Understanding the "Expanded Notion" of Videogames as Archival Objects: A Review of Priorities, Methods, and Conceptions

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This paper aims to show how videogames are construed as archival objects in the videogame-preservation literature by investigating drivers and motivations, selection of material, and methods of preservation. The review focuses on the *expanded notion* of videogames ("the EN"), a concept this paper introduces to collectively refer to the cultural and social aspects of videogames—for example, game culture, experiences, play, and community life and activity. The study's research aims are pursued on the basis of a critical systematic literature review of 42 publications originating from academic research and videogame-archiving projects. The study's main finding is that the archiving literature construes the EN of videogames in three principal ways: i) as an essential part of the videogame as an archival object; ii) as a useful resource in archiving videogames, able to provide documentation of game culture and social context; and iii) as a useful resource in inquiries focused on the current state and recent history of society and culture from a sociotechnical viewpoint. The study suggests videogame community dynamics, videogame ontology, the development of archival theory, and videogame-archive studies as rewarding directions for further research.

Introduction

What are the conditions for obtaining information about noncurrent videogames, now and in the future? This key question for many modes of videogame research centers to a large extent on the topic of this paper: videogame archives and the practices and modes of thought that shape them.[1] By way of a literature review, the present paper investigates how videogames are understood as archival objects in the archival literature, and how they are seen to be best ingested into archival collections. The conventional way of preserving videogames is to safeguard their accessibility either by emulation or collection of physical copies of games and the hardware needed to run them (McDonough et al., 2010). Although this approach is crucial to the endeavor of videogame archiving as a whole and a complex practice in its own right, it has seen considerable research attention in recent years and is therefore largely left aside here. Instead, the paper places special emphasis on investigating archival literature that engages with the *expanded notion* of videogames ("the EN"). The EN is a concept introduced in this paper to collectively refer to aspects of videogames other than the purely material: game culture, cultural and social aspects including experience, play, and community life and activity. This particular focus constitutes the major contribution of the present paper in relation to earlier reviews of research and practice in the field of videogame preservation (e.g., Winget, 2011b).

The term "videogames" designates a broad set of software with varying manners of use, consumption, distribution, and sales—ranging from multiplatform and large-scale studio productions to smartphone games and independently released PC games for niche audiences. Even though there are many views on where the boundary should be drawn between the game and what is "game-related," it is nonetheless clear that videogames have strong connections to hardware (consoles, controllers), software (operating systems, drivers), network connections (LAN or Internet), and other materials (game boxes, manuals) alongside the social relations and cultures of videogame players (Kraus & Donahue, 2012; McDonough et al., 2010; Winget, 2011b; Winget & Murray, 2008). The reasons put forward for the creation and curation of videogame archives often pertain to the cultural and economic significance of games, and the ubiquity of play (e.g., Bachell & Barr, 2014; Lowood, 2004). Preservational motivations aside, videogames have also attained scholarly importance, and game research is carried out in

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[1]All general expressions denoting the selection, collection, and safeguarding of games and game-related information (e.g., "videogame archiving" and "videogame preservation") are used equivalently. "Videogames" is similarly used as an umbrella term for electronic games, including computer games, smartphone games, console games, and arcade games.

multiple disciplines, including game studies, an interdisciplinary field focused on researching videogames and associated phenomena.

The increasing economic, cultural, societal, and scholarly weight of videogames has heralded a broad array of museum and archival projects and scholarly work aimed at ensuring that videogames are preserved and kept available for future study and use. Examples of major research projects in this area are the Preserving Virtual Worlds (PVW) (McDonough et al., 2010) and KEEP (Pinchbeck et al., 2009) projects. PVW broadly investigates issues relating to videogame archiving (including intellectual property law, migration, emulation, and metadata models) using a case-study approach, while KEEP focuses on developing software to facilitate the use of emulation as a preservational technique. An array of approaches is also visible in prominent videogame archives and museums. The ambulating videogame exhibition Game 2.0 (Barbican International Enterprises, n.d.) is marketed primarily as an arcade, offering its visitors the opportunity to play a wide selection of older games, which is markedly different from the British National Videogame Archive (Newman & Simons, 2009) and its orientation towards preserving videogame culture. Scholarly contributions to the theory and practice of videogame archiving show a similar spread of focal points: gameplay and the available ways of gameplay capture are a salient theme in Lowood's writing (2004, 2009, 2011); Winget (2011a) explores player-made collections of videogame-related materials and how they can benefit the work of preserving videogames, and Swalwell (2009, 2014) investigates different ways of telling videogame history via archival and museum collections.

Purpose and Aims

As the above examples show, there are substantial differences in the conceptions and practical approaches underpinning the building and curation of videogame archives. While archival efforts of many kinds are needed to capture videogames (McDonough et al., 2010), research relating to the creation and development of archives in general shows that self-reflexivity and the interlocking of theory and practice are crucial factors in successful preservational projects (Cox, 2002; Gilliland & McKemmish, 2004). Work on videogame preservation can thus only fully contribute to the advancement of the archival field if it is complemented by an examination of the patterns of archival reasoning and suggested practice present therein. The scarcity of such meta-analysis in the videogame-archiving field motivates this paper: to explore the questions of what the EN of videogames is from the viewpoint of videogame archiving, and to see how varying conceptions and definitions of the EN of videogames inform preservational practice.

The first aim of the present study is to examine the overarching motivations and drivers for videogame preservation so as to provide a background for subsequent discussions in the paper. Second, the study seeks to show how the EN of videogames is construed in the videogame-preservation literature by investigating patterns of motivations and drivers, selection of content and materials, and methods of preservation. The third aim of the study is to identify rewarding directions for future work and highlight important points of debate.

