

***Before It's Too Late:  
A Digital Game Preservation White Paper***



Game Preservation Special Interest Group,  
International Game Developers Association

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## Introduction

*Henry Lowood*

The Game Preservation Special Interest Group was founded in 2004, only five years ago. Even in that short time, however, interest in the preservation of digital games and virtual worlds has intensified remarkably. Today, cultural institutions such as universities, libraries, and museums have begun to collect, display, and make available artifacts of game culture, and opportunities for the practical or critical study of game content and technology are increasing rapidly. Game studies, a field that barely existed ten years ago, now boasts of annual conferences, journals, and organizations dedicated to it.

All of these developments are fine and good. In this white paper, however, we address a threat not just to academic game studies and the historical appreciation of game culture, but also to game developers and the industry itself: the potential disappearance of original game content and intellectual property through media decay, obsolescence, and loss.

We wish to be very clear about one point, so at the risk of repetition, allow us to say it again in other words: *if we fail to address the problems of game preservation, the games you are making will disappear, perhaps within a few decades.* You will lose access to your own intellectual property, you will be unable to show new developers the games you designed or that inspired you, and you may even find it necessary to re-invent a bunch of wheels.

The intended readership of this white paper, therefore, is primarily the members of the IGDA. Our intention in this document is to present the problems that you face, before it's too late. We want to get your attention. We hope that we can achieve this goal by distributing this white paper at the Game Developers' Conference in 2009. Once we have your attention, the next step will be the preparation and distribution of a second white paper on best practices and solutions at GDC 2010. In the meantime, please consider joining the Game Preservation SIG and helping us in our work.



# Losing Digital Game History: Bit by Bit

*Devin Monnens*

Digital games are in dire need of preservation. Every year, thousands of games move one step closer to oblivion as a result of the same threats to longevity that affect all digital media: bit rot and obsolescence. Digital media have a shockingly short life span due to the natural decay of the original materials and the rapid obsolescence of older media forms, as well as the failure and obsolescence of the hardware necessary to run them. Many digital games that are only a few decades old are already at-risk and require immediate preservation attention. Libraries and archives around the world have only just begun to pay serious attention to digital games, yet they already face the immediate problem of working together. If no concerted action is taken to save these games before they disappear forever, we will have lost the foundation of our industry's history. It will not be enough simply to hand the problem over to libraries and archives that are beginning to collect digital games – these repositories lack the expertise and funding to solve the many problems of digital preservation. They will also need the industry to help, because preservation methods are further complicated through current business practices of digital rights and distribution.

In short, thousands of digital games are on their last life. Once they reach that final Game Over screen, we will not get a replay.

## ***Media Decay, or Bit Rot***

The greatest threat to the longevity of digital games is media decay, also known as bit rot. Bit rot is the gradual and natural decay of digital information and storage media over time, resulting in eventual unreadability. Bit rot affects different storage formats at different rates depending on the format's durability. Magnetic storage and optical discs are especially subject to varying forms of digital decay. For the time being, masked ROM cartridges appear to be fairly durable while EPROMs are at greater risk.

### *Magnetic Disks*

Magnetic storage media such as floppy disks, magnetic tape, and hard drives are particularly susceptible to bit rot. In magnetic storage, media decay results from the weakening of the disk's magnetic properties over time, causing them to "fade" and become unreadable.<sup>1</sup> Floppy disks are at the greatest risk of decay due to the flimsy nature of these disks and their age, which in many cases now exceeds their life expectancy, while games stored on magnetic tape are also at risk. Current estimates place the lifespan of floppy disks at between 10 and 30 years,<sup>2</sup> with disks from 1985 and earlier already showing considerable signs of decay and unreadability.<sup>3</sup>

Thousands of games were published on 3.5" and 5.25" floppy disks up until the mid-1990s. Many of these are now over twenty years old and well on their way to oblivion. It is therefore critical that preservation methods be undertaken to preserve games stored on magnetic media before the large and significant part of the history they carry is lost forever.

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<sup>1</sup>Software Preservation Society (SPS) (2006, Mar.). Bit Rot. *Software Preservation Society*. Retrieved from [http://www.softpres.org/glossary:bit\\_rot](http://www.softpres.org/glossary:bit_rot)

<sup>2</sup>Ibid.

<sup>3</sup>As part of the "Preserving Virtual Worlds" project sponsored by the U.S. Library of Congress, the Stanford Libraries have identified unreadable floppy diskettes in the game collection for games published as recently as the mid-1990s.

## Optical Discs

Optical discs can be damaged physically by pits and surface scratches as well as chemical deterioration due to inks, adhesives, and other materials, but they are also affected by bit rot. The physical material of optical discs breaks down over time; physical and chemical destruction of the reflective layer of the disc causes pits on the disc surface, known as CD rot or laser rot, and discoloration of the disc, known as CD bronzing. Any of these will eventually cause a disc to become unreadable.

The lifespan of disc-based media is unknown. Based on rapid aging tests,<sup>4 5</sup> media decay has been shown to affect discs created through lower-quality manufacturing and using low-quality materials, such as silver-based dyes.<sup>6</sup> While beta discs and other media printed on CD-R's are at particular risk, bit rot has also been documented in formats as recent as Blu-Ray discs<sup>7</sup> and Sega Dreamcast discs,<sup>8</sup> and so will continue to be a problem well into the future.

Uncertainty about the long-term stability of optical discs means that their longevity is of great concern. It is imperative that measures be taken to better understand the life expectancies of different kinds of optical disc-based games and the need to preserve them before the problem becomes as dire as that of magnetic storage media.

## ROM Cartridges

ROM cartridges are less affected by bit rot than other digital game storage media. ROM cartridges are made of durable material, and most commercial cartridge-based games are burned to masked ROM cartridges, which have considerably longer lifespans than most other digital media. However, ROM cartridges require protection to mitigate corrosion from moisture and battery acid, while restoration may also be necessary to preserve such functions as battery-backup. The ultimate lifespan of masked ROM cartridges is unknown, but it is possible that some cartridge-based games will last longer than the copyrights associated with them.

However, EPROM (Erasable Programmable ROM) cartridges are subject to more rapid digital decay.<sup>9</sup> EPROM cartridges store data by charging electrons inside the chip; over time, these charges will slowly leak through the chip insulation, causing irretrievable loss of information.<sup>10</sup> Current estimates suggest that EPROM cartridges can last upwards of 25 years; many early cartridge-based games have already surpassed this age and

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<sup>4</sup>Shahani, C. J., B. Manns, and M. Youket. Longevity of CD Media Research at the Library of Congress. Preservation Research and Testing division, Library of Congress. Retrieved from <http://www.loc.gov/preserv/studyofCDlongevity.pdf>

<sup>5</sup>Hartke, J. L. (2001, July 17). Measures of CD-R Longevity. *Media Sciences, Inc.* Retrieved from <http://www.msscience.com/longev.html>

<sup>6</sup>Bronzing is caused by a chemical reaction from the aluminum coating in CDs to sulphur components normally found in CD booklets and inserts. The result is a gradual discoloration of the disc and eventual unreadability. Lampson, D. (1995, Sept.). CD Bronzing. *Classical Net – Koussevitzky Recordings Society Journal*. Retrieved from <http://www.classical.net/music/guide/society/krs/excerpt3.php>

<sup>7</sup>Quilty-Harper, C. (2007, June 16). Blu-ray disc coatings starting to rot? *Engadget*. Retrieved from <http://www.engadget.com/2007/06/16/blu-ray-disc-coatings-starting-to-rot/>

<sup>8</sup>Shadow460 (2008, Oct. 12). Laser rot occurs on Dreamcast games [Msg 1]. *Atari Age*. Message posted to <http://www.atariage.com/forums/index.php?showtopic=132948>

<sup>9</sup>Blackjax (2005, Dec. 8). A small lesson in Bit Rot. *System Failure*. Retrieved from <http://my.ais.net/~xtreme/SF/Bit-Rot/>

<sup>10</sup>Ibid.

demonstrated the effects of bit rot.<sup>11</sup> This places games stored on EPROM cartridges at risk and requires the implementation of measures to ensure their long-term preservation.

