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Video Game Preservation in the UK: Independent Games Developers' Records Management Practices

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Abstract

Video games are a cultural phenomenon; a medium like no other that has become one of the largest entertainment sectors in the world. While the UK boasts an enviable games development heritage, it risks losing a major part of its cultural output through an inability to preserve the games that are created by the country's independent games developers. The issues go deeper than bit rot and other problems that affect all digital media; loss of context, copyright and legal issues, and the throwaway culture of the 'next' game all hinder the ability of fans and academics to preserve video games and make them accessible in the future.

This study looked at the current attitudes towards preservation in the UK's independent ('indie') video games industry by examining current record-keeping practices and analysing the views of games developers. The results show that there is an interest in preserving games, and possibly a desire to do so, but issues of piracy and cost prevent the industry from undertaking preservation work internally, and from allowing others to assume such responsibility. The recommendation made by this paper is not simply for preservation professionals and enthusiasts to collaborate with the industry, but to do so by advocating the commercial benefits that preservation may offer to the industry.

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Introduction

Video games have been a part of our culture for more than sixty years, with their origins dating as far back as the late 1940s (Goldsmith et al., 1948), while they have been available as affordable, mainstream entertainment for over forty years. Video games have only increased in cultural significance, and are now a global and highly lucrative industry. In recent years the study of video games has become a serious endeavour, with a growing body of research dedicated to the sociological and cultural impact of the medium. The legitimacy of video games as an important cultural medium has been recognised by governments in the UK, USA, France and Canada, with the UK government putting forward plans for tax relief for the video games industry (Wilson, 2013). The UK's independent games developers, in particular, have produced numerous successful titles of cultural significance, including *Dear Esther* (The Chinese Room), *Rust* (Facepunch Studios) and *No Man's Sky* (Hello Games). Relatively small UK-based developers have also been responsible for games published by much larger studios, including *LittleBigPlanet* (Media Molecule) and the console versions of *Minecraft* (4J Studios).

The increasing prevalence of video games as a business and a focus of study, as well as the rapid evolution of the technology used to create them, has made the question of how they will be preserved and made accessible in the future all the more pertinent. The issues of preserving video games are tied to the wider field of digital preservation but, arguably, games are more particularly affected by certain issues of preservation than other electronic media. Games are subject to the inherent physical preservation issues that come with all digital storage mediums (such as optical disks) and the hardware that is used to read them, the copyright laws which govern how the software is used and distributed (which are common to nearly all commercial software), and the methods by which developers and publishers will protect their work (such as Digital Rights Management (DRM) software)[1].

While these are some of the main factors that are particular to video game preservation, there are various other concerns that may exert an influence. Some may be particularly relevant to certain categories of games, such as online multiplayer titles which require the game to be connected to a server, and more problematically, rely upon the presence of other players within the game world. Several MMORPGs (Massively Multiplayer Online Role Playing Games) such as *Star Wars Galaxies* or *The Matrix Online* – games made within the last decade – have already disappeared and are now unavailable and unplayable (Lowood et al., 2009), while games such as *Halo 2* for the PC have lost multiplayer functionality (Yin-Poole, 2013). In this volatile landscape, it is not surprising that much of the medium's early history has already been lost (Gooding and Terras, 2008).

The term 'video game preservation' can be seen to encompass preservation actions associated with video game material, including records management practices intended to preserve access to business and creative documentation, emulation of older titles for educational and entertainment commercial purposes, and curation and control of software components, including code, which may be re-used in subsequent projects or re-purposed as a learning resource. While each of these approaches to video game preservation may cater primarily to particular audiences – advances in emulation of vintage games titles have, for example, typically been led by 'retro' gaming enthusiasts

1 For a detailed overview of preservation issues associated with video games, see Newman (2012) and Gooding and Terras (2008).

– they are all relevant to developers if they wish to learn – and profit – from their previous endeavours. The term 'video game preservation' encompasses all of these approaches.

The rapid loss of video game material, both physical and digital, has not gone unnoticed. The International Game Developers Association (IGDA) comprises a wide variety of Special Interest Groups (SIGs), including one dedicated to tackling the issues of video game preservation. Specialist groups such as the UK National Videogame Archive, the International Centre for the History of Electronic Games and numerous smaller or independent groups have risen to the challenge of preserving gaming history. Other organisations across the world, such as the US Library of Congress, have also begun their own projects to collect and archive video game material (Owens, 2012). Going further still, Kirschenbaum (2013) notes that the idea of establishing a 'National Software Registry' akin to the National Film Registry has been discussed at Library of Congress. Such a body would provide games with the same legislative protection that ensures culturally significant films are preserved with fidelity to the original versions.

A 2008 study carried out by Rachel Donahue and Kari Kraus sought to document the preservation practices being carried out by the video games industry, and by the player community. The results showed a worrying disinterest in preservation on the part of the industry, which contrasted with the enthusiasm shown by the player community. The study here differs from Donahue and Kraus' work by looking specifically at the independent video game industry's current attitudes towards preservation in the UK. The results should better inform archivists, curators and information management specialists on the current state of preservation activities within the UK's 'indie' games industry.

The Current State of Digital Game Preservation

There exists a wide variety of literature on the subject of digital preservation, including guidelines and recommendations for archivists and curators working with digital materials. What literature exists tends not to discuss the particular requirements of archiving video games (although that is the aim of several projects), instead favouring discussion of the influences of various parties on preserving the medium. This discussion tends to involve the three main groups who influence the preservation of video games: the video game industry, the player community, and the heritage sector as a whole.

The Video Game Industry and Preservation

Discussion on the influence of the industry tends to be somewhat limited, though this may be attributed to the protective nature of many video game developers and publishers. A recent study by Kraus and Donahue (2012) provides a rare glimpse of the industry's attitude to preservation and records management, comparing these attitudes with those of the player community. The overall results of the study revealed a distinct lack of interest from the industry, with only a few individuals or companies taking any real action to preserve their work, while many respondents stated that only those materials that were required or reusable were kept. This is exemplified by a quote from an interviewee who states that aside from the source code, very little is retained:

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> 'Other than the source code of a game that ships, we don't care. I just had someone looking for annotated versions of our tools and we don't have them.'

The inability to find annotated tools, which help track changes in code, suggests that records management issues do affect games developers, but are not deemed important enough for many companies to take further action. Donahue and Kraus (ibid.) suggest that much of this disinterest is to do with the pressures of developing a game; with the main effort of the workforce being channelled into launching a title, little resource remains that could be directed towards preservation actions. This line of thinking is taken a step further by Newman in the only current published book on the subject of video games preservation, *Best Before: Videogames, Supersession and Obsolescence* (Newman, 2012). Newman posits here and in a previous article (Newman, 2009a) that one of the main reasons for the industry's lack of interest stems from its inherent nature as a fast-paced creative sector, working with a medium that is built around its own obsolescence and supersession. According to Newman, supersession is an inevitable result of "digital gaming's 'perpetual innovation economy'", a term coined in a paper by Kline et al., (2003). Originally put forward by Paul Duguid (1996), supersession is an idea that was applied broadly to 'new media'. Supersession implies that new media are often overtaken and then subsumed by the creation of newer media, and that rather than multiply, new media is simply 'upgraded'. Newman argues that supersession affects video games more than other new media due to the lack of a systematic approach to game preservation. Not only does the video games industry lack the time and manpower to enact any concerted record keeping effort, it is also an industry that actively replaces its past with an 'upgraded' version.

The views of Newman and Donahue are shared by industry veteran and former archivist Warren Spector, designer of the critically acclaimed *Deus Ex* (originally released in 2000). In an interview with Gamasutra (2012), Spector states that the combination of indifference and the industry's own perception of video games as 'ephemeral' is one of the greatest dangers to long term preservation:

> 'Most people making games see what they do as ephemeral, as not worthy of preservation. Who cares about an early design doc for any one of the thousands of games released each year?'

These sentiments are echoed from outside the industry as well, as was demonstrated when the Museum of Modern Art (MoMA) in New York announced that it had acquired fourteen video games for a design display (Antonelli, 2012). This move was met with mixed responses, and sparked further debate on whether video games deserved to be described as art (Grubb, 2013). However, Spector states that lack of funding for museums and archives to perform preservation work on video games is also a significant impediment for the field, especially considering that many of these institutions are already facing budget cuts and financial pressures.

The question, then, is what support does the video game preservation community need from the industry? The International Game Developer's Association (IGDA) Game Preservation Special Interest Group (SIG) argues that for video games to be preserved, the industry needs to give its support where technological expertise, business practises and legal issues are concerned, and provide backing for company and industry archives (Lowood et al., 2009). The benefits of providing legal support to libraries and archives to preserve games in the long term are obvious; it would allow these institutions to carry

out the crucial emulation and migration actions that would otherwise be in breach of copyright. This is a problem that is further complicated by the existence of different copyright laws in different countries. The complexities of international copyright law in regards to software are the subject of a legal study by the Keep Emulation Environments Portable (KEEP) project (Anderson, 2011), in which the co-operation of software creators and libraries or archives is proposed, in line with the IGDA Game Preservation SIG's recommendations.

