpture by creating

⁹⁰ Michelle Barger, Carol Stringari, Elisabeth Sussman, and Jill Sterrett. "Eva Hesse, Expanded Expansion," Getty Center, Los Angeles, CA. 25-26 January 2008, A Cross Disciplinary Conference on the Preservation and Study of Modern and Contemporary Art, Accessed February 1, 2012.

http://www.getty.edu/conservation/publications_resources/videos/object_in_transition_day2.html.

⁹¹ Steve Dietz, "Collecting New Media Art," YProductions (blog).

interactive and/or participatory software-based installations. Museum professionals such as collection managers and registrars have learned to identify when there is loss on an oil painting or when a photograph is beginning to fade, they will also need to learn to recognize when software is beginning to have code errors. These professionals are not trained painting conservators and they do not need to be software programmers. Many museum studies and/or Museology programs offer elective courses in art conservation, the conservation of digital art should also be an elective course so that emerging professionals can begin to acquire the necessary skills to recognize code formats and how the code functions. This will enable museum professionals to work with specialist such as technical writers and software programmers while being advocates for maintaining technological formats and ensuring a work is emulated and/or migrated as intended by the artist. It is also essential that conservation programs in the United States beginning to offer specializations in Digital Art and Experimental Media in order to teach future professionals who are trained in conservation theory and computer science, specifically software programming. Many painting conservators and objects conservators have backgrounds in studio art; therefore future digital art conservators may have backgrounds in digital and experimental media studio art.

Past media-based research projects have focused on specific categories such as film, to establish standardized guidelines and protocols. Research indicates that there are examples of software-based artwork in museum collections, such as James Turrell Skyspaces, that would benefit from in-depth collaborative research projects like *Matters in Media Art* and the *Variable Media Initiative*. *Light Reign* has ongoing issues that are potentially software related. Collaborative conservation of this work with the artist, media conservators, curators, collection managers, IT staff and operations staff can serve as a case study to establish guidelines and

protocols of how to identify hardware, processing, coding and/or wiring issues in a software-based work. The conservation project would include documenting of the visible (hardware) and invisible (software program code/instructions). As well as an identifying how the artist desires the work be maintained in the future when if and when components of the computerized lighting control system need to be repaired or replaced.

While there are venues for digital artists and experimental media artists to exhibit their work, it took extensive research to uncover many of these venues. Resources for museums regarding the documentation and preservation of software were also difficult to locate. Research projects such as *Matters in Media Art*, *Variable Media Initiative*, *Electronic Art Intermix*, *Inside Installations* and *Curatorial Resource for Upstart Media Bliss* provide some information on this topic but these resources can be difficult to navigate. None of the resources I found had any templates or examples of software code documentation, apart from the *Matters in Media Art* template. This template might be overwhelming for a museum professional who does not understand the terminology on the form. An example of a completed template and a copy of software code with descriptive text would allow be a better reference model. The field needs more professionals who are advocates for the inclusion of software-based art in museum collections and to share software documentation templates and/or models across the field. Digital technology has become a pervasive aspect of daily life for most individuals if we do not actively collect, document and preserve digital artworks we risk losing a large portion of our current cultural history.

Glossary

- Browser art (Tate Glossary)
 - Definition: Browser art is a sub-genre of Net art and relates specifically to a renegade artwork made as part of an URL, that uses the computer as raw material, transforming the codes, the structure of the websites and the links between servers into visual material. Some Browser artworks automatically connect to the Internet and then proceed to mangle the web pages by reading the computer's code the wrong way. The duo Joan Hermskerk and Dirk Paesmans, known as Jodi, have devised a program which the Net art writer Tilman Baumgärtel has described as transforming a PC into an unpredictable, terrifying machine that seems to have a life of its own. Other artists, like the British based duo Tom Corby and Gavin Baily, reduce image-rich web pages to stark white text and the American artist Maciej Wisniewski has developed a browser that transforms the interactive experience of surfing the net into a passive activity, staring at floating images and texts. (see also Software art)