Battery failure is another form of data loss, as in the case of digital information stored in RAM chips, which is deleted once the chip loses power. For example, games based on Capcom CPS-2 arcade boards contain security codes stored in a static RAM (SRAM) chip powered by a battery. When the SRAM loses power, the board "commits suicide" and the security code is erased, making the game unplayable. Capcom currently offers a service for repairing the boards, though this service is not guaranteed to be available even ten years into the future.<sup>12</sup>

### *Conclusion*

Because digital media's lifespan is so short, preservation efforts must include data migration and refreshing from older, decaying media formats to newer formats. Unfortunately, this often conflicts with copyright laws. Therefore, efforts must be made to ensure the legality of digital media transfer for preservation purposes in libraries and archives. This is a contentious issue, but one that needs to be resolved for the security of our digital past and future.

### **Obsolescence**

Digital games, like all digital media, are also subject to obsolescence. Obsolescence occurs when older media formats are replaced by newer formats with greater speed, storage capacity, and functionality. When old media are replaced, there are no longer systems to support them, and they will not run on the latest software and hardware platforms. As a result, even if the medium on which a game's data is stored is able to last a hundred years, after only a fraction of that time, its data will be unreadable in the latest hardware and software environments. Additionally, media that are less durable and stored on obsolescent hardware will be more difficult not only to use, but to preserve for long-term use.

Every media format undergoes obsolescence, and the media of today are no exception. When the VHS tape was introduced, few foresaw how quickly it would be replaced by the optical disc. The optical disc, while currently backwards compatible from Blu-Ray to DVD to CD, may not be a viable format even 20 years from now. And so on. Format longevity is never guaranteed. Market forces, rather than the needs of long-term preservation, usually determine the survival or disappearance of media formats.

Digital games are particularly susceptible to media obsolescence. Digital game technology evolves rapidly, and therefore game hardware becomes obsolete faster than most other technologies. Only a few game platforms have ever had backwards compatibility, and even then, compatibility of older games with newer platforms has rarely been 100%.<sup>13</sup> Several competing game platforms are released with each generation so that the number of obsolete game systems presents a daunting challenge to those trying to preserve console games. Additionally, the personal computer platform is exponentially more complex, given the wide range of customizable hardware systems available, each of which affects game presentation and performance. These different

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<sup>11</sup>Ibid.

<sup>12</sup>The CPS-2 Suicide Information Page. *CPS-2 Shock*. Retrieved from <http://cps2shock.retrogames.com/suicide.html>

<sup>13</sup>Compatibility regards not only whether or not the software will run but also whether the software will run in a form identical to how it would run on the original hardware.

hardware environments must also be considered when dealing with digital game preservation.

Software compatibility is also a significant issue for digital games. Personal computer games and other software are only compatible with specific versions of operating systems, such as Windows XP and Mac OS, and these same operating systems only function within specific hardware environments.<sup>14</sup> Furthermore, all computer hardware use drivers, which are also only compatible with specific operating systems, further complicating requirements for preservation.

As a result of obsolescence, it is imperative that we preserve the hardware and software environments that are required to run the games we wish to preserve: without the platforms to run them, the games themselves are useless. Unfortunately, the maintenance of old hardware and software environments is ultimately not feasible for long-term preservation due to the high costs of maintenance and inevitable failure of computer components.<sup>15</sup> Long-term preservation will require methods such as data migration, which means transferring information from one hardware or software format to another, and emulation, which means replicating the exact operation of another hardware and software environment. These methods, in turn, raise significant issues with regard to ownership, copying, and migration of game software.

None of these problems can be solved without industry support. Indeed, the problems themselves are sometimes exacerbated by industry practices. Unfortunately, it is usually the case that the consequences of these problems are experienced by companies, consumers, and academic repositories only after the technical, marketing, or legal decisions behind them are themselves history. By then, it may well be too late.

### ***Industry Support is Crucial***

The history of the game industry cannot be saved without support from its creators. Currently, there is no single institution within the game industry or in any government that is responsible for archiving digital games. There is no Library of Congress for games, only various independent efforts made by libraries and archives throughout the world, and there are few industry-operated archives for the preservation and documentation of a company's history. Because preserving digital game history requires methods such as migration and emulation, support from the industry is required to overcome the many legal and technical barriers that currently prevent the preservation of its own history.

### ***Legal Support***

The first line of support that game companies can give libraries and archives is legal support. Digital Rights Management (DRM) licensing and copyright laws present barriers to the long-term preservation of digital games. While these laws were created to protect the intellectual property of the industry, they prevent the only viable techniques of long-term preservation: migration and emulation.

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<sup>14</sup>For instance, Mac OS9 will only function natively on computers with PowerPC architecture, and not on the newer Intel chipsets.

<sup>15</sup>Maintenance of computer systems for preservation, or "the museum approach," is merely a short term, stop-gap strategy incapable of long-term viability. Guttenbrunner, M. (2007, Oct.). Digital Preservation of Console Video Games. Vienna University of Technology. Retrieved from [http://www.ifs.tuwien.ac.at/~becker/pubs/guttenbrunner\\_games2007.pdf](http://www.ifs.tuwien.ac.at/~becker/pubs/guttenbrunner_games2007.pdf) These findings concur with those of Cornell University's Digital Preservation Management studies. Retrieved from <http://www.icpsr.umich.edu/dpm/index.html>

In order for digital media to survive decay and obsolescence, the information must be transferred, or migrated, from one storage format to another, which involves creating a copy. Sometimes, copy protection schemes prevent this process and must be overridden to secure a copy of the data, and often the physical act of simply copying the data may violate contract agreements and copyright laws. Additionally, the software and hardware platforms must be emulated, which can conflict with copyright laws governing hardware and software environments.

For long-term preservation to occur, exceptions must be given to libraries and archives so these tasks can be performed. It may well be that game companies and owners of game-related intellectual property do not object to game preservation by these institutions, but protocols for assigning these rights have yet to be worked out in a clear manner.

Additional legal support involves tracking ownership of copyrights and intellectual property rights for games that need to be preserved as well as verifying the existence of "lost" or missing games. Often, little information is known about older titles, making it difficult to determine ownership. The establishment of clearinghouses for such information, perhaps by trusted academic institutions or repositories, would benefit the industry as well as game preservation activities.

### *Technological and Business Practices*

Developing sustainable distribution formats and business practices that support long-term preservation would benefit both game companies and repositories such as libraries, museums, and archives. Certain business practices such as digital distribution, server-side authentication, and installation verification are only some of the challenges that future preservation efforts will face.

Digital distribution causes considerable problems for archives due to its reliance on remote storage. For instance, games distributed through Xbox Live Arcade (XBLA) are almost wholly dependent upon the longevity of the XBLA service. If a title were to be delisted from XBLA, it would only be available on systems whose owners had purchased and downloaded the title.<sup>16</sup> Other streaming digital distribution services do not even allow the creation of local copies. Industry attention is therefore required in order to ensure the long-term preservation of digitally distributed games because preservation efforts will ultimately depend on the distributor.

Installation licenses and encryption key verification tools introduce further problems for preservation. Installation licenses require that a game be installed only a limited number of times. This limitation is useful in helping to prevent piracy but causes problems for long-term preservation. These practices ultimately tie copies of a game to a particular computer that is prone to failure and obsolescence rather than to a particular user, who has greater permanence. Moreover, encryption key verification tools often run on company servers whose lifespans may be limited to decades or, more likely, years. These services may not be operational in the future; when a validation service fails or is dissolved, games associated with it can no longer be verified and almost certainly cannot be run. Overcoming both problems will ultimately require industry support, because companies create, own, and operate these services.

Lastly, online games provide a unique challenge, particularly Massively Multiplayer Online games (MMOs); these persistent game worlds require servers run or operated by game companies for a variety of functions. Libraries and archives are currently exploring

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<sup>16</sup>Microsoft has "set parameters by which [they] can delist," but as of this writing, there appear to be no plans for title delisting. Pigna, K. (2008, Oct. 12). TGS 08: Microsoft Holding Off on Delisting XBLA Games. *1up*. Retrieved from <http://www.1up.com/do/newsStory?cId=3170592>

various methods for how to best preserve MMOs,<sup>17</sup> but most of the preservation efforts may ultimately rely on a developer or publisher's ability to preserve these titles for the long-term after their virtual world has shut down.