This question is somewhat turned on its head in the Preserving Virtual Worlds final report which posits that one of the main barriers to the industry's cooperation with preservation initiatives is trust (or a lack thereof):

> 'Many software companies would view sharing something like source code as equivalent to handing over the crown jewels. Assurances that material will be 'dark' archived and made available only at some later date or under certain conditions are not of any real significance to a software company unless they already have trust in the individuals and the institution making the promises.' (McDonough et al., 2010).

This highlights the fact that the support of industry and that of recognised and well-regarded institutions are vital to securing permissions to preserve video game material. In an edited version of the IGDA Game Preservation SIG white paper (Lowood et al., 2009), it is argued that in order for the preservation community to expect the industry to collaborate in its efforts, the commercial benefits must be presented clearly. Taking a longer view, the benefits of, for example, facilitating emulation of older game titles extends beyond the commercial opportunities associated with being able to sell 'retro' titles on current platforms. The industry also stands to benefit from supporting emulation as an educational tool, allowing future up-and-coming game developers and designers to examine and learn from the medium's rich heritage, resulting in better, potentially more commercially successful products in the future, so that they might become all the more successful.

The Player Community and Preservation

Video game players occupy an integral but complicated position within the field of game preservation. Players are intimately involved with conservation actions (especially in the area of emulation), but their efforts are hampered by the often arcane legislation that protects digital games from piracy and other unauthorised activities. Fan-based initiatives now represent some of the most active groups in preserving gaming heritage, which have attracted the interest of more established institutions, who must consider how the growing wealth of fan expertise and resources can be utilised in future projects, or if they should be used at all.

The study by Donahue and Kraus (Lowood, 2009; results in Kraus and Donahue, 2012) found that in contrast to the industry's apparent disinterest in preservation, the player community is enthusiastic and active in collecting, curating and preserving video game heritage (also revealed in the responses to the survey after it had concluded; see Montfort, 2009). The efficacy of amateur game archivists is attested to in an article by Stewart Brand over a decade ago, who describes them as "archivists, archaeologists, and resurrectionists [sic]", and goes on to state that:

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> '...techniques pioneered by such vernacular programmers are at present the most promising path to a long-term platform migration solution… such massively distributed research can convene enormous power.' (Brand, 1999).

It is suggested in both Brand's article and the study by Donahue and Kraus that the collaborative efforts of amateur preservationists has provided many of the technologies, practices and methods utilised in current practices for preserving games.

The main recommendation of Donahue and Kraus' study was that institutions seeking to create video game repositories must begin to support the policies and practices of the gaming community's efforts:

> '...not only because of the potential for integrating the members of this community into the larger preservation network, but also because their attitudes and values may well influence those of professional archivists in years to come.' (Kraus and Donahue, 2012).

The argument is that a more flexible approach to what is an acceptable level of preservation, or what constitutes an 'authentic' object, is a healthier outlook towards preserving something as changeable and volatile as video games. The study demonstrated that amateur collectors and preservationists are integral to preserving gaming heritage, and that normal methods of calculating integrity and authenticity of player-run repositories cannot be applied. The issue, therefore, is once again a matter of establishing trust.

The enthusiasm for fan-generated tools and amateur archiving efforts is not universal. Newman (2012) argues that while tools such as emulators are certainly fascinating and valuable to preservation efforts, amateur archival projects come with a variety of drawbacks and warns against overstating the degree to which fan-based projects compensate for the current lack of academic and heritage sector activity:

> 'Much of what we will see players and fans produce might just as easily be considered to be objects in need of archival attention...'

In his article *On Emulation* (2009b) Newman expands upon the concerns he and others at the National Videogame Archive (NVA) have with the use of emulators, stating that as a tool for preservation, what they preserve may not be as important as establishing what hasn't been preserved (such as the controller). Loss of context is a primary issue, and games such as *Rock Band* or light-gun games would not even come close to being experienced in the same fashion without the dedicated peripherals that are central to the way the game was intended to be played.

However, Newman does state the importance of collaborative effort in fan-led projects, citing that player partnership and the exchange of knowledge are vital. He lauds the efforts of projects such as the High Voltage SID Collection (HVSC)[2] and World of Spectrum[3] as examples of the potential strength of fan endeavours in which dedicated individuals with considerable knowledge of the domain collaborate to achieve a shared goal.

The issue of copyright is still a significant barrier for many of these fan efforts, and while projects such as World of Spectrum go to great lengths to obtain the permissions

2 High Voltage SID Collection: http://www.hvsc.c64.org/
3 World of Spectrum: http://worldofspectrum.org

of rights holders in order to preserve and distribute their work (World of Spectrum, 2013a; 2013b), many projects do not have the ability, resources or inclination to do so. In June 2013 the torrenting (peer-to-peer file sharing) website Underground Gamer, which specialised in providing pre-2004 games, announced that it was closing due to legal difficulties (Ernesto, 2013), apparently instigated not by the game publishers but by copyright watchdogs. As can be seen from some of the comments published on the site, the loss of such a resource was lamented by fans, and many stress that some of the games were unique to the site and couldn't be found anywhere else. This case illustrates the dangers that threaten fan-driven projects and further highlights the need for industry and heritage institution collaboration to provide legal guidance and protection.

The Role of Academics and Traditional Heritage Institutions

The rise of video game preservation as a practice by traditional memory and heritage institutions is a recent development. However, there is a growing number of professional organisations across the globe that are dedicated to preserving video games, either by conservation work and archiving, or by researching the strategies, methods and policy-making that will affect how best to conserve, archive and exhibit video game material.

The IGDA Game Preservation SIG had attempted to keep track of current preservation projects on its site wiki, though, at time of writing, the wiki is no longer available. However, the SIG continues to operate an email digest that addresses questions and issues raised by the game preservation community. The group's white paper, released in 2008, was one of the first efforts to provide a concise summary of the issues of game preservation, and called for action on the part of both the industry and the academic sectors. It was also one of the first attempts to gauge the attitudes of both the industry and fans to game preservation as a practice.

Perhaps the most ambitious project in the field is the Preserving Virtual Worlds (PVW) project, which completed its first phase and associated final report in 2010 (McDonough et al., 2010). The project covered a range of issues concerned with preserving video games and interactive fiction, including defining what constitutes a virtual world, preservation strategies and the relation between video games and the law. The project is currently in its second phase, which seeks to determine the significant properties of various games, while making recommendations for future best practice for preservation actions (such as migration), and analysing how the preservation process is best documented (Senseney, 2011).

As discussed previously, the MoMA has its own display of video games; however these are displayed from the perspective of design, and it is the code and how the game looks that is prioritised over how the game plays. This ultimately ignores the context, both physical and historical, in favour of aesthetic appreciation. Such an approach is not, in itself, an issue – MoMA also carries out conservation work on games software – but arguably this mode of display doesn't allow for long term preservation of the games in their original contexts. With these limitations in mind, MoMA also carries out conservation work on games software including *Eve Online*[4] and *Dwarf Fortress*[5] (Fino-Radin and Emerson, 2013), while the International Center for the History of Electronic Games (ICHEG), located in the Strong National Museum of Play in New York, not only

4 Eve Online: http://www.theverge.com/2014/2/24/5441866/eve-offline-how-do-you-archive-a-universe
5 Dwarf Fortress: http://www.fastcodesign.com/3034130/asides/how-the-worlds-craziest-video-game-is-changing-moma

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collects video games and their associated hardware, but also archives related documentation such as design documents and concept art:

> 'They record every step of the preservation process in digital form. They create instructions, manuals and techniques on code emulation and electrical repair. They're creating a self-maintaining system, one they can pass on to future historians, so that the ICHEG won't become merely a part of the history it's trying to save.' (Mahardy, 2013).

A notable collaboration between the US-based National Software Reference Library[6] and the Stephen M. Cabrinety Collection in the History of Microcomputing at Stanford University[7] takes the approach of imaging the game software held in the Cabrinety Collection, collating appropriate metadata, and archiving the images in a digital repository. The challenges identified by the project, however, extend beyond the technical: the final part of the process is securing permissions from those companies which hold the copyright for the games being imaged (Owens, 2013).

The Internet Archive's Console Living Room project[8] takes an emulation-focussed approach to preservation, using the JavaScript-based JMESS emulation software[9] to provide access to games from a selection of obsolete consoles, including the Atari 2600 and Magnavox Odyssey, and making them playable in most modern web browsers. While this is certainly a fun endeavour, the emulated games are also presented as a teaching tool, providing scholars with access to titles that would otherwise be almost impossible to play.

In the UK, the National Videogame Archive (NVA)[10] was established in 2008 as a joint venture between the National Media Museum and Nottingham Trent University. Much like the ICHEG, it seeks to collect video games and their associated materials, including fan-made material such as mods (game modifications) and fan artwork, and place them in their "historical, social, political and cultural contexts." Newman (2009a) describes its earliest work, including donations from Sony Europe and Nintendo, which attests to a degree of collaboration between archives and some of the largest video game companies. However, the article echoes the lessons of Donahue and Kraus' earlier study:

> 'Through our journeys in the past couple of years, we have encountered shoeboxes under CEOs' desks and proud parents' collections of tapes and press cuttings. These are the closest things to a formalised archive that we currently have for many of the biggest British game development and publishing companies.'