The study is a critical systematic literature review (Grant & Booth, 2009) of publications originating from a broad range of academic disciplines and videogame-archiving projects. Content analysis (Krippendorff, 2004) and writings on the method of systematic literature reviews (e.g., vom Brocke et al., 2009; Webster & Watson, 2002) inform the paper's theoretical and methodological approach.

Methods and Research Design

The present review draws on a selection of method papers on qualitative systematic literature reviews (Bandara, Miskon, & Fielt, 2011; Dixon-Woods et al., 2006), including literature-review methods accentuating the need for transparency and rigor (vom Brocke et al., 2009; Webster & Watson, 2002). Although distinctions do exist among these works, the review connects to their common methodological thrust: to make transparent the reviewer's resources and literature search processes. The review has also drawn inspiration from Burda and Teuteberg's (2013) systematic review of digital-preservation literature in terms of research design, article structure, and table layouts. The publication types included in the review are English-language, peer-reviewed scholarly journals and conference proceedings, book chapters, white papers, and project reports. Based on the argument that the academic journal is the primary medium of communication in the research domains most relevant for this paper, the review excludes monographs, professional journals, and brief documents (posters, extended abstracts). Following Dixon-Woods et al. (2006), the selection of publications to include in the present review was based on topical relevance. Three such criteria were employed:

1. Topically, the review focuses on works that address the motivations for and procedures of videogame archiving and the definition of games as archival objects.
2. Texts discussing the preservation of software in general have been omitted from the review, as have those that focus on games in relation to libraries, museums, or cultural heritage without engaging with matters of videogame archiving.
3. Publications that focus on conceptual modeling, metadata description, or the technical aspects of videogame archiving are not included despite their importance for the larger project of preserving games.

Preliminary database searches indicated that the field of game-preservation research has no easily identifiable core journals or conference proceedings. Hence, the scope of this review is not defined with reference to any particular disciplines or publication venues; the search results are instead wholly determined by the above limitations in conjunction with the chosen databases and search strings (see Table 1).

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TABLE 1. Search results in total numbers, parsed by database.

Database	Limiters	Search date	Results[c]	Av. f. download
ACM	Title, abstract, review	2015-10-08	7	7
GScholar	N/A	2015-10-08	42	42
IEEE	'Metadata'[a]	2015-10-08	3	3
LISA	'Metadata'[b]	2015-10-08	8	7
LISTA	Abstract, title, keywords	2015-10-08	3	1
WoS	Topic, title	2015-10-08	6	6

[a]Includes abstract, index terms, and bibliographic citation data (such as document title, publication title, and author).

[b]See http://search.proquest.com/lisa/advanced?accountid = 14715.

[c]Relevant search hits per database. Overlaps did occur, that is, some texts were listed in several databases. The following search strings were used: "game* archiv*"; "game* preservation*"; "game* document*"; "videogame* archiv*"; "videogame* preservation*"; "videogame* document*".

TABLE 2. Precodification scheme.

Theme	Driving question
Motivations and drivers: VGs	What are the drivers and motivations of VG archiving?
Motivations and drivers: the EN	What are the drivers and motivations of the archiving of the EN?
Content	What informational content is considered to be of priority in the archiving of the EN?
Materials	What materials are considered to carry the prioritized informational content?
Methods	What approaches are deemed effective in the archiving of the EN?

VG = videogames; EN = the extended notion (of videogames). Both abbreviations are henceforth used in all tables. The five themes of the precodification scheme each correspond to a heading in the findings section.

The Literature Search Process

The database resources at the author's disposal were those provided by Uppsala University Libraries with the addition of Google Scholar. Google Scholar arguably has more breadth than traditional academic databases and was included to lessen the risk of missing important contributions that would otherwise not be included in the review. Preliminary searches led to the identification of six databases to be included in the review, along with six search strings to query them (Table 1). The selection of databases and search strings was based on the topical relevance of the databases in combination with the quality of the results from the preliminary searches.

The database queries resulted in 53 unique hits. Based on an analysis of the abstract, introduction, and concluding sections of each yielded document, a first selection of relevant texts was made. This led to the exclusion of a total of 24 items. The remaining 29 texts comprised the starting point of a backward and a forward reference search (Bandara et al., 2011), which yielded a total of 42 texts to include in the review.

Content Analysis and Coding

The analysis of the extracted publications was performed using content analysis (Krippendorff, 2004). In preparation of the first steps of coding, a precodification scheme (Table 2) was established based on research aims 1 and 2 and fundamental themes outlined in best-practice archiving literature (e.g., *Good practice handbook*, 2003; cf. Bandara et al., 2011; vom Brocke et al., 2009; Burda & Teuteberg, 2013). The purpose of the scheme was to provide a theoretical structure for the review, strengthening its conceptual focus and serving to tie the analysis to the aims of the paper. With initial direction from the precodification scheme, the coding of the selected publications proceeded inductively and cyclically with guidance from grounded theory (as per Charmaz, 1983, pp. 111–116) and the related method of constant comparison (Corbin & Strauss, 1990, p. 9). The 42 publications under review were analyzed in full text, and this analysis resulted in the creation of 22 discrete same-level categories (see Tables 3–6) ordered in the five high-order themes of the precodification scheme.

Limitations

The design of this review has several limitations. The review's critical focus means that it provides less descriptive detail and overview in favor of analysis and discussion. Additionally, the choices and prioritizations implicit in the processes of literature search and coding significantly impact the findings and conclusions of this paper. To ensure the intersubjective confirmability of the results, the literature review was carried out in accordance with the guidelines of systematic literature reviews and includes a high degree of transparency in method. Since the review method and precodification scheme have been adjusted to the specifics of the present study, their transferability is limited. If due adaptive efforts are made, however, the combination of the procedures of the systematic review, the precodification scheme, and inductive coding approach can provide guidance for research on the principles and practices of other archival fields as well.