### *Support for Industry and Company Archives*

The IGDA Game Preservation SIG also encourages companies to set up their own archives or records management programs. Studios will ultimately benefit from having these local archives. Corporate records held in a company archive or records management program let companies preserve materials for games currently in development and track copyright ownership. This same material can also pay dividends through practical applications such as training new developers and providing resources for game development: simply put, old code and prototypes can inform the development of new games. Additionally, some of these materials may have commercial value, as they can be used to create products such as retro game collections, art books, and soundtracks. Finally, an archive can be used to record the history of a company to demonstrate pride in employees and their creations as well as for annual reports and marketing.

Due to the complex nature of digital preservation, some companies may not have the knowledge required to create their own archives. As a result, even their current production archives may already be at risk of data loss, to say nothing of their archives of years-old data stored on dusty floppy disks, creaky hard drives, and fading optical discs. The IGDA Game Preservation SIG can work with game companies interested in better managing their data and records by providing advice and assistance in creating long-term archives.

### *Conclusion*

The problems of a general game library or archive are the same as those of a company or development studio's corporate archive, so cooperation between the industry and the archive will ultimately benefit both parties. With your support, together we can ensure the long-term preservation of digital games, along with their cultural and historical importance.

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<sup>17</sup>For example, the U.S. Library of Congress's National Digital Information Infrastructure Preservation Program (NDIIPP) has funded the "Preserving Virtual Worlds" project as part of its Preserving Creative America program. The project is being carried out by a group of universities: University of Illinois, Stanford University, University of Maryland, and Rochester Institute of Technology.

# Why are Games Worth Preserving?

Devin Monnens

## Introduction

Digital games are disappearing. With each passing day, magnetic disks continue to decay and older computer hardware wears out or becomes obsolete, bringing the games that make up so much of our history closer to oblivion. If something is not done quickly, it will be too late to preserve our past.

How do cultural artifacts survive? Works of art and other objects have lasted through the ages for a variety of reasons:

- They are made of durable materials (stone)
- They are copied before the originals are lost or destroyed (books)
- They are massive in scale (the pyramids)
- They are stored in environments that aid in their preservation (the Dead Sea Scrolls)
- They are moved away from wars, disasters, and iconoclasts

And finally:

- Somebody cared and took an active role in preserving them

If digital games are to survive as business properties and cultural artifacts, we are the ones who have to care and take an active role in their preservation.

But why should we preserve digital games? Why should we be concerned with preserving what many people consider to be a fancy toy, a waste of time, or – at worst – a corruption of our youth and society?

We need to preserve our games because they are important. They are important to our industry, to our culture, to our society, and to ourselves. They are important because we make them, and put heart and soul, blood, sweat, and tears into their creation: for that reason alone, we need to preserve them. Games are also a significant part of contemporary culture; as part of our culture, they are a part of what makes us human, and by learning from them, we can better understand ourselves.

## Games are History

Digital games need to be preserved because they are history. They chronicle the rise of an industry that today rivals that of film and document the genesis of an art form for the 21<sup>st</sup> Century. We must preserve that history because it defines who we are today and reminds us of our roots. Games are our legacy for the future, and we must take pride in our history. The past shows us how far we had to go to get to where we are today, and it puts into perspective how far we still have to go: the past is the prologue to the future.<sup>18</sup> In addition, we should preserve digital games out of gratitude to the developers who made them – many of whom are still alive today. Maybe you are one of those developers. Digital game development isn't something that began a hundred years ago like film production did; it is still a very young industry, and that makes it even sadder that these games are being lost so quickly. We need to preserve our history lest we forget who we are and forever lose an important part of what defines us.

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<sup>18</sup>Introduction. *Digital Preservation Tutorial*. Cornell University Library. Retrieved from [www.icpsr.umich.edu/dpm/dpm-eng/timeline/index.html](http://www.icpsr.umich.edu/dpm/dpm-eng/timeline/index.html)

## **Games are Property**

Digital games are owned, as intellectual property, by the companies that design, produce, and distribute them. They are owned as tangible property by the consumers who support the game industry with their purchases of games and an associated spectrum of materials ranging from clothing to published game guides. Both forms of ownership are jeopardized if the assets in question are too easily lost.

## **Games are Design**

Digital games need to be preserved because they tell us about design. Just as good filmmakers learn from the films of the past, the developers of today can learn a lot from the games that others have made. Game development is an art form, and as in any art form, we should not have to continue reinventing the wheel. Some studios recognize the need to teach their employees the history of the industry and to use old prototypes to help inform the creation of new titles.<sup>19</sup> A game library or archive can serve as an excellent teaching tool for future developers, just as it can be used by critics to examine the games of today in relation to the past. Such an archive also provides access to games we may have only heard about and which are no longer easy to find, making it a boon for students of game development as well as scholars.

Further, many games possess a certain uniqueness in their designs that makes them worth preserving in their own right. Games like *Adventure* (1979, Atari) and *Donkey Kong* (1981, Nintendo) were as much solutions to limitations of computer hardware as they were fun games. And yet, we should not limit ourselves to preserving the best designs, the "masterpieces of fun": we have the potential to learn something from every game, regardless of how well or poorly it was made, for without failures, how can we know what failed to work and learn from it?

The past serves as much as a learning tool as a gallery of design, so it is important for the maturing game industry to recognize the significance of the past and apply it towards the future.

## **Games are Art**

Digital games need to be preserved because they are an art form: they have things to say about culture and the human condition through the languages of play, simulation, and narrative. Games have proven their capacity to explore and critique the nature of human culture and the world we live in, as well as reflect on their own nature as a medium.

The recognition of games as an art form is slowly becoming more widespread.<sup>20</sup> Some scholars argue that early games like *Pac-Man* (1980, Namco) and *Final Fantasy* (1987, Square) may be considered art,<sup>21 22</sup> and it seems clear that games possess an innate ability for expression.<sup>23</sup> Certainly, modern games such as *Ico* (2001, Sony Computer Entertainment), *Braid* (2008, Number None), and *Passage* (2007, Jason Rohrer) meet the requirements some artists, critics, and curators would place on defining art, and the body of work reaching and exceeding this level will only become larger as

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<sup>19</sup>For example, designers such as Warren Spector and Will Wright have used older designs to develop rapid prototyping techniques or to train new developers.

<sup>20</sup>Jenkins, H. (2000). Art Form for the Digital Age. *Technology Review*. Retrieved from <http://www.geocities.com/lgartclass/handouts/ArtfortheDigitalAge/ArtFormfortheDigitalAge.html>

<sup>21</sup>Kelman, N. (2005). *Video Game Art*. Assouline Publishing: New York, NY.

<sup>22</sup>Poole, S. (2000). *Trigger Happy*. Arcade Publishing: New York.

<sup>23</sup>Ian Bogost, Ernest Adams, and Ed Rothberg have all forwarded theses of this nature.

the years pass. Like comic books or animated films before them, digital games compose a media form that is gradually becoming accepted as a valid form of artistic expression. The medium's future expressive potential is slowly emerging as it extends its reach into new venues such as art museums.

As such, digital games need to be preserved both in order to document the history of an emerging art form and as works of art in their own right. We have lost many early films due to their lack of preservation, many of which had something meaningful to say about the world in which they were created; won't we also mourn the loss of early digital games a hundred years from now if we allow them a similar fate? Digital games must be preserved to save their artistic values as well as their messages for posterity before they, like many early films, are lost.

### **Games are Culture**

Digital games need to be preserved because they are part of contemporary culture. As a multibillion-dollar international industry with digital games in 65% of American homes,<sup>24</sup> as a social phenomenon frequently covered in the news, as a staple of contemporary pop culture, or as an emerging art form, digital games have had a profound impact on our culture that cannot be ignored. The significance of this impact has yet to be fully realized, particularly since the digital game generation is still growing to adulthood. What will be the impact of digital games on the way we see the world? Will it be an influence as profound as that of other visual media, such as film or photography? The games we play tell us a lot about ourselves, and we play a lot of games. They are as much a part of our culture as television, the newspaper, and the book. Through understanding culture, we better understand ourselves, and how can we understand our culture if we fail to preserve it?