The work carried out at the ICHEG to document the process of preservation for future archivists and curators is important, and, alongside the PVW project and other archival efforts, such as those at the NVA, Internet Archive and Stanford, this collective body of work should represent a valuable set of resources for game preservation well into the future.

6 National Software Reference Library: http://www.nsrl.nist.gov
7 Stephen M. Cabrinety Collection: http://www-sul.stanford.edu/depts/hasrg/histsci/index.htm
8 Console Living Room: https://archive.org/details/consolelivingroom
9 JMESS: https://github.com/jsmess/jsmess
10 National Videogame Archive: http://nationalvideogamearchive.org/about

Methodology and Results

Methodology

Data collection for this study was carried out in two parts: an online survey for games developers (see Appendix 1 for full text) and interviews with relevant individuals from the industry (see Appendix 2 for transcripts). The purpose of this dual approach was to create a broad set of data from the surveys, combined with a small number of interviews, which would help provide some context for the results generated.

Survey questions were adapted from the questionnaire used in the study by Donahue and Kraus (in Lowood et al., 2009), although the number of questions was reduced. While this means a more narrow set of data was collected, it was thought useful to minimize the amount of time each respondent would spend completing the survey, and so maximise the number of responses. The questions were a mixture of multiple choice and free text and were designed to investigate records management activities and policies within the industry, from which attitudes towards preservation could be inferred. The survey itself was created using Google Docs and was distributed online via the Scottish Games Network Facebook group, the Game Kettle Facebook group (its members comprised of development studios in the north east of England), to various UK developers via Twitter, and also to UK developers present at the 2013 Dare ProtoPlay games festival in Dundee. As such, respondents comprised a sample of 21 small independent games development companies in Scotland and northern England with typically fewer than ten employees.

Face-to-face interviews were also carried out with individuals at the Dare festival. The questions for the interviews were directly related to attitudes towards preservation, and were themed around the role of the video games industry in the preservation of games, the role of external institutions (such as museums) and the training of games development students in records management. The survey and interview participants were anonymised in order to encourage participation; the survey collected no personal data likely to identify individuals or the organisations for which they worked, and the interview data anonymised such information.

Results

Developer Survey

The survey[11] generated a total of 21 responses, 19 of which included answers to every relevant multiple choice question. Of the two free text questions, only four respondents answered both (19%). Seven of the respondents' organisations (33%) had a formal archives or records management program, and three had a library (14%). Of those that did not have one or the other, three respondents (14%) said that their organisation had considered establishing one. If the respondent's organisation did not have a formal records management program or archive, they were asked to complete questions according to whatever records management practices they did employ. Two questions were asked regarding records content, the first regarding general record-keeping, and the second regarding records pertaining to a particular game. The results are summarised in Figures 1 and 2.

11 Reproduced in Appendix 1 below.

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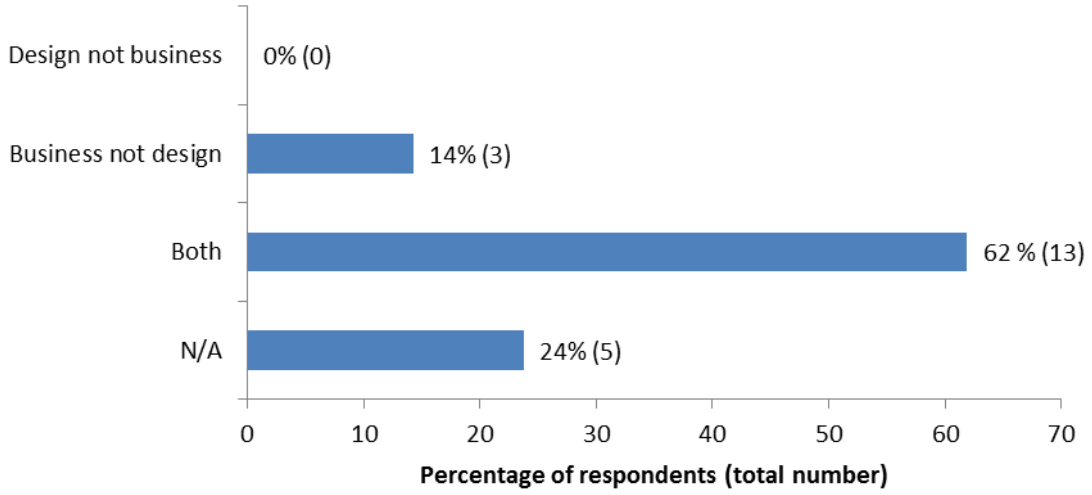

Figure 1. Records included in archives/records management programs.

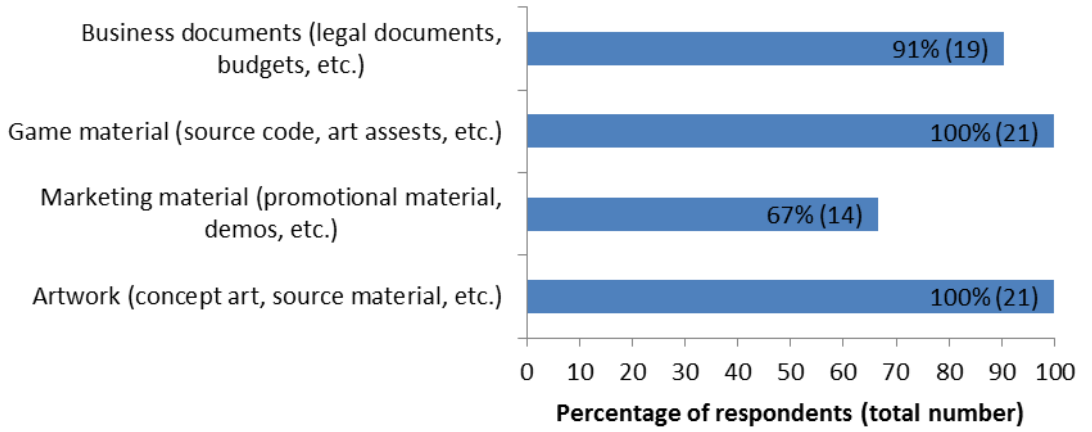

Figure 2. Materials retained from a particular game.

The results show that all companies that kept software design materials (such as pre-release versions, sketchbooks, etc.), also kept business records, but three companies kept only business records (such as minutes of meetings, payroll documents etc.), as shown in Figure 1. When looking at records pertaining to particular games (see Figure 2), marketing material was kept by the smallest proportion of participants (67%), with 91% of participants retaining business documentation. Every participant stated that they kept both the game materials (such as source code and assets) and artwork (such as concept art). Records were mostly retained on-site, with 14 respondents (67%) keeping them on site and seven respondents (33%) storing records off-site with another company.

Retention schedules (policies which govern the retention and disposal of records in an organisation) were used by only three respondents (14%). Comments as to how decisions were made regarding the disposal of records revealed a range of different actions. Several respondents said that decisions were made based on experience, on a case-by-case basis (one adding the condition that there was available space); records

may simply be disposed of when no longer used. Two stated that they attempted to keep everything and one stated that they kept records for one year before disposal. One respondent stated that their approach was to "wing it". Representing perhaps the most stringent approach to retention, one respondent reported that their company maintained source archives, with additional DVD-based backup.

When asked about which versions of a game were kept, 14 respondents (67%) stated that they kept all versions, four (19%) stated that they kept every major revision, and three (14%) that they only kept the final product. Several respondents indicated that version control and change log software was often used to track changes in game versions (these are also known as configuration management tools). Only one specified that they used Git version control, an open source control system[12]. When asked if games that do not make it to market are included in their records, 17 respondents (81%) stated that they did retain them, while one respondent qualified this by stating that records for such games were retained on-site with other records kept off-site. Only a relatively small minority (three respondents; 19%) stated that they did not keep games that did not make it to market.

On access to game-related records, two questions were asked: who had direct access to a the company's records and whether the company would consider, or has considered, transferring records to an institution, such as a museum or university. The majority of respondents (76%) stated that only staff were allowed access to their records; the remaining five respondents stated that only staff and those with approved requests could access their records, one respondent adding that this was only likely to be investors in the company. Seven of the respondents (33%) stated that they had considered or would consider transferring their records to an institution, though almost all of them qualified this by stating that such a transfer would depend on circumstances, or would be reliant on the records only being used for education and non-commercial purposes.

The final five questions in the survey were related to preservation activities and records maintenance practices. When asked what preservation actions are taken to ensure files and software remained accessible, 15 respondents stated that they carried out simple bit-stream preservation in original formats; four respondents stated that they took no action. One respondent stated that they converted files into preservation formats when they were no longer actively used and the final respondent stated that they converted files as and when required.

When asked whether emulation (the simulation of an operating environment, such as a specific hardware or software configuration), migration (conversion or transferral to a different hardware or software format), or a mixture of both were employed by their organisation, around half of respondents stated that neither method was employed, though one commented that their organisation planned to migrate files in the future. Five respondents (29%) stated they used emulation, two respondents (12%) practised migration, and only one practised both.