Findings

Motivations and Drivers for the Preservation of Videogames

Table 3 provides an overview of the motivations and drivers of videogame preservation found in the reviewed archiving literature. The main portion of the categories are mainstays in the general discussion of videogame archiving. These categories include technological motivation of two kinds: first, that of access at risk due to the fragility of hardware and the extensive dependencies of both videogame

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TABLE 3. Motivations and drivers: videogames.

Category	Common position	Related topics	References (e.g.)
Technology *i*	VGs "are among the most fragile of digital works [. . .]." McDonough et al. (2010, p. 106)	Hardware and software obsolescence and volatility; the viewing problem; bit rot.	Antonescu et al. (2009), Bachell et al. (2014), Barwick et al. (2008), Gooding et al. (2008), Guttenbrunner et al. (2010), Guttenbrunner et al. (2008), Kraus et al. (2012), Lowood (2009), McDonough et al. (2011), McDonough et al. (2010), Monnens et al. (2009), Newman (2011), Swalwell (2009), Swalwell (2014), Thompson et al. (2009), Winget et al. (2008).
Technology *ii*	VGs "have had an important influence on [. . .] computing technology [. . .]." Barwick et al. (2008, p. 4)	Technological value; computer and software development history.	Anderson et al. (2010), Galloway (2011), Pinchbeck et al. (2009), Swalwell (2014), Takhteyev (2013), Thompson et al. (2009).
Society and culture	VGs "are as central to our culture, our heritage, our development as individuals as television or books." Anderson et al. (2013, p. 3)	Play; digital culture; sociotechnical history; VG culture.	Anderson et al. (2010), Antonescu et al. (2009), Barwick et al. (2011), Esposito (2005a), Esposito (2005b), Guttenbrunner et al. (2010), Guttenbrunner et al. (2008), Harviainen et al. (2012), Lowood (2004), Lowood (2011), McDonough et al. (2011), Murphy (2013), Newman (2009), Newman et al. (2009), Sköld (2013), Stuckey et al. (2013a), Stuckey et al. (2013b), Swalwell (2007), Swalwell (2009), Takhteyev (2013), Winget et al. (2008).
Learning, re-use, and research	Archived VGs are "relevant to developers if they wish to learn [. . .] from their previous endeavors." Bachell et al. (2014, p. 141)	Educational tools; scholarly importance; user access.	Anderson et al. (2013), Anderson et al. (2010), Bachell et al. (2014), Barwick et al. (2008), Barwick et al. (2011), Gooding et al. (2008), Guo et al. (2012), McDonough et al. (2011), Monnens et al. (2009), Newman (2011), Newman (2012a), Pinchbeck et al. (2009), Winget (2011b), Winget et al. (2011).
Economic and financial	VGs "are taking their [financial] place [. . .] alongside the established mediums of film and music [. . .]." Gooding et al. (2008, p. 20)	The VG industry revenue, sales, and employment; entertainment industry context; brand name management.	Bachell et al. (2014), Barwick et al. (2008), Esposito (2005a), Esposito (2005b), Gooding et al. (2008), Guo et al. (2012), Harviainen et al. (2012), Lowood (2004), McDonough et al. (2010), Monnens et al. (2009), Newman (2011), Newman (2012a), Sköld (2013), Winget (2011b), Winget et al. (2008), Winget et al. (2011).

Note. In this table, and in all the following tables in the findings section (Tables 3–6), the "category" column evinces a high-level abstraction of topic; "common position" presents an example of the category as expressed in the literature, while "related topics" show the topical breadth of related discussions.

software and the machines needed to run it. McDonough et al. (2010) explore this extensively in the *Preserving Virtual Worlds Final Report* alongside many other studies (Gooding & Terras, 2008; Monnens et al., 2009; Thompson, McAllister, & Ruggill, 2009). The second motivation is that videogames are drivers of technology, and hence a valuable resource in the rendering of computing history (Anderson, Delve, & Pinchbeck, 2010; Galloway, 2011).

A range of publications (Esposito, 2005a, 2005b; Lowood, 2011; Newman, 2011; Winget, 2011b) use one of the broadest modes of reasoning for keeping videogames in the archives, referring to the impact of videogames in contemporary society: games are understood as a weighty factor in the shaping of culture and media consumption patterns, including play. Similarly, the size of the videogame industry is also presented as a reason to safeguard games, principally due to its current and prospective business values and its parity with other media already established in the archival sphere, like books and movies. Of lower visibility is the way of reasoning that games should be kept because of their informational potential, as seen in Winget and Sampson (2011) and Guo and Iosup (2012). In this view, developers, educators, and students would benefit from access to noncurrent videogames so that they can employ and study them for their respective purposes.

Motivations and Drivers for the Preservation of the EN of Videogames

The motivations and drivers of archiving the EN of videogames can be structured into three principal groupings. The first is "ontology" (O)—where videogame culture and the act of play is seen as an inalienable part of what a videogame is. The second is "contextuality" (C)—accentuating the EN of videogames as vital contextual information. The third is "epistemology" (E)—where documentation of the EN is considered to be important for understanding past and present forms of social life involving digital technologies (Table 4).

The ontological argument for preserving the EN is that videogames are essentially contextually bound, interactable artifacts that archival strategy must account for in a way that preserves this defining characteristic. Galloway (2011) and Stuckey, Swalwell, and Ndalianis (2013a) employ the notion of culture to characterize the relationship between games and their contexts of use, while other publications use the concepts of play and interaction (Newman, 2011; Shipman & Marshall, 2014).