### **Games are Fun**

Digital games need to be preserved because they are fun. Fun is not something to fear or dismiss; fun and play are as much about being human as they are about enjoying our world. We enjoy many forms of entertainment, whether they are games, film, books, or television, and indeed, fun and entertainment are things that make some of the best books and films last for generations. Games and play are an important part of human culture and may even be seen as a guiding force behind it.<sup>25</sup>

As much as we love personal entertainment, we also love to share things that we enjoy with others: if we read a book that we find compelling or enjoyable, we naturally want to tell others about it, to share the experience and make others happy. When we see a beautiful sunset, we want to share it with our friends and loved ones to appreciate it together. And when we play a game we enjoy, we want to share it with others. What parent has not tried to introduce their child to a game they played when they were young? As much as a game developer's job is to produce a salable product, he or she also wants to make something that will bring enjoyment to others. We should preserve what gives us joy so we can share that happiness with future generations and continue to make the world a better place.

In other words, we should care that future generations might not be able to play our games.

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<sup>24</sup>Industry Facts. *The Entertainment Software Association*. Retrieved from <http://www.theesa.com/facts/index.asp>

<sup>25</sup>See the writings of Johan Huizinga and Roger Caillois for more thoughts on these topics, especially Huizinga's masterful *Homo Ludens*.

## What Constitutes History?

Zach Vowell

With the significance of digital games in mind, we might well ask ourselves, "What constitutes a history of digital games?" We now recognize the importance of such a history (or histories), but what exactly do we need to preserve in order facilitate its composition, whether in corporate publications, on websites, in magazines, in journals, or in academia?

The central preservation priority would seem to be the games themselves. After all, if a future game developer or historian cannot experience the gameplay, then all other issues might seem pale in comparison. There is certainly some truth to this notion, but if we place too much emphasis on preserving only published games, we relegate much of the history behind games to the shadows. To challenge this over-emphasis on the game itself, we may consider whether a future historian can learn how a game was made by only playing it, or whether that historian could learn about the history of a development studio and the culture of the development team simply by playing their games. Similarly, could apprenticing game producers compare successful development processes to unsuccessful ones simply by playing a AAA-title alongside an unreleased game, or could biographers write histories of key developers only by playing the games those developers worked on?

Decidedly, the answer to all these questions is *no*: the stuff of game history encompasses far more than the games themselves.

We face a host of missed opportunities if we do not confront this universe of documentation head-on. Perhaps digital games will retreat from their impressive advance into modern American culture; they might be relegated to a passing fad – who knows? Players might continue to play these games in the future, but their understanding of digital games' place in society would lessen, and their estimation by the same degree would be lower. To be clear, people would not revile games; they simply would not care about them as much. Games of the past would become objects of pure nostalgia, found only in cabinets of curiosities rather than archives, libraries, and museums.

On the other hand, proper documentation places digital games in their proper context and opens them up to serious attention – at the level of histories of art or government. Archival documentation reveals among many other elements of humanity the thought, time, innovation, toil, and inspiration that go into the making of games.

So, we feel compelled here to *begin* a list of materials (and types of materials) besides the game software itself that would be suitable in an archive where historians, writers, and other researchers, as well as companies, players, and fans, could find them and use them in their work. We say *begin*, because this is only a beginning of a list of things that could constitute game history. Archivists love nothing more than being educated by practitioners with respect to what constitutes history. We hope that game developers and other IGDA members will "take ownership" and add to this list, whether by contacting the IGDA's Game Preservation SIG to update information on its wiki or by seeking out a local archival repository and asking if it would be interested in some documentation or an artifact, no matter how unusual it may be. The list we are about to present is necessarily incomplete: ideas about what is important will change in the future.

Without further ado, consider the following list of materials. If you notice something in it that leads to a dusty trove in your garage, please also consider donating your valuable materials to the trusted repository of your choice. Such a repository will not only provide a potential home for these materials, but archivists there will help you

work through issues of intellectual property and other legal matters that may arise. And remember that hard drives and other media that contain digital copies of these types of documentation are welcome, too:

- Design documents of all kinds
- Development-related correspondence
- Artwork, such as conceptual art, sketches, and storyboards
- Versions of games, from original prototypes to patches, sequels, and mods
- Game development source code, assets, tools, and the resulting binary executables
- Machinima, replays, and other recordings of gameplay
- Development-related maps (shadow maps, influence maps, texture maps, etc.)
- Wikis, subversion/sharepoint/perforce directories, internal websites, notice board notes and posters, and other collaborative/group media
- Scheduling/planning documents
- Developer or publisher budgets, forecasting, market research, and other business-related documentation
- Other documentation related to the developer/publisher relationship
- Company newsletters and circulars
- Information on projects, teams, and company structure over time
- Photographs and videos of the company, people, and events (both internal and external)
- Advertising and marketing materials, especially pieces used for unique, one-time purposes
- Press kits and demos
- Legal documentation
- Books on game design, development, and game studies
- Research papers produced by academics for developers
- Source materials (i.e., writings, film, art, etc. that inspired a game)
- PowerPoint and other presentations for conferences and meetings
- Game magazines, including clippings files
- Archival and business records or personal papers from groups, organizations, and individuals who are associated with the game industry, but are not involved in game development

Looking over this list, we fully appreciate the legal concerns a developer might have when considering a donation of such materials: your company's team of IP lawyers

probably leaps to mind. While these are serious concerns, it should also be noted that most established archival repositories have a long history of finding the delicate balance between protecting their donors' interests and providing researchers access to the materials they need for their work. What we need from game companies is for them to think about and determine their comfort level with access to their historical materials. Once we have that, where there is a will, there is a way.

Another way to think of historical documentation is its capacity as *evidence*. An early archival theorist, Hilary Jenkinson, noted that "the outstanding feature of the Archive, putting this at its simplest, is that it is by its nature unique, represents some measure of knowledge which does not exist in quite the same form anywhere else." In the same breath, Jenkinson also recognized "the possibilities of Archives as evidence, as correctives of the more or less *ex parte* statements of contemporary or later commentators on events."<sup>26</sup>

Where digital game history is concerned, ask yourself if you have ever been involved in a dispute at your company. Was some decision wrested from your hands, such that the resulting game suffered as a result? Has a design decision been controversial? Do you know of an unsung developer who never gets the credit he or she deserves? Does some aspect of the game industry go unnoticed or, conversely, is it often overemphasized? Or hang it all, do you just want your work to be commemorated? To be sure, evidence you might think is important for documenting how games are made or what decisions were made in your company need not have legal significance – it just begs to set the record straight.

Finally, allow us to devise a different kind of list. This list merely implies the possible types of documentation by describing the many aspects of digital games that might be documented:

- **Games are fun.** People *play* games, and that often-discussed word "fun" will no doubt be debated endlessly as the years pass by. How exactly have developers made fun games?
- **Games are art.** Art historians and literary scholars have always been interested in the processes that inform a finished work of art, and games will be no different.
- **Games are business.** Sometimes it can be difficult to avoid thinking that the business aspect of games is a thorn in the side – after all, some might say that business is no fun. But conducting business is the industry's lifeblood, and there will always be people who want to study how that lifeblood ebbs and flows. Some will study accounting, marketing, or entrepreneurship; others will compare the results of big companies to the feats of an inspired indie.
- **Games are digital.** With so much of the game industry conducted in the realm of 1s and 0s, it seems obvious that much of its documentation would come in digital form, yet so often people tend to dismiss their digital hoards – that would be a colossal mistake!
- **Games are advertisements.** The world of gameplay may not contain much advertising (though the rise of in-game marketing may change that), but game production often carries a bevy of advertising, marketing, and publicity efforts that inextricably become linked to our experience of the game.

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<sup>26</sup> Jenkinson, H. (1984). Reflections of an Archivist. In M. Daniels & T. Walch (Eds.), *A Modern Archives Reader*. Washington, D.C: National Archives and Records Service, U.S. General Services Administration. (Original work published 1944).