Participants were asked how their electronic records were stored from a list of choices, and the results are shown in Figure 3. Nine respondents (42%) stated that they used only networked hard disks for storage, with six respondents (28%) using a mixture of networked storage and external media or solitary hard disks. The results labelled 'other' were all forms of cloud storage (aside from one respondent who labelled theirs as "Mix"), two named their providers as Dropbox, and one other as Amazon Instance S3; the remaining three were simply described as cloud storage. One respondent used cloud storage in addition to networked hard disks, one used the cloud in addition to external magnetic media, and two used cloud storage in addition to a solitary hard disk,

12 Git: http://git-scm.com/

while the remaining two stated that they only employed cloud storage. 11 of the respondents (52%) used only one storage solution, while the remaining ten used a mixture of various storage mediums.

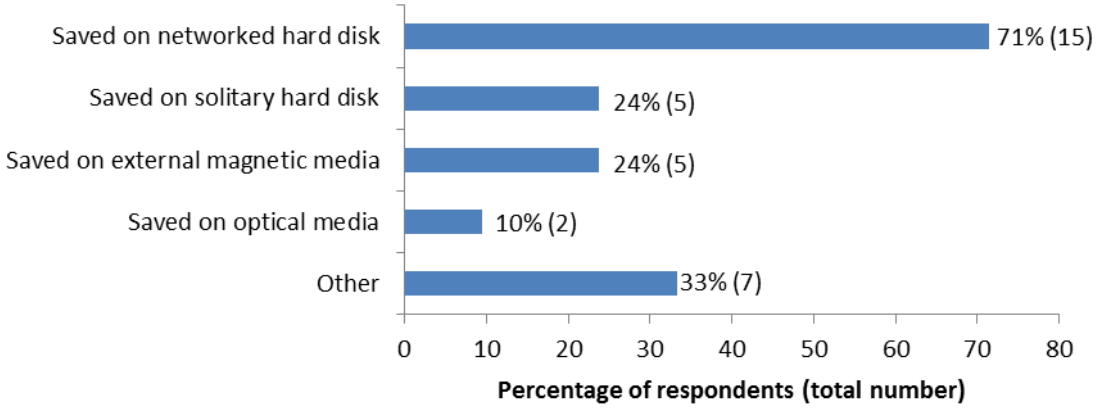

Figure 3. Storage types.

Finally, participants were asked what they used to describe their game-related records; this was the only multiple-choice question which was not answered by all respondents, with 19 of the total 21 participants providing a response. Ten respondents used an in-house list of vetted or agreed terms to describe records, seven used unstructured text, and two stated they did not have any method for describing their records. Of the five respondents who answered the final question about what type of metadata was generated (and what was generated manually versus automatically), three stated that no metadata was generated, and two stated that their metadata was generated manually.

Interviews

Interviews consisted of a set of questions designed to apply to several sections of the video game industry.[13] The first questions pertained to students in game development or related courses, the second to indie developers or those with jobs within the industry, and the last group related to the teaching of professional games development courses. A total of six interviews were carried out at the Dare ProtoPlay independent games festival. The interviewees consisted of one student, three developers (two of whom had been students in professional games development courses), and two developers who also lectured on various games development courses. The interviews were designed to elicit the opinions of the interviewees on industry involvement with preservation, heritage institution involvement with preservation, educating students about records management and preservation issues.

To begin, each interviewee was asked whether or not they considered video games to be a medium that is worthy of preservation. The response to this from every interviewee was that they were worthy of preservation and the reasons for this can be split into three categories: for their historical value, for their commercial value, and for use as educational tools. Nearly all the interviewees stated two or more of these reasons were important for preservation, however these categories represent the main themes across all interviewee responses. Most often cited was preserving games for their

13 See Appendix 2 for full transcripts.

historical value, suggested as a major imperative for preserving games by all of the interviewees to some degree.

> '...it's definitely important to preserve them for future generations to play otherwise you're missing out on some great games.' – Games Development Student.

> 'I lecture quite a number of classes and film makers and everything, and I try to emphasize to them that you can go out and buy Casablanca, you can go out and buy The Seventh Seal, you can go out and buy Ben Hur ...The Voyage to The Moon from the late 1800s. We [video game fans and developers] can't do that.' – Games Developer/Lecturer.

Preserving games for commercial purposes was the most contentious reason, with two interviewees stating that it was important to preserve games as it could benefit companies financially:

> 'The games industry, rather than capitalising on this back-catalogue, rather than using this to create some sort of long tail and actually maximise the lifetime revenue of a game, the games industry has, to date, ignored its entire back-catalogue, ignored the preservation of games and the commercial opportunities that opens up.' – Games Developer/Lecturer.

> '...a lot of retro games are being ported on to iPhone, iPad, Android and such. Yeah, I think it's good for the industry to show that the state it was in.' – Games Artist.

However, two others stated that preservation did not relate to every company's business model, and preservation actions (on the part of the company) did not necessarily benefit developers financially:

> '…preservation is not... a sales driven thing, therefore it's not part of the business model, therefore it's not something [developers are] going to be focused on.' – Games Developer.

> 'It would be nice if developers could leave their work to be used later...but there's a lot of time and cost involved with that sort of thing with no real financial benefit to the company at that time.' – Games Artist.

Preserving games as an educational tool was explicitly cited as an important reason by two interviewees; to demonstrate to students or to developers the way in which older generations of games played, and how this could be translated or built upon in newly-developed games:

> 'In order to understand how games work you need to understand where they came from: In order to understand a mechanic, you need to know where it was introduced, why it was introduced, what the designers were trying to achieve.' – Games Developer.

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> 'Stuff like quick time events you can trace that ancestry back to skill checks in Dungeons & Dragons, and having an understanding of where it came from enables you to see what's going to come next.' – Games Developer.

Though historical value was the most often cited as a reason video games should be preserved, this was typically linked to commercial value or educational value as well. A game's value as a commercial entity or as a good example to be used to educate the next generation of developers gave the game value as an historical entity, and *vice versa*.

The opinions of the interviewees on the involvement of the industry and heritage institutions tended to indicate that the onus of preservation work was not on the industry, but on institutions and the wider gaming community. However, it was generally recognised that the industry had a role to play in the preservation of its work, and often it was simply a case of the developers allowing other parties to take on the role and responsibility of preserving their games for them:

> 'Developers have a responsibility to allow it, and then it has to be somebody else's job to actually do it, and that could be a museum, could be a university, could just be a community who feels very strongly... if you aren't making money from it any more then somebody should be able to come along and say well I really like this game so as a community thing I am going to take on the costs of keeping this alive to an extent and preserving it that way.' – Games Developer.

One interviewee gave the example of the game developer id Software, the studio responsible for the critically acclaimed *Doom* series, who have released the source code for the *Doom* engine, stating:

> '...developers should be more practical about opening up the source, getting all the game data archived online, making sure people can access the game and keep it alive.' – Games Developer.

While only one interviewee was explicitly asked about their views on emulation and community involvement, several interviewees made the connection between community preservation and game software piracy. However, it was always seen as a positive force for the industry:

> 'The community will preserve your game; the community has already hacked your game and given it away for free. The benefit of that is that it's there forever, it will never go away. So the best way to look at piracy is the de-centralisation of archiving.'

> 'But yeah, I think the industry is far, far too paranoid about, sort of, like piracy and intellectual property theft...one kid downloading a game from 20 years ago and playing on an emulator I do not see as any great threat to the future of the industry, I actually see it as an asset.' – Games Developer.

The final section of questions focussed on the education of students in records management or preservation issues. Three interviewees who had been students in games development-related courses were asked if they had been taught about records

management during their time as students. All three stated that they had not, and another stated that such issues had not been brought up during their time working within the industry either. One remarked that they had been told about a video game archiving project being carried out in their university, but it was only brought up briefly and records management was never presented as a professional issue.

When asked whether or not they felt that records management should be a subject discussed or taught to students of games development, the response from the interviewees was that it should to some extent, though usually in the context of the general production of games and how to keep records as part of a business. One interviewee stated that he felt that the lack of business knowledge within the industry (especially smaller developers) was one of the major barriers to developers taking preservation actions, and stated that the rapidly changing design of iOS devices (such as iPhones and iPads) meant that after just a couple of generations of hardware the software that had been developed was no longer usable.

Overall, interview respondents supported the preservation of games, with the involvement of the industry limited to providing better access for the wider gaming and academic community to preserve games on their behalf. Education of games design and development students in basic record keeping was advocated as a business strategy rather than a means of promoting preservation. Piracy was a subject that was linked into the discussion on several occasions by the interviewees, and is clearly a barrier to some developers allowing access for preservation work, though those who discussed it did so in a positive light, advocating better access to older, commercially non-viable titles for preservation work.

