It's Dangerous to Go Alone: Understanding How Museums Preserve and Exhibit Video Games

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Abstract

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Video games are increasingly common in museum collections, but little work has been done in the museology field to address how games are being cared for, exhibited, and digitized by the museums that own them. The goal of this research is to compare current practices in game collecting museums to identify the activities, philosophies, and costs surrounding video game preservation. This descriptive qualitative study involved interviews with collection managers, directors, and curators to compare strategies between three institutions. These museums differ in terms of content, size, funding, age, activities, and how their game collection is utilized, but they care for their collection in strikingly similar ways. Though each institution exhibits their games differently, they share similar philosophies and many of the same concerns about the future of game preservation. Further research is needed to expand on this knowledge base and promote information exchange to benefit museum professionals and the preservation community.

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Chapter 1: Introduction

In May of 2011 the National Endowment for the Arts officially recognized video games as an art form, fundable under their category of "Arts in Media," formerly "Arts in Radio and Television" (Droege, 2011). A month later, on June 27, 2011, the Supreme Court ruled on the contentious *Brown v. Entertainment Merchants Association* that video games are protected by the First Amendment, under the same auspices as art and literature (*Brown v. Entertainment Merchants Assc.*, 2011). Despite federal recognition for more than half a decade, public opinion on whether or not video games qualify as art or even as significant cultural material remains divided.

Whether or not members of the public believe personally that video games qualify as art or belong in museums, it is undeniable that museums have already begun answering this question for themselves, and the answer is "yes." In 2012 the Museum of Modern Art (MoMA) in New York added 14 video games to their collection, prompting media criticism (Sharpe, 2015). At the same time, the Smithsonian opened their exhibition *The Art of Video Games*, featuring 80 games and 20 gaming systems, which traveled across the country until September of 2015 (Johnson, 2012). And in April of 2016, the National Videogame Museum opened its doors in Frisco, Texas. Regardless of public sentiment, video games have already reached museum collections across the country, fueled perhaps by the fact that all of the kids who grew up playing Nintendo in the 80's and 90's are now adults ready to redefine visual and material culture in a technologically advanced world.

While games are here in museums to stay, we as museum professionals have barely begun to discuss the implications both of how to care for them and how to make them accessible to the public. Literature on the topic of game preservation specific to museums is limited to a

study on metadata development for the Seattle Interactive Media Museum (Lee et al, 2013), a

short essay detailing the practices of the National Videogame Archive (Woolley et al, 2014), a

discussion of the development of the Smithsonian's *Art of Video Games* exhibit (Goodlander,

2011), and an interview about the MoMA's game galleries (Ferranto, 2015). This does not even

begin to cover all of the museums who currently have games in their collections, and does not

provide a sufficient amount of information on how a variety of different institutions care for their

physical games, mitigate damage in their exhibits, or engage in digital preservation.

    Museums with significant collections of video games have to figure out how to store and

catalog them with few or no centralized resources or guidelines on how to do so. Museums who

want to exhibit their games face the problem of how to allow visitors to play them without

causing undue wear or irreparable damage to aging magnetic media and the hardware it operates

on. Museums who want to ensure their games are preserved for future generations must question

whether they have the means or the resources to embark on the long-term digital preservation of

their collections and how they will navigate the myriad of practical, legal, and ethical problems

that come with game digitization. With the presence of video games in museum collections and

exhibits, it is time to open the discussion on what these institutions are doing and what other

museums can learn from them.

Problem, Purpose, and Research Questions

    If we can agree, at minimum, that video games are products of human ingenuity and that

their effects on society give them cultural significance, then they certainly have a place in

museums as technological artifacts, artistic media, and historic objects. Although there are

museums across the country with video games in their physical collections, to date there is very little literature or documentation generalized to the museum community on how to care for this specific type of media, how to effectively exhibit video games in ways that will allow access while preserving the original media, or how museums can participate in digital preservation efforts.

The goal of this thesis is to research and compare current practices in three different museums which have significant video game collections that they make accessible to the public. The study identifies the activities, philosophies, and costs surrounding how they care for their collections, how they exhibit their collections, and what efforts they make towards digitization and long-term preservation. Although there may be a need for the development of best practices regarding video games in museum collections, existing institutions who focus on games are still limited and have only just begun collaborating and sharing information; and attempting to lay down a definition of best practices would be far too great a scope for a graduate thesis. Instead, the following research questions provide a valuable starting point for conversations across the museum community:

1) What are some of the current practices, challenges, and standards for the care of video games in museums?

2) How do museums balance the simultaneous need for preservation and public access in their video game exhibits?

3) What strategies are museums currently implementing towards the long-term digital preservation of video games? What costs, barriers, impacts, and benefits are museums experiencing as a result of implementing these strategies?

Video games are a relatively young form of media, but despite their youth, the physical media they were produced on in the past is already failing, and there is an increasing need for video game preservation recognized among memory institutions and the academic community. Museums are in an excellent position to participate and spearhead their own efforts in digital preservation. However, the museum community would benefit from research that describes the work already being done at institutions with significant collections and the technical skills to care for and preserve them, so that museums outside the technology field have a practical, accessible reference for managing their own collections. This study will be the first step in an ongoing dialogue concerning game preservation in museums and how institutions can learn from each other by sharing their own expertise, strategies, and philosophies.

Chapter 2: Literature Review

Since video games became a federally recognized art form in 2011, museums like the Smithsonian and the MoMA have started building and loaning exhibits celebrating the rich history of video games, which has in turn produced some literature and documentation describing how these museums choose to provide public access to the games in their exhibits. Across institutions there is ongoing work regarding the digital preservation of video games, most notably the Preserving Virtual Worlds project, a body of research funded by the Library of Congress, which will be described in more detail below. Decisions on how to exhibit games and whether or not to participate in digital preservation efforts are strongly influenced by each individual museum's needs, goals, and resources, as well as by the external pressures of copyright and public opinion.

Since we are discussing video games in museum collections, it seems prudent to open by defining what is meant by the term "video games." In the context of this paper, video games are interactive electronic media with a video output that requires user input to progress through a sequence of events to achieve a goal. This includes text-based games, touchscreen games, visual novels, simulators, and augmented reality. Additionally, a term that may come up in the discussion of games in museums is "memory institution." This term refers collectively to museums, libraries, and archives; institutions who engage in the long-term preservation of cultural and/or historical materials as one of their primary functions.

Although there are a growing number of museums across the country with video games in their physical collections (Windleharth, 2017), to date there is very little literature or documentation generalized to the museum community on how to care for this specific type of media, how to effectively exhibit video games in ways that will allow access while preserving

the original media, or how museums can participate in digital preservation efforts. This literature review will lay the groundwork for our examination of how games are cared for at current institutions. Its goal is to establish a context for examining how selected museums are currently caring for their game collections, and will be organized as follows:

1) **Public Opinion:** Since any museum's goal is to draw visitors, how the public perceives the inclusion of games in memory institutions directly affects museum outcomes in terms of visitorship and reputation, and could shape museum professional's opinions on whether games belong in their collections.

2) **Exhibits:** This section will highlight past and current exhibits at various museums that have been documented through catalogs, reviews, and/or analysis, to consider how games are displayed in these spaces and accessed by the public (or not). Considered exhibits will include the MoMA's video game collection and the Smithsonian's traveling exhibit "The Art of Video Games."

3) **Preservation Strategies:** This section will explore both existing and potential short-term and long-term strategies for the physical and digital preservation of video games, and how this is being addressed by both institutional collections and private collectors. Some of the specific concerns addressed under this theme are: emulation, the use of programs that virtually recreate hardware environments to run digital copies of video games; metadata and cataloging, which concerns the descriptive data used to identify digital objects and the development of controlled vocabularies for video game categorization; and copyright, which has been a stumbling block for preservationists for many years.

Public Opinion

An unfortunate but necessary element of any academic discussion of video games is justifying that they have cultural relevance. When asking whether video games are "art," the question considers art in the broadest sense: that they have equal value to society as works of film, literature, theater, sculpture, photography, design, and fine art. If this is the case, then they should no doubt be preserved and collected with the same care and rigor and urgency as any other endangered art form, and most certainly belong in museums and other public memory institutions.

The question of whether or not games really are "art" is perhaps less important than the impression that validating them as art makes upon a public that might otherwise see them as frivolous or dispensable. If games are valuable to society and to our shared history and culture, then naturally they belong in museums with other objects that we value, and therefore museums need to know how to take care of them and ensure that they survive for the enjoyment of future generations.

Early in 2011 the National Endowment for the Arts (NEA) released their guidelines for the 2012 grant application cycle and included "interactive games" in their guidelines under a new category called "the Arts in Media," formerly known as "the Arts on Radio and Television." The category was expanded to include both games and internet-based media (Droege, 2011). The NEA is a granting agency that provides funding for thousands of museums nationwide, and their acknowledgment of games as a fundable art form validates their importance as cultural artifacts.

The June 2011 U.S. Supreme Court decision on *Brown v. Entertainment Merchants Association* was a landmark ruling that categorized video games as constitutionally protected art.