The contextual reasons for the archiving of the EN that emerge in the reviewed literature emanate from a viewpoint of collection and documentation. Publications such as Kraus and Donahue (2012) accentuate why archives need to reflect the context of videogames in order to

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TABLE 4. Motivations and drivers: the EN.

Category	Common position	Related topics	References (e.g.)
Culture (O)	VGs "are software artifacts, communities, and commodities." McDonough et al. (2010, p. 5)	Experiences; social relationships; attitudes; material culture; behaviors; folklore; discourses.	Anderson et al. (2010), Barwick et al. (2008), Conley et al. (2004), Galloway (2011), Guo et al. (2012), Guttenbrunner et al. (2010), Guttenbrunner et al. (2008), Harviainen et al. (2012), Lowood (2004), Lowood (2009), McDonough et al. (2011), McDonough et al. (2010), Murphy (2013), Newman et al. (2009), Pinchbeck et al. (2009), Sköld (2013), Stuckey et al. (2013b), Swalwell (2014), Takhteyev (2013), Thompson et al. (2009), Winget (2011a), Winget (2011b).
Play (O)	VGs "come to life in the act of play." Stuckey et al. (2013b, p. 1)	Interaction; modes of gameplay.	Anderson et al. (2013), Antonescu et al. (2009), Barwick et al. (2011), Gooding et al. (2008), Lowood (2004), Newman (2011), Newman (2012b), Newman et al. (2009), Shipman et al. (2014), Stuckey et al. (2013a), Stuckey et al. (2013b), Swalwell (2014), Winget et al. (2011), Winget (2011b).
Interpretation (C)	"[B]uilding contextuality is important [. . .] for future users." Kraus et al. (2012, p. 3)	Retrospect understanding of impact; gameplay, culture, experiences, and relationships.	Esposito (2005a), Esposito (2005b), Galloway (2011), Harviainen et al. (2012), Kraus et al. (2012), Lowood (2009), Lowood (2011), Monnens et al. (2009), Stuckey et al. (2013b), Winget (2011b).
Ecosystem (C)	VGs are" shaped by [. . .] player[s], software, hardware, game design, and often wider culture [. . .]." Gooding et al. (2008, p. 22)	IP law; digital culture; VG industry (development and publishing).	Anderson et al. (2010), Bachell et al. (2014), Gooding et al. (2008), Lowood (2004), McDonough et al. (2010), Monnens et al. (2009), Murphy (2013), Newman (2009), Shipman et al. (2014), Takhteyev (2013).
Digital culture and society (E)	VGs "are as much a part of our culture as television, the newspaper, and the book." Monnens et al. (2009, p. 11)	Play; visual media; media remix.	Anderson et al. (2013), Gooding et al. (2008), Monnens et al. (2009), Murphy (2013), Lowood (2011), Swalwell (2007).
Socio-computational history (E)	"Videogames were a prime harbinger of digital technologies." Swalwell (2007, p. 257)	Computer appropriation and use; software development; VG history.	Anderson et al. (2010), Barwick et al. (2008), Stuckey et al. (2013a), Stuckey et al. (2013b), Swalwell (2007).

Note. O = ontology; C = contextuality; E = epistemology; IP = intellectual property.

competently safeguard videogames. The argument presented here is that videogame archives must hold contextual information so as to provide their users with the opportunity to better interpret the impact and consequences of individual titles, the development of gaming and gameplay, and other vital aspects of videogames. Lowood (2004), among others, focuses instead on the ecosystems of videogames, arguing that it is important—in videogame archiving—to acknowledge the many relationships that together define what a videogame is; for example, software, performance, and a part of an industry.

The epistemological grouping stresses the relationship between the EN of videogames and broader cultural formations, which are understood as shaping each other. The value of documenting the EN is here seen as stemming from the ability of such materials to provide a window into the development and constitution of contemporary society and digital culture, as well as the processes of computer appropriation and the history of software development (Barwick, Dearnley, & Muir, 2008; Murphy, 2013).

Selection of Content and Material

This section focuses on the processes of selection geared towards preserving the EN of videogames. In order to elucidate both the aims and implementations of selection, distinction is here made between content and material in the analysis. The former describes the information that is desirable for the game archives to retain. The latter denotes the types of materials that would need to be collected. Table 5 shows the processes of selection ordered into three principal groupings: "videogame users" (U), "videogame communities" (COM), and "the artifact of the game" (G).

The selection of materials providing insights into core and peripheral modes of gameplay emerges in the studied publications as a main strategy in the preservation of the EN (Antonescu, Guttenbrunner, & Rauber, 2009; Lowood, 2004, 2009, 2011; Newman, 2009, 2012a, 2012b). Newman (2011) and Sköld (2013), among others, suggests that user-produced materials (www-materials,[2] speedruns) can tell of

[2]"www–materials" is a shorthand term for websites, forums, blogs, wikis, Twitter, and similar services.

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TABLE 5. Selection of content and material in the preservation of the EN.