Discussion

Before discussing the results of the survey there are several observations about the data set as a whole, its context and certain caveats that must be considered in order to accurately interpret the data. First, the size and scope of the data collected means that this can only be considered a keyhole look at the workings of the industry. The 21 responses that the online survey elicited is a small percentage of the total number of developers in the UK, and this percentage is indicative of how difficult it can be to contact developers. According to data released by the UK games industry association TIGA, the number of development studios in the UK rose from 329 to 448 in 2012 (TIGA, 2013) and so the number of responses represents less than 1% of all studios in the UK. Kraus and Donahue (2012) attributed the small number of responses they received for their similar study to a lack of interest in preservation on the part of the industry, discussed in greater detail below. Likewise, only a small number of interviews were conducted, representing a broad range of disciplines and roles within the industry, and these may not represent the views of the industry as a whole. Finally, while every effort was made to ensure that unambiguous terms were used to describe preservation actions, it is possible that respondents were unclear about what, for example, a "records management program" might entail (see Appendix 1 for questionnaire text).

Despite these factors, this study still gives an important glimpse into the records management practices conducted by the UK's independent games industry and its attitudes towards preservation. This discussion will inevitably be made in the context of the study by Kraus and Donahue (2012), as it is currently the only other study of this

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type to have been published. The discussion of the results is divided into three sections: current preservation actions, attitudes to preservation, and recommendations.

Current Preservation Actions

Overall, the survey generated a similar picture of the industry's approach to preservation to that found in Donahue and Kraus' study: largely disorganised record keeping practices that are not governed by any overarching guidelines, with decisions made on an ad hoc basis by individual developers, only a small percentage of whom have formal training in records management. These results are expected and understandable, however, as the number of smaller developers in the UK means that very few organisations in the independent studios – which may comprise as few as one or two personnel – would be able to employ dedicated records management staff. Therefore, the staff who do have to carry out this kind of work have no official guidelines to follow and are often working to tight deadlines and budgets, leaving little time or money for dedicated preservation activities.

However, the results do show that effort is being made to retain game-related material, even if not explicitly for preservation purposes. Every developer that responded to the survey stated that they kept game materials, such as source code and art assets. Only a small number proportion of respondents did not keep materials relating to games that had not been sold on the market. Over half the respondents also reported keeping all versions of a game, and several stated that they used version control to archive and monitor changes in game versions. Whether the statement that all versions of the game are kept refers to the use of version control is unclear, but is a distinct possibility. The use of configuration management software was also noted in Donahue and Kraus' study, though it was also noted that few of the respondents who stated they used such software also had training in its use. As it was not directly asked of respondents in the survey, it is unknown how many used configuration management software, and how many had training in its use; however face-to-face comments made by respondents indicated that most developers would use some form of version control in order to recover earlier game builds should problems arise. The use of version control is very beneficial for the long-term preservation of games, not least because the retention of previous versions of the game provides an indication of how the game was created, and what processes and changes were made during its development.[14] This was recognised as an important element in the preservation of video games (specifically for the training of new developers) by one of the interviewees who stated:

> 'So I think, actually, as well as preserving the games themselves, you also have to preserve as much of the development process as possible; the documentation, the designer's thoughts. And not just the designer, everyone who worked on the game, everyone has their creative input and that input happens for a reason.' – Games Developer.

The results also suggest that there have been shifts in the way that records are being stored by developers. Storage solutions are now being increasingly focused on keeping records in cloud storage, a shift that may be observed in many business sectors in recent years. A number of cloud storage providers, many of whom offer free data storage up to

14 Version control is widely accepted as good practice for any software developer to adopt. The developers of the popular open source version control system Git provide an overview of the advantages at: http://git-scm.com/book/en/Getting-Started-About-Version-Control

a certain capacity, make it straightforward for data to be accessed from anywhere with an internet connection, while additional storage may be purchased without the need to migrate data to new physical media. As maintaining in-house data storage can require considerable investment, it is understandable why many games developers would opt to save money by storing data in the cloud (see Kelly, 2013). Cloud storage comes with its own issues concerning, in particular, the privacy and security of materials stored in the cloud (Hashizume et al., 2013). The opportunities and issues of cloud storage is a large and complex subject in its own right, and will not be discussed here. However it is noteworthy to see that certain independent developers within the video games industry are adopting it as a storage solution.

Current Attitudes towards Preservation

Previous work carried out into the preservation activities of the video game industry revealed that the industry has little interest in preservation, with efforts concentrated instead on developing and releasing the next game. The data collected during this study demonstrate that this is not necessarily the case, although the reasons for recording and preserving games vary widely between the industry, the gaming community, and the wider digital preservation community. As was stated in the results, while preservation for historical purposes was seen as a positive, it was always in the context of educating new developers or providing commercial opportunities. This focus on producing new talent and exploiting older resources for commercial benefit may be grouped under the heading of 'preservation as a business strategy', and it appears that for most developers that do retain records this is the primary reason to do so; keeping records for historical or cultural purposes is a secondary concern at best, if it is considered at all.

For the most part, the interviewees appeared to recognise most of the issues associated with preserving video games. It was acknowledged that fast-paced changes in technology pose problems, and more promisingly, it was recognised that there are benefits in preserving the work that they carry out. However, it also evidenced that, for the moment, preservation is not a primary concern, and in the case of one interviewee, not something that had even been mentioned during their time as a student or their career as a games artist. Indeed, another interviewee delegates the entire problem to the gaming community, giving the impression that there is no point in the developer or even heritage institutions attempting to preserve video games, because the gaming community has already done so through pirating and re-distributing games online. This is obviously a problematic viewpoint, even though the gaming community has done an admirable job in preserving gaming heritage thus far, the technical complications associated with newer games, such as reliance on developer-maintained servers and increasingly onerous DRM measures, means that there is only so much the community can do before the power to preserve games is out of their hands entirely.

According to one of the developer interviewees, a main issue for many smaller independent developers is that they are generally quite short-lived:

> 'A lot of them don't survive past five years; many don't survive past one year. And, so it's going to be difficult for studios to be guaranteed preserving things in the long term.' – Games Developer.

This is an issue for studios and game preservationists alike, as it means that much of the video game content produced in the UK may disappear as a result of companies closing down. The UK's many smaller developers are less likely to keep records as the

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prospect of the studio continuing to make games, even in the near future, is quite low. The issue, then, for the individuals working for these companies is that they are less likely to retain the work they have completed. Further, the digital content they do retain is still subject to the same degradation and possible loss as any other digital data, and, once the game is no longer in development or being sold, it is unlikely that the data are being maintained as necessary to preserve it in the long term. This may lead to swathes of games being lost due to neglect, as data is lost in a variety of ways, meaning that evidence of companies' work is gone forever. The work that they have done, which may have secured them employment in the future or could have been a resource for future subsequent work, is liable to disappear entirely. The smallest developers are arguably those who stand to benefit the most from preserving the games they have made.

The lack of concerted preservation effort from the industry means that the player community and associated preservation projects have to pick up pieces wherever and however they can, but access is still a large significant barrier to continued preservation. The survey revealed that in all cases only staff and individuals with approved requests had direct access to company records. This is, perhaps, unsurprising: it is unlikely that many independent developers would make dedicated exhibitions of their material available to the public. This is reinforced by the fact that marketing and promotional material was the category of records retained by the least number of respondents, which is probably the result of more companies moving to digital distribution of games (especially mobile games), and thus any marketing and promotion is likely to be carried out by more ephemeral internet-based means, as opposed to producing multiple copies of printed material for use in game stores. One of the interviewees stated that in excess of 90% of games developed in Scotland are destined for digital distribution, as the majority of independent studios develop tablet and mobile games, which would certainly mean far fewer physical records would be available to be exhibited or analysed.

The fact that around a third of the respondents would consider transferring their records to an institution is encouraging, even with the conditions that they only be used for education and/or non-commercial purposes (which for many, if not most, museums would be the norm). It indicates that the industry is not completely averse to the idea of having their games preserved, but the fact that many still would not consider doing so shows that reservations persist, and there is still a trust barrier to be overcome between the industry and academia. For institutions that do want to take on the responsibilities of preserving video games, or those who have already done so, building relationships of trust with the industry is of paramount importance. If the industry recognises that it may permit and support preservation activities that not only benefit wider cultural preservation, but also benefit the companies involved by having their work recognised and recorded, a major barrier in preserving video games in the future can be overcome.

As one of the interviewees suggests, it appears that these two sectors must work together. The industry retains the rights to reproduce and ultimately preserve the game, but also has technical expertise needed to do so. This must be applied in conjunction with the preservation community's knowledge of the preservation of records, and most importantly, harness its will to do so, a will that the video game industry currently lacks. As the International Game Developers Association preservation Special Interest Group states:

> 'Each of these stakeholders brings a different set of capabilities, strengths and methods to the table... a weakness in one stakeholder is often countered by a strength in another.' (Lowood et al., 2009).

Recommendations

As with the IGDA game preservation SIG and the Preserving Virtual Worlds project, the main recommendation of this paper is the collaboration between the industry and the wider preservation community, whether academic institutions or projects carried out by the gaming community. This study indicates that the independent video games industry is slowly coming to acknowledge that there are benefits to allowing their games to be preserved, and that at least some developers may be willing to work with institutions to allow preservation work to be carried out. The historical and cultural benefits of allowing future generations to play the video games of today are clear, and well-argued by many projects and individuals already named in this paper. However, even within this relatively small sample of independent games developers, current record keeping practice is revealed to be sporadic, disorganised and ad hoc in nature. However, the commercial and educational benefits, which could have tangible effects on the video games industry, are not being communicated with sufficient clarity or energy.