The case was a dispute between the game industry and a California law restricting sale of violent

video games to minors. The court concluded that games constituted free expression and are

therefore protected from censorship by the First Amendment (*Brown v. Entertainment Merchants*

Assn, 2011). These protections have allowed artists of all mediums to display their work in

museums, no matter how provocative or radical; affording video games the same constitutional

protections as literature, fine art, film, theater, and other forms of creative expression offers them

the same level of creative freedom and social relevance.

Finally, the Smithsonian American Art Museum developed and toured their own exhibit,

The Art of Video Games, from 2012 to 2015. The goal of the exhibit was to "document and

explore a 40-year evolution of video games as an artistic medium," suggesting even with the title

that there was no doubt, for the Smithsonian at least, that video games are a qualified art form

(Johnson, 2012). As the nation's museum, the Smithsonian is particularly influential as part of

the museum community and as an institution known to the general public. The fact that they not

only exhibited but toured a show that boldly pronounced "Art" in the title suggests an intent to

influence the public's notions of video games from frivolous entertainment to legitimate creative

works.

We can conclude based on the fact that the NEA, SCOTUS, and the Smithsonian have all

recognized the creative and cultural relevance of video games, that at least the U.S. government

considers games valid. The public, however, is not always in agreement. When the Museum of

Modern Art (MoMA) acquired 14 video games for their collection, they did so under the premise

that video games represented "interaction design" rather than art (Ferranto, 2015). Even so, the

inclusion of games at such a prestigious art institution drew criticism from the press with

headlines admonishing MoMA for "mistaking" video games for art pieces (Hernandez-Gerber,

2015). However, MoMA's senior curator Paola Antonelli maintained that these were simply knee-jerk reactions, and curator Michael Mansfield from the Smithsonian compared the response to contentions in previous eras over whether photography qualified as art (Sharpe, 2015). Though society tends to go through growing pains when it comes to technological advancements, museums themselves have so far proven capable of knowing when and how video games belong in their own institutions, and including them is reaching a new demographic of museum-goers.

Exhibits

The authentic gameplay experience is the ideal that video game preservationists strive towards, and is also critical in the decisions that museums make about how they are going to exhibit video games. Since games are by their nature meant to be played, and are also stored on perishable media, museums must decide how to exhibit games in a way that allows visitors an interactive experience with the games on exhibit while also mitigating any potential damage to the original media.

For many museums, the answer to this problem is emulation. Video game emulators are programs that virtually recreate hardware environments and execute digital copies of video games as though they were running on their original console or operating system. There are a variety of emulators available, and many of them were developed independently in the retrocomputing hobbyist community and video game fan communities (Murphy, 2013).

At the MoMA, games from the collection are run on emulators in their exhibit space. They have been divorced from their original media and hardware, but are all fully playable for visitors without concern for damage (Ferranto, 2015). At the Computer History Museum in

California, original Pac-Man games and ephemera are displayed in a glass case, while several

emulator stations are situated in front of the display where guests can play Pac-Man (Guins,

2014). In this case, ephemera of the original game and hardware give the emulation context

within the exhibit.

Although emulation is a practical and very attractive option for exhibition, it is not

without its problems, both in terms of legality and authenticity. This will be discussed in more

depth in the section on emulation and copyright.

Other museums take a more direct approach, utilizing original media and hardware. The

National Videogame Archive in the UK allows visitors to play games from their collection on

their original hardware in their Games Lounge, including arcade cabinets and consoles. They

also have a few emulated games for some titles that would otherwise have been too difficult or

fragile to actively operate (Woolley, Newman, & Simons, 2014). At the Strong National

Museum of Play, guests can play video games with controllers linked to consoles that are pre-

loaded with a cartridge or software and secured in a protective display case (Guins, 2014). The

direct approach preserves games within their original contexts, but might court disasters that

museums must be prepared for. Regular maintenance must be available, as well as multiple

copies of game software.

More unique approaches are not unusual. The Smithsonian's *Art of Video Games* exhibit

featured a few playable games, but mostly relied on videos of gameplay footage and high

resolution screenshots to tell the story of video game development over the years (Goodlander,

2011). Video capture is notably a feature of video game preservation efforts, to be discussed

further in the preservation strategies section, and so makes a good alternative for exhibits as well.

The Museogame Exhibit at the Musée des Arts et Métiers in Paris mitigated public access and

preservation by displaying the museum's game collection securely and partnering with a private game collector to provide games the public could access and play. By doing so, visitors were able to experience gameplay while the museum collection remained protected (McDonough et al., 2010).

When it comes to exhibits, museums tend to make decisions on how to display their games based on their available resources and mission-based philosophies, sometimes through trial and error. The goal of exhibits is not always to provide a play experience, but with interactives being a major draw for engagement in exhibit design, building a game exhibit without gaming experiences seems counterintuitive. As games in museums become more prevalent, museum professionals will have to continue to find ways for their own institutions to solve the problem of public access vs. preservation.

Preservation Strategies

It is important to note that game preservation is problematic due to the nature of video games and how they exist in their cultural contexts as material items. Considering the average museum object, such as a renaissance painting or a hand-woven basket, the scope of preservation is understood both in terms of what needs to be preserved—namely, the object itself and the information about it—and in terms of how best to preserve the object based on material needs and susceptibilities. In the case of video games, however, preserving the cartridge or optical disc a game is stored on is only the beginning. The object contains code which must be preserved, and this code must be executed on its corresponding console, which is in turn linked with a compatible television or monitor for output and a controller or joystick for input. Finally, in

order for a game to exist in its full state, it must be played by a human being. These requirements are collectively referred to by game preservationists as the "gameplay experience" and this is the ideal being strived for in both physical and digital video game preservation.

Before discussing what we can learn directly from game-collecting museums, the available literature will provide a base of understanding for the methods and practices in use. The topic of preservation strategies is broad and involves complex topics such as emulation, copyright, metadata, and partnerships between institutions for preservation projects. Subsections focused on these topics will follow, but first we will examine a few broader examples of preservation literature.

An article written by curators at the UK's National Videogame Archive (NVA) offers an idea of how literature on game collections in museums might look. The article discusses the purpose of the archive, followed by descriptions of the materials being collected, challenges that the archive faces regarding preservation of hardware and software, and finally their challenges, solutions, and experiences with public exhibition (Woolley et al., 2014).

The archive utilizes environmental storage controls with low temperatures and low relative humidity, but notes that "not running the machines or plugging/unplugging cartridges may, in certain circumstances, accelerate the ageing process, as specific electronic components lose charge, corrode and may ultimately become inoperable (Woolley et al., 2014, p. 67)." So it seems that in some cases simply storing a console or cartridge game to avoid human contact and potential damage might not be the best practice for assuring longevity. This suggests that exhibiting games and allowing the public to access and play them might be more beneficial than detrimental to games and their hardware.

The NVA article is insightful, but at nine pages long is hardly comprehensive, and does

not address long-term solutions such as digital preservation. For that, we must turn to the

Preserving Virtual Worlds (PVW) project. This was the first and most prolific study of video

game preservation undertaken in Euro-American academia and will be referenced continually

throughout this thesis due to its breadth and relevance. The project involved four universities and

ten researchers, and operated under a grant from the Library of Congress. Their final report,

released in 2010, is still the largest and most significant piece of literature available on this topic.

The executive summary explains the most important details and purpose of this research project:

> The Preserving Virtual Worlds project is a collaborative research venture of the
> Rochester Institute of Technology, Stanford University, the University of
> Maryland, the University of Illinois at Urbana-Champaign and Linden Lab,
> conducted as part of Preserving Creative America, an initiative of the National
> Digital Information Infrastructure and Preservation Program at the Library of
> Congress. The primary goals of our project have been to investigate issues
> surrounding the preservation of video games and interactive fiction through a
> series of case studies of games and literature from various periods in computing
> history, and to develop basic standards for metadata and content representation of
> these digital artifacts for long-term archival storage (McDonough et al., 2010, p.
> 5).

The project's final report is a landmark, 200-page document that covers collection development,

copyright issues, and challenges of technological obsolescence, documentation, collections

access, strategies for digital preservation, and a case study of their attempted preservation efforts

of the massive multiplayer virtual environment *Second Life*. Although much of their findings are

specific to the Library of Congress and their collection activities, or to the digital preservation

movement, much of this documentation is useful in museum contexts.

The game experience, as opposed to a single object, requires that several complex

electronic devices be maintained in working condition, not only to successfully connect to each

other and operate as designed, but also to withstand human use as a necessary and integral part of

the game's existence. The PVW project elaborated on the difficulties of preserving gameplay in this manner in the final report, discussing a research attempt at recreating gameplay with Atari 2600 consoles. These consoles use analog over-the-air transmission signals to connect to television sets, and as the team discovered, the console would only function properly on 1970's televisions. Contemporary TVs, which cannot receive analog signals due to the digital signal conversion in the US, were not able to operate with the console at all (McDonough et al., 2010). So although these technologies can benefit from being used rather than stored, as the NVA found, the availability of equipment to fully operate original game consoles is also necessary and complicates attempts to preserve games with their original hardware.

Despite the scope and length of the PVW report, however, the conclusion drawn by the research team was that more work needed to be done in order to establish a viable set of best practices for video game preservation. It also identified some problem areas on the topics of emulation, copyright, and metadata.

