

# Where Does Significance Lie: Locating the Significant Properties of Video Games in Preserving Virtual Worlds II Data

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## Abstract

This article extends previous work known as Preserving Virtual Worlds II (PVWII), funded through a grant from the Institute of Museum and Library Services. The author draws on interview data collected from video game developers, content analysis of several long-running video game series, as well as the project's advisory board and researcher reports. This paper exposes two fundamental challenges in creating metrics and specifications for the preservation of virtual worlds; namely, that there is no one type of user or designated video game stakeholder community, and that significant properties of games cannot always be located in code or platform. The PVWII data serve to explain why existing ideas about preservation of video games are inadequate when games are treated as digital cultural heritage. Preservation specialists need to bind nebulous and dynamic digital objects, a process that is necessary while inherently artificial.

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## Introduction

That institutions like the Library of Congress (LoC), New York's Museum of Modern Art (MoMA), the Internet Archive, and the UK National Videogame Archive (NVA) are concerned with preserving games signals a new era in preservation of digital objects (Bachell and Barr, 2014). Video games have become recognized as cultural artifacts – not just technical inventions, but designed experiences for numerous communities of players. Digital preservation does not happen in a vacuum: objects are preserved with the idea that some community will use them at some point in the future. The stakeholders with interest in video games are manifold: players, historians, researchers in the academe, and industry partners. However, current preservation practices for video games presuppose a designated community somewhat narrower than 'everyone' (CCSDS, 2012). Normative practice for digital preservation has focused on information about games' codes and platforms as significant properties for long-term access. Even recent work on emulation developed along the lines of recommendations from the International Game Developers Association (IGDA) struggles to encompass the significant properties of video games that relate to use and users of a game (Anderson et al., 2010). Different groups think of significant properties in different ways. While many scholars and research projects have accounted for the underlying code and surrounding computing environment, the data in this article extend current understanding by showing that, for some designers and players, surface and affective experiences are the most significant (Best and Marcus, 2009; Bogost, 2015).

This paper follows notions of significance as they emerge from the data drawn from the Preserving Virtual Worlds II (PVWII) grant project, funded 2010-2012 by the Institute of Museum and Library Services (IMLS) to investigate the significant properties of video games and how this information might be put to use in aiding preservation decisions. The author argues that what constitutes a significant property, according to PVWII data, sits with discomfort in the realm of archival science because it points to properties that lie outside the archival objects themselves. Preserving games is not just making a game playable at a given time: in fact, some of the PVWII research data suggest that the ability to play a particular game is not a necessary condition of preservation. Rather, preserving games is about understanding the significance of a particular place and time, the social interpretability of a game (McDonough, 2013 in Anderson and Delve, 2013). This is to say, for example, that it may be more important to understand the affective experience of Halo 5 to people in 2015 and what will be necessary in future to facilitate such comprehension, rather than to keep a working copy of code and its native computing environment.

This article employs interview data from the PVWII project; content analysis of the set of video game franchises explored during PVWII; specific examples from one series from the research set, Carmen Sandiego, that serve to illustrate the broader findings; and meeting minutes and project reporting done by the principal investigators, their research assistants, and the grant's advisory board members. From these data emerges new conceptions of significance.

The content of the analysis of the three data sets reveals how users, academic and otherwise, find and speak about what is indispensable for long-term preservation of video games. These data are the evidence for the main argument of this article: that existing preservation guidelines do not adequately account for significance that is not

located solely in an object's code or platform. The author concludes with a call for new guidelines to enable preservationists to work with an expanded notion of significance. Significance exists at a number of different levels: in the code, but also the computing environment; analog and digital peripherals; and also in social and cultural experiences of the game, such as particular performances of play or relationships between the game and contemporary world events.

## Background and Literature Review

The term 'significant properties' has a long and loaded history within preservation and curation literature. Hedstrom and Lee (2002) define the term as "those properties of digital objects that affect their quality, usability, rendering, and behavior". Described variously in many places, previous research has summed up the sheer quantity and variety of uses of this term (Giaretta et al., 2009). Such discussions occur across institutions and information types. There is a general consensus that significant properties are necessary but the tensions, like those noted in the introduction, partly explain why there are no widely adopted methods by which one can determine what is 'significant' for preservation purposes.