Providing developers with clear guidance on records management procedures, while encouraging companies to permit others to take on the role of preserving video games, will benefit the industry significantly. The Library of Congress Recommended Format Specifications[15] – specifically those relating to Software and Electronic Gaming and Learning – are an example of how national institutions may help illuminate the way. Proper guidance and the introduction of practices such as data migration will potentially protect developers from data loss, and allow for more efficient access to records and game assets. Allowing others to take on the role of preserving games will mean that developers do not have to redirect their own resources into doing so in-house, and any preservation project would likely benefit from the knowledge and expertise of archivists, curators and other information management specialists, who would likewise benefit from games developers' technical expertise and intimate knowledge of the industry. However, to do this, institutions must be able to demonstrate to the industry that they are trusted repositories, which is no small challenge.

The video games industry, as well as many other industries that now rely heavily on digital distribution, face a major problem with piracy, and although some developers see game emulation by fans as beneficial, the vast majority of developers still consider it to be one of the greatest threats to the industry. Examples such as the closing of the torrenting site Underground Gamer, which contained many unique games, highlight the potentially damaging effects of blanket enforcement of copyright law. The study by Kraus and Donahue (2012) advocated the utilisation of fan-driven projects and preservation efforts, and the vast knowledge possessed of the gaming community. While the knowledge and expertise of the gaming communities that contribute to these projects is an invaluable resource – and needs to be utilised by academic preservation projects – the constant legal dangers of running such a project without the support of the developers who created the content means that they cannot be relied on for long term preservation.

This study – through engagement with the recent graduates who represent the UK's developing 'indie' games industry, and their lecturers – also suggests that a useful course of action would be to place greater emphasis on preservation when educating future games developers and designers. Finally, it may also be that industry bodies have a role to play in advocating a more relaxed approach to copyright enforcement in the broader interests of developers. As integrated parts of the industry, such bodies may be

15 Library of Congress Recommended Format Specifications: http://www.loc.gov/preservation/resources/rfs/

able to make the case to developers, publishers and copyright watchdogs for assuming a less litigious outlook, by presenting the cultural, educational and economic advantages of allowing memory institutions – and even fans – to help preserve their work. In the UK, the relevant bodies would include TIGA[16] and UKIE[17].

Conclusion

Video games are a cultural phenomenon; a medium like no other that has become one of the largest entertainment sectors in the world. The UK is a major player in this market, and has produced – and continues to produce – many critically acclaimed and commercially successful titles, such as *Grand Theft Auto*, *Tomb Raider*, and the *Fable* series. While the UK has an enviably strong video gaming heritage, we it risks losing a major part of its cultural output through an inability to preserve the games that are created in the UK. The issues go deeper than bit rot and other problems that affect all digital media; loss of context, copyright and legal issues, and the throwaway culture of the next game all hinder the ability of fans and academics to preserve video games and make them accessible in the future.

This study looked at the current attitudes towards preservation in the UK's independent video games industry by examining current record-keeping practices and soliciting the views of 'indie' developers. The results show that there is an interest in preserving games, and possibly a desire to do so, but the issues of piracy and cost prevent the industry from undertaking preservation work internally and discourage companies from allowing others to take on the responsibility for them. While the scale of this study is, perhaps, too small to make robust claims about the attitudes of the games industry as a whole, certainly, the UK's independent developers do not appear to share the disinterest in preservation identified by Kraus and Donahue (2012).

The recommendation made here is not simply to collaborate with the industry, but to do so by advocating the commercial benefits of preservation to the industry, and by demonstrating that the industry stands to lose significant portions of its their work due to negligence. By preserving video game history, the preservation community, the video independent games industry, and the wider video gaming community can gain a great deal, and prevent the loss of a significant portion of the world's cultural output.

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References

Anderson, D. (2011). *A layman's guide to the KEEP legal studies* (KEEP Deliverable No. D2.6). Retrieved from Keep Emulation Environments Portable project website: http://www.keep-project.eu/ezpub2/index.php?/eng/content/download/20703/103715/file/D2.6_laymansguidelegalstudies_final.pdf

16 TIGA: http://www.tiga.org/
17 UKIE: http://www.ukie.org.uk/

Antonelli, P. (2012). Video games: 14 in the collection, for starters [Web log post]. Retrieved from Museum of Modern Art website: http://www.moma.org/explore/inside_out/2012/11/29/video-games-14-in-the-collection-for-starters

Brand, S. (1999). *The clock of the long now: time and responsibility*. New York, NY: Basic Books.

Donahue, R. (2011). Videogames as objects of cultural preservation [Web log post]. Retrieved from Maryland Institute for Technology in the Humanities website: http://mith.umd.edu/videogames-as-objects-of-cultural-preservation/

Duguid, P. (1996). Material matters: The past and futurology of the book. In G. Nunberg (Ed.), *The future of the book*. Berkeley: University of California Press.

Ernesto. (2013). Underground gamer goes down citing legal problems [Web log post]. Retrieved from TorrentFreak website: http://torrentfreak.com/underground-gamer-goes-down-citing-legal-problems-130602/

Fino-Radin, B., & Emerson, L. (2013, November 15). Program series: New media archives [Video file]. Retrieved from http://vimeo.com/80395889

Gamasutra. (2012, February 23). Warren Spector: We have a chance to preserve our video game history [Online news article]. Retrieved from http://www.gamasutra.com/view/news/162364/Warren_Spector_We_have_a_chance_to_preserve_our_video_game_history.php

Goldsmith, T. (1948). *U.S. Patent No. 2,455,992: Cathode-ray tube amusement device.* Washington, DC: United States Patent Office. Retrieved from http://www.jmargolin.com/patents/2455992.pdf

Gooding, P., & Terras, M. (2008). 'Grand theft archive': A quantitative analysis of the state of computer game preservation. *International Journal of Digital Curation*, *3*(2), 19–41. doi:10.2218/ijdc.v3i2.56

Grubb, J. (2013, May 28). Why curator Paola Antonelli added video games to the NYC Museum of Modern Art. *Venturebeat*. Retrieved from http://venturebeat.com/2013/05/28/why-curator-paola-antonelli-added-video-games-to-the-museum-of-modern-art/

Hashizume, K., Rosado, D.G., Fernández-Medina, E., & Fernandez, E.B. (2013). An analysis of security issues for cloud computing. *Journal of Internet Services and Applications*, *4*(1), 1–13. doi:10.1186/1869-0238-4-5

Kelly, T. (2013, April 26). SMEs must embrace the cloud to achieve global growth [Web log post]. Retrieved from The Guardian website: http://www.theguardian.com/media-network/media-network-blog/2013/apr/26/cloud-services-sme-businesses-growth

Kirschenbaum, M. (2013). An executable past: The case for a national software registry. In *Preserving.exe: Toward a national strategy of software preservation* (pp. 12–22). Retrieved from Library of Congress, National Digital Information Infrastructure and Preservation Program website: http://www.digitalpreservation.gov/multimedia/documents/PreservingEXE_report_final101813.pdf

Kline, S., Dyer-Witheford, N., & De Peuter, G. (2003). *Digital play: The interaction of technology, culture, and marketing*. Montréal, Canada: McGill-Queen's University Press.

Kraus, K., & Donahue, R. (2012). 'Do you want to save your progress?': The role of professional and player communities in preserving virtual worlds. *Digital Humanities Quarterly, 6*(2). Retrieved from http://www.digitalhumanities.org/dhq/vol/6/2/000129/000129.html

Lowood, H. (Ed.). (2009). *Before it's too late: A digital game preservation white paper*. Mt Royal, NJ: International Game Developers Association, Game Preservation Special Interest Group. Retrieved from http://www.lulu.com/

Lowood, H., Armstrong, A., Monnens, D., Vowell, Z., Ruggill, J., McAllister, K., Pinchbeck, D. (2009, September). Before it's too late: Preserving games across the industry/academia divide. In *Breaking new ground: Innovation in games, play, practice and theory*. *Proceedings of DiGRA 2009.* Retrieved from http://eprints.port.ac.uk/3430/

Mahardy, M. (2013). Back to the future: Preserving the history of video games. *Polygon*. Retrieved from http://www.polygon.com/features/2013/6/25/4452894/the-strong-preserving-the-history-of-video-games

McDonough, J.P., Olendorf, R., Kirschenbaum, M., Kraus, K., Reside, D., Donahue, R., Rojo, S. (2010). *Preserving Virtual Worlds final report.* Retrieved from http://hdl.handle.net/2142/17097

Montfort, N. (2009, April 3). Surveys on recordkeeping in the game industry [Web log post]. Retrieved from http://grandtextauto.org/2009/04/03/surveys-on-recordkeeping-in-the-game-industry/

Newman, J. (2009a). Save the videogame! The National Videogame Archive: preservation, supersession and obsolescence. *M/C Journal*, *12*(3). Retrieved from http://journal.media-culture.org.au/index.php/mcjournal/article/view/167

Newman, J. (2009b, April 6). On emulation [Web log post]. Retrieved from National Videogame Archive website: http://nationalvideogamearchive.org/archives/61

Newman, J. (2012). *Best before: Videogames, supersession and obsolescence*. Abingdon, UK: Routledge.