Emulation and Copyright

This topic is an overlapping issue, since emulation is often the end goal of successful digital preservation, and emulators are frequently used in exhibits to provide the public with playable video games without using or damaging original media or hardware. Emulation is currently the most viable means of ensuring video games can continue to be played long into the future, however there are legal issues surrounding emulation and industry opposition to emulator use.

To support authentic gameplay on classic consoles and vintage computers, a variety of obsolete technology must be acquired and maintained, as discussed earlier regarding the Atari 2600. Depending on the kind of technology needed, this could be time consuming and costly as older tech and the expertise to repair it becomes more and more difficult to find. Many game collecting memory institutions have at least partially turned to emulators as a more sustainable solution, both for exhibiting their classic games and ensuring they are preserved for future generations.

Since fan communities have been creating and using emulators for classic game systems for years, the PVW project encourages preservationists to take advantage of the presence and future improvements of emulators, with some precaution (McDonough et al., 2010). Emulators can indeed preserve the experience of playing games and exhibit them at with full access to the public without the concern of damaging the original media or hardware. But they are not without their challenges.

The trouble with emulation as a preservation alternative is twofold. First, emulators are not always capable of rendering the game exactly as originally played, and without the original hardware and controllers, the gameplay experience is subsequently less authentic. As James Newman states succinctly in his book Best Before:

> […] if the emulated incarnation of Donkey Kong does not look like the original (displaying graphical differences), does not sound like the original (having music and sound effects anomalies), is not controlled in the same way as the original (using a different hardware interface) and does not play like the original (with variations in the feel of the gameplay), then to what extent is it an appropriate archival or display resource? […] videogames are far more than technology and we need to not only consider the technical environments necessary to reproduce them but also what qualitative specific properties they possess that are in danger of not making it intact through the transformative process of emulation (Newman, 2012).

Even the most popular fan-created emulators may fail to render games in a way that is true to the

original, or may not play some games at all. Guttenbrunner et. al. discovered in their research

with various popular emulators that software designed to run games for multiple platforms was

the least effective at rendering them authentically, despite other benefits to their design.

Furthermore, none of these popular emulators run on "virtual machines," which are high-level

emulators that recreate entire computing environments and enable sub-emulators to continue

operating regardless of technological advancements that might otherwise be incompatible. If an

emulator does not work with a virtual machine, it is subsequently less effective at long-term

preservation as a result (Guttenbrunner, Becker, & Rauber, 2010).

The second and even more pressing problem with emulation is legal. Many emulators,

even ones utilized by museums and archives, are viewed as gross violations of copyright by the

game industry. Nintendo in particular is vehemently against emulation and the distribution and

use of its classic games on fan-created emulators, according to their legal FAQ ("| Nintendo -

Corporate Information | Legal Information (Copyrights, Emulators, ROMs, etc.)," n.d.).

Literature on the subject of emulation notes that the long-term challenge facing the future of

digital game preservation and successful, legal emulation will require both addressing copyright

law and convincing game and software development companies to recognize and contribute to

the efforts to preserve the cultural media they have created (Guttenbrunner et al., 2010).

Some emulation software, such as the multiple arcade machine emulator (MAME),

makes every attempt to divorce itself from copyright violations by insisting that users obtain

licenses for the digital game files they run on it (Murphy, 2013). Museums exhibiting games may

seek out permission from IP holders to display and provide public play at no charge, using

emulators or original media, but the process is long and difficult when the original rights holder

has been out of business for decades and the IP may have changed hands several times since then (Woolley et al., 2014).

Guttenbrunner et. al. note early in their research that "The current copyright laws of most countries do not exempt archives from laws against circumvention of copy protection mechanisms or copyright laws. In the current situation archives can legally collect video games only on their original media (Guttenbrunner et al., 2010, p. 12)." Since video games are a young form of media, museums and other memory institutions engaged in digital preservation efforts have to find ways to operate under the auspices of fair use, or potentially face legal charges from an unsympathetic industry trying to protect their properties from piracy. Additionally, Digital Rights Management (DRM) and other hard-encoded copy protection schemes pose a difficult obstacle for preservationists. These issues must continue to be addressed as preservation efforts move forward.

Metadata and Cataloging

In digital preservation, "metadata" refers to the descriptive data coded into a digital file that helps identify and categorize the file as a digital object. Among preservationists, concerns about video game metadata are connected to the lack of a standard community-wide controlled vocabulary set that can be used to encode metadata and categorize video games in museum catalogs and databases. Much of the active research in the digital preservation field is being done in this area.

PVW researcher Jerome McDonough's article for *Preserving Complex Digital Objects* discusses the problems of metadata and documentation, and the ongoing need for a more

comprehensive and robust system for cataloging video game archives. Although this problem is generalized to digital preservation efforts, the need for a controlled vocabulary for cataloging purposes is reflected in the Lee et al research projects referenced below (McDonough, 2014).

A team of researchers at the University of Washington began a project in 2013 to develop a metadata schema for the Seattle Interactive Media Museum, which had a brief home at the Seattle Center Armory. This project used personas to imagine the needs of potential end users of a future online catalog and attempted to begin developing a controlled vocabulary for the purposes of cataloging video games (J. Lee, Tennis, Clarke, & Carpenter, 2013). In a follow-up to this article, the research team addresses the problem of acquiring, cataloging, and preserving video games with additional content such as downloadable extras, expansions, or fan created mods. They propose that the conceptual model described in the Lee et al (2013) article helps solve some of these problems by giving "additional content" its own entity category, complete with controlled vocabulary specific to that category, which situates the additional content in relation to the (conceptual) game, its editions, local releases, and distribution packages (J. H. Lee, Jett, & Perti, 2015). Finally, the team proposes a user-centered conceptual model for video game metadata as an alternative to the Functional Requirements for Bibliographic Records (FRBR) model often used in library ontology. The model groups information under the "entities" of Game, Edition, Local Release, Additional Content, and Distribution Package, as a way to break down the myriad of variations that any one video game might have (Jett, Sacchi, Lee, & Clarke, 2016).

The Game Metadata and Citation Project (GAMECIP) is a collaboration between Stanford and UC Santa Cruz, and has been developing a Linked Open Data (LOD) controlled vocabulary for library catalogs. Although their research was limited to only video game

platforms rather than games themselves, the research team still found the scope overwhelming and had to limit it further to platforms within their own collections. The team also noted the contemporary shift towards digital downloads and that metadata development would be crucial for games that never have a physical release. Though they have a basic set of vocabulary, the process will be ongoing (Kaltman et al., 2016).

Museum collections rely on controlled vocabularies to manage their catalogs and accurately, consistently describe materials in the collection to maintain a historical understanding of these objects. Assuring that there is a standard for the vocabulary and the metadata attached to video games is as important as preserving the game itself, so that future generations comprehend its relevance.

Partnerships

An early overview by Henry Lowood examining the complexity of video game preservation needs and discussing efforts underway to create archives highlights the machinima archive at Stanford and collaborations with the Internet Archive to build digital collections and emulators. He stresses the importance of collaboration between institutions and with fan communities to future success in preservation efforts (Lowood, 2004). Partnerships between memory institutions and academic groups, private collectors, and professional networks help spread the burden of resources on projects that museums might not have the funds or expertise to handle alone.

A few case studies illustrate this. One collaboration between a computer museum operated by retrocomputing hobbyists and digital preservation researchers at the University of

Texas School of Information promotes the preservation of vintage computers as an integral step in digital preservation. Through the partnership they were able to recover digital files otherwise impossible with current media (Galloway, 2011).

Another study describes an interdisciplinary effort to preserve local video game software written and distributed in New Zealand during the 1980s. As a pilot program, the team attempted to secure IP permissions, digitize, emulate, and port a locally produced video game to a mobile platform, and focused on public access and raising awareness about preservation as an indicator of success (Swalwell, 2009).

Many of the articles cited throughout this literature review are the result of multiple institutions working together to address the problem of video game preservation, including the PVW project. Partnerships and collaborations that exchange information and practices between institutions and can help develop expertise and improve preservation outcomes.

Conclusion

Findings from this literature review establish that: 1) video games are acknowledged as being culturally relevant and worthy of care and display in museums, and indeed there are a growing number of museums collecting and exhibiting video game; that 2) the literature available which describes how these museums care for their games and exhibit them is limited, generally to very large and prominent institutions who have game exhibits, such as the Smithsonian and the MoMA; and that 3) academics researching preservation methods and needs for video games agree that there is a significant amount of work that still needs to be done to ensure these games survive in the long term.

That being said, a basic question remains as to whether preserving video games and making them available in museums really a necessity? A quantitative survey on the availability of video game software and hardware in the UK searched for 10 hardware platforms and 50 software titles from 1970s and 80s on Ebay. They concluded that Ebay "proved a better source of games than the combined collections of public archives (Gooding & Terras, 2008)." Imagine if Amazon.com had more book titles available than every single library in the US combined. It is the work of memory institutions to collect and preserve our cultural legacy, and video games are part of that. This study proves that there is still a great deal of work to be done.

It is clear that there is a need for further exploration into what museums are doing with their games, their collections practices, exhibition practices, and partnerships with other institutions. By providing this information to the museum community, museum professionals can begin learning from each other and engage in an ongoing conversation about how to best care for these materials as they become increasingly more prevalent and relevant to museums.