Webb, Pearson, and Koerbin (2013) of Australia's National Library nicely sum the situation in saying:

"We have come to a tentative conclusion that recognising and taking action to maintain significant properties will be critical, but that the concept can be more of a stumbling block than a starting block, at least in the context of our own institution."

Deciding where significance might lie is something that is addressed, if not directly, in a number of projects in recent years dealing with the preservation of games and other complex media. There has been a noticeable shift in the preservation community away from an assumption that migration to new media should be the default strategy: projects like the Keep Emulation Environments Portable (KEEP) (Anderson et al., 2010) project, Dappert and Farquhar's work on significance (2009), Hedstrom and Lampe's (2001) investigation about emulation versus migration in video games, and even the 2012 revisions to the OAIS reference model (CCSDS, 2012) acknowledge the preservation community's increasing understanding of the importance of the computing environment and thus the need for strategies like emulation. While some have suggested that this move away from migration means less change in the game object over time making the issue of significant properties less relevant, this article postulates that the significant properties debate remains salient. By recognizing that significance can be located beyond the code, Dappert and Farquhar bring the discussion of significance to emulation and the computer environment. This article proposes to go a step further: it suggests a treatment of significance and calls for future projects that work across the many proposed preservation strategies, including but not limited to emulation, migration, universal machines, and computer history museums.

Video games are a compelling object of study to tackle these issues: they are complex objects with diverse user communities. Here the term 'user community' is deployed purposefully. Designated community, a term stemming from the OAIS reference model (CCSDS, 2012), refers to a purposefully defined and, often with

cultural heritage or public content, artificially narrowed subset of all possible or even all current users. This article explores just how varied the user community is in the case of popular games, a task which makes its artificial narrowing for the purpose of creating a particular designated community all the more difficult.

Video game user communities are important because it is the remit of preservationists to provide access to an object that must be performed and meet ideally some expectations between the creators and the users (Montague et al., 2010). The research conducted through PVWII asked about significance without qualifying a particular definition for the term. Interviewees were asked different questions depending on their professional role. Interview subjects were asked questions such as: What makes a franchise over time? What elements are most significant about a game? What draws you to this franchise? What was the formula and why did you stick with it? What are the anchors? What is significant about this game? If things must change over time, what must remain consistent? This is important because the lack of preconditions helps to capture, at different times and with different participants, various elements of the vocabulary and model identified by the Digital Object Properties Working Group (DOPWG) of the Planets project, including the performance of the object, properties and values according to both creators and users. Cultural objects like games have different user groups with different expectations of how the objects will be performed over time and the breadth of data types and sources in PVWII serve as a reflection of this variance.

### **Situating PVWII**

Based at the University of Texas-Austin, the Preserving Games Project was an IMLS-funded ethnographic initiative that sought to document and preserve the design process of massively multiplayer online games (MMOs). The focus of that project was the role of game production materials, which are often ephemeral, in preserving the totality of a game (Winget, 2007). Winget's work is complemented by Bachell and Barr's research with independent game studios in the United Kingdom (Bachell and Barr, 2014). Bachell and Barr also worked with developers in order to understand the archiving and records management studios do for their own titles, a move in keeping with the larger digital preservation ethos to push preservation practices upstream. The precursor to PVWII, Preserving Virtual Worlds I (PVWI), received money from the National Digital Information Infrastructure Preservation Program (NDIIPP)<sup>1</sup>, a program administered via the Library of Congress as part of the recognition that the increasingly digital cultural record needs a special infrastructure for its preservation (McDonough et al., 2010). PVWI looked at issues of emulation, copying, and copyright.