- **Games make statements.** True, with interactivity, the statement changes from player to player, but the statement is still there, and the game's designers craft the rough outlines of each statement with the rules, parameters, and narratives in their games.
- **Games say something about ourselves.** The reverse is true too – games have the unique ability to allow us to express ourselves through play, whether it's a high score and style of attack in *Space Invaders* (Taito, 1978) or a chosen occupation and power level in *World of Warcraft* (Blizzard, 2004).

The possibilities for exploration are endless, and the more evidence that we can gather, the more our understanding of all these facets of games is deepened.

However, if we ignore the problem of game preservation, those possibilities will be lost.

## What if We Do Nothing?

Judd Ruggill, Ken McAllister

Whenever archivists and collectors assemble, their conversation inevitably turns to a question that always proves vexatious in a self-congratulatory way: "What if nothing is done to identify, locate, catalog, and preserve this material?" Among such confederacies, "this material" could be anything from Khmer folkware or Scottish incunabula to antique jack planes and back issues of *Penthouse*. In any case, the anxiety at the heart of this question – "What if we do nothing?" – is simultaneously an expression of value, a fear of regret, and a condemnation of the short-sighted masses.

At a certain level, though, the question at hand – "What if we do nothing to archive and preserve digital games?" – is spurious: collectively, we (i.e., publishers, players, pundits, and scholars as well as developers) do nothing every day. Rather than collaborate systematically to conserve the cultural and material heritage of our medium, we go about the process of preservation idiosyncratically and haphazardly, if at all. We carefully preserve some things (e.g., limited edition consoles, games, and memorabilia), casually discard others (e.g., poorly rated games, game packaging, and documentation), and generally think more about present and future titles than past ones. Occasionally, fortune smiles and a case of well-preserved games or consoles is discovered in a long-neglected back room or storage closet. More often, tastes and technologies change and "old" games (i.e., titles more than ninety days old) simply – and perhaps naturally – fade from view. The art and practice of digital game preservation is left to hobbyists and collectors, whose interests, archival sensibilities, and preservation expertise vary greatly and who are often less concerned with the importance of art, labor, organization, and memory than the exchange value of rare goods.

The question, "What if we do nothing to archive and preserve digital games?" is misleading too because in calling for an answer, it obscures the fact that ultimately there cannot be one. Once a game is lost (and not merely misplaced or forgotten), it is gone forever. One cannot suddenly produce a copy and then contrast the state of the art – to answer "what if" – pre- and post-discovery.

And yet, the question of inactivity, of doing nothing in the way of game conservation, is at the heart of this white paper. Indeed, it is at the heart of the digital game medium itself, for whatever development, play, and study of games takes place now and in the future is always done in the context of its antecedents, in the context of all of the games that have already been developed, played, and studied. In this sense, conservation is a part of every game-related act, from design and development, to marketing and play, to analysis and storage. Each of these actions, alone and collectively, forms a part of the logic by which people understand what a digital game is, how and why it works, what it takes to bring one from concept to completion, and the pleasures and problems a game, its development, and play are capable of producing.

Unfortunately, this logic is impoverished by the vagaries of memory. The human mind is as porous as it is prodigious, allowing some things to escape just as others are retained in intricate detail. One might well recall the fun of *Time Pilot* (1982, Konami) or *Boogerman: A Pick and Flick Adventure* (1994, Interplay Entertainment), for example, but perhaps not the specific mechanics underpinning that fun. Yet, it is precisely these specifics where, so to speak, the finger meets the nostril because they provide the context for and the inner windings of the fun those games afford. Game preservation is thus both a mnemonic (i.e., it spurs researchers to remember details that would otherwise be forgotten) and creative act (i.e., it leads to the generation of new historical knowledge); preservation mitigates the leakiness of memory and provides the kind of functional detail that is crucial to spurring the growth and creativity of the medium.

The same is true for other media, and film in particular provides an excellent case study on the value of preservation. Despite the fragility of film stock – celluloid is in many ways far more delicate than most forms of digital media storage – films of all kinds and of all eras have been incredibly well preserved across a variety of institutions, from local collections (e.g., Fukuoka City Public Film Archive; Provincial Archives of New Brunswick) to university archives (e.g., University of the Witwatersrand Archive; UCLA Film and Television Archive) to national centers (e.g., Laos National Film Archive and Video Centre; National Film Archive of Iran). This widespread and deep conservation has sustained the cultural, economic, educational, and creative viability of the medium for more than a century, through a host of challenges from competing media such as television, the Internet, satellite radio, cellular telephony, and digital games. One need only look to the proliferation of film festivals around the world or to the remarkable and influential power of the Hollywood star system to see that the medium possesses a cachet distinct from that of other media, a cachet due in large part to the enduring record of the films of the past and the ways in which that record continues to influence film production, consumption, and study today.

Ultimately then, despite some reservations about the question, "What if we do nothing?" we feel obliged to attend to it. The fact of the matter is that materials do go missing, and virtually all of these materials would contribute to the historical understanding of the digital game were they to be found. We turn then to a very brief catalog of the problems of doing nothing for game preservation.

### **Examples**

The number of known instances in which digital game material has been lost is quite large, and they fall into a variety of categories. We will not cover them all in this section of the white paper, but rather will treat three of the most important gaps in the record, the locales of absence: (1) source code for unreleased games, (2) published games, and (3) ephemera. These sections are by no means comprehensive; rather, they are intended to outline the rough circumferences of the major historical sinkholes for digital games as a way both to flag work yet to be done and to suggest the range of probable consequences should that work go undone.

#### *Source Code for Unreleased Games*

Daniel Bienvenu has documented nineteen games for the ColecoVision System that were advertised – including screenshots – but never released: the whereabouts of these games and their source code is unknown.<sup>27</sup> The researchers at Games That Weren't, a web-based archive of information related to lost games for various platforms,<sup>28</sup> have identified more than 75 games that made it into the alpha stage of development (at least), but then vanished. This issue plagues the latest consoles as well: researchers at Unseen64.com, for instance, have documented at least sixteen titles for the PlayStation 3 that have been canceled since that system was released. Mothballed games are not necessarily permanently lost, of course, nor should such titles necessarily be released to the public – there are more than enough bad games on the shelves as it is. It is important for those committed to game preservation to recognize these stoppages, however, because stopping work on a game is often the first step in its complete disappearance: a well-funded game is canceled, the developer cut loose, the physical studio packed up and closed down, the hard drives stored, ruined, and lost.

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<sup>27</sup>Bienvenu, D. Unreleased Games. *Daniel Bienvenu's ColecoVision HomePage*. Retrieved from [http://www.geocities.com/newcoleco/unreleased/unreleased\\_en.html](http://www.geocities.com/newcoleco/unreleased/unreleased_en.html)

<sup>28</sup>*Games That Weren't*, <http://gtw64.retro-net.de/>

Studying failure is often highly beneficial, but in cases of complete disappearance, there is nothing left to study.

### *Published Games*

There also exist many lost titles that made it through the development process and felt the cold steel of a store shelf. Calling these games "lost" is perhaps an exaggeration; even in the rarest of these cases, one or two dedicated collectors will have secured copies for their private collections. Such isolated copies, however, do little for future game development or game studies because they cannot be accessed by anyone else; they are thus functionally "lost." Here are some examples:

- *Mr. Boston* was a Vectrex-based 1983 promotional adaptation Clean Sweep developed for the Mr. Boston distillery in Massachusetts. It is considered ultra-rare by collectors, with auction prices that reflect this.
- *Shootout at Old Tucson* for the 3DO is believed to be a one-of-a-kind game developed in 1994 by American Laser Games.
- *3-D Rubik's Cube* was designed by Peter Niday for the Atari 2600 (VCS). Approximately three hundred copies are known to exist.
- *American Hero CD*, designed for the Atari Jaguar system in 2003, was the first Jaguar game to extensively use full-motion video and is only one of two games for that system that used David Schwartz' Jaguar GameFilm technology.
- *Les Schtroumpfs Autour du Monde* [The Smurfs Tour the World] was the last Sega Master System Game released in Europe. Since its release in 1996, fewer than one hundred copies have been located.