Chapter 3: Methods

Video games are present in a wide number of museums across the country, in varying forms and quantities and for a variety of different reasons. To pursue the question of what museums are doing to preserve games, beyond the limited amount of published documentation discussed in Chapter 2, a new approach had to be developed from the ground up. Since there are no pre-existing research studies on video games in museum collections to date (although there is one underway, which will be discussed below) this approach was developed with general best collections practices in mind.

Therefore, the goal of this research was to record and compare current practices in three different museums that have significant video game collections that they make accessible to the public. To accomplish this, the study identified the activities, philosophies, and costs surrounding how these institutions care for their collections, how they exhibit their collections, and what efforts they make towards digitization and long-term preservation. Specifically, it addressed the following questions:

1) What are some of the current practices, challenges, and standards for the care of video games in museums?

2) How do museums balance the simultaneous need for preservation and public access in their video game exhibits?

3) What strategies are museums currently implementing towards the long-term digital preservation of video games? What costs, barriers, impacts, and benefits are museums experiencing as a result of implementing these strategies?

Research Design

Since this is a relatively new area of study, and since it is too new to seek to develop best

practices just yet, it seemed the best approach to begin collecting information from a variety of

museums to investigate just what they are doing with their collections and the philosophies

behind their care. Therefore, the design for this research was a descriptive qualitative study,

comparing data collected from interviews across three institutions. This method provided rich in-

depth data from multiple institutions and informed the study with a variety of perspectives

arising out of different situations and needs.

Recruiting and Sampling

To ensure that sites would be able to address the research questions outlined above, a

sampling criteria was established based on these three questions. For an institution to be

considered for participation, they must have met the following requirements:

1) Active museums with a physical brick-and-mortar public space. Online, pop-up, or

    developing museums were not considered.

2) Significant collection of physical and/or digital video games—"significant" meaning

    that the collection is both sizeable and relevant to the museum's mission, not simply

    coincidental.

3) One or more publicly accessible exhibits that feature video games from their

    collection, ideally in a way that is playable for visitors.

4) Engaging in digital preservation efforts in some way; this may involve digitizing their

    collection or other activities such as preserving game code, recording gameplay data,

    and/or collecting born-digital games in a digital collection or archive.

Institutions that met these criteria were identified through word of mouth, personal

research, and through an in-progress study conducted by Travis Windleharth at the University of

Washington Information School (Windleharth, 2017). Initially there were 6 institutions that met

this criteria, and the selected "short list" of three ideal sites was composed based on the notably

different profiles of the three that might result in an interesting contrast of information. Those

profiles are discussed in more detail below.

Candidates for interviews at each selected institution were chosen based on job title and

description, and were anticipated to be collection managers or archivists. In each case the

selection was made by simply contacting the institution, explaining what was needed, and being

recommended to a certain individual or group of individuals.

Description of Sites

The following three sites were selected for this research study. A brief description of the

site and the interview candidates are listed below.

Living Computers: Museum + Labs

LCM+L opened as the Living Computer Museum in Seattle, WA in 2012, combining a

large assortment of vintage technology collected by Microsoft co-founder Paul Allen with an

augment of donated hardware and software. The museum's goal was to provide visitors with a

unique hands-on experience by showcasing restored, operable and usable computers dating back

to the 1960s. In 2016 the museum rebranded to Living Computers: Museum + Labs and

expanded their exhibits to include emerging technologies like robotics, AI, and virtual reality,

and their educational offerings to support emerging innovators.

A major draw of the museum's vintage computer collection is the video games made available for visitors to play in the microcomputer exhibit on the second floor. The games are selected from the museum's software collection, and in the summer of 2016 they began a project to start digitizing and copying some of these games to prevent the original software from being damaged through use. This institution was selected for being mid-sized and growing in both size and formal practice, and for having a game collection that was coincidental to the museum's focus (though still significant).

Collection Manager Cynde Moya, Media Archivist Dorian Bowen, and Archivist Amelia Roberts were interviewed for this study on April 5, 2017.

Museum of Art and Digital Entertainment (MADE)

The MADE is a dedicated video game museum in Oakland, CA, established in 2010 by gaming journalist Alex Handy. They focus on playable exhibits of historic consoles and games, host lectures and tournaments, provide programming classes, and support game development projects. Their goal is to "inspire the next generation of game developers" and are "dedicated to the heralding of video games as an artistic medium."

The MADE was discovered and chosen as a candidate due to their work on preserving the code for the Commodore 64 massively multiplayer online role-playing game, *Habitat*. This site was chosen as an institution that focuses entirely on video games and gaming, and also as a museum that is still quite small and just beginning to gain notice locally and nationally.

Curator Chris Wolf was interviewed for this study on April 5, 2017.

The Strong National Museum of Play

The Strong was founded in 1968 by collector Margaret Woodbury Strong, and evolved over the years to be not only a children's museum, but a museum of toys as artifacts. The museum's International Center for the History of Electronic Games was established in 2009 and their extensive collection includes arcade cabinets, console and handheld gaming hardware and software, games for personal computers, portable electronic toys like Simon and Tamagotchi, and collections from most major game developers.

The Strong was recommended as a candidate for this research by nearly everyone the researcher spoke to about it, as the museum with the largest and most significant game collection in North America and the most well-known activity in the sphere of digital preservation. This site was selected as a large internationally recognized institution, whose collection is an important element of their focus rather than the center of it.

Jon-Paul Dyson, Director of the International Center for the History of Electronic Games was interviewed for this study on April 21st and May 3rd, 2017.

Data Collection Procedures

Interviews were conducted with the person or people who work the most closely with the video game collection, exhibits, and preservation efforts to provide further detail about the museum's philosophies regarding preservation and public access, as well as plans they have for the future. At least one interview was conducted per institution, depending on who was best able to address these topics. When practical, interviews were conducted with more than one interview candidate at a time.

These interviews covered three broad topics: collections, exhibits, and digital preservation. These three question sets were separated out between candidates as needed. The instrument used for these interviews can be found in Appendix A.

Analysis Plan

Interviews were transcribed and reviewed to identify prevalent themes. As there is no existing rubric or paradigm specific to this topic, these themes were identified as they emerged, categorized as relevant to the three focus areas discussed (collections, exhibits, and digital preservation) as well as the core themes of the three research questions (practices and standards, philosophies of access, and sustainable preservation). These themes were then compared across the three participant sites to construct a narrative discussing each museum's practices and philosophies, how they are similar to each other, and how they differ.

Limitations of Study

The sample size and scope of this study does not make it reasonable to identify best practices or generalize practices to the museum community; it can, however, provide a richly detailed comparative overview of how three different museums mitigate access to their video game collections to museums who are considering what methods would work the best in their own institutions. Since the sites chosen are remarkably different, although they may provide interesting information, it does not reflect broadly across all game collecting institutions for whom the information gleaned might not be relevant. Additionally, it may not generate a cohesive enough picture of practices and challenges to generate any solid, actionable conclusions.

Chapter 4: Results

Living Computers: Museum + Labs

LCM+L opened as the Living Computer Museum in Seattle, WA in 2012 with the goal of providing visitors with a unique hands-on experience. This museum showcases restored, operable and usable computers dating back to the 1960s and allows visitors to interact with them, sometimes unsupervised. In 2016 the museum rebranded to Living Computers: Museum + Labs and expanded their exhibits to include emerging technologies like robotics, artificial intelligence (AI), and virtual reality.

Current Practices, Standards, and Activities at LCM+L

The Collection

The museum's collection consists of two separate collections; the first is the Paul Allen (PGA) Collection, which is made up both of the founder's original vintage computing collection and additional objects that have been acquired through purchase over the years. The second is the 501(c)3 (LCM) collection, which is acquired via donation. There are internal rules within the museum about how these two collections can or cannot be used or stored together—for example, whether software from one collection can be used on a computer from the other collection. The collections grow via both purchase and donations which come in through the museum's website and other channels.

Video games are added to the collection largely to fill out software needs for a particular machine, since the exhibits are known for having retro games available to play. Although video games are not the focus of this museum, they are considered significant software and especially valued as a means to attract interest and give visitors a way to engage with the technology on

display. Titles will often be acquired per visitor request, and with the new open storage area on

the second floor, visitors can also request to play titles from the collection.

LCM+L currently operates with a general collection management policy adapted from

the American Alliance of Museums (AAM) sample policy. It was indicated by collections staff

that there is a good "social understanding" of their collections practices and needs, that may be

formalized into a document later. Their acquisitions committee selects new objects to add to the

collection once per month, and they are increasingly interested in expanding their software

holdings, including video games and the ancient ancestors of video games, including paper tape

software and DEC tapes.

The software collection has recently been moved into its own separate storage space.

Software is organized on the shelf by the computing system it is run on, alphabetically by title.

Colored stickers on the box exterior and the collection barcode applied to the disk denote

whether the software belongs to the PGA or LCM collection. Games and other software are

generally stored in their original packaging, unless the diskette and/or the package inserts are

loose. Single disks are stored with other singles in archival metal edge boxes; disks with manuals

or other peripherals are stored in poly bags.