Owens, T. (2012). Yes, the Library of Congress has video games: An interview with David Gibson [Web log post]. Retrieved from http://blogs.loc.gov/digitalpreservation/2012/09/yes-the-library-of-congress-has-video-games-an-interview-with-david-gibson/

Owens, T. (2013). Video game preservation at scale: An interview with Henry Lowood [Web log post]. Retrieved from http://blogs.loc.gov/digitalpreservation/2013/02/video-game-preservation-at-scale-an-interview-with-henry-lowood/

Senseney, M. (2011). About. Retrieved from Preserving Virtual Worlds 2 website: http://pvw.illinois.edu/pvw2/?page_id=55

TIGA. (2013). UK games industry returns to growth [Press Release]. Retrieved from http://www.tiga.org/news/press-releases/uk-games-industry-returns-to-growth

Wilson, R. (2013, July 2). UK games tax relief passes another milestone. *GamesIndustry*. Retrieved from http://www.gamesindustry.biz/articles/2013-07-02-uk-games-tax-relief-passes-another-milestone

World of Spectrum. (2013a). Distribution permissions – Individual programmers/artists. Retrieved from http://www.worldofspectrum.org/permits/individuals.html

World of Spectrum. (2013b). Distribution permissions – Individual software houses. Retrieved from http://www.worldofspectrum.org/permits/publishers.html

Yin-Poole, W. (2013, January 17). Microsoft will switch off Halo 2 PC multiplayer next month. *Eurogamer*. Retrieved from http://www.eurogamer.net/articles/2013-01-17-microsoft-will-switch-off-halo-2-pc-multiplayer-next-month

 doi:10.2218/ijdc.v9i2.294

Appendix 1: Questionnaire

1. Does your company have an established archives/records management program (activities, policies, and procedures to deal with the paperwork/files generated during business)?
2. Does your company have a library?
3. If your company does not have either a library or an archive, has establishing one ever been considered?

For the following questions please answer in regard to the library or archive policies your company has in place. If your company has neither then answer in regard to any record keeping policies your company has in place.

4. Has anyone in your company had any formal archives or records management training?
5. Does the archives/records management program include: (select options that apply)
    - Software design materials? (pre-release versions, sketchbooks, etc.)
    - Business records? (Payroll, meeting minutes, etc.)
    - Not applicable
6. 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?
7. How do you determine what is permanent (worth saving indefinitely) and what is temporary (eventually disposed of)?
8. Are your permanent records stored in your company's facilities, or off-site with another company?
9. What materials are included in the set of records pertaining to a particular game?
10. Who is allowed to access the archives/library (or to your records in general, if you lack a formal program)?
11. Are games that don't make it to market included in the archives?
12. Are all versions of a game deemed to be worth saving permanently, or only the final product?
13. Has or would your company ever consider(ed) transferring records to an institution (such as a university) to make them available to the public?
    - If you answered 'yes' to q.13, please give details.
14. What software preservation actions 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?

15. Do you practice emulation, migration, or a combination of the two?
16. Are files kept on external magnetic or optical media, or in networked storage? What type of media/storage set up?
17. What do you use to describe game-related records?
    - What level and type of metadata do you create and maintain? What portion of it is generated manually versus automatically?

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Appendix 2:
Interview Transcripts

Interview 1: Games Design Student

Have you ever heard about archiving or records management as a profession before?

Not in a video games context, but certainly for other fields of study, yes I have.

Do you believe video games are an art form or medium worthy of long term preservation? Is it something you believe needs to be done?

Definitely, I mean, a classic example is *Grim Fandango*, everyone raves about the game, it's a well-loved game, it's meant to be one of the best point and click adventures ever. But you just can't play it nowadays because it doesn't run on modern PCs and it takes a lot of working around to get it to run on multi-cores, it's only designed to be single core. So it's definitely important to preserve them for future generations to play otherwise you're missing out on some great games.

In your opinion then, who should be responsible for that? Should it be part of the developers' responsibility to preserve or do you think it's the responsibility of museums and other institutions to do so afterwards?

I'm not entirely sure. I can see for a lot of other areas of study, obviously it's museums who take care of stuff like that; fossils, archaeology, stuff like that. But one thing I don't get, I don't understand why developers wouldn't want to keep a record of their own games, why they wouldn't want to preserve them. Because it's a history of their achievements, it's everything they've worked on. I believe developers should keep a record of everything, but I'm also not against the idea of there being video game museums where they have all these old games.

Do you think it would be beneficial then, for things like records management to be taught to students who want to enter the industry?

Yeah, I definitely think there should be some sort of module in university, even if it's not an official thing just for them to be briefed about it, just to get the idea in there that you want to keep all the stuff you create, because you never know. The changes in technology might render it unplayable, so you always need a way of accessing that again.

Interview 2: Games Developer

Do you believe video games are an art form or medium worthy of long term preservation?

Absolutely, yeah. I don't think there's any question around that.

Do you think it's important for the industry itself to preserve its own heritage?

Yes, not in a sort of "oh, look at where we came from" sort of way, but in a practical, pragmatic sense. In order to understand how games work you need to understand where they came from. In order to understand a mechanic, you need to know where it was introduced, why it was introduced, what the designers were trying to achieve. So I think, actually, as well as preserving the games themselves, you also have to preserve as much of the development process as possible; the documentation, the designers' thoughts. And not just the designer, everyone who worked on the game, everyone has their creative input and that input happens for a reason. I think we need to be preserving that stuff as well, the kind of ancillary aspects, all the stuff that goes into making a game.

Do you think it's more on the shoulders of developers to do this kind of work, or do you think it's more to do with museums and institutions?

I think they have to work together. I think, in the very long run, the average development studio is a short lived entity. A lot of them don't survive past five years, many don't survive past one year. And, so it's going to be difficult for studios to be guaranteed preserving things in the long term, but I think they should do everything they can to do that, when possible. Obviously museums, academic institutions, universities, that sort of thing, have a very important role to play in that. I think the fact that video games are being taken more seriously by academia now, I see that as a very encouraging sign. One of the things I think is actually really important is, one thing I've wanted to do in the past is, Id [software] are very good at this actually, when a game has outlived it's sort of shelf life, when it's no longer really a commercially viable entity, it's no longer something you'd sell in huge numbers, I really feel like developers should be more practical about opening up the source, getting all the game data archived online, making sure people can access the game and keep it alive, you know, keeping it running on new platforms, maybe even modifying it, building new games out of it, I think that stuff is really important, it's not done nearly enough.

What is your opinion of fans emulating games?

I think it's a really important part of maintaining history, I mean you can't always find the original hardware for some game, sometimes the original hardware has like, you know a console doesn't last forever. I have my old SNES [Super Nintendo Entertainment System, a games console] and it's died, it's busted, the power unit is dead or something, and I can't get that fixed, I'd have to get a new SNES and there's only going to be a limited number of SNESs in the world. I don't know how many working Atari 2600s there are, but that's going to be a dwindling number. So I think in the long run you need emulation, there's going to be no other way to play games from 30 years ago in the future, if that makes sense. But yeah, I think the industry is far, far too paranoid about, sort of, like piracy and intellectual property theft and stuff. I mean, yeah intellectual property theft on an industrial scale is a problem, I can see why the industry would be worried about that, but on an individual scale, one person, one kid downloading a game from 20 years ago and playing on an emulator I do not see as any great threat to the future of the industry, I actually see it as an asset. As I said before, we need to have game 'literacy', we need to know where this stuff has come from, especially if they're working as designers or whatever. Emulation is an important part of that.

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When you were a student did the issue of records management come up?

Briefly, I remember there was an initiative, now what's it called, the Uni did have a thing called the Scottish Video Games Archive, SVGA and I think that's still running, and they were just collecting sort of old, like donated old hardware and old games and stuff as a preservation thing essentially. So yeah it came up, but it never really came up as a professional issue or anything, it was never mentioned as part of the course, it's was something that happened on the side as one of the lecturer's pet, hobby projects.

Do you think it's something that needs to be taught to students of game design?

Well certainly, in a way yeah, if you're teaching the history of games. If you're teaching game design you have to teach the history, because as I say you need to know where this stuff has come from. If you're teaching history then archiving and preservation is an important part of that because how else are you going to teach about old games, you need to be able to play them, right? So there needs to be some way to hold on to that stuff, to make it available to new students, new designers coming into the industry. I think it falls on naturally from the premise.

Interview 3: Games Artist

Do you believe it's important for the industry to preserve its games for the long term? Do you think games are a worthy medium for preservation?

Oh yeah, certainly. Whether that's on the original platforms or whether that's porting them onto current platforms, I know a lot of retro games are being ported on to iPhone, iPad, Android and such. Yeah, I think it's good for the industry to show that the state it was in.

When you were a student did the issue of records management come up?

No, it was all about getting through development. I did my masters at Abertay and it didn't come up and it's never come up during my job either.