Each of these examples holds important details about the game industry that at present cannot be sussed out because these games are inaccessible. *Mr. Boston* is one of the earliest instances of a game "mod" as well as of a corporate digital game. *Shootout at Old Tucson* is remarkable for its tie-in not to movies – standard fare by 1994 – but to an actual movie set that served as the location for dozens of classic western films. Peter Niday's *3-D Rubik's Cube* not only demonstrated how frenzied the Rubik's Cube craze became (Atari had two versions of the puzzle for its VCS), but also broadly extended the gameplay boundaries of the 2600 hardware with some of that system's most brilliant programming. And *American Hero CD* and *Les Schtroumpfs Autour du Monde* were both swan song games for two marginally successful and internationally distributed systems, which is to say that they are milestone games that only the tiniest fraction of players, developers, and researchers have been able to play.

### *Ephemera*

Finally, there is the loss of all the peripheral material that surrounds game systems, from game documentation and memorabilia to tie-in products and corporate communications. Here again, the known losses are great and are likely dwarfed by the unknown losses. Hundreds of development studios have started and folded over the past half-century, most of them having made only small contributions to the history of the game medium. Considered individually, these studios and their creations may be relatively insignificant. Collectively, however, these numerous companies – their games, vision statements, financial structures, leadership, development models, and so on – add up to a highly detailed history of the industry and the medium it is built around. As a consequence, the loss of any material from these companies equates to missing pieces of the puzzle which researchers assemble to interpret their subject. This lack is not only a

loss for designers interested in learning about the past in order to make better games in the future, it is also a loss to all the other people in the game industry who might benefit from knowing what has come before in their particular professions: legal papers, business plans, industrial designs, technical specifications, management strategies, marketing schemes, and innumerable other information sources.

### ***What If We Do Something***

French philosopher Jean Baudrillard writes in his essay, "The System of Collecting":

What makes a collection transcend mere accumulation is not only the fact of its being culturally complex, but the fact of its incompleteness, the fact that it lacks something. Lack always means lack of something unequivocally defined: one needs such and such an absent object. (p. 23)<sup>29</sup>

From this perspective, the serious work of game preservation would be a never-ending commission from the outset. Were such a charge to be proffered, however, the results would be prolific and profound. Indeed, Baudrillard observes that collectible objects "constitute themselves as a system, on the basis of which the subject seeks to piece together his world, his personal microcosm" (7).<sup>30</sup> This intimate and microcosmic system of collecting has sustained digital game history for decades, but its limitations are now becoming painfully clear to researchers – whether from industry or academia – whose vision of the future is increasingly hindered by accidental ignorance of the past.

Historian of computing Kevin Schürer remarks in his essay, "The Implication of Information Technology for the Future Study of History,"<sup>31</sup> that there are many countervailing forces acting upon the project of preserving electronic media, but he argues that the most fundamental implication is inherent in digital media themselves. Contrasting traditional archivists dealing with volumes of physical letters, notebooks, drawings, reports, memos, and other documents that attest to a person's ideas and achievements, archivists of the digital age routinely deal with far more evanescent artifacts. While these artifacts tend toward the transitory, if an effective set of principles and practices could be developed for digital game preservation – and collectively adhered to – the history of this medium has a chance to become a tool for understanding its present and future incarnations.

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<sup>29</sup>Baudrillard, J. (1994). The System of Collecting. In J. Elsner & R. Cardinal (Eds.), *Cultures of Collecting* (pp. 7-24). London: Reaktion.

<sup>30</sup>Ibid.

<sup>31</sup>Schürer, K. (1998). The Implication of Information Technology for the Future Study of History. In E. Higgs (Ed.), *History and Electronic Artefacts* (pp. 155-168). New York: Clarendon Press.

## Some Possible Solutions

*Andrew Armstrong*

While the state of digital game preservation seems bleak, there are many active efforts to preserve digital games going on behind the scenes, and you can help us in focusing attention on items that are worth saving now, or coming up with better ways to ensure preservation of games and other materials that will become important in the future!

### ***Current Archiving Efforts***

Throughout the world, various museums and archives are working to preserve the history of computer systems and digital games. They do this usually through donations of games, hardware, and other software that is preserved for public display, as well as cooperation with historical archives.

There are also different ongoing academic projects to help preserve digital games, specifically researching the need to preserve the games themselves, as well as document how they were made.

The histories of different areas are also being researched and recorded via documentary films, books, and online resources. Internet databases dedicated to different systems, developers, and series of games all exist and are constantly updated.

### *Museums*

There are many computer museums around the world,<sup>32</sup> many which collect game software and hardware as parts of computer history.<sup>33</sup> These museums usually host archives of software and manuals, but their main purpose is putting on displays for the public. However, general computer museums concentrate on a broad range of computing fields; therefore, collections and projects devoted to game systems work can sometimes be limited.

### *Archives*

Archives hold documentation and related materials for researchers of almost any sort to access; the emphasis is on the organization of collections and provision of access to them, rather than public displays and exhibitions. Some archives host digital game material in addition to general computer work,<sup>34</sup> while others focus solely on the history of digital games.<sup>35</sup> <sup>36</sup> There are also online archives and catalogs of digital material, such as the Internet Archive, that contain games and game-related material.<sup>37</sup> All of these sources readily accept important items related to digital games.

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<sup>32</sup>List of Museums and Archives accepting contributions, [http://www.igda.org/wiki/Game\\_Preservation\\_SIG/Contributions](http://www.igda.org/wiki/Game_Preservation_SIG/Contributions)

<sup>33</sup>The National Museum of Computing, UK, <http://www.tnmoc.org/>

<sup>34</sup>Stephen M. Cabrinety Collection in the History of Microcomputing, Stanford University Libraries, <http://howtheygotgame.stanford.edu/>

<sup>35</sup>UT Videogame Archive, University of Texas, <http://www.utvideogamearchive.org/>

<sup>36</sup>National Videogame Archive, National Media Museum, UK <http://www.nationalvideogamearchive.org/>

<sup>37</sup>Internet Archive Game Videos collection, <http://www.archive.org/details/gamevideos>

## *Projects*

Throughout the world, different projects are being worked on to help preserve digital games. Examples include the Preserving Virtual Worlds project,<sup>38</sup> funded by the US Library of Congress and based at four US universities, and the UK's National Videogame Archive, which has created a promotional effort called Save the Videogame.<sup>39</sup> In addition, there have been exhibits and displays on the history of digital games, such as Game On, a traveling exhibition that has been held in the UK's Science Museum, the Computer History Museum, the Australian Center for the Moving Image, and, most recently, at the State Library of Queensland, Australia.<sup>40</sup>

## *Individuals*

Individuals and small groups also work on the historical preservation of digital games. Examples include Jason Scott's work on his *Get Lamp* documentary on the history of text adventures,<sup>41</sup> the efforts of a great number of private collectors, and books on the history of various companies, systems, or types of games.<sup>42</sup>

Individual collectors typically can help documentation efforts by providing information to databases, caring for personal collections of games, and conducting their own research into areas of interest.

### *How can you help?*

If you have ever worked on a digital game or in the industries surrounding them, you probably have physical items or digital artifacts (documents, screenshots, videos, software) that are important for the work of preserving our medium's history. We listed categories of useful historical materials above and ask that you consider donating them to your favorite or nearest museum.<sup>43</sup> If you do not have one, just contact a member of the IGDA Game Preservation SIG for advice.

If for any reason you do not currently wish to provide public access to material in your possession, consider the option of donating it for inclusion into so-called 'dark' archives, which generally do not make materials available for a stated period of time.

### *I can't donate right now!*

It is likely that you or your company own copies of games or archival materials of historical interest that you are not ready to donate to a repository. Perhaps you still need them for game development or as a means for documenting I.P. that you own. You should still consider contacting one of the archives or libraries listed in this white paper. Consider archiving them for now in a trusted or institutional repository (such as a corporate library or company archive) while providing information about them to a historical archive or museum. The curators are probably interested in knowing about material that will be available in the future; in some cases, they may prepare lists so both you and they can keep track of these materials. You might find it easier to locate what you have after consulting with archivists or librarians. This is very useful for digital games being produced today!