CONTENT				MATERIAL
Category	Common position	Related topics	References (e.g.)	Examples
Gameplay and game engine-use (U)	"[VG archiving entail] capturing traces of activity in game worlds [. . .]." Lowood (2009, p. 122)	Different modes of gameplay; non-gameplay engine-use.	Antonescu et al. (2009), Barwick et al. (2011), Guo et al. (2012), Guttenbrunner et al. (2010), Lowood (2004), Lowood (2009), Lowood (2011), McDonough et al. (2010), Monnens et al. (2009), Newman (2009), Newman (2011), Newman (2012a), Newman (2012b), Shipman et al. (2014), Swalwell (2007), Swalwell (2014), Thompson et al. (2009), Winget (2011a), Winget (2011b).	Videos; demos; machinima.
Development and regulation of gameplay (U)	"[M]echanism[s] for sharing, exploring, regulating and legitimising gameplay [. . .]." Newman (2011, p. 121)	Competition; expertise; cheats; exploits; min-maxing; gameplay norms.	Barwick et al. (2011), Lowood (2004), McDonough et al. (2010), Monnens et al. (2009), Newman (2011), Newman (2012a), Shipman et al. (2014), Sköld (2013), Swalwell (2014), Winget (2011a).	Walkthroughs; FAQs; speedruns; www-materials; reviews.
Experiences and memories (U)	"These materials [. . .] indicate something of the meaning of the world [. . .] to the players." Winget (2011a, p. 48)	Experiences of consumption, gameplay, and non-gameplay use; social experiences; hardware.	Anderson et al. (2010), Barwick et al. (2008), Barwick et al. (2011), Esposito (2005a), Esposito (2005b), Gooding et al. (2008), Guttenbrunner et al. (2010), Guttenbrunner et al. (2008), Lowood (2009), Lowood (2011), McDonough et al. (2010), Stuckey et al. (2013a), Stuckey et al. (2013b), Swalwell (2007), Swalwell (2014), Takhteyev (2013), Winget (2011a), Winget (2011b), Winget et al. (2011).	Recorded oral information; www-materials; screenshots; fan fiction; I/O devices; game ephemera.
Community VG archiving efforts (COM)	"[T]he data and metadata sets [and] ROMs [. . .] represent some of the most complete [VG collections available] [. . .]." Newman (2012a, p. 13)	Metadata; content; website and service design.	Galloway (2011), Kraus et al. (2012), McDonough et al. (2010), Newman (2012a), Newman (2012b), Newman et al. (2009), Stuckey et al. (2013a).	Hardware and software technical documentation; metadata structures; Executable game files; ROMs.
VG Culture (COM)	"[T]he act of playing a videogame cannot be [. . .] considered or appreciated without [an understanding of] videogame culture [. . .]." Stuckey et al. (2013b, p. 3)	User behaviors and activities; events; folklore; discourses; player-to-player and player-to-community relationships.	Anderson et al. (2010), Antonescu et al. (2009), Bachell et al. (2014), Barwick et al. (2011), Galloway (2011), Guo et al. (2012), Guttenbrunner et al. (2010), Harviainen et al. (2012), Lowood (2004), Lowood (2011), McDonough et al. (2011), McDonough et al. (2010), Newman (2012a), Newman et al. (2009), Sköld (2013), Swalwell (2014), Thompson et al. (2009), Winget (2011a), Winget (2011b).	Ethnographies; recorded oral information; event transcripts; videos; www-materials; machinima; mods; fan art; fan fic.
The game (G)	"[The] systematic acquisition of video games, [. . .] consoles [. . .], [. . .] formats and their equipment needs [. . .]." McDonough et al. (2010, p. 105)	Hardware; software; technical documentation.	Galloway (2011), Guo et al. (2012), Lowood (2009), McDonough et al. (2010), Murphy (2013), Newman et al. (2009), Swalwell (2014), Takhteyev (2013), Thompson et al. (2009).	Hardware and software; technical documentation; player-software-network interactions.
Development, reception, and post-release work (G)	"To make sense of historical artifacts and activities [. . .] information about [. . .] their creation, reception, and display [is important]." Winget (2011b, p. 10)	VG news media and user reception; marketing.	Anderson et al. (2013), Bachell et al. (2014), Barwick et al. (2011), Lowood (2004), McDonough et al. (2010), Monnens et al. (2009), Newman (2009), Newman (2011), Newman (2012b), Newman et al. (2009), Stuckey et al. (2013a), Stuckey et al. (2013b), Swalwell (2007), Swalwell (2014), Thompson et al. (2009), Winget (2011a), Winget (2011b), Winget et al. (2011).	Design documents; prototypes; www-materials; concept art; story boards; artwork; budgetary information; ports; patches; support tickets.

Note. (U) = videogame users; (COM) = videogame communities; (G) = the artifact of the game.

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TABLE 6. Methods employed in the preservation of the EN.

Category	Common position	Related topics	References (e.g.)
Conceptual work	The archival challenges of "digital games and virtual worlds [. . .] demand new [. . .] strategies." Lowood (2011, p. 113)	Authenticity; significant properties; provenance; selection; VG industry asset management; socio-computational history; cultural heritage objects.	Anderson et al. (2013), Bachell et al. (2014), Galloway (2011), Guttenbrunner et al. (2008), McDonough et al. (2010), Monnens et al. (2009), Newman (2009), Newman et al. (2009), Swalwell (2007), Swalwell (2014), Thompson et al. (2009), Winget (2011b), Winget et al. (2011).
Cooperation	"It is essential that [. . .] [the] videogame industry trade bodies, publishers, developers [. . .], [and] gameplay communities [. . .] work together [. . .]." Newman (2012a, p. 14)	VG communities (material, selection, metadata service design); industry (material, copyright); heritage institutions (coordination, delegation).	Bachell et al. (2014), Conley et al. (2004), Galloway (2011), Harviainen et al. (2012), Lowood (2009), McDonough et al. (2010), Monnens et al. (2009), Newman (2009), Newman (2012a), Newman et al. (2009), Sköld (2013), Stuckey et al. (2013a), Stuckey et al. (2013b), Swalwell (2007), Winget (2011a), Winget et al. (2011).
Adaptation	"[R]efreshing of storage mechanisms [. . .] migration [. . .] and emulation [. . .]." Winget (2011b, p. 4)	Remix; backwards compability.	Conley et al. (2004), Guttenbrunner et al. (2010), Guttenbrunner et al. (2008), Kraus et al. (2012), Lowood (2004), Murphy (2013), Takhteyev (2013), Winget (2011b).
Collection and creation of "context materials"	"[C]rawling game- and virtual world-related websites [. . .] [provide] documentation [of] player activities." Lowood (2009, p. 126)	Screenshots; videos; manuals; forums posts and comments; fan fiction; wikis; databases; developer materials; documentation of oral information.	Anderson et al. (2013), Antonescu et al. (2009), Barwick et al. (2011), Esposito (2005a), Esposito (2005b), Gooding et al. (2008), Harviainen et al. (2012), Kraus et al. (2012), Lowood (2004), Lowood (2009), Lowood (2011), McDonough et al. (2010), Newman (2009), Newman (2011), Newman et al. (2009), Sköld (2013), Stuckey et al. (2013a), Stuckey et al. (2013b), Swalwell (2014), Takhteyev (2013), Winget (2011b), Winget et al. (2011).