Do you think it's more on the shoulders of developers to do this kind of work, or do you think it's more to do with museums and institutions?

[laughs] Now that's a question, isn't it? It would be nice if developers could leave their work to be used later, I mean that should be the case, but there's a lot of time and cost involved with that sort of thing with no real financial benefit to the company at that time. I could maybe imagine a large publisher like, say, EA, they might deal with a lot of that stuff. Also I think if it's down to museums, there's a lot of technical limitations for them. If things aren't left in a state that they can use it then there's not really a lot they can do without a huge cost to them either. It's not like getting archive footage or archive sound or anything. [5 seconds inaudible due to background noise].

Interview 4: Games Developer

Do you believe video games are an art form or medium worthy of long term preservation? Do you think it's something the industry should be doing?

Oh that's a can of worms, Jesus! So, yes and no, and yes. So what I would say probably is that preservation is important, I mean there's a bit outside just now that is

the history of games, I haven't had a close look yet, but it's in the corner over there [referencing the exhibit of consoles and other materials] and that's important to have a record of where we've been and I always say to students and everybody else to look at the games that have come before to get an idea of what we're going to build on in the future. Stuff like quick time events you can trace that ancestry back to skill checks in *Dungeons & Dragons*, and having an understanding of where it came from enables you to see what's going to come next. So from an industry point of view preservation is important. I'm not really going to necessarily touch on the art form thing because that's a little too contentious. It's one of those questions where it's like, the fact that we're having to ask the question even is kind of problematic. In terms of preservation, I also understand that stuff like *WoW* [*World of Warcraft*, a popular MMO], preservation is not necessarily part of the... it's not a sales driven thing, therefore it's not part of the business model, therefore it's not something the''re going to be focused on. As we move into stuff like, *SimCity* is a good example, *SimCity* has got this always online, and everybody is sort of rage quitting the internet over [it]. I think it's completely feasible for them to do that because that is the business strategy, at the same time I would like to see, and I don't know if it's possible or necessarily, you know it's not something that turned into law (?), but when you sunset the servers you have to release the server code, because if you aren't making money from it any more then somebody should be able to come along and say well I really like this game so as a community thing I am going to take on the costs of keeping this alive to an extent and preserving it that way, so preservation through server code of always-on stuff and that's something that we should be trying to push as a policy. I don't think it would necessarily fly, but it would be quite interesting.

Who should be responsible for that? Should it be part of the developer's responsibility to preserve or do you think it's the responsibility of museums and other institutions to do so afterwards?

Well, ok so, developers have a responsibility to allow it, and then it has to be somebody else's job to actually do it, and that could be a museum, could be a university, could just be a community who feels very strongly. So there's an installation at the Seattle Museum of something or other, which you probably know about from research around this area. So I was chatting with a guy who set that one up, probably about this time last year, who's very big into these things, but he's based around preservation and he comes at it from a library perspective, he's not a dev necessarily, but he's very into the taxonomy and the categorical aspect. So yeah, devs have the responsibility to allow preservation and then, like I said, somebody else needs to take it on because it's not a business decision it's not part of the business system therefore you can't push it into the business world.

From an education point of view, do you think that things like records management should be taught to students of game design? Even just from a business perspective?

Business records absolutely, if that's what you mean by records. I mean, logging things is always important, with everything. I am hugely analytics driven, that's my AI background, the more data you have the worst thing that you can do is do nothing with it, right? And then if you've got the data maybe you can do something with it. So having records and actually learning how to use those properly is maybe a good thing. That said I'm not necessarily convinced that there is one way to do it, so maybe having it codified

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as something to be taught is maybe not the right way to go about it, But yeah, as a weakness? Yes it's important and how we tackle that is maybe a different question.

Interview 5: Games Developer/Lecturer

Do you believe it's important for the game industry to start to preserve its heritage?

I have very, very strong views on this, you'll be amazed to hear, I'm sure. Yes it's incredibly important and the video games industry has always suffered from being driven forward by technology the way it does, but what it means is that previous technologies disappear from the market they aren't manufactured anymore and it means that what you used to be able to play five years ago you can no longer play, legally. What this has led to is a huge range of sites out there called abandonware and so, the games industry, rather than capitalising on this back-catalogue, rather than using this to create some sort of long tail and actually maximise the lifetime revenue of a game, the games industry has, to date, ignored its entire back-catalogue, ignored the preservation of games and the commercial opportunities that opens up. Because the hardware you needed to play the game legally no longer exists and it's taken a very small number of companies like Good Old Games and arguably the app store to go out and actually show the market that there is a real demand. It might not be a massive demand, but there's a real demand there for all of these things. I lecture quite a number of classes and film makers and everything, and I try to emphasize to them that you can go out and buy *Casablanca*, you can go out and buy *The Seventh Seal*, you can go out and buy *Ben Hur*, you can go out and buy, you know, *The Voyage to The Moon* from the late 1800s. We can't do that, if I wanted to go and buy *Lemmings*, the original *Lemmings* today, couldn't do it. If I wanted to go buy the *Hitchhikers Guide to the Galaxy* from Infocom, I just can't do it because it doesn't exist and it wouldn't work on a Mac. I can, admittedly play it in on the BBC website where it exists as a flash game, but that's not the same. So I think the games sector has missed a massive opportunity, I think it's starting very, very slowly to wake up to this. But what it means is that for most people, if they want to revisit the games of their childhood, the classic games that they've known, if they wanted to do anything, play any game that is not on the current generation of hardware they've either had to have their old console at home or they've had to break the law by getting an emulator and downloading a cracked copy. I own the Multiple Arcade Machine Emulator, and I use it in all of my lectures, all of my classes and I speak to a lot of people and I am showing them some of the old games and I've got basically every game ever released. I've got, I must have at least 3,000 games on my hard drive. I've got a phone, I've got an iPhone which has emulators for pretty much any device I have ever owned, so am I breaking the law by going back and playing *Ant Attack*, or *Shadow of the Beast* or *Lemmings* again? I've owned all of these games and they're quite possibly up in the attic or in a box somewhere, I don't know. But you know, it's my *Hired Guns* disks, one of them just degraded and wouldn't play anymore, so despite the fact that I've still got my Amiga 600 and I own a legal copy of that game, I can't play it. So I think the games industry is, again it's this short term thinking, it's this lack of business understanding, it's this lack of recognising itself as a medium, an art form in its own right. So they've absolutely missed a massive opportunity up to the present day. I think they are starting to catch up now and the smaller companies will probably be faster than the big companies to actually pick up on this, but it's something that has to happen otherwise we run the risk missing out a very, very significant part of

the cultural output of the UK and the rest of the world simply because the hardware that we used to build and consume these experiences no longer exist and that's what can happen.

Do you think it would be a worthwhile thing to teach things like records management or information management to get that sort of thing into students' minds?

I think again, I think it's a problem that's almost solving itself. Because most of the development happening now, as I said 90% plus in Scotland of all development is online so therefore degradation of physical media and changes to hardware are less of an issue, but I think it would be a very good idea. Part of the entrepreneurial education of design, development, production students should absolutely include elements like the 'long tail'. If your game can't be found and can't be played and you're not going to make any money from it, and if that happens, okay so suppose Apple releases the iPhone 6 in September this year and it is significantly changed, it's got a different chip-set in it and so it won't play anything before the iPhone 4. So that means everything released before the iPhone 4 came out is no longer supported, and this has already started to happen with iOS, really old titles that if you've got an iOS 3 phone you just can't play. So yes it's absolutely vital, it's absolutely significant and I think there's a massive business opportunity out there and Good Old Games seems to be doing pretty damn well, I mean every time I get an email from them I usually end up spending five quid on something. Film relies on the long tail, music relies on the long tail, you know I can go and buy everything The Beatles have ever recorded now, finally I can get it digitally, which more-or-less means it will live forever, but I bought The Beatles albums and some Stones albums, "Brian Jonestown *Massacre"* on vinyl - [interview had to be cut short due to time constraints].

Interview 6: Games Developer

Do you believe it's important for the game industry to start to preserve its heritage?

We've got no choice, it's there and it's never going away. You know, for the makers who are making these disposable games, these free-to-play things, they essentially waste 5-10 years of their lives making these games because they can't ever show them again, we can't, nobody can experience them because they have to be experienced in this contemporary narrative. Is that a bad thing? Probably, because we won't be able to appreciate just how bad they were, in my opinion. For things like *Lemmings* and *Mario* we've got no choice because they are never leaving us, it's a moot point I think.

Who should be responsible for that? Should it be part of the developers' responsibility to preserve or do you think it's the responsibility of museums and other institutions to do so afterwards?

Neither, the games developer, it's their own personal responsibility for themselves, but the community will preserve your game, the community has already hacked your game and given it away for free. The benefit of that is that it's there forever, it will never go away. So the best way to look at piracy is the de-centralisation of archiving.

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Do you think then it would be beneficial for developers to harness that back-catalogue?

Again, I don't think we've got a choice, but I think there are definite business models to make money out of people pirating your stuff. I think that's about the only thing you can do is to steer it in a way that people buy your t-shirts because they like your game that they've pirated from you. Yeah, I don't think there's any choice.