LCM+L currently uses Polaris to catalog their collections. Their catalog was migrated

from Horizon in 2006 and is primarily maintained by the collections staff. The online, publically

accessible catalog is updated once per month using a tool called Library World, which pulls data

from select fields in Polaris. Until recently, they used an internally defined ontology for

cataloging their video games, but are now beginning to incorporate a controlled vocabulary with

the help of the University of Washington's iSchool. This project will be discussed in more detail

below in the collaborations section.

Exhibits

LCM+L exhibits the video games in their collection by providing them for use on the museum floor with the microcomputer collection. This collection spans two decades of computing and includes popular gaming platforms such as the Commodore 64, the Atari™ 2600 and ST models, the Amiga, multiple Apple™ II models, and a host of IBM and IBM compatible computers. Each station in the microcomputer exhibit has at least a few disks, cartridges, or CD-ROMs readily available for visitors to use, and most of them are video games. Some of the software is copied for preservation purposes; however, many of the disks are original copies from the collection.

Classic video games have been a huge draw for the museum since it opened and continue to be a critical feature in the 2nd floor exhibit. Visitors are attracted to the nostalgia of both the vintage computers and the retro arcade-style games available to play, and staff at the museum describe interesting generational interactions between adults who remember using this technology when it was new and children who are used to more advanced and responsive tech. In either case, the interactive nature of games makes the microcomputer exhibit popular with visitors of all ages.

Digital Preservation

Digital preservation at the LCM+L rose from two different but related needs: one, for the engineering team, who kept an assortment of digitized software and images they had collected from the hobbyist community to use for their restoration work, and two, for the software being used on the floor in the microcomputer exhibit. The first need required that the software and

images be cataloged and digitally archived for organization and reference purposes. The second

need required that some, or as much as possible, of the physical software collection be digitized

and copied for visitor use on the floor to mitigate damage to the original disks. Based on these

needs the collections team recognized they would have to form a skillset to begin engaging in

digital preservation activities.

Current activities include the digitization project, which uses Super Card Pro to create

disk images and make copies of video games and other software. The images are then archived

on the museum's server and the physical copies are provided on the museum floor for use with

the microcomputer exhibit. Another developing project is providing services to the greater

community to read obsolete media and recover stored data. Non-software related material is also

being preserved digitally, such as documentation and schematics.

Philosophies of Access at LCM+L

Prior to the museum's inception, the entire concept as envisioned by Paul Allen was a

museum of operational computers that could be actively used, hands-on and unrestricted, by

visitors. Nothing would be barricaded off or behind glass and the museum would provide online

timeshare accounts for programmers on some of their active mainframes and macrocomputers.

Although the museum still adheres to this philosophy by and large, there are some rare and/or

fragile objects that are now behind glass and a few exhibits where visitors are discouraged from

fiddling with the parts of a machine that might cause a system crash, and instead redirected to the

keyboard for interaction. Visitor services staff are also on hand to help with operating older,

unfamiliar machines.

Coping with damage and loss

Collections staff at LCM have found that older media often tends to be hardier and more durable than newer media such as CDs. Software on paper tape could potentially last decades into the future, assuming the paper was stored well and undamaged. However, magnetic media has a lifespan, and one of the biggest concerns at LCM+L is finding ways to either prolong that lifespan, such as through cold storage for older magnetic tape, or to transition this media to digital format, where it can be preserved long-term. Additionally, they expressed concerns about the availability of software titles as media ages and gets harder to find, the organization of media in the collection, some of which is still loose without barcodes or catalog entries, and finally the reliance on restoring vintage computers, which in some cases is the only way to operate some of this obsolete media.

The collections team cited visitor confusion as the most likely source of media on the floor being damaged. Related stories included a visitor trying to run a CDROM in a 5 ¼ inch floppy drive, trying to put two disks in a disk drive at the same time, and having to replace multiple copies of the game *Oregon Trail* during a special exhibit. Some visitors do not understand how to use the machines, and some are young enough they have never been exposed to technology of this age. The project to try and make preservation copies of games for use on the floor grew out of this problem, although so far there has not been universal success across all media types. One of the primary reasons for being unable to copy some of this media is copy protection, which was originally meant to prevent piracy and protect copyright but is now a stumbling block for archivists trying to preserve obsolete software. LCM+L has tracked down copyright holders for some of the software featured in the museum, which is a slow and difficult

process when the original rights holder is a company that no longer exists. Unfortunately, simply

having permission will not override hard-coded copy protection on an original disk.

Joysticks were cited as the most likely objects on the floor to be replaced; they have

started keeping as many extras as possible on hand due to how quickly they are

damaged. Collections staff surmised that this happens because of the difference in response times

between controllers for vintage games and controllers for contemporary game consoles—so

somebody used to playing games on their lightning-fast Playstation 4 will feel like the slower

Atari joystick is lagging or not working and, subconsciously or otherwise, push on it too hard.

Sustainable Preservation at LCM+L

Future Plans

The collections team cited a need for better climate control and cold storage for the more

sensitive media in the collection as improvements they hope to make in the future. Emulation as

a service is a project in the works, with some interns working on projects with the PDP 10

emulator Sim H and Commodore 64 emulators. The long-term hope is that the museum will be

able to offer emulation service to community members and partners who need to access data on

obsolete files and media.

When asked what the biggest challenge was to their digital preservation efforts, the

collections team answered, immediately, "Time." The staff at LCM+L is still relatively small,

accomplishing digital preservation projects requires expertise in a fairly new field, and

developing that expertise requires time and training. Having specialized staff means either hiring

someone and teaching them, or training current employees to take on additional tasks. Collection

Manager Cynde Moya hopes to add someone to the team in the future who will focus entirely on

copying, not only the software used on the museum floor but also the older tapes and disks in the collection that would benefit from digitization.

Collaborations and Partnerships

LCM+L first tried to collaborate on a digital preservation project with the University of Washington Special Collections in 2012, but at the time they were not prepared or staffed well enough to take on the project. However, in the last year they have started forging relationships with several partners, including the Computer History Museum's Center for Software History. They are in the middle of a collaborative project with the University of Washington's iSchool GAMER group, who are updating the video games in their catalog with a new controlled vocabulary developed to specifically describe video games. Recently other contacts have been made as well, which may result in further collaborations, and they may yet revisit the project with UW Special Collections. LCM+L also hosted their first Preservation Week event in April of this year, which involved the Software Preservation Network, MoPOP, and the Seattle Municipal Archives.

The Museum of Art and Digital Entertainment

The MADE is a dedicated video game museum in Oakland, CA, established in 2010 by gaming journalist Alex Handy. They focus on playable exhibits of historic consoles and games, host lectures and tournaments, provide programming classes, and support game development projects. Their goal is to "inspire the next generation of game developers" and are "dedicated to the heralding of video games as an artistic medium."

Current Practices, Standards, and Activities at the MADE

The Collection

The MADE's collection began as a storage space for a group of private collectors who combined their individual game collections to form the museum, initially featuring about 300 titles. When Alex Handy learned that the gaming publication GamePro was liquidating their inventory, he sent over volunteers from the MADE to bring back carloads of boxes from the GamePro offices full of games, magazines, or anything else they could find. The collection doubled overnight and still features a sizeable amount of games from this acquisition. New items are added to the collection by donation, usually from people cleaning out their attics or basements who want their old games and consoles to go somewhere they will be appreciated.

At this time the MADE has guidelines and procedures in place for managing the collection, but does not have a written collection management policy. As the institution continues to grow and the collection grows with it, it seems that more formal community-standard museological practices are slowly being incorporated as well. Curator Chris Wolf indicated that his own work has largely been to organize and archive the collection, which was previously just shelved or boxed, and he anticipates that with changes such as this and a switch to using archival software that a written policy would likely be drafted in the future.

The collection is stored in two areas. Most of the playable games are either shelved on the museum floor, if they are cartridges, or removed from their cases and stored in archival sleeves and filed behind the front desk, if they are CDs. Visitors can select the empty case for the game they want from the shelves and "check out" the CD from the front desk, in a library-style system. Extra stock, consoles, and objects that do not have a place on the floor are stored in the back room on shelving units, organized by system, alphabetically and chronologically. Individual

shelves are organized vertically, with the consoles on one side and the games, controllers, and related materials on the other. Games are usually stored in their original boxes, with the exception of the CDs behind the front desk.

The MADE has been using a third-party software called Collectorz to catalog their collection; however, at the time of interview, the staff had an upcoming meeting to discuss implementing museum archival software. They planned to test out File Maker and Past Perfect to see which one would work best for their institution. They do not currently use an official controlled vocabulary, but use terminology for cataloging that is considered typical within the gaming community. The online catalog is updated occasionally by exporting from Collectorz and passing the file along to the IT manager who updates the website. The museum hopes for better online catalog management to be part of their archival software update.

Exhibits

The MADE has a huge amount of their collection on display, either as part of rotating or permanent exhibits. With the exception of rare and fragile objects which are exhibited in glass cases, all of the games on the museum floor are playable. Stations are set up with monitors at seated eye-level and the console below, and shelves of cartridges or game cases nearby for visitors to select what they want to play. Consoles dating back to the 70s are available up through the "middle" generations of the early 2000s, including imported consoles and games. A themed rotating exhibit highlights games from the collection that represent a certain genre or idea, based on staff and visitor suggestions and decided on during staff meetings. A permanent "timeline" exhibit also incorporates the collection and explores the history of video games.