the development and regulation of gameplay. Sources relaying user experiences and memories—including memories of gameplay as well as shared social experiences—are additionally seen as important. These sources encompass hardware (displays, gamepads), videogame journalism and news publications, user-produced www-materials, and videogame paraphernalia (Barwick, Dearnley, & Muir, 2011; Guttenbrunner, Rauber, & Heister, 2008; Swalwell, 2007).

Many efforts aiming to preserve videogames are driven by volunteer work. Such videogame deposits often exist online either in the form of websites or file-distribution networks. The literature suggests that the form and content of these community-run services and collections can be of use in the institutional archiving of the EN of videogames. Specifically, game files or ROMs, metadata, and technical documentation are examples of materials of interest in this regard (Galloway, 2011; Kraus & Donahue, 2012; Newman, 2012a). Several of the studied publications argue for the collection of documentation relating to the structure of social life and meaning-making in videogame communities. In Table 5 such materials are denoted by the catch-all term "videogame culture." To gather user-produced materials is suggested here, but also the approach of creating materials like descriptions of important in-world locations. Recorded oral information and event transcripts are other types of materials mentioned in this context (Anderson et al., 2010; Kraus & Donahue, 2012; McDonough et al., 2010; McDonough & Olendorf, 2011; Newman & Simons, 2009).

The reviewed literature states that the preservation of the EN encompasses also the collection of retail versions of games and in some cases contemporary hardware setups. Further, it is noted that materials should be selected that provide information on the life cycle of games, from development (design documents, concept art) to reception (reviews, www-materials, sales figures) and postrelease work (ports, patch documentation) (Anderson & Delve, 2013; Bachell & Barr, 2014; Swalwell, 2007).

Methods

The publications in review offer a range of responses to the question of the proper way to archive the EN of videogames (Table 6). The methods detailed in Table 6 do not include the most general approaches of collection creation; for example, the gathering of games and related hardware. These methods are, of course, of great relevance in the archiving of the EN (e.g., Guttenbrunner, Becker, & Rauber, 2010; Lowood, 2009; McDonough et al., 2010). Related to the selection and collection of software and hardware are the methods of collection and creation of "context materials" (Kraus & Donahue, 2012; McDonough & Olendorf, 2011; see also Table 5).

A recurring viewpoint is that there is an incompatibility between the traditional archival concepts and the characteristics of videogames. Winget and Sampson (2011) discuss the notion "original" from this viewpoint, and Swalwell (2014) "authenticity." Successful work with videogames as archival objects is hence seen to necessitate the development of the archival conceptual framework. Several publications highlight the importance of strengthening the definition of videogames as archival objects of worth. Such a redefinition would aim at harnessing support for and aid in videogame preservation in general (Newman & Simons, 2009), but also specifically from memory institutions (Swalwell, 2007) and

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TABLE 7. The major patterns in the findings relating to the preservation of the EN.

Core conceptions of the EN		Prioritized content	Primary provenances	Principal methods
(A) Videogames are the EN	Culture and community	Behavior; discourse; social structures; experiences; perceptions	Gameplay videos; www-materials; descriptions	Collection; creation; conceptual work
	Play	Gameplay; the development and regulation of gameplay	Gameplay videos; www-materials; machinima	Collection; creation; conceptual work
(B) The EN is a resource in videogame archiving	VG context information	Production; reception; gameplay; behavior; experiences; perceptions	Gameplay videos; www-materials; descriptions; machinima; developer materials	Collection; creation; conceptual work; collaboration
	VG ecosystem	The game; production; community archiving; behavior; social structures; community archiving	Gameplay videos; www-materials; developer materials; software; hardware	Collection; creation; conceptual work; collaboration
(C) The EN tells of the contemporary	Digital culture and society	Behaviors; discourses; social structures; gameplay; developer materials; community archiving	Gameplay videos; www-materials; developer materials; software; hardware	Collection; creation; conceptual work; collaboration
	Socio-computational history	Experiences; developer materials; community archiving	Descriptions; design documents; hardware; software	Collection; creation; conceptual work; collaboration; adaptation

the videogame industry (Bachell & Barr, 2014; Kraus & Donahue, 2012).