Using the term 'virtual worlds' to explore the preservation of spaces like Linden Lab's Second Life, PVWI explored pragmatic preservation challenges ranging from intellectual property concerns to the best tools with which to copy code within a game or virtual space (McDonough et al., 2010). PVWI research led to concrete recommendations, such as packaging standards for gaming content operable with both the Functional Requirements for Bibliographic Records (FRBR)<sup>2</sup> and the Open Archival Information System (CCSDS, 2012). One of the conclusions of PVWI led directly to PVWII: the understanding that "...without a clear understanding of which aspects of a game are likely to be considered significant by scholars in the future, it is extremely

1 National Digital Information Infrastructure and Preservation Program:  
<http://www.digitalpreservation.gov/>

2 Functional Requirements for Bibliographical Records (FRBR):  
<http://www.ifla.org/publications/functional-requirements-for-bibliographic-records>

difficult to choose an appropriate preservation strategy” (McDonough et al., 2010). This article begins to answer this call by rendering the PVWII data in service of understanding how significant properties should inform choices about preservation: if the general conclusion of PVWI was that every aspect of a game might not be maintainable over time, then tools and reference models are necessary to help determine what must be prioritized.

## Methodology and Results

### Data Collection

PVWII studied a set of long-running game series: Carmen Sandiego, Oregon Trail, Typing of the Dead, Doom, Civilization, Harpoon, and a variety of Mario games. These franchises cover the years from 1985 to the present. The research team examined significance by collecting data using content analysis of each of these game sets and interviews with game designers and other stakeholders. In addition to playing every game in the series, researchers examined associated materials including packaging, source code, mods<sup>3</sup>, and occurrences of games in popular culture. These latter included things like the relationship between the video game production studio and its television reincarnations in the case of Carmen Sandiego, as well as popular game mod communities or phenomena like news coverage about the ‘Eternal War’, where a Civilization player was stuck at a particular point in a single on-going game for several years and had their story picked up by web venues such as Reddit and later by national news coverage such as CNN. The data analysed for the article cover a population of 40 participants, including 20 interviews each averaging around 50 minutes. The research team conducted semi-structured interviews with professionals involved in different aspects of game production, including game designers of both of the aforementioned titles and also of contemporary titles as a basis for comparison. The interviewees included enthusiasts involved in the creation of popular mods as well as others involved in game production at studios, such as those in marketing. Nine hours of advisory board meetings minutes compiled by a PVWII project manager covers another 20 participants.

Selecting interview participants reflected the changing nature of game design and production over the time period covered by the games in the PVWII game set. For the older games in the PVWII canon, those who penned the original ideas for the games might also have done everything from programming the game itself to writing the music and designing the box logo. Video game labor is now more likely to be compartmentalized or specialized than in earlier years of game development. Interview subjects thus included art specialists, programming specialists, and promotional and public relation personnel in addition to primary coders of older games who had much more holistic roles in game creation. PVWII interview subjects included developers of the games in the set as well as developers working on contemporary games for comparison. Coders who designed mods, or modifications of popular games, were also included in the PVWII designer interviews in recognition of their work within this field and this totality of perspective, though not meant to be representative, is

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3 ‘Mods’ refers to modifications of computer games made by fans wherein fans build on existing game code or platforms to add features to existing games or to create entirely new games using components of the original.

nevertheless reflective enough to enable the researchers to speak to changes across the industry as roles and times change.

Interviewees were asked about their own game playing experiences, preferences, and moments of significance in games apart from work. The diversity of their data helped develop a broader understanding of what constitutes significance in games.

For this article, these data were coded iteratively using NVivo software, beginning with the semi-structured interview data. Codes denoting significance were then applied to the advisory board minutes and content analysis of the game franchises. The author applied three overarching codes: explicit significance, implicit significance, and non-significance. Firstly, explicit significance referred to situations wherein participants used terms significant, significant property, or significance to describe what they were speaking about. Secondly, the author employed a code for implicit significance, situations in which participants used language to describe aspects of a game or their interactions with it as very important or essential to long-term understanding. The third overarching node was for those things participants described as insignificant or unnecessary for long-term understanding. Within each overarching node, content was further broken down by where the significance was located: within the code, within the computing environment, within the hardware, or external to the code, environment, and hardware.