- Computer-for-art (French Equivalent: Ordinateur-pour-art) (DOCAM Glossaurus)
 - Definition: New trend in the media art world represent by all-in-one units (computers, drives and monitors) which are beind use to contain works of computer-based art in convenient (and highly saleable) modules, giving a sense of permanence and commodity to mediums once thought unmarkeable - case-in-point, Internet art. While highly successful on a commercial level, however, these "object" solutions don't solve the larger questions of authenticity and originality posed by conceptual and media-based art.
 - Caitlin Jones. The evolution of authenticity: Objects and intent in the art world. In Artpress2 Media Arts, Conservation and Restoration, February-March-April 2009

- Digital art (French Equivalent: Art numérique) (DOCAM Glossaurus)
 - Definition: Digital art can be computer generated, scanned or drawn using a tablet and a mouse. In recent times some digital art has become interactive, allowing the audience a certain amount of control over the final image.
 - The Tate glossary online. <http://www.tate.org.uk/collections/glossary/default.html>

- Digital Art (Tate Glossary)
 - Definition: The first use of the term Digital art was in the early 1980s when computer engineers devised a paint program which was used by the pioneering digital artist Harold Cohen. This became known as AARON, a robotic machine designed to make large drawings on sheets of paper placed on the floor. Since this early foray into artificial intelligence, Cohen has continued to fine-tune the AARON program as technology becomes more sophisticated. Digital art can be computer generated, scanned or drawn using a tablet and a mouse. In the 1990s, thanks to improvements in digital technology, it was possible to download video

onto computers, allowing artists to manipulate the images they had filmed with a video camera. This gave artists a creative freedom never experienced before with film, allowing them to cut and paste within moving images to create visual collages. In recent times some Digital art has become interactive, allowing the audience a certain amount of control over the final image.

- Electronic Media (Tate Glossary)
 - Definition: The most common examples of electronic media are video recordings, audio recordings, slide presentations, CD-ROM and online content. The term also incorporates the equipment used to create these recordings or presentations; television, radio, telephone, computer. Much of the theory surrounding the use of electronic media by artists is based on Walter Benjamin's seminal essay of 1936, *The Work of Art in the Age of Mechanical Reproduction*, which discussed the democratization of art, freed from its confines as a unique entity thanks to the development of photographic reproduction and forms such as cinema, where there is no unique original.
- Installation art (French Equivalent: Art d'installation) (DOCAM Glossaurus)
 - Definition: The term "installation art" can be used to describe works that are site-specific, often created by artists for specific exhibition spaces. Created from nearly any medium, material, or object, these works may be as permanent as concrete or as ephemeral as cotton candy. The preservation needs of installation art are equally broad in scope.
 - EAI Online Resource Guide for Exhibiting, Collecting & Preserving Media Art <http://resourceguide.eai.org/home.html>
- Interactive (French Equivalent: Interactif) (DOCAM Glossaurus)
 - Definition: While the word is most commonly applied to electronic media such as computer driven installations and Web sites, interactivity also describes installations that allow visitors to manipulate or take home components of a physical artwork. The variable media questionnaire tracks such considerations as the type of interface; the method by which visitors modify the work; and the form in which traces of such input are recorded.
 - Variable Media Glossary. Depocas, A., Ippolito, J., and Jones, C. (eds) (2003). *Permanence Through Change: The Variable Media Approach*. New York: Guggenheim Museum Publications and the Daniel Langlois Foundation for Art Science, and Technology http://www.variablemedia.net/e/preserving/html/var_pub_index.html
- Internet art (French Equivalent: Art Internet) (DOCAM Glossaurus)
 - Definition: Art made specifically for viewing or distributing on the Internet.
 - Variable Media Glossary. Depocas, A., Ippolito, J., and Jones, C. (eds) (2003). *Permanence Through Change: The Variable Media Approach*. New York:

Guggenheim Museum Publications and the Daniel Langlois Foundation for Art Science and Technology

http://www.variablemedia.net/e/preserving/html/var_pub_index.html

- Kinetic art (Tate Glossary)
 - Definition: The word kinetic means relating to motion. Kinetic art is art that depends on motion for its effects. Since the early twentieth century artists have been incorporating movement into art. This has been partly to explore the possibilities of movement, partly to introduce the element of time, partly to reflect the importance of the machine and technology in the modern world, partly to explore the nature of vision. Movement has either been produced mechanically by motors or by exploiting the natural movement of air in a space. Works of this latter kind are called mobiles. A pioneer of Kinetic art was Naum Gabo with his motorized Standing Wave of 1919;²⁰. Mobiles were pioneered by Alexander Calder from about 1930. Kinetic art became a major phenomenon of the late 1950s and the 1960s.