Digital Preservation

In 2014 director and founder Alex Handy began working on preserving the source code for *Habitat*, the world's first graphical massively multiplayer online role-playing game (MMORPG), developed for the Commodore 64 by Lucasfilm Games in 1987. The MADE has since been the center of activity for attempting to get the game up and running again as they gather various needed bodies of code from various sources. The museum has acquired one of the original servers used to run the game and have hosted "hackathons" in the past to work on getting it operational. Ultimately they hope to have it available for anyone to play through a portal on their website, using a C64 emulator.

There are two preservation activities that the MADE is engaged in: the *Habitat* project and collecting digital games for use at their emulator station. The emulator collection includes four systems emulators, for the original Nintendo, the Super Nintendo, the Sega Genesis, and the PlayStation 2. The MADE has a library of games available to play on these emulators, all of which are also in their collection. The MADE avoids obtaining digital games for emulation if the museum does not already own hard copies, to avoid potential copyright disputes.

Philosophies of Access at the MADE

Asked about the museum's philosophy, Mr. Wolf described a "three-pillar system" concept that articulates the MADE's vision and purpose. The first pillar, the past, has to do with preserving and caring for the collection, and situates it within their storage and archival spaces where games are taken in and repaired and cataloged. The second pillar is the present, and is situated in the exhibit area where contemporary kids can play games from the past and develop ideas of what makes a game good or bad. Then the third pillar, the future, is situated in the

classrooms, where these kids can then learn programming and game development and start making their own games based on what they learned from the historic games they played. Assuring that the games of the past are still available and playable is crucial for this vision and the MADE's mission to "inspire the next generation of game developers."

Coping With Damage and Loss

Mr. Wolf indicated that the biggest concerns the MADE has for preservation are light, heat, and electrical stability. On busy days or during big events, there are a lot of people present and a lot of machines running hot, so keeping the building cool with open windows and fans is paramount. Windows in exhibit areas are covered to prevent sunlight from fading or damaging objects or overheating any of the game consoles. Heavy duty surge protectors keep the consoles safe and staff have a strict policy to ensure all electricity is turned off at closing.

When asked if there were frequent issues with games being damaged, surprisingly Mr. Wolf reported that there were not. Games will often arrive already damaged on acquisition, and staff will spend time cleaning and repairing them to working quality. On-floor damage by patrons, however, seems to be infrequent. He related one instance where a child playing a game ran away from the console while still holding the controller, accidentally yanking it off the shelf and onto the floor. In response, after moving to their new space, the museum placed the consoles on lower shelves, so they will be less likely to be damaged by a fall.

Their biggest concern, however, is not visitor damage but theft. A patron who visited the MADE's former location frequently asked to be given games from their collection, and was once caught trying to smuggle several out in his coat. In their new location, the "check-out" system at

the front desk was designed to prevent theft by securing most of the games in the archive files

only accessible to staff.

Sustainable Preservation at the MADE

Future Plans

In the future, after adopting new archival software, the MADE's policies and procedures

surrounding the collection might undergo changes accordingly. One new task to be incorporated

is using UPC barcode scanners to help catalog the games. Using UPC codes could help

differentiate between versions, localizations, and re-releases of games, which will in turn provide

more accurate catalog data.

Since the collection is constantly increasing there has been a need to find ways of

deaccessioning duplicate items that are not needed by the museum. The MADE now has status as

a 501(c)3 nonprofit, and has obtained a reseller's license, so they are currently exploring ways to

downsize via a gift shop or raffles. Ideally in the future the museum might incorporate a policy

that Mr. Wolf describes as the "Rule of 3," primarily used by Japanese game collectors: you have

three copies of a game, one for play, one for display, and one to lend to friends. Three copies of a

game should be enough for the museum, he surmises, but currently they have anywhere from

five to ten copies of more popular games from various generations taking up valuable storage

space.

Collaborations and Partnerships

The MADE has engaged largely with the Oakland community on collaborative projects,

including working on reviving *Habitat*, and they reached out to the Oakland library system about

archival software. Being a small, up-and-coming museum, it seems that no major partnerships

with other institutions on the topic of game preservation have been forged yet.

The Strong National Museum of Play

The Strong was founded in 1968 by collector Margaret Woodbury Strong, and evolved

over the years to be not only a children's museum, but a museum of toys as artifacts. The

museum's International Center for the History of Electronic Games was established in 2009 and

their extensive collection includes arcade cabinets, console and handheld gaming hardware and

software, games for personal computers, portable electronic toys like Simon and Tamagotchi,

and archive collections from major game developers.

Current Practices, Standards, and Activities at the Strong

The Collection

In 2006 after adopting their new mission, the Strong began re-examining what "play"

meant in the contemporary world and recognized the huge impact of video games on modern

play. They began building their video game collection with the belief that games would be a

subject of research in the future, and grew the initial 100 or so game related objects already in

the collection into the foremost collection in North America, with over 50,000 games and

hundreds of thousands of related archive items. The collection grows with a mind for the two

intended audiences, both visitors and researchers, as well as a mind for their exhibits and the

historic relevance of potential acquisitions. The game collection feeds both the International

Center for the History of Electronic Games and the World Video Game Hall of Fame,

established in 2015.

The Strong has a broad collection policy that covers all areas, which is the primary document that governs the video game collection. However, there are some additional policies specific to the game collection, such as guidelines for the treatment of arcade cabinets. Most prominently, there are procedures for designating a game under the "restricted" category, which means the game is too rare or fragile to be made available for public use. It can be displayed, but not played. In some cases, the museum will have a second copy of the game so that one can be protected and the other made available for visitors to play. There is also a process in place for games previously open for public use to be recategorized as "restricted" should the need arise.

The collection is stored in climate controlled storage spaces and separated into multiple storage areas, including the library and archive. Generally, games are stored in their original packaging, unless there is a problem identified with that packaging that might damage the media. Fragile and one-of-a-kind items are more likely to receive special treatment and archival housing, as the collection has grown so rapidly staff have to pick which items need the most attention.

There are three catalog systems at the Strong, one for their physical collection, one for the archive, and one for the library. Their primary software is Argus, which also exports to the website and displays information from select fields. The controlled vocabulary for the video game collection is common to the entire museum, which is the Nomenclature 4.0, a hierarchical system for categorizing manmade objects, which was developed at the Strong in the 1970s. Although it does not include terminology specific to video games, staff at the Strong have been able to make it work for them and have ongoing discussions about the best way to categorize game attributes as they are cataloged.

Exhibits

Video games are displayed in multiple permanent exhibits at the Strong. Their main exhibit, *eGame Revolution*, focuses on the history, evolution, and controversies of video games, features 40+ arcade cabinets, games for play on the Playstation 3, Xbox 360, and Nintendo Wii, as well as artifact displays and a myriad of other activities. With the exception of the arcade cabinets, most of the games available for guest play in the exhibit are acquired specifically for exhibition and are not part of the museum collection. Since the arcade cabinets require full time maintenance to keep them operating, guests purchase tokens to play them, but also have the option to play an emulator for free.

The museum also hosts the World Video Game Hall of Fame, which features games that have been particularly influential to the history and development of video games. Additionally, the museum installs temporary video game exhibits, such as the *Raceway Arcade* exhibit that was up at the time of interview and featured 20+ arcade racing games. Materials from the video game collection are also featured in other exhibits across the museum.

Digital Preservation

The Strong began engaging in long-term strategies as part of their collection activities at the same time they began collecting video games, with long-term preservation encoded into the museum's mission. Since video games are stored on sensitive material with a limited lifespan, the Strong has three main areas they pursue to preserve games in their collection: migration, video capture, and digital collections.

Migration essentially means copying data from one storage medium to another; however, this process can be complicated if the original media is obsolete, or encoded with copy

protection. The Strong uses a device called Kryoflux, which is a capture card and software set, similar to Super Card Pro used at LCM+L. Kryoflux can create disk images as well as convert game data into files that run on emulators. Using this, staff can digitize games that need conservation.

Video capture involves recording games as they are being played, which is particularly valuable for research and when, for whatever reason, it is not possible to preserve a game's original executable file. The Strong is also beginning to experiment with digital collections, which means collecting and preserving born-digital games which have no physical media. They are currently hiring a digital curator to take over this project.

Philosophies of Access at the Strong

The Strong's collection management policy denotes which games are playable by visitors and which are too valuable to risk damage, and preservation is encoded into the museum's mission. They recognize, however, that games and their hardware often do better and last longer when they are played, rather than stored away unused.

Coping with Damage and Loss

The Strong is primarily concerned with the short lifespan of video game media and being able to conserve and migrate as much as possible. However, their collection is so huge that they're limited in how much the staff is feasibly able to do. They have a process for choosing which media to focus on, considering how vulnerable the media is, how important it is, and what is required to rescue the data and move it to a more stable environment.

Wear and tear are common on games in the permanent exhibits, with nearly half a million guests coming through the museum annually. The Strong has a technician on staff full time to maintain the arcade games, and the consoles in the exhibit will also sometimes need to be repaired or replaced, the Xbox more often than the others. Modern controllers are fairly durable, but older joysticks are not, and the museum replaces them with arcade-quality controllers that can withstand the visitor traffic. Although changes to the exhibits are usually interpretive in nature, games may be removed from the floor if they aren't holding up, and more sensitive or unique games and hardware are usually emulated for visitor play rather than offered directly, with the originals on display.