## Data Analysis

In PVWII, researchers looked for significance in a number of places. Following existing frameworks for documenting significance in software (Matthews et al., 2008; Knight, 2008), the first portion of the research project focused on the games themselves. For the research about the games and their code, the team compiled a number of titles from each series, an exercise that was equal parts detective work and opportunity, given the age of this franchise. Similarly, for each title it was necessary to build a platform that could read and play the storage media. Following the construction of a functional computing environment, each game was played through and subjected to content analysis. The analysis aimed to elicit technical and mechanical significant properties, including elements inherent to the code and computing environment, such as color spaces, sounds, and interactions with screens and peripheral technologies. What the researchers found in terms of technical properties did not always match the findings from the second part of PVWII, the interviews with game creators and what they reported as significant properties.

Looking across entire game series led to the conclusion that specific content from an individual title from a franchise is not always necessarily significant when looking at the series as a whole. When asked about what constituted the formula of an entire game series and the decisions about what to keep and change with each successive title in the franchise, one game developer said:

“So the content was always just supposed to be secondhand to it, it was not supposed to be, you know, it wasn’t the main thing. It was mostly about chasing Carmen Sandiego around the world finding cool stuff... I think... the general... experience doesn’t matter what platform or where you see it or what it’s played on.”

For example, the narrative structure for all of the Carmen Sandiego is consistent across games and their contemporary transmediated (predominantly television) counterparts. The graphical interface and method of control/player-interface interaction is also remarkably similar over time, barring small changes given the intended age of

the audiences and changes over time in technological capacities. This suggests a significant property of the franchise is located in consistency across the series, over titles and over time. Part of what motivates this type of franchise consistency that then becomes a significant property of the series. The interview data from Broderbund marketing noted that the formula was so [financially] successful that the lack of changes was purposeful:

“So that was one important part of it and... already the game structure was a very successful and profitable product for Broderbund. So there wasn't a business reason to change what wasn't broke, you know?”

These significant properties, like the inherent Carmen-ness of each game, also lie in surface and some affective experiences of the game. Within the context of game history, the idea of Carmen-ness takes on added importance given its role in the development of character identities within the field of video game development more broadly. Said a game developer about the success of the Carmen formula:

“And so we pushed heavily on the [Carmen] character because ... Gene [Portwood] was an ex-Disney animator that worked on the original Snow White and all that stuff. And Disney was incredibly character oriented. It was the first time, he was really part and parcel of bringing character development into games...”

Time is also significant in some games, in the sense that even perfectly rendered code in an emulator is not sufficient to play the game. Among many things to be further explored are the signs that locate each game firmly in its time of creation apart from the technical aspects that reflect contemporary technological capabilities. Using Carmen Sandiego as an example again, content analysis of the games series revealed things such as changes in country names over time, changes in socially acceptable representations of marginalized and indigenous people, and representations of gender and race, among other things. Because the game is a geography-oriented scavenger hunt, without an understanding of basic geopolitics contemporary to the original publication date, the game is unplayable. This was borne out informally during the course of the research. A younger student playing a game while the author took notes was confounded by the need to use a paper encyclopedia and asked repeatedly to use Google to find answers. The very behaviors inherent required in looking something up in a paper encyclopedia or dictionary are no longer staples of the US education system, yet the use of the analog copy control in the first Carmen game requires this for play. An interview subject who was involved in the original marketing of the Carmen games said about the significance of the use of an analog book with the game over time:

“...having children who are in high school now and... the education on how to use reference is of course internet-based now. However, I think that they miss out and maybe kids who don't have physical books as the first place they go for reference do miss some of the, not just information but also the way you have to search and the speed, the slow speed that you have to use to find the thing that you're looking for.”

The player interface for Carmen titles reflect this speed of information seeking for game progress: levels are not timed in the sense of a ticking clock, allowing players time to look up signifiers needed to identify a location and/or historical period. Significant properties of games include the particular temporal context in which the game was designed, and this is manifested in many ways. For Carmen, this includes not only dated geography but also the then-unusual emphasis on character development and

the use of paper encyclopedias for doing on-the-spot research necessary to advance the games.