- Media art (French Equivalent: Arts médiatiques) (DOCAM Glossaurus)
 - Definition: This is the term used to cover all artistic practices using or based on any of such media as video, sound, electronic, digital and interactive media and Internet.
 - Glossary. In *Artpress2 Media Arts, Conservation and Restoration*, February-March-April 2009

- Networked artwork (French Equivalent: Art en réseau) (DOCAM Glossaurus)
 - Definition: A networked artwork is designed to be viewed on an electronic communication system, whether a Local Area Network (LAN) or the Internet. Networked media include Web sites, e-mail, and streaming audio and video.
 - Variable Media Glossary. Depocas, A., Ippolito, J., and Jones, C. (eds) (2003). *Permanence Through Change: The Variable Media Approach*. New York: Guggenheim Museum Publications and the Daniel Langlois Foundation for Art Science and Technology
http://www.variablemedia.net/e/preserving/html/var_pub_index.html

- New media (artistic environment) (French Equivalent: Nouveaux médias) (DOCAM Glossaurus)
 - Definition: New media are the means by which art, science, politics, economics, and other forms of culture are reinvented and manipulated as information. In contrast to broadcast media, new media such as the Web, e-mail, text messaging, and peer-to-peer networks encourage many-to-many communication and a "do it yourself" approach to innovation.
 - Variable Media Glossary. Depocas, A., Ippolito, J., and Jones, C. (eds) (2003). *Permanence Through Change: The Variable Media Approach*. New York:

Guggenheim Museum Publications and the Daniel Langlois Foundation for Art Science and Technology.

http://www.variablemedia.net/e/preserving/html/var_pub_index.html

- New Media (Tate Glossary)
 - Definition: A term used to describe the sophisticated technologies that have become available to artists since the late 1980s. New media defines the mass influx of media, from the CD-ROM to the mobile phone and the World Wide Web, that can enable the production and distribution of art digitally. Websites like MySpace and YouTube are key aspects of new media, being places that can distribute art to millions of people at the click of a button. (See also Browser Art; medium; Net Art; Software Art)

- Net Art (Tate Glossary)
 - Definition: Art made on and for the internet is called Net art. This is a term used to describe a process of making art using a computer in some form or other, whether to download imagery that is then exhibited online or build programs that create the artwork. Net art emerged in the 1990s when artists found that the Internet was a useful tool to promote their art uninhibited by political, social or cultural constraints. For this reason it has been heralded as subversive, deftly transcending geographical and cultural boundaries and defiantly targeting nepotism, materialism and aesthetic conformity. Sites like MySpace and YouTube have become forums for art, enabling artists to exhibit their work without the endorsement of an institution. Pioneers of Net art include Tilman Baumgarten, Jodi and Vuc Cosik.

- Online art (French Equivalent: Art en ligne) (DOCAM Glossaurus)
 - Definition: The term "online art" in many ways corresponds to the strict definition of net art: art that can or should only be experienced online. [...] There are two kinds of "online art": art that is only there on the net, or art that is always there on the net - "only" being the stricter criterion since it tends to rule out telerobotics and web cast performances which may have an additionally important offline dimension.
 - *Andreas Brøgger* <http://www.afsnitp.dk/onoff/Texts/broggernetart,we.html>

- Software (French Equivalent: Logiciel) (DOCAM Glossaurus)
 - Definition: Software is a general term for the various kinds of programs used to operate computers and related devices.
 - Terminology committee – DOCAM

- Software art (French Equivalent: Art logiciel) (DOCAM Glossaurus)
 - Definition: A genre of digital art that emphasizes the creation of original or revelatory software applications - such as alternative Web browsing, image

manipulation, or video-editing tools - rather than any single image or output produced with such a tool. Software art is typically compiled, but often freely distributed over the Web.