The authors reviewed describe cooperation as a method that aims to add to the resources needed to safeguard the EN. They regard cooperation between institutions like archives and museums as beneficial. Areas of responsibility could be drawn up (Barwick et al., 2008) and work on establishing interinstitutional praxis in the curation of videogames as archival objects could be coordinated (McDonough et al., 2010). The knowledge and the collections of videogame communities, including the communities of retrogaming and fan-driven game-preservation projects, are valuable prospective partners concerning game archive service design, technical knowledge, the documentation of lived experience, and metadata work (application and structure) (Galloway, 2011; Newman, 2012a; Stuckey, Swalwell, & Ndalianis, 2013a; Stuckey, Swalwell, Ndalianis, & de Vries, 2013b; Takhteyev, 2013). Cooperation with the videogame industry, in turn, potentially yields materials with provenance in the development process and the opportunity to circumvent the legal hindrances to videogame preservation presented by IP law (Bachell & Barr, 2014; Conley, Andros, Chinal, Lipkowitz, & Perez, 2004; Winget & Sampson, 2011).

A strong theme in the reviewed literature is the consideration of the videogame platform as a crucial type of material. Due to the many dependencies of software, methods of adaption are required to maintain the capacity to access archived videogames. Emulation and migration are the two methods of adaptation currently available, and they are thoroughly discussed in the publications under study in terms of benefits and drawbacks, implementations, and long-term consequences (Anderson et al., 2010; Guttenbrunner et al., 2008, 2010; McDonough et al., 2010; Murphy, 2013; Pinchbeck et al., 2009).

Discussion

The main finding of this study is how videogames are construed as archival objects in archival literature that shows an interest in the social and cultural contexts of videogames, that is, what has been termed "the EN" in this paper. These results form the basis of suggested directions for future work in the area of videogame archiving (see Table 8).

Table 7 synthesizes the results of the review and shows the three core conceptions of the EN that emerged from the analysis, along with their main motivations and reasons, prioritized informational content and materials, and recommended preservational methods. The three core conceptions of the EN of videogames are:

A. Videogames are essentially culture, community activity, and play (the EN).
B. Materials with a provenance in videogame culture, community activity, and play (the EN) are important in the archiving of videogames.
C. Materials with a provenance in videogame culture, community activity, and play (the EN) are an important resource in the study of present-day technology and society, and its recent history.

Perspective A relates to the significant characteristics of videogames while B and C primarily address how the EN of videogames connects to broader cultural and social contexts.

In perspective A, the EN of videogames is construed as a key significant property—that is, the aspects that should be represented in the archive—of the archival object of the videogame. Successful efforts in the area of videogame archiving must, in this view, include elements of play and culture; the mere safekeeping of software and hardware is considered to be only a partial fulfillment of the basic aims of videogame preservation. The content types in focus in this

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TABLE 8. Directions for future work.

Area	Topic	Research question	Potential outcome	Related research
Videogame community dynamics	Knowledge production	How do VG communities produce and document knowledge?	The shaping of expertise and production of VG information resources	Barr (2014)
	Regulation of play	How are patterns of gameplay regulated and reproduced?	The interconnection of the EN and gameplay	Newman (2011)
	Social media	How are VG communities entangled with social media services?	Insights into a key communicative structure and the shaping of VG-related new media-services	Sköld (2013, 2015)
Videogame ontology	Videogames	What is a VG in an archival context?	More precise and productive use of terminology	Wardrip-Fruin (2009)
	"The EN"	What are the principal components of the EN?	More precise and productive use of terminology	The present paper
Archival theory	Conceptual development and application	How can core notions of archival theory be adapted to VG archiving?	Integration of VG archiving into broader archival discourses and knowledges	Winget (2011a, 2011b)
Videogame archive-studies	Videogame archives	What is kept in VG archive-holdings?	Results of past approaches and priorities; future directions	Rydén (2014)
	User studies	How are VG archives used, who are their users, and what are the users' interests?	Directions for metadata system design and collection development	Huvila (2008)
	Archivists and practices	How are VG archives created and curated, and what informs curatorial decisions?	VG archives in the making; future directions	Gilliland and McKemmish (2003)

specific archival formulation of videogames are those that speak of the cultures and social interactions of videogame communities, including gameplay and its regulation. Prioritized materials include www-materials and recorded gameplay, for instance gameplay videos, machinima, and walkthroughs. The view the EN of videogames as expressed in perspective A is shared by, for example, Newman (2011), Lowood (2004), Gooding and Terras (2008), and Sköld (2013).

In perspective B, the EN is viewed as an important resource in the preservation of videogames due to the contextual information it provides about the archived videogame itself, and of the relationship between the game and the ecosystem that comprises the videogame industry, player practices, community culture, and the framework of technology. By archiving the EN of videogames besides the software of the games themselves, the resulting archival collection contains a wider potential for use by virtue of its more diverse informational content. More significantly, the presence or absence of contextual information is directly related to the usefulness of the archived videogames as it affects their interpretability. The reviewed literature contains a range of formulations of how videogames as archival objects benefit from the contextual information provided by preserving the EN. Kraus and Donahue (2012) put forward the constant technological advancement of videogames as a reason why the documentation of context is important in videogame archives, even more so than in other record types. Reasons to archive the EN of videogames in order to safeguard information about the videogame ecosystem are put forward by, among others, Harviainen, Gough, and Sköld (2012) and Monnens et al. (2009), who focus on the entanglement of videogames with their related www-services and the structures of the videogame industry, respectively. In perspective B, relevant information also encompasses the reception of videogames, and the ways in which they were experienced and understood by players. Content pertaining to the "superstructure" of videogames—the patterns of production and marketing strategies of the videogame publishing industry and www-services that play key roles in videogame community communication and knowledge production—are also important. Examples of material types of priority are those with provenance in the videogame industry, videogame software and hardware, www-materials, reviews and videogame journalism, text and video recordings of gameplay, and game engine use.