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<sup>38</sup>Preserving Virtual Worlds project, <http://www.ndiipp.uiuc.edu/pca/>

<sup>39</sup>Save the Videogame campaign, <http://www.savethevideogame.org/>

<sup>40</sup>Game On at the State Library of Queensland, <http://www.slq.qld.gov.au/whats-on/exhibit/cur/game-on>

<sup>41</sup>GET LAMP, THE TEXT ADVENTURE DOCUMENTARY, <http://getlamp.com/>

<sup>42</sup>IGDA Game Preservation SIG Resource List, [http://www.igda.org/wiki/Game\\_Preservation\\_SIG/Resources](http://www.igda.org/wiki/Game_Preservation_SIG/Resources)

<sup>43</sup>IGDA Game Preservation SIG Resource List, [http://www.igda.org/wiki/Game\\_Preservation\\_SIG/Resources](http://www.igda.org/wiki/Game_Preservation_SIG/Resources)

### *How about things not written down?*

In addition to any physical documents or digital files, your own role in making digital games is an important part of the historical record, and there may be ways to document it. Much of the past is lost when people do not have their own histories recorded. International efforts are currently underway to accomplish this goal via the IGDA Game Preservation SIG,<sup>44</sup> and many museums and archives conduct oral history programs, while private consultants can help to organize a company-wide oral history project. If you start up such an effort, please let the IGDA Game Preservation SIG know about it.

### *Is there any way I can help if I don't have material to contribute?*

Even if there is nothing you can contribute listed above, there is plenty of volunteer work to be done toward recording the history of digital games. You could start by joining the IGDA Game Preservation SIG and helping with our projects, or by providing sponsorship or donations to the various organizations trying to preserve the history of digital games. Even just paying a visit to museums and archives that do such work will make it worthwhile for them, and the visit might spark your interest in game preservation or history.

Finally, getting the word out that digital game history is being lost would help bring attention to the problem. People need to realize that they have to start preserving now, not tomorrow, and that there are organizations that require their help.

### **What Do We Need to Do Next?**

This is the first of two IGDA Game Preservation SIG white papers. Now that we have provided a call to action, we feel obligated to offer some solutions. The next step is laying out the best methods for preserving digital games and related archives, letting developers know how their companies can help during the production process, and providing working practices for both archives and companies. While museums and archives can hold some material, much of it will be retained by companies and individuals who should know the best way to store physical materials and software to keep these materials safe and secure for the future. Therefore, our next white paper will focus on how you can preserve what you own. This will benefit companies that hold copies of all their games and documentation materials and need help in managing them for long-term preservation.

Look for our next white paper at GDC 2010.

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<sup>44</sup>IGDA Game Preservation SIG, Oral Histories project,  
[http://www.igda.org/wiki/Game\\_Preservation\\_SIG/Oral\\_Histories](http://www.igda.org/wiki/Game_Preservation_SIG/Oral_Histories)



## **Acknowledgements**

*Henry Lowood*

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## Appendix 1. Museums and Archives

For the full list of contact information for museums and archives accepting contributions check: [http://www.igda.org/wiki/Game\\_Preservation\\_SIG/Contributions](http://www.igda.org/wiki/Game_Preservation_SIG/Contributions)

### Online Media Archives

- Internet Archive Videogame Collections, <http://www.archive.org/gamevideos>
- Software Preservation Society, <http://www.softpres.org/>

### North America

- Computer History Museum, California, <http://www.computerhistory.org/>
- DigiBarn, California, <http://www.digibarn.com/>
- Stephen M. Cabrinety Collection in the History of Microcomputing, Stanford University Libraries, <http://howtheygotgame.stanford.edu/>
- Strong National Museum of Play, New York, <http://www.museumofplay.org/>
- UT Videogame Archive, Texas, <http://www.utvideogamearchive.org/>

### Europe

- Association MO5.com, France, <http://mo5.com/>
- The Centre For Computing History, United Kingdom, <http://www.computinghistory.org.uk/>
- Computer Game Museum, Germany, <http://www.computerspielemuseum.de/>
- The National Museum of Computing, United Kingdom, <http://www.tnmoc.org/>
- National Videogame Archive (NVA), United Kingdom, <http://www.nationalvideogamearchive.org/>
- Retro Computer Museum, United Kingdom, <http://www.retrocomputermuseum.co.uk/>
- Silicium, France, <http://www.silicium.org/>

### Rest of the World

Please see the contributions page for further updates of places in Asia and Australia. If you know of any further archives or museums that accept digital game material, please contact the IGDA Game Preservation SIG.



## **Appendix 2: Survey – Records Management in the Gaming Industry**

*Part of the Game Documentation Study*

<http://terpconnect.umd.edu/~donahrm/survey/>

This is a research project being conducted by Rachel Donahue, under the participation of Dr. Kari Kraus at the University of Maryland, College Park. We are inviting you to participate in this research project because of your involvement with the video game industry and/or user community.

The purpose of this survey is to gather information related to the records management and preservation activities of the video game industry. Over the last several decades, video games have become more than simple entertainment for individuals. They've begun engaging the imagination and commenting on society in ways previously reserved for the book. As the cultural importance of video games (and other software) grows, professionals in the information world are faced with the challenge of keeping these digital objects accessible indefinitely into the future. Whether your company has a formal records management program or simply relies on the most junior programmer to deal with keeping things in order, knowing what YOU (and your company), the creator, do with these materials is the first step in understanding how to make sure your legacy is available in the future.

The results of this survey will benefit everyone involved in the gaming community by providing: an increased understanding of methods currently used to preserve culturally important software; starting point for scholars to explore the technical history of video games; a starting point for archivists to develop a documentation strategy for the video game industry; and a look into the ways amateur and professional preservationist activities intersect and deviate, complement and contradict one another. The results of this will be used to inform academic video game preservation projects and may be published in professional literature or conference proceedings. Although knowing what companies are associated with what policies would be very useful to the research, a desire to remain anonymous is understandable. Please be sure to check "I wish to remain anonymous" on the survey if you wish to do so. Even if you agree to follow up questions and submit your company's name with the survey, these details will be available only to the researchers and will not be shared with the community.

The survey is made up of both multiple choice and free text questions, with the option to add free-text responses to many of the multiple choice questions. The survey may take anywhere from 30 minutes to two hours, depending on the level of detail you choose to provide. These questions are intended to collect data and not to imply that any form of records management or preservation is better than any other. If you dislike the options available, please feel free to use the free text fields to elaborate. For questions with numerous, non-exclusive options, check all that apply.

We will do our best to keep your personal information confidential. To help protect your confidentiality, your responses will be sent with SSL encryption and stored in a password-protected account. Personally identifying information will only be available to the researchers. Any data shared with outside researchers will have all personally identifying information removed from the responses. Very little demographic data is being collected, and you may choose to remain completely anonymous by not providing answers to revealing questions.

Participants from the industry face some risk of retaliation by their employer for revealing internal practices, and commercial entities (competitors) may be able to use

published findings to their advantage. Your responses will be paraphrased to make identification less likely. You may choose the "I wish to remain anonymous" option to avoid having the name of your company published. If, however, you are willing to be directly quoted (with or without your name), please state this in the last question and provide your email address. Quotes will be verified prior to publication.

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time.

If you have any questions about the research study itself, please contact Kari Kraus at [kkraus@umd.edu](mailto:kkraus@umd.edu) or myself at [donahrm@umd.edu](mailto:donahrm@umd.edu)

If you have questions about your rights as a research subject or wish to report a research-related injury, please contact: Institutional Review Board Office, University of Maryland, College Park, Maryland, 20742; (e-mail) [irb@deans.umd.edu](mailto:irb@deans.umd.edu); (telephone) 301-405-0678

This research has been reviewed according to the University of Maryland, College Park IRB procedures for research involving human subjects.

Thank you for your participation!