- Variable Media Glossary. Depocas, A., Ippolito, J., and Jones, C. (eds) (2003). Permanence Through Change: The Variable Media Approach. New York: Guggenheim Museum Publications and the Daniel Langlois Foundation for Art Science and Technology
http://www.variablemedia.net/e/preserving/html/var_pub_index.html
- Software Art (Tate Glossary)
 - Definition: In the 1960s, software programs were the digital tool with which artists could create art on computers. Since then, these programs have become so sophisticated that they can now be considered the work of art rather than just a facilitator. Software art is closely related to Net art because of its reliance of the World Wide Web as a tool for dissemination. Often Software art parodies or re-configures existing computer programs. Web Stalker, created by the art collective I/O/D was a radical re-interpretation of an internet browser and Adrian Shaw's Signwave parodied the computer program Adobe Photoshop. The rise of Software art has led to several international new media festivals, namely FILE (Electronic Language International Festival) held in São Paulo in Brazil and transmediale in Berlin. The rise of Software art has provoked questions about the dematerialisation of art and culture and how this has had an effect on the world of conceptual art. (See also Browser Art; Net Art)
- Sound art (French Equivalent: Art sonore) (DOCAM Glossaurus)
 - Definition: Art about sound, using sound both as its medium and as its subject. Since the introduction of digital technology sound art has undergone a radical transformation. Artists can now create visual images in response to sounds, allow the audience to control the art through pressure pads, sensors and voice activation.
 - The Tate glossary online <http://www.tate.org.uk/collections/glossary/default.html>
- Sound Art (Tate Glossary)
 - Definition: Art about sound, using sound both as its medium and as its subject. It dates back to the early inventions of Futurist Luigi Russolo who, between 1913 and 1930, built noise machines that replicated the clatter of the industrial age and the boom of warfare, and subsequent experiments in the Dada and Surrealist movements. Marcel Duchamp's composition Erratum Musical featured three voices singing notes pulled from a hat, a seemingly arbitrary act that had an impact on the compositions of John Cage, who in 1952 composed 4'33" a musical score of four minutes and thirty three seconds of silence (four minutes thirty three seconds is 273 seconds. The temperature minus 273 celsius is absolute zero). By the 1950s and 1960s visual artists and composers like Bill Fontana were using kinetic sculptures and electronic media, overlapping live and pre-recorded

sound, in order to explore the space around them. Since the introduction of digital technology sound art has undergone a radical transformation. Artists can now create visual images in response to sounds, allow the audience to control the art through pressure pads, sensors and voice activation, and in examples like Jem Finer's 'Longplayer', extend a sound so that it resonates for a thousand years.

- Systems Art (Tate Glossary)
 - Definition: Loosely describes a group of artists who radically re-thought the object of art in the late 1960s early 1970s. They sought to connect with the political developments of the decade and make their art more responsive to the world around them. Building on the structures of Minimal art and Conceptual art, they reacted against art's traditional focus on the object by adopting experimental aesthetic systems across a variety of media including photography, dance, performance, painting, installation, video and film. Examples of Systems art include Richard Long who imposed rigid structures to his walks across the landscape.
- Time-based work (French Equivalent: Installation médiatique fondée sur la durée) (DOCAM Glossaurus)
 - Definition: Artwork with a specific duration and an art experience over a specific period of time. The performance may include slides, video, film, live audio, digital media.
 - Terminology Committee – DOCAM
- Video art (French Equivalent: Art vidéo) (DOCAM Glossaurus)
 - Definition: The term 'video art' is understood to refer to expressions of visual art in which video is used as a medium, both in the production process and the presentation.
 - EAI Online Resource Guide for Exhibiting, Collecting & Preserving Media Art <http://resourceguide.eai.org/home.html>
- Video Art (Tate Gallery)
 - Definition: Loosely describes a group of artists who radically re-thought the object of art in the late 1960s early 1970s. They sought to connect with the political developments of the decade and make their art more responsive to the world around them. Building on the structures of Minimal art and Conceptual art, they reacted against art's traditional focus on the object by adopting experimental aesthetic systems across a variety of media including photography, dance, performance, painting, installation, video and film. Examples of Systems art include Richard Long who imposed rigid structures to his walks across the landscape.