Data from PVWII also suggest that peripheral devices should be included within the umbrella of significant properties. A researcher on the PVWII team brought up the oft-cited example of the Nintendo title *Duck Hunt*: game play requires the use of a special controller, a light gun, which in turn only works with cathode ray tube display monitors. When a colleague embarked on a project exploring preservation of *Duck Hunt* in 2010, the chief difficulty was finding a working light gun: she was able to find several copies of the game cartridge itself as well as working Nintendo Entertainment System (NES) consoles, but struggled to track down the light gun. At the time, CRT televisions were still somewhat available: as of the writing of this article, these too are also becoming increasingly rare. From the PVWII case set, the encyclopedia bundled with *Where in Time is Carmen Sandiego* (CSD Time) is necessary to play the game on a personal computer: it acts as a copy control, requiring the player to enter words printed on certain pages of that specific copy of the *New American Desk Encyclopedia* in order to advance play. The encyclopedia is a peripheral, and it is a piece of analog representation information, to use the language of OAIS (CCSDS, 2012). This same book comes bundled with the CSD Time port<sup>4</sup> for the Nintendo Entertainment System (NES); in this game, the encyclopedia can help players looking for historical facts as they seek to catch Carmen, but the book itself is not integral to play, especially in the era of Google and Wikipedia. Is the encyclopedia still a peripheral? Is it still a piece of analog representation information? Even if the answer is yes, are preservationists absolved from the task of preserving<sup>5</sup> the encyclopedia just because its use is no longer mandatory? Does the fact that the original packaging was a particular size just to accommodate the book affect this decision at all? Ephemera like concept sketches or packaging materials, annotated code and other elements of the production process also constitute important game components (Newman, 2012), much like the production ephemera researched by Winget (2007) and Bachell and Barr (2014). A Carmen employee working in management and marketing noted that the book was a part of the game. In response to a question about the formula for consistency across the series and how closely it was adhered to in the production process for each new title, the interviewee said:

“...everybody I think at the time, particularly [creators] Gene Portwood and Lauren Elliot, felt very strongly that the book part of it still be always the center of what the physical product was... And it was one of the feedback that we got... from the teachers and the school districts that were buying it that reference material gave it that much more credibility...”

For the Carmen series, the books that came bundled with each new title in the franchise in part determined the financial success of the game, which in turn facilitated it becoming a long-running series. Other game developers from other games noted the importance of financial success in allowing games to have a sufficient public use and profile that thus rendered them worthy of long-term preservation. This article argues that the Carmen Sandiego books are a significant property of the game, and despite that

4 Port in this case refers to the fact that the game code was initially written by Brøderbund for a variety of personal computers including Macs, PCs, and Tandys, and a Nintendo second party developer was hired to make a version for the NES.

5 And perhaps hunting down the book – the copy of *CSD Time* that was obtained by the PVWII research team had long since lost its book. The author also found other copies of this game for sale on online resale sites that also lacked the attendant books.

fact that with successive generations it becomes less an object of representation information and more a piece of ephemera, its status as significant does not diminish.

### **Moving Beyond the Peripherals**

The importance of peripherals and even the computing environment itself is something that has been recognized by many games researchers; both of these are also reflected across the PVWII data. Some examples from the PVWII data: all the Brøderbund interviewees spoke of the importance of the book and an interview subject who worked on the first Civilization title released for Microsoft Windows spoke at length about the importance of that particular environment, citing the financial push behind it (Windows machines were cheaper than Apple products), as well as the new flexibility of multiple, resizable windows and their utility for the game. Projects that advocate the preservation of environments as well as objects, like KEEP, speak to this recognition. Preserving boxes and original packaging also has an official stamp behind it when these types of objects are included in video game retrospectives in major cultural heritage institutions like the Smithsonian in the United States or Beeld en Geluid in the Netherlands. This paper extends this argument to say that the social and historical aspects of game play also constitute significant properties for some communities and institutions. Both of these are part and parcel of play and how players punctualize games (Law, 1992; Bogost, 2015). Punctualize here stems from socio-technical studies literature and denotes the act of distilling a nebulous network of social and technical actors under a single term, very similar to the way one might use the simplistic designation Carmen Sandiego or Civilization in a way that encompasses a broad collection of games, television shows, social media identities and social experiences.