In perspective C, finally, the preservation of the EN is important for the scholarly work of interpreting present-day society along with its recent history and development. The similarities with perspective B are notable: in both perspectives, the preservation of the EN is what allows archived videogame software to be viewed in relation with the contexts of videogame use and production as well as larger issues relating to technology, society, and culture. Anderson and Delve (2013) suggest that the preservation of the EN allows the archives to speak not only of the transient consumption of videogame entertainment, but also of important contemporary varieties of the innate human activity of play. Stuckey, Swalwell, and Ndalianis (2013a) and Swalwell (2007) argue that videogame culture and memories of playing games are useful sources of information on the history of personal computing and the sociotechnical developments

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that led up to the role of digital technology in contemporary society and culture. Content in focus in perspective C encompasses, besides the already-mentioned documentation of videogame culture and player memories, information about the development and publishing processes. Accounts of memories of videogame use, www-materials, documentation (text, video) of gameplay, in addition to videogame software and hardware, are prioritized materials.

Directions for Future Work

The findings of this review inform several directions for future work in the area of videogame archiving. Table 8 shows the main suggestions for further research along with tentative formulations of research questions, empirical contexts, and related literature. The suggestions are in line with the present study's interest in the EN of videogames and research-based development of the archival frameworks.

A possibly rewarding direction for research concerns user-generated types of evidence (gameplay videos, www-materials, machinima), as indicated by the overall absence of discussions in the reviewed publications addressing how such materials come into being and the role they play in the videogame community. Research aiming to elucidate how important and commonly occurring processes in videogame communities—for instance, knowledge production and the regulation of gameplay—interconnect with the creation of relevant types of www-services-like wikis and walkthroughs—could inform the work of selection and more purposeful material collection in game-preservation efforts (see Barr, 2014; Newman, 2011; Sköld, 2013, 2015). Knowledge of how such important locations actually are used, and the activities that shape and sustain them, could inform the work of selection and appraisal in many ways, for instance in the configuration of web archiving efforts aiming to collect videogame-related www-materials. The work of adapting core archival concepts and practices to videogame archiving is of great importance because it can provide a solid foundation for the advancement of the field (e.g., Lowood, 2009; Swalwell, 2014; Winget, 2011b). Starting from the fact that almost half of the texts reviewed in this study were conceptual in character, a plausibly fruitful approach in future work would be to complement conceptual efforts with empirical research. Winget's (2011a) study of players' collections of in-game artifacts provides a good example of how empirical phenomena relevant to the preservation of videogames could be used as a kind of "test-bed" for conceptual development by relating the findings to, for example, discussions of description, provenance, and authenticity.

A major segment of the roadmap for research shown in Table 8 is "Videogame archive studies," and it represents a knowledge gap in the literature. The purpose of this proposed research agenda is to examine current instantiations of videogame archives and the work that has created them, with the aim of discussing the findings in the context of best practice and concept-focused videogame-preservation research. Empirically, these studies would benefit from the fact that several videogame-archiving projects are currently underway, like the ones described by McDonough et al. (2010), Newman and Simons (2009), and Stuckey, Swalwell, and Ndalianis (2013a). The first of the three empirical focal points suggested in Table 8 is the constitution and collections of videogame archives, that is, finding out what videogames and related videogame materials the archives keep and how they are described. The second suggestion is to carry out studies of the needs and wants of different user groups. Third, the practices of archivists and curators working with videogame collections, along with shaping organizational factors, should be researched. Ideally, studies examining issues such as these would be carried out in different archives and different countries so that the local qualities of videogame archiving—like special interests, varying legal frameworks, differences of skill sets in the archival staff—would emerge in comparative analysis.

Finally, the question that has guided the present paper also merits additional work. This review was carried out using the basic analytic instruments of a series of fundamental but general questions (the precodification scheme, see Table 2) and the broad notion of the EN, encompassing culture, social structures, discourse, and more. A logical next step would be to explore in more detail the principal components of what here has been called the EN and their connections to videogame archiving practice and theory. A way forward here is to let research focused on exploring the nature of games inform the continued development of the videogame-preservation terminology, for example, the wider discussion about games being both artifacts and processes (e.g., Wardrip-Fruin, 2009).

Conclusions

This paper connects to the research tradition that finds inquiries aiming to make tangible the attributions of priority and the setting of boundaries at the center of every preservational activity as a valuable resource in progressive archival work (e.g., Cox, 2002; Gilliland & McKemmish, 2004). Coming from this perspective, the present study investigates how videogames are construed as archival objects in the videogame-preservation literature by way of a systematic literature review of 42 publications. The study aims to examine the drivers and motivations, selection of content and materials, and methods of archiving suggested in the archiving literature regarding the preservation of videogames in a generic sense (Table 3) and—which is of primary interest in the present paper and its principal knowledge contribution—as products of culture and social activity (Tables 4–6). The study showed that the EN of videogames is construed in three principal ways in the reviewed archival literature:

A. The EN as an essential part of the videogame as an archival object.
B. The EN as a useful resource in the archiving of videogames, able to provide documentation of game culture and social context.

DOI: 10.1002/asi

C. The EN as a useful resource in inquiries focused on the current state and recent history of society and culture from a sociotechnical viewpoint.

This rendering of what the EN of videogames in fact *is* in archival research is substantiated by an analysis that showed the connections between the aims and motivations of preserving videogames and the prioritizations of materials and methods that underpin the curation of archival videogame collections (Table 7). The study furthermore seeks to suggest directions for future work (Table 8), a road map that hopefully will prove to be a resource for empirical research and meta-analysis in the area of videogame preservation in academic, professional, and player communities. The proposed directions for further empirical and conceptual study are videogame community dynamics, videogame ontology, the development of archival theory, and videogame-archive studies.

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