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Appendix A

Template One



EQUIPMENT: COMPUTER-BASED

1. Inventory
2. Status of the equipment
3. Type
 - Computer
 - Peripherals
4. Provenance
5. Passwords, keys and dongles
6. Power requirements
7. Condition assessment
8. Maintenance, Servicing, Failure & Repair
9. Risk of obsolescence

1. INVENTORY

- Please list all the hardware which came as part of the purchase of the work
- Please list all additional equipment required in order to display the work
- If the equipment has been provided with a unique reference number as part of your collection management strategy – please list it.

2. STATUS OF THE EQUIPMENT. Please describe what is important about this equipment in relation to the work of art. The status of the equipment will determine how important it is to gather detailed information about it.

- Is the hardware considered part of the work of art? If so how and by whom? (artist, registrars, curator, artist's gallery etc)
- Is the equipment visible in the installation and valued as part of the visual appearance of the work of art?
- Is it purely the function of the equipment that is significant?
- Is the equipment obsolete and therefore not easily replaced? Is the function difficult to understand or unusual? Has the equipment been modified for either technical or aesthetic reasons?

3. TYPE

- COMPUTER

- GENERAL
 - Type
 - Server
 - Laptop
 - Desktop
 - PDA
 - Make
 - Model no
 - Serial number
 - Motherboard (more important to get details on if the system is built as a one off)
 - RAM
 - Network Interface
 - Details of where the equipment was acquired from
 - Warrantee information
 - Date purchased or received
 - Dimensions (packed and unpacked including weight)
 - Voltage
 - Battery details (if applicable)
 - Operation manual?
 - Service manual?
 - Other details (please specify)

- CENTRAL PROCESSING UNIT (CPU)
 - PROCESSORS
 - Number
 - Make
 - Model number
 - Clock speed
 - Other details (please specify)
 - COOLING SYSTEM
 - Details of fans
 - Passive heat sink
 - Active heat sink
 - Water cooling

- HARD DRIVES
 - Number
 - Configuration
 - Type
 - ❖ Serial ATA
 - ❖ Parallel ATA
 - ❖ SCUSI
 - ❖ IDE
 - ❖ Other (please specify)
 - Capacity
 - Amount of free space

- FILE SYSTEM
 - FAT32
 - NTSC
 - HFS
 - Other (please specify)
 - SOUND CARD
 - Sampling rate (kHz of input and output)
 - Sampling rate (kHz of input and output)
 - Built in RAM?
 - Polyphony (number of distinct channels that can be output simultaneously and independently)
 - Method connected to the motherboard
 - Specification of the digital-to-analogue converter
 - Driver name and location
 - Outputs and inputs: (colours refer to Microsoft PC99 colour coding)
 - Analogue microphone input (Pink)
 - Analogue line level input (Light blue)
 - Analogue line level output for the main stereo signal (Lime green)
 - Analogue line level output for rear speakers (Black)
 - Analogue line level output for side speakers (Silver)
 - S/PDIF digital output or analogue line output for a centre speaker or sub-woofer (Orange)
 - GRAPHICS CARD
 - Number of video buses
 - Type and style (e.g. PCi Express, style e.g. parallel or serial)
 - Size of video buses (capacity)
 - Internal Memory (VRAM, SDRAM)
 - Outputs:
 - ❖ Composite
 - ❖ Component
 - ❖ SVideo
 - ❖ Dvi
 - ❖ HDMi
 - ❖ Other
 - Other details
 - MODEM
 - Make
 - Model
 - Type (e.g. wireless etc)
 - Speed (Washington n.d.)

- PORTS
 - Number
 - Type
 - ❖ USB
 - ❖ Firewire
 - ❖ Other
 - PERIPHERALS
 - Integrated
 - DVD drives
 - LTO drive
 - Other (please specify)
 - Accessories and external peripherals
 - Joystick
 - Cables or adapters supplied
 - Other (please specify)
4. PROVENANCE (if the equipment came from the artist's gallery or the artist they may be able to provide this information)
- Supplier
 - Cost
 - Warranty information
 - Date purchased or received
 - History
5. PASSWORDS, KEYS AND DONGLES REQUIRED
- Please give details including any key operational reminders regarding access to menus etc.
6. POWER REQUIREMENT
- Voltage required
 - Adapters provided (please give details)
 - Built-in uninterrupted power supply (please give details)
 - External Uninterrupted power supply provided or required (please given details)
 - Current drawn
7. CONDITION ASSESSMENT
- Programmes and content all loading smoothly
 - Drives have been de-fragmented
 - Virus free
 - Back up image created? – name the programme that created it and the location of the image
 - Back up drives, available, loaded and tested?