Rachel Donahue

Graduate Student

iSchool

University of Maryland, College Park

College Park, Maryland

USA

1. Do you wish to remain anonymous?
  - Yes
  - No
2. What company do you work for?
3. Would you label your company a
  - Developer
  - Publisher/distributor
  - Both
4. What type of games does your company deal with?
  - Browser-based games
  - Mobile device games
  - Computer games
  - Mini games
  - Console games
  - Other:
5. How long does game production typically take, end-to-end?
  - 0-6 months
  - 6 months to less than 1 year
  - 1-2 years
  - 3-4 years
  - Longer/It depends:
6. How large is the company? (All staff - if your company's business model involves hiring teams based on project size, please use the free text space to describe.)
  - 1-4
  - 5-9
  - 10-24
  - 25-49
  - 50-99
  - 100+
  - It's complicated:
7. How large is your records management/archives/library staff?
  - I am the staff
  - 2-10
  - 10-20
  - More than 20
  - Other:

8. Does your company have an established archives/records management program (activities, policies, and procedures to deal with the paperwork/files generated during business)?

- Yes
- No
- If yes, any details you would like to share?

9. What about a library?

- Yes
- No

For the rest of the questions, if your company has a library but not an archives, answer the question for your library's materials/policies. If you have neither, try to answer as regards whatever record keeping activities your company does engage in, and feel free to elaborate in the free text fields.

10. If not, have you considered establishing one?

- Yes
- No
- If yes, any details you would like to share?

11. Have you (if you handle your company's records) had any formal archival/records management training?

- Yes
- No
- If yes, what form did that education take?

12. Are you a member of any professional organizations (gaming, computer science, archives, or other)?

- Yes
- No
- If yes, which ones?

13. How long have you worked for the company?

- 1 month to less than one year
- 1-3 years
- 4-6 years
- 7-10 years
- More than 10 years

14. Does the archives/records management program include:
- Software design materials (pre-release versions, sketchbooks, etc)
  - Business records (Payroll, meeting minutes, etc)
  - Both
  - Design but not business
  - Business but not design
15. Does your company use records schedules, which define what materials should be retained on a temporary or permanent basis, for the development portion of the business?
- Yes
  - No
16. How do you determine what is permanent (worth saving indefinitely) and what is temporary (destined for the shredder)?
17. Are your permanent records stored in your company's facilities, or off-site with a company such as Iron Mountain?
- On-site
  - Offsite (where):
18. Do your programmers use an automated version control system?
- Yes
  - No
  - Which one?
19. Do your designers use a 3d asset management tool? (e.g. Collada)
- Yes (Which one):
  - No
20. What are your main records series/groupings (under what over-arching headings are your records filed under)?

21. What materials are included in the set of records pertaining to a particular game?
- Design documents of all kinds
  - Development-related correspondence
  - Artwork, such as conceptual art, sketches and storyboards
  - Prototype versions of games
  - Game development source code, and the resulting binary executables
  - Game assets (e.g., the original 3d models of characters)
  - Tools developed to support game design and programming
  - Machinima and other recordings of gameplay
  - Development-related maps (shadow maps, influence maps, texture maps, etc.)
  - Scheduling/planning documents
  - Budgets, forecasting, market research, and other business-related documentation
  - Other documentation related to the developer/publisher relationship
  - Company newsletters and circulars
  - Advertising and marketing materials, especially pieces used for unique, one-time purposes
  - Press kits and demos
  - Legal documentation
  - Books on game design, development, and game theory
  - Source or inspirational materials (i.e., writings, film, art, etc. that inspired a game)
  - Powerpoint presentations for conferences and meetings
  - Game magazines, including clippings files
  - Records from groups, organizations, and individuals who are associated with the videogame industry, but are not involved in game development
  - Other:
22. Who is allowed to access the archives/library (or to your records in general, if you lack a formal program)?
- All staff
  - All staff and the public
  - People with approved requests
  - If (3), please describe the approval process
  - All staff, with selected materials on exhibit for the public
  - Only selected exhibit materials can be accessed

23. Are games that don't make it to market included in the archives?
- Yes
  - No
  - Sometimes (please elaborate):
24. Are all versions of a game deemed to be worth saving permanently, or only the final product?
- All versions
  - Major revisions
  - Final product
25. Has or would your company ever consider(ed) transferring records to a university or other institution to make them available to the public?
- Yes
  - No
  - Where/other details:
26. What software preservation tactics do you take with archived copies of software; in other words, what do you do to make sure the software and files remain uncorrupted and accessible?
- Simple bit-stream level preservation in the original format
  - Transformed/converted into a preservation format when no longer actively used: (Free text for format description)
  - Transformed on demand (E.g. if the game is needed for a "classic hits" release)
  - Other:
27. Do you practice emulation, migration, or a combination of the two?
- Emulation (simulation or virtualization of the original operating environment)
  - Migration (transference, transformation, or conversion to a different hardware/software format)
  - Both
  - Details:
28. Are files kept on external magnetic or optical media, or in networked storage? What type of media/storage set up?
- Saved on networked hard disk
  - Saved on solitary hard disk
  - Saved on external magnetic media
  - Saved on optical media
  - Other or a combination, please describe:

29. What do you use to describe game-related records?

- An XML Metadata schema
- In-house authority list (list of accepted/vetted terms to describe the records)
- Unstructured text
- Other/details:

30. What level and type of metadata do you create and maintain? What portion of it is generated manually versus automatically?

31. Anything else you would like to say?

32. Would you be willing to answer some follow-up questions and/ or would your company be interested in working with an academic project exploring the preservation of video games? Follow up questions may be as simple as a request to quote directly from your responses, or a request for clarification of your procedures. Please provide an email address if so.

## **Appendix 3: Survey – Preservation activities in the video game user community**

*Part of the Game Documentation Study*

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Participants within the community could face legal action for breach of license agreements if identified. Given the lack of identifiable data being collected, this is unlikely. Your responses will be paraphrased to make identification less likely. If, however, you are willing to be directly quoted (with or without your name), please state

this in the last question and provide your email address. Quotes will be verified prior to publication.

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1. What classic game systems interest you?
  
2. What modern game systems interest you?
  
3. Do you actively collect game systems and software?
  - Yes
  - No
4. Do you only collect officially released items, or do you also look for unreleased material?
  - Official Releases Only
  - Unreleased Only
  - Both
5. Do you actively collect related materials like posters, toys, and other promotional materials?
  - Yes
  - No
6. Do you own the original consoles for the systems that interest you?
  - Yes
  - No
7. Do emulate the systems that interest you? (E.g. ZSNES, Stella, AppleWin)
  - Yes
  - No
  - What do you use?
  
8. Do you play classic games on modern systems? (E.g. Virtual Console, Namco Museum releases, etc)
  - Yes
  - No
  - Details:
  
9. If you answered yes to questions 4 or 5, how does the game-play experience compare to the original console?

10. What gaming websites do you regularly visit?

- MobyGames
- Home of the Underdogs (before it shut down)
- GameFAQS.com
- GameSpot
- IGN
- 1up
- Other (Please list):

11. What gaming websites do you contribute to? (E.g. Providing game data, writing articles, etc.)

- MobyGames
- Home of the Underdogs (before it shut down)
- GameFAQS.com
- GameSpot
- IGN
- 1up
- Other (Please list):

12. Have you ever participated in preservation activities (activities that will ensure the games are playable into the future) for games?

- Written/contributed to an emulator
- Ported a game
- Released a previously unreleased game
- Imaged disks
- Restored/refurbished hardware
- Translation of a game into another language
- Other (Please describe):

13. Have you ever remixed a game or added your own content? (E.G. building custom levels, replacing sprites, editing a game to make something new like the Mystery House Taken Over project)

- No
- Yes (Describe):

14. What aspects of a game do you think are most important to preserve? (Check all that apply, enter additional aspects in the free text field.)

- Graphic content
- Color fidelity (E.g. if something was originally played as white text/sprites on a black field, is it ok to present it as black text/sprites on a white field?)
- Text content
- Sound
- Timing (Think old adventure games, here -- is system lag part of the experience?)
- Method of user input (keyboard, controller, etc)
- Other:

15. Anything else you'd like to say?

16. Would you be willing to answer follow up questions? Follow up questions may be as simple as a request to quote directly from your responses, or a request for clarification of an answer. Please provide an email address if so.

## Notes

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