Often of utmost importance is the gameplay experience, and although this can constitute the functionality of the game itself, it also encompasses the social performative aspects of play according to PVWII data. For example, when Carmen Sandiego and Oregon Trail debuted, they were marketed as ‘edutainment’ and were more often than not played in schools. In this environment, many students would cluster around a single machine and play together as a single avatar, as these games are technically for one-player. One game developer who worked on Oregon Trail said:

“I’d also place [preserved games] in context... I’d see [a game] in place. I’d see pictures of school kids and their computer labs at that era, because... each of those games... are very much contextual of what the kids are doing at the time... Computers were expensive so you shared them generally with friends so it was a little more social that way.”

Such games were one-player in the sense that they only had a single avatar, but were explicitly designed with the idea that multiple people would collaborate to operate that single avatar, meaning these early edutainment games are some kind of hybrid between the single and multi-player categories. A developer for Carmen Sandiego games said in response to a question about designing learning experiences through games:

“And I have had opportunities to... watch students play the game when it was first available. But also to talk with people who are now in their 30s who remember playing the game when they were in school.”

This particular performance of play – crowded around the school computer – is itself a type of significant property not embodied in the code or the platform.

For many game players, glitches, Easter eggs<sup>6</sup>, tempo and/or pitch of music, and other similar elements make up core experiences of the game object. These are significant properties that are often noted post facto when they are missed in archival copies and this is clear in the PVWII data. Sound is an acknowledged challenge in the grand landscape of game preservation. This was noted in PVWI and appears in PVWII data as well. A contemporary game developer interviewed for PVWII noted the difficulty with sound emulation when discussing the merits of emulation as a preservation strategy. When building playing environments for the Carmen Sandiego game series during phase one of PVWII, the author was unable to play through one title because of the inability to locate either an appropriate operating system or an emulator that contained the proper sound card to play the audio track: Carmen Sandiego Deluxe, a 1992 CDROM game, gives audible directions and cues. Progressing beyond the basic introduction was not possible even though the images and other game mechanics were in working order. As part of a session that looked at reimplementing versus preservation of original code and environment, an advisory board member from a national museum shared an experience with a video game reimplementing where the sonic emulation was very poor. This was so disruptive to his experience, having a memory of earlier versions, that he could not play the reinstated version of the game. What makes this story salient is not just the note about the difficulty with sound emulation, but that this person's children responded to the same emulation by saying "well, what's wrong with it?". For these children, the difference in sound did not interfere with play because the general behaviors of the game were still interpretable; for the parent with a different set of expectations, who thus clearly represents a different user subset, this meant the emulated version of the game was not an adequate reinstatement of his original experience. In these pieces of evidence, the sound is a significant property of the game, not just as a piece of code operating on a particular environment and hardware set. It is also the aural affective experience of the game that is significant.

There is increasing recognition of the value of playthroughs as archival tools. Playthroughs refer to either externally or natively created<sup>7</sup> videos that follow a player as they play through parts of the entirety of the game. PVWII explored these, speed tests, and saved game files as potential benchmarks for authenticity. Understanding how a game progresses, acts, and feels is essential to its preservation. When moved to another machine or console, a game has to look, act, and feel a certain way in order for people to recognize it as the cultural artifact in question. The question of how important these playthroughs are arose in PVWII advisory board meetings. In a session about saved games and speed runs, one advisory board member pointed out that institutions like libraries might want native playthroughs themselves plus video recording of the people actually doing the playthrough: these in combination might serve as the best benchmarks of authenticity and quality in game preservation. In the same session, a PVWII researcher described a mod wherein fans combined two games from the cast set, Quake and Doom, by running the game logic, plots, characters etc. of Doom in the more expansive Quake engine, which allows for more different moves, capabilities, scenes, etc. This researcher registered concern that by watching an external playthrough video

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6 Easter eggs in the context of video games, other interactive software, and digital video refer to hidden content that can be uncovered by users. The name invokes the notion of an Easter egg hunt in that users need to search for this content rather than it being obviously displayed as a normal feature of the media and program. They often contain hidden messages, jokes, or bonus features.