- Expected hours to failure (if known, make a note of what is likely to fail first and the cost of such repairs. Often this information is as much the result of experience as information provided by the manufacturer.)

8. MAINTENANCE, SERVICING, FAILURE & REPAIR

- Provide details of recommended maintenance and servicing schedules
- Provide 'Mean-Time-To-First-Failure' rates or 'Mean-Time-Between-Failure' rates if provided by the manufacturer.
- Specify which parts are most likely to fail and an estimated or known cost of replacement.
- Provide details (if known) about where to get parts or where best to go to have the equipment serviced or repaired

9. DIMENSIONS & PACKING DETAILS

- Unpacked dimensions
- Packed dimensions
- Weight
- Type of packing
 - Manufacturer's box
 - Flight case
 - Other (please specify)

10. RISK OF OBSOLESCENCE OF THE EQUIPMENT

- Is the equipment still being manufactured?
- Are parts still available?
- How many years is the manufacturer committed to providing parts?
- Difficult elements to replace with other systems

Template Two



MEDIA ELEMENTS FOR COMPUTER- BASED ARTWORKS

1. General
 - a. Presentation parameters
 - b. Visitor interaction/ participation
 - c. Computer environment
2. Component information
 - a. Media
 - i. Software
 - ii. Content/ assets
 - b. Production history
 - c. Condition assessment
3. Assessment of risks

11. GENERAL INFORMATION PRESENTATION PARAMETERS

- Where is the work sited?
 - Static gallery installation
 - Constructed environment
 - Existing space such as a lift or staircase
 - Outdoors in a public area
 - Portable
 - Networked and accessible via the internet
 - Closed network with multiple access / viewing points. Describe where these are located
 - Within a sculpture
 - Other

VISITOR INTERACTION / PARTICIPATION

- NO? simple playback
 - Does the work have a fixed duration?
 - Via data projectors or screens
- Yes?
 - Multiple or single user?
 - Motion detection

- Visitor navigation e.g. joystick or mouse
- Visitor required to input information
- Via the internet accessed by a computer
- Via a portable device such as a PDA
- Via a virtual reality suit
- Via body suits or motion detection
- Other (please specify)

STRUCTURE

- Simple executable file?
- Web page?
- System with proprietary devices and coding?
- System with custom-built devices with coding?
- Other (please specify)

COMPUTER ENVIRONMENT

Please describe the computer environment the work has been optimised for. Please include details of the system, for example:

- Platform
- Processor
- System software
- RAM
- Display peripherals.

12. COMPONENT INFORMATION

Describe in general terms the elements which make up the work, their role (for example are their archival materials or materials used in the display?) and how they interact. Indicate what came as part of the purchase of the work and what needs to be purchased/made in order to display the work.

See also the template 'Installation Specification'.

13. MEDIA

SOFTWARE

Give an overview of the original and current software environment and what it does. Please state whether it is pre-loaded and whether you have the licence details and back-up disks. Please include the following details

- Operating system
 - Name

- Version
- Location

- Main programme
 - Name
 - Version
 - Location
 - Describe whether the programme was written for this work or proprietary. If written for this work describe the environment in which it was written and by whom.
 - Open source?
 - Open format?
 - Proprietary?
 - Custom?
 - Adapted?

- Subsidiary software including plug-ins such as media players and drivers for peripheral devices etc
 - Name
 - Version
 - Location

- Production History (if proprietary please indicate)
 - Who built the software?
 - Were there any problems? Has it been modified to ‘work better’? If so please describe the modifications
 - Has the software been ‘upgraded’ since the work was first installed – what were the reasons for these ‘upgrades’?
 - What are the dependencies of this software on the other components of the system e.g. Operating system, peripherals etc?
 - What do you think will be most likely to fail as other components change?