Sustainable Preservation at the Strong

Future Plans

One change the Strong hopes to make in the future is to better organize its collection, which is currently spread across several storage rooms and mixed in with the rest of the museum's objects. Currently, once the digital curator position is filled, the staff will have someone to specifically manage their digital objects, but overall staff time for digital preservation remains limited, which results in only high-need objects being slated for conservation.

Cold storage, while ideal, would require huge operating costs to maintain and might not be attainable in the future, considering the size of the Strong's collection. Digital preservation continues to be a challenge cost-wise—both financial to fund contracted preservation work and purchase servers to store digital objects, and in terms of the staff time needed to engage in these projects.

Collaborations and Partnerships

The Strong has engaged in many international collaborations for exhibits and is constantly in discussion with other institutions. They were involved in the Preserving Virtual Worlds project and partnered with the Rochester Institute of Technology's video game design program and the Royal Library of Denmark on video capture projects. Perhaps most importantly, the Strong has reached out to the game industry to discuss how best to preserve their history, specifically the history of the companies who make games and consoles, their internal documents and archives.

Discussion

This research involved three institutions that differed in interesting ways, across various lines. One is an internationally recognized institution that has been open to the public for over thirty years and serves half a million visitors annually; one is a quickly growing museum gaining national recognition and local popularity in Seattle; and one is a small local museum just beginning to expand and make strides within the gaming community. We could also say that one is a museum that focuses entirely on video games, one is a museum that has a massive collection of video games as an important aspect of their overall focus on play, and one has a game collection as a related factor to their focus on computers that has coincidentally become a major draw for visitors.

Each of these institutions has different goals and missions, but are similar in that they have a collection of video games that are significant to the process of meeting those goals and upholding their missions. This discussion will examine how these three sites are approaching

their collections and compare and contrast their practices to learn what aspects of video game

care are important to museums at varying levels.

Practices

Collections

What are the current practices, challenges, and standards for the care of video games in

museum collections? The storage and care for the physical video game collection is similar

across all three sites: with a few exceptions, the games are stored in their original packaging, on

basic shelving and with industry standard climate controls. Archival housing is used when

needed for particularly sensitive material and for games without packaging. Organizing the

collection by game system also seems to be preferred.

Of the three sites interviewed, only the Strong has a written collections policy specific to

the game collection. LCM+L has a broad policy that covers the collection at large, and the

MADE has staff procedures. Since the Strong has been operating much longer than the other two

sites and has a much larger collection, having a written policy is more critical and necessary just

to keep the collection under control.

All three sites used different cataloging software and different controlled vocabularies,

and all three sites have public-facing versions of their catalogs on their respective websites. Of

the three, only LCM+L is currently implementing a controlled vocabulary set developed

specifically for video game cataloging, and only the MADE uses their own internal ontology,

using terminology they feel is standard for the gaming community. Although each site is able to

make their own vocabulary set work, the benefit of controlled vocabulary is to assure that in the

future anyone reading a catalog is able to understand what is meant by each descriptive entry

used because the terminology has been formalized and can be reliably referenced. This is why

the development of controlled vocabularies for video games has been an active element of game

preservation research, and why it is important for game collecting institutions to incorporate it as

they are able, and as it becomes more widely available.

Although storage is fairly standard, collection needs are met at each site based on their

available resources, as well as the level of museological practice—the formal standards

developed within the professional museum community—incorporated at each site. The Strong

understandably exhibits a higher level of museological practice than the other two younger

museums, with the game collection codified into their written policy and cataloging with the

museum-specific software Argus. However, the other two museums incorporate methods that

work for them: the MADE has standard practices for staff and uses archival software that

originated from the private collecting community, which is where their collection originated;

LCM+L has a general policy and uses the library software Polaris because much of their staff

have library backgrounds. These institutions developed their methods based on their unique

needs and staff expertise, and will undoubtedly continue to evolve as their institutions expand

and the collections grow.

Exhibits

How do these sites balance the need for preservation and public access in their exhibits?

The three sites interviewed expressed different practices and philosophies in regards to how they

exhibit their video games; however, all of the sites allow visitors to actively play original media.

At the MADE, all of the games are playable unless they are extremely rare or fragile; all playable

games are original except the ones at the emulator station. At LCM+L, select games from the

collection are playable and preservation copies are made whenever possible to protect the

original media from wear and tear. At the Strong, most games in the exhibit are playable, but

only the arcade cabinets are part of the museum's collection; most other games are acquired

specifically for the exhibit and are not collection items.

LCM+L is the only site where interpretation of the history of video games is not part of

the exhibit that featured games from their collection, and in fact is the only site where games

were not expressly the point of the exhibit, but rather a vehicle for understanding and interacting

with the microcomputer collection on display. The MADE is the only site where visitors are free

to play nearly any game from the collection they choose, on demand. The choices these sites

make are closely connected to their individual missions, and use different means to achieve their

goals. All of these institutions agree that video games were meant to be played, and take steps to

mitigate damage with the resources they have.

Digital Preservation

What strategies are these sites implementing towards the long-term preservation of video

games? Digital preservation work varies widely depending on available resources, both financial

and staffwise. All three sites have begun incorporating emulators into their practice, slightly

differently in each case and with different goals in mind. The Strong is the only site working

with video capture, the MADE is the only site preserving game code, and LCM+L is the only

site creating physical game copies to be used on the museum floor. We can conclude that each

museum engages in digital preservation in ways that their institution can accommodate and that

most benefits the museum's mission and collection. The Strong's mission specifies preservation

as a key goal, so engaging in a broad array of digital preservation activities including video

capture supports its efforts to preserve as much information about their collection as possible for future researchers. The MADE is focused on inspiring future game developers, so preserving code and reviving an old online game provides a teaching opportunity for younger game enthusiasts and emerging programmers. LCM+L makes copies of their games to better fulfill their mission to provide a hands-on experience while still protecting their collection items.

Access

While there are differences in practice, the most important commonality among the three sites interviewed is the philosophy behind their decision to offer playable games in their exhibits. All sites agree that games and game technology are meant to be used, and that being able to play video games gives visitors a better understanding of and appreciation for the games and the technology they were built on. Advances in emulation afford people the opportunities to play games that might otherwise be too rare and precious to risk damage, but for most games, especially mass-produced, widely available titles, the consensus appears to be that the benefit of giving visitors access to play outweighs the potential for damage.

Although the risk for damage is present, all sites report that the risk to the games themselves or even game hardware is fairly minimal compared to the abuse that game controllers are put through. LCM+L keeps a stockpile of joysticks on hand and the Strong replaced many of their older controllers with industry-grade arcade joysticks. All sites agreed that optical media is the most likely to sustain damage or wear, either on intake or due to use, while cartridges tend to be more durable. In the case of arcade cabinets, the Strong has found that the games often fare better being used than being stored, which is corroborated by some other testimony discussed in Chapter 2.

Ultimately each site makes their own choice about how to mitigate the damage that is likely to happen, whether that involves hiring a full-time technician for repairs, as the Strong does, or making preservation copies for visitor use, as LCM+L does. These decisions rise out of their individual circumstances and depends heavily on their available resources, but the philosophy that games should be played tracks directly from each museum's mission.

Sustainability

Among the three sites interviewed, very similar wish-lists were outlined when asked about hopes and plans for the future: cold storage options, better organization, updated and improved cataloging procedures or collection policies, among other things. The challenge expressed across these institutions was *time*—time for staff to be trained and time for staff to do the kinds of projects they want to be able to do. A need for qualified staff was expressed by both the Strong and LCM+L as they continue to expand their digital preservation work. Although financial constraints were cited as part of the overall limitations of what any given institution is able to do, the budget is not nearly as much of a problem as not having staff both able and available to take on a particular project or task.

Although all of the sites engaged in preservation-focused collaborations, at minimum with their local communities and at maximum with sites around the world, it is notable that none of the collaborations listed by interviewees were common to all three sites. In other words, there is no single institution, organization, or network that each of these game-collecting sites are partnered with. There does not appear to be a centralized line of communication that memory institutions with game collections can all connect with to exchange information and experiences, which could act as a means for new institutions or old institutions new to game collecting to

learn from others. Such a centralized organization might be a great benefit to the museum

community in the future as games become more and more relevant as cultural and historical

artifacts.

Chapter 5: Conclusions

The goal of this research was to compare current practices in three different museums which have significant video game collections that they make accessible to the public, to identify the activities, philosophies, and costs surrounding how they care for and exhibit their collections and engage in long-term digital preservation. The study was framed by these research questions:

1) What are some of the current practices, challenges, and standards for the care of video games in museums?

2) How do museums balance the simultaneous need for preservation and public access in their video game exhibits?

3) What strategies are museums currently implementing towards the long-term digital preservation of video games? What costs, barriers, impacts, and benefits are museums experiencing as a result of implementing these strategies?

To address these questions, interviews with three game collecting institutions were conducted. The current practices, challenges, and standards for the care of video games were very similar in each institution: collection management was focused on industry-standard guidelines, and organizational practices in storage were markedly similar in that all institutions stored their games in original packaging and sorted them by game system. Museological practice in areas of policy and procedure differed between institutions based on size and experience.