7 External in this case refers to video made using screen-captures or a separate filming device. Natively created files are those wherein the game itself has a mechanism for recording play and saving this data.

of someone playing, the viewer would not necessarily be aware that underneath the surface package they are experiencing a hybrid of two games. This suggests that the hybridity of two games is a significant property for the user embodied by the game researcher. Other PVWII researchers suggested that adequate metadata could be the solution for these concerns: descriptions could accompany the video which explain the mod that combines Doom and Quake. Furthermore, in this case part of what warrants documentation to inform future users of this is also the social moment wherein fans of the two games use the more expansive engine of one to explore new possibilities in the other; this social moment in which fans had the means and desire to combine the two is also a significant property for the game mash-up because it speaks to the social position the fans occupied in terms of skill sets and leisure time, for example.

For certain games scholars, the code is really essential to understanding what was happening with in a Doom/Quake mod; the PVWII researcher who suggested this anecdote identifies as part of this user community. Games have several varied user communities, and the question for a memory institution is how to convey the significant property to best match user and institutional needs: what is significant in the Doom/Quake example is a melding of code, but also the social context of the games that allowed the two to be joined and the resultant affective experience for fans able to mash two popular titles together. This latter significant property can be documented in a number of ways, from the creation of simple documentation stating this to pointers that indicate fan web content in the Internet Archive; appeals to code may not be necessary to express this kind of significance.

While playthroughs may be valuable as benchmarks, the comment by the PVWII advisory board member about saving playthroughs for libraries suggests they can become archival objects unto themselves. When the playthrough becomes the object, as it is when users want to watch the playthrough more than they actually play the game itself, then the significant properties of that game become entirely a matter of its surface characteristics. This move away from play is important to recognize because norms of game preservation take the ability to generate a working copy as a given (McDonough in Anderson and Delve, 2013). Drawing on the PVWII data, this may not always be the case. A contemporary game art developer interviewed during PVWII provides an example of this. This developer cited interactive fiction games as the reason he entered the profession of game development. Post interview, he showed the author a collection of arcade games that he restored as a hobby, including ones kept at the studio where he worked so other game developers could play them for research and inspiration purposes. When asked if he ever 'restored' his favorite old interactive fiction titles to show to colleagues or his children he responded by saying absolutely not. He did not think anyone would be interested in playing that type of game, despite the formative role interactive fiction games played in his own development. Play of these old games did not seem important to the interview subject, yet they retain significant properties that might be accessible to future audiences through other means.

What these data demonstrate is that, perhaps unsurprisingly, gamers and game programmers often want different things from preservation than archivists and computer scientists. Part of this tension may arise from the fact that in order to address significant properties as identified by larger stakeholder groups, preservation professionals will have to make archival packages that vary substantially from those they traditionally made. Changes to workflow bring discomfort, a common trope encountered in interview data with digital cultural heritage professionals in Europe and North America conducted by the author. One of the major difficulties in recognizing expanded notions of significant properties is the potential burden it places upon these preservation

professionals: it is hard enough to preserve virtual worlds, and now there is the added impetus to preserve things beyond the code and computing environment. This article does not advocate a scenario in which everything remotely connected to a game needs to be preserved. In fact, the argument here is exactly the opposite: given that significance is so much broader than initially conceived, it is all the more necessary that the preservation community embark upon the creation of guidelines that enable institutions to responsibly and intelligently draw boundaries around objects in order to render them static enough to be preserved.

Understanding games as boundary objects is particularly helpful here in understanding what gets preserved and who preserves it (Star and Griesemer, 1989). In this case a boundary object refers to an object that has weak but generally understood meanings across larger groups of stakeholders while retaining stronger, often slightly different, meanings at a local level. For some stakeholders, the box or book that came with a game might be terribly important, while for others it is not important at all. In game preservation, there has been a tendency to place primacy on code, and better yet, working,

executable code. A researcher on PVWII noted during the reimplemention versus code retention discussion:

“I need to speak up for my designated user community. There are people who are more interested in the source code than they are in the game. In my environment, technological historians are a pretty important stakeholder.”

Even while recognizing the importance of the social interpretability of games, McDonough says, as part of the POCOS project, “Maintaining access to the game itself, while obviously a necessary condition of game preservation, is not in itself sufficient” (McDonough, 2013, in Anderson and Delve, 2013). The more important point raised in the data from PVWII is that for some, the code itself is not important at all. This sentiment is apparent in the interview data. Many designers interviewed thought the back-end was not that important, so long as the front-end experience remained the same. After a presentation about interviews conducted with a variety of developers involved in the creation of the Civilization game franchise, a PVWII advisory board member asked: “What are you going to do with these interviews? The interviews are amazing. If I had to choose between the interviews and the games, I might actually take the interviews.”