- Passwords, keys and dongles required?

CONTENT / ASSETS

Many computer programmes draw upon images, sound and video. For the purposes of this project these files are called assets. You may have been provided files used in the making of the work by the artist or their representative or extracted them from the work.

- TYPE
 - Video (.avi, .mov, .mp4 etc)
 - Audio (.aiff, .mp3, .wma etc)
 - Images (.gif, .tiff, .jpeg etc)

- FILE NAMES AND EXTENSIONS
 - Link to the file extension database project
- LOCATION
 - The assets will be drawn on by the software, describe where they are located within the system/ computer. Also state where you are storing the copies you are saving as part of the archival strategy for the work.
- HOW IS THE CONTENT DEPLOYED
 - Describe how and where the assets are used in the programme.
- PRODUCTION HISTORY – Please describe the history of the production of the work.
 - Who was involved in the production of the different components.
 - If possible describe the software used to create the asset and the version if known. For example audio file recorded with a mini disk, ingested into Garage Band 3.0.4 and exported as an AAC file.
- STATUS
 - The assets are usually back-up of content used in the work – either provided by the artist or the gallery or extracted. It may be of a higher resolution than the assets used in the programme.
- PROPERTIES
 - Size of the file
 - Sampling rate/bit rate/resolution etc.
 - Duration if applicable.

CONDITION ASSESSMENT

- Artwork fully functioning
- Artwork unchanged by any changes in technology
- Properties such as colour, speed etc as intended
- Vulnerable due to dependencies on outside links or proprietary software, or particular hardware

14. ASSESSMENT OF RISKS

- Vulnerable to failure due to dependencies on
 - External links (web environment)
 - Proprietary software
 - Particular hardware
 - Features of hardware which are likely to change
 - Particular versions of software – for example plug-ins

Appendix B

VMN Behaviors

- Contained: refers to works such as, John F. Simon, Jr. Color Panel v. 1.0, 1999. Digital sculpture. This work is “framed” within a specified and required color panel in order to be viewed when on display.⁹²
- Interactive: often applied to electronic media such as computer-driven installations and websites as exemplified by Mark Napier. Net Flag, 2001. Web site. This term also tracks and considers the type of interface and tracks appropriate inputs received by visitor interactions.⁹³
- Interchangeable: applies to works that can be perfectly cloned, such as digital media or works with equipment that is readymade, industrially fabricated, or mass-produced as exemplified by Jenny Holzer. Untitled (Selections from Truisms, ...), 1989. Electronic installation.⁹⁴
- Encoded: implies that all or part of the work is written in computer code or another language that requires interpretation (e.g. dance notation). Examples include Mark Napier. Net Flag, 2001. Web site and Jenny Holzer. Untitled (Selections from Truisms, ...), 1989. Electronic installation. In non-digital components the code can be archived from the work itself.⁹⁵
- Networked: designed to be viewed through an electronic communication system such as a Local Area Network (LAN) or the Internet such as Websites, e-mail and streaming audio and video as exemplified by Mark Napier. Net Flag, 2001.⁹⁶

VMN Strategies

- Storage: this is the standard strategy used by most museums to store a work physically once it is added to the collection, can include mothballing dedicated equipment, archiving digital files on a storage disk, stock piling out-of-production bulbs or playback equipment.⁹⁷

⁹² “Behaviors,” *Variable Media Network*, accessed February 3, 2013, <http://www.variablemedia.net/e/index.html>.

⁹³ Ibid.

⁹⁴ Ibid.

⁹⁵ Ibid.

⁹⁶ Ibid.

⁹⁷ Ibid.

- Emulation: this means to devise a way of imitating the original look of a piece using completely different technology to resemble the physical appearance of the original. This strategy can be expensive and may lead to inconsistent delivery of the artist's intent.
- Migration: this involves upgrading equipment and/or source format. This is also expensive and will probably change the appearance of the work.⁹⁸
- Reinterpretation: this is the most radical strategy and associated with each installation. Artist approval should be sought when possible, because this involves using contemporary mediums that would have similar metaphoric meaning for the work. This may be the only way to re-create a performance, installation, or networked art designed to vary with context.⁹⁹

⁹⁸ Ibid.