These museums balanced the need for preservation with public access in different ways, but with notably similar philosophies that play encourages engagement, and that games were meant to be played. Strategies for dealing with public access and mitigating potential damage included hiring maintenance staff, implementing a library style "check-out" process, acquiring

games for exhibit use only rather than using games from the collection, and making preservation copies of games for use on the museum floor.

The digital preservation projects each institution engaged in arose out of its individual mission and collection needs, and fit within its available resources. Larger institutions with more resources are subsequently able to implement more projects. However, even very small institutions can take on one or even a few projects, provided they have the expertise from staff, institutional partners, and/or the community to assist them.

Costs and challenges for preservation work was similar across all three museums. They expressed concern for the longevity of the media in their collections, a need for qualified staff, and a need for time and resources to engage with digital preservation projects. Notably, among the three institutions interviewed, there was no commonality among their partnerships and collaborations with other entities on the topic of preserving games and/or similar media.

So, why does it matter? There is an increasing demographic segment of museum visitors and potential museum visitors are people who grew up playing video games, who are drawn to game exhibits by nostalgia, as well as younger visitors who want fun and interesting exhibits (Sharpe 2015). The MoMA and other institutions have found that game exhibits draws in visitors who might otherwise never set foot in a museum (Ferranto, 2015). LCM+L has found their collection of retro games to be a great draw to bring in visitors and engaging them with vintage computing and computer history. Despite the discourse over whether games qualify as art, a lot of people really like games and will go to museums to play them.

Many museums across the country and around the world already have video games in their collections, and some of them are museums not otherwise focused on games or related technology. An as-yet unpublished study conducted by Travis Windleharth at the University of

Washington's iSchool found that a diverse range of institutions have games in their museums, including flight museums, historical museums, military museums, and art museums (Windleharth, 2017). When the early results of this thesis were presented at the American Alliance of Museums Annual Meeting, as part of the Emerging Innovators Forum, a professional from the Chess Hall of Fame reported having a number of electronic chess games in their collection. Visitors to the poster presentation on this thesis at the AAM Annual Meeting were enthusiastic about learning the results of this study, how it could be applied to their own institution, and what more needed to be done. At LCM+L, attempts to digitize their game collection have served as a jumping-off point for broader projects to preserve software, and partnerships within the preservation community to help advance work in metadata development and emulation. As video games become a growing part of the museum collection landscape, museum professionals are becoming more eager to want to talk about their collection, and what they can do to preserve them.

What can we do moving forward? For practitioners, many of the findings in this study may be reassuring. In the case of physical care for video games, all of the sites interviewed reported that they were using methods fairly standard in the museum community for caring for any object: storing them in an environmentally controlled space, using archival materials, and taking special care with anything damaged or delicate. For the most part, games and their peripherals don't appear to need specialized care when it comes to storage. Practitioners considering how to exhibit the games in their collection can draw from the experiences of these three institutions and consider their methods for mitigating damage.

Furthermore, these findings suggest that there are two immediate needs to be addressed by the museum community. One is that museums with games, as well as similar media such as

software and ebooks and such, need qualified staff trained in digital preservation methods.

Museological graduate programs and similar educational organizations should at minimum be

aware of where to direct their students in order to receive this training, such as conferences or

online webinars. In the long term, programs should incorporate training in digital preservation

and digital asset management, if they have the resources to do so. Partnerships with library

science programs who often teach courses on these topics could build certifications for graduate

students. Collections at all institutions will become increasingly digitized in the future, and

graduate programs should reflect this change and the need for trained staff.

The community would also benefit from a professional network for video game

preservationists. This network could run across all memory institutions and would allow

institutions with games and similar media to share their knowledge and practices with each other.

Foundations for such a network have already been laid by organizations such as the Software

Preservation Network and could, perhaps, function as an offshoot of that organization or a

similar one. Professional networks require time and leadership to develop, so this would be a

challenging project to undertake and it may be many years yet until such an interdisciplinary

network becomes a reality. A resource such as this would allow institutions without a strong

technological background or technically trained staff to learn from more experienced institutions

how to manage and preserve their games. Having a centralized community would also allow for

the eventual development of best practices surrounding game preservation.

Whatever the future holds, the bottom line is that this research is a conversation that

needs to continue. Similar studies like this one should be conducted with more and different

institutions to learn what they know and how they care for their games. As both information and

people come together, a more cohesive view of preservation, and the future of preservation, will

become clear. In *The Legend of Zelda*, the hero Link is told "It's dangerous to go alone," and is given a sword to take on his journey. When it comes to preservation, though, we don't need a sword—we just need to not go alone, because we can accomplish so much more when we work together.

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Appendix A: Interview Instrument

Consent Script:
Thank you for agreeing to meet with me today. Before we begin, let me clarify that I am asking you to participate in this interview as part of my thesis research at the University of Washington. The goal of this research is to record and compare current practices in museums with significant video game collections to identify the activities, philosophies, and costs surrounding how they care for their collections, how they exhibit their collections, and what efforts they make towards digitization and long-term preservation. This interview will take about an hour and will be recorded for research purposes. You and your institution will be identified in my published report and anything you say may be quoted or paraphrased. You may request to review your quotations prior to the final submission of my thesis. Your participation is voluntary and refusal to participate will involve no penalty or loss of benefits. If you have any questions or concerns in the future you may contact me or my advisor.

Do you agree? Do you have any questions before we begin?

(*for groups*) I have three areas that I'm interested in talking about today: collections, exhibits, and digital preservation. I realize that not all of you work in the same areas, but wherever your expertise overlaps, please feel free to chime in and give your perspective.

Let's start with introductions. Please tell me your name and job title and briefly describe what you do here.

Collections:

Give me a short background on your video game collection; where it came from, how it grows, and how it fits into your institution.
        How important is it to your institution overall?
        Do you have collection management policies specific to your video game collection?
                (*Yes*) Could you briefly explain them and why they're important?
                        Who established these policies and how long ago? Have they been updated?
                (*No*) Is there a particular reason why not?

I'd like to know about your storage system and how your physical games and related materials are stored. Do you have a separate or special storage area for your games or are they stored alongside other materials?
        What archival storage materials/methods do you use?
        What are the biggest preservation concerns for your collection (re:agents of deterioration)?
        Is there a philosophy or standard driving your storage decisions?

I'd like to know more about how you catalog the video games in your collection.
        Who is in charge of updating your catalogs?
        What database do you use?

Are all the entries in the database original or have some been adapted from another source?
Do you use a standardized ontology or develop your own?
Do you have an online public-facing catalog?

What are the biggest challenges of physically storing and preserving games in your collection?
How are you addressing these challenges?

Do you think your collections and storage methods might change in the future?
(Yes) How might they change and why?
(No) Why not?

Have you partnered, collaborated, or just talked to any other institution, academic program, or gaming industry representatives about managing your video game collection?
What did you learn from each other?

Is there anything else you'd like to share about these topics?

Exhibits:

(for out-of-state institutions) I'd like to get an idea of what your video game exhibit looks like.
Is it a prominent feature in your museum?
What would I see going into it?
Would I be able to interact with any part of it, and if so, how?

When you developed your exhibit, what were your primary goals?
Was your exhibit developed to support an existing video game collection or was the exhibit developed first and the collection obtained for it?
Were issues of preservation and public access things that you considered when designing the exhibit?

What were your considerations when it came to visitors playing the games on exhibit?
How did your institution weigh the need to play the games vs. the need to preserve them?
What is the institutional philosophy behind the level of access provided to visitors?
Did you have any other potential solutions?
Do you think the exhibit in its current state is the best solution? Why or why not?

Have you had any problems with visitors using the games in your exhibit?
Have you had to repair or replace games, consoles, components, etc due to wear or accidental damage?
If so did you make changes to the exhibit in response?
Do you think the potential damage is worthwhile if visitors get to play the games?

Have you partnered, collaborated, or just talked to any other institution, academic program, or gaming industry representatives about your exhibits and/or issues surrounding exhibition?
What did you learn from each other?

Is there anything else you'd like to share about these topics?

<u>Digital Preservation:</u>

What was the impetus behind your decision to digitally preserve your collection?
    What were the challenges of taking on this project?
    What were the costs in terms of resources and staff time?
    Was your organization willing to take on those costs and challenges or was there
    resistance?

Talk briefly about the specifics of your digital preservation activities.
    What kind of hardware and software are you using?
    What formatting or encoding methods are you using?
    Are you reproducing or storing your games? How?
    What kinds of problems are you running into? Did you find solutions?

Are you using emulators or specifically encoding digitized games to run on an emulator?
    Which one and why?
    Are there unique challenges to working with emulators?
    In a general sense, do you feel that emulators are a viable long-term archival solution?
    (if no) Is there a particular reason you chose not to use emulators?

Are you making the digital copies of your games available to the public?
    To other institutions? Internal only? Briefly explain your decision.
    Have you had any issues with copyright or copy protection? If so talk briefly about your
problem.

Have you partnered, collaborated, or just talked to any other institution, academic program, or gaming industry representatives about digital preservation or video game preservation in general?
    What did you learn from each other?

Is there anything else you'd like to share about these topics?