The data demonstrate that significance is not always sufficiently represented or embodied in the digital object or its environment and this finding is operationalized to show that contemporary models for preservation are insufficient to encompass what is often most important about digital objects like games. The data from PVWII imply that stakeholders find significant properties in the code and the environment as well as in surface and social aspects of the games. A content analysis of three different types of data, all of which emerged from PVWII, demonstrates this central contention through an examination of the ways in which significant properties appear in the data. This broad view is particularly important when dealing with digital cultural heritage, like games, because it reflects (if not it does not necessarily aim to represent) the inherently broad perspectives on significance that arise when the user community of the object is very heterogeneous. The analysis begins with an exploration of the significance of peripheral materials as described by interview subjects and primary research about the PVWII game sets. This is followed by data examining the social situation of games and how this informed the ways in which interview subjects and researchers spoke about significant properties of games.

One can also make meaning out of the PVWII process itself, and this is a key lesson to be garnered from the data. Tensions arising between researchers working towards a shared goal demonstrate how complex and multi-dimensional the preservation of games has to be. Even if the primary result here is just that game significance and preservation are incredibly complex, these struggles can be operationalized to create more concrete deliverables. The salience of this argument is palpable through the interview and minutes data.

## Conclusion

‘Since cultural heritage is not the mechanical and neutral transmission of information from one generation to another, but a social construction, the understanding of its meanings and consequences depends on taking into account its historical context’ (Arantes, 2007).

What does it mean, then, to preserve a game? There is no obvious or simple answer to the question, as a game is composed of many parts and each component might be preserved in different ways. Games as an idea, or more technically speaking as a FRBR work, are composed of a number of complex boundary objects in the sense that different participants define the abstract and larger punctualizations of games in different ways, not to mention the fact that preservation itself is a broad boundary object that finds different local meanings among different stakeholders.

Games come to signify not just code, but interaction with a certain kind of machine, space, and time. Games can also encompass packaging materials, like those Library of Congress saves in archival boxes – the original box, the basic game play instruction manual, the folded wall poster, or in the case of Carmen Sandiego, a third-party encyclopedia to help with investigations that simultaneously serves as a hybrid digital/analog copy control. Gamers, collectors, and general enthusiasts make up an extremely heterogeneous group from which input will have to be sought, as well as professionals in industry and the academe. It is important to note that the scope of this paper does not even touch on another important set of potential stakeholders in terms of game preservation: game laborers. This term refers to both those who offer free labor in service of the games, often seen in the work of mods for popular games. This work was covered in part by interviews conducted as part of PVWII. But this term also refers to those who are required to do labor within games for wages, like those discussed by Lisa Nakamura (2009). Both populations play an undeniable role in constituting the moving boundaries of games, and the marginalized status of the latter type of paid laborer means that the scope of their work is often underestimated and they are entirely absent from game preservation literature as of the writing of this paper. Discussions on this theme would make for interesting inquiries in future work.

What makes a game locally is particular to each separate interest group. Preservation produces great friction given the multitude significant properties, located in different components of the game and play experience: preservation requires spaces of “awkward engagement” wherein stakeholders with vastly divergent goals are temporarily united around a shared project (Tsing, 2005).

This paper issues a renewed call for a recognition of the interpretive aspects of preservation and archival work (MacNeil and Mak, 2007): authenticity is continually

constructed and this construction is an artificial act. The argument here is for embracing the creation of boundaries in representation information, but doing this in a transparent and responsible manner. It is perhaps superfluous to say that the preservation of video games is a complicated endeavor because the objects themselves are complicated: they are fluid, boundless, “unstable” (Newman, 2012). But because the objects are inherently unstable, the process of stabilizing them for preservation means necessarily changing something about them.

The end take away is that the PVWII data highlights the need for the creation of reference guidelines for the creation of artificial boundaries on nebulous digital objects like games for the sake of comprehensive and transparent preservation.

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