⁹⁹ Ibid.

Appendix C

Media-based Art Collection: Policies, Practices, and Challenges

Thank you for taking the time to answer all of the questions on this survey and for submitting additional comments.

What is your institution's name and primary contact (name, phone number and e-mail) for this survey.

How many media-based works are in your institution's collection? When was your first work acquired? *

Media based artwork includes: video/film, audio, computer/web based, internet based, has a technology functioning component.

Does your institution collect internet/web based art? How many works are in the collection? *

Do your institution collect computer based artwork? How many works are in the collection? *

Requires computer to operate specific program or written code to function when exhibited.

Which categories apply to your institution's media-based collection? *

Check all that apply, if "other" is selected please define "other"

- Video/Film
- Sound
- Technology Based Installation
- Computer
- Internet/Web
- Other:

What are your institution's acquisition goals for media-based artwork? *

Are you actively expanding this collection?

Does your institution utilize a documentation model for acquiring, preserving and exhibiting media-based artwork? *

If "other" is selected please define "other"

- Maters in Media Art
- Variable Media Initiative
- Electronic Arts Intermix
- Inside Installations
- Other:

Will you share the forms you use to document media-based artwork? *

- Yes
- No

Who on staff is responsible for caring for media-based works? *

Singular department and/or specific personnel, if "other" is selected please define "other"

- Collections staff
- Art Handlers
- Operations Staff
- Conservator
- IT Staff
- Specialized Contractors
- Other:

How does collecting media works affect your institution's annual exhibition budget? *

What is your typical format for exhibition? I.e. Laserdisc, CD, digital/USB, video server? How much is budget?

How is media playback equipment repair/replacement budgeted for? *

Is there an annual departmental budget for this? Which department is responsible for the budget?
How much is this budget?

What is the typical archival format for video/film? *

If "other" is selected please define "other"

- CD
- DVD
- Laserdisc
- 16MM
- 8MM
- Digital/USB
- Digital Server
- Other:

How your institution store computer and internet/web does based works? *

Digital server?

What is the top challenge your institution has in collecting media-based art? Please be as specific as possible. *

I.e. having enough staff, documentation, exhibiting, and preservation/conservation resources?

Additional Comments *

Related to your institution's media-based artwork collection.

Would you like a published copy of my research? *

- Yes
- No

Appendix E

Instrument 1

Thesis Interview Survey: James Turrell skyspaces
Institution Name:
<u>Skyspace tombstone:</u>
Primary Contact:

1. What was the impetus for your institution to acquire this work?

2. How frequently do you consult the James Turrell studio? Have you had to ask the studio questions about maintenance or upgrades?

3. How does your institution classify or identify the skyspace? I.e. media installation, sculpture?

4. How is maintenance funded? Which department is responsible for this budget?

5. Do you have a conservation plan for the skyspace? Who is included in this dialogue?

Y/N	Methods	Comments
	Annual budget for conservation	
6	Consultants	
	Contract specialists for repair	
	Art handlers	
	Other	

6. What is the top challenge your institution has in maintaining the skyspace?

Instrument 2

<u>Interview Guide: Touring skyspace with institutional staff</u>
Institution Name:
Skyspace tombstone:
Primary Contact:

1. Photograph

Y/N	TYPE	Comments:
	Oculus/Aperture	
	Lights	
	Computer Housing	
	Structure	
	Seating	
	Walls	
	Ceiling	
	Floor	
	Other	

2. What is the maintenance process/procedure for this work?

Y/N	TYPE	Comments
	Oculus/Aperture	
	Lights	
	Computer Program/Housing	
	Structure	
	Seating	
	Walls	
	Ceiling	

	Floor	
	Other	

3. Have any portions/components of the skyspace had to be repaired and or replaced?

Y/N	TYPE	Comments
	Oculus/Aperture	
	Lights	
	Computer Program/Housing	
	Structure	
	Seating	
	Walls	
	Ceiling	
	Floor	
	Other	

4. What kind of challenges has this work presented to your institution's policies and procedures?

5. Do you have security protocols to monitor the work?