

# A qualitative investigation of users' discovery, access, and organization of video games as information objects

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## Abstract

Video games are popular consumer products as well as research subjects, yet little exists about how players and other stakeholders find video games and what information they need to select, acquire and play video games. With the aim of better understanding people's game-related information needs and behaviour, we conducted 56 semi-structured interviews with users who find, play, purchase, collect and recommend video games. Participants included gamers, parents, collectors, industry professionals, librarians, educators and scholars. From this user data, we derive and discuss key design implications for video game information systems: designing for target user populations, enabling recommendations based on appeals, offering multiple automatic organization options and providing relationship-based, user-generated, subject and visual metadata. We anticipate this work will contribute to building future video game information systems with new and improved access to games.

## Keywords

Appeal factors; metadata; player types; user behaviour; user needs; video games

## 1. Introduction

Video games are an increasingly important part of culture and society. The global video game marketplace, including mobile games, is forecast to reach US\$102.9 billion by 2017.<sup>1</sup> In addition to people who play video games themselves, other stakeholders need to find games and related information, such as parents interested in children's game content, librarians and curators of game collections, video game industry employees, educators who are interested in using games in educational settings and academic scholars. Furthermore, video games are the subject of a wide variety of research, from understanding player experiences to honing game design. As commercial sales and cultural interest increase, it is critical to design information systems that provide useful and efficient access to video games from a user-centred perspective.

Video games pose interesting challenges for description, representation and organization owing to problems rooted in their unique nature as information objects. First, they are multifaceted: these interactive media include textual, visual and auditory information as well as traditional metadata elements (e.g. game title, publisher). Additionally, this information is represented in a range of formats at different levels of abstraction: from console-specific formats (e.g. cartridges, discs) to printed materials (e.g. walkthrough guides), videos (e.g. trailers) and other relevant ephemera (e.g. AR cards, figures) for video games. Distribution of video games is shifting to digital channels, complicating the acquisition and creation of

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metadata. These challenges will naturally affect users' ability to effectively search and browse video games and game information.

However, little research exists on how players and other stakeholders find video games and what information needs they have regarding selection, acquisition and play. This study addresses this gap and improves our overall understanding of people's game-related information needs and behaviour. Consequently, our analysis will help identify design requirements for user-centred video game information systems. We specifically seek to answer the following research questions:

**RQ1.** What kinds of information needs and behaviour do video game players and related stakeholders exhibit regarding the discovery, access and management of video games as information objects?

**RQ2.** What are the implications of these needs and behaviours for designing user-centred video game information systems affording these user activities?

## 2. Relevant work

### 2.1. Information needs and behaviour

Information needs and behaviour have been objects of investigation in library and information science for more than 30 years. During this time, scholars have suggested a variety of models and theories to explain the information needs of various user groups, and the multiplicity of ways in which they seek that information. Many of these scholars, such as Wilson [1], Ellis [2] and Kuhlthau [3], just to name a few, reflect an attempt to understand information needs and behaviour with general applicability across multiple domains and contexts.

While these efforts offer a broad view of information needs and behaviour at large, the wide body of research in this area also shows that information needs and behaviour are affected in various ways depending on context. The following factors may affect them and the ways in which we understand them:

- task/activity, such as career seeking [4] or voting [5];
- subject or discipline, such as history [6] or music [7];
- occupations, such as physicians [8] or lawyers [9];
- demographics, such as age [10] or gender [11];
- role, such as consumer [12], patient [13] or student [14];
- material/media, such as ebooks [15], or other electronic information resources [16];
- setting/environment, such as specific geographical area [17], or online environments [18].

The list above is purely illustrative and far from comprehensive. In addition to hundreds of studies examining the above factors, many studies look at information behaviour at the juxtaposition of two or more of these aspects, such as women seeking health-related information [19] or African-American cancer patients [20], to list a few examples.

Despite the massive amount of information behaviour research conducted in such a large variety of contexts, little exists regarding information-seeking behaviour specifically targeting users of video games. What does exist often discusses information behaviour within a game, such as Adams's [21, 22] and Karlova and Lee's [23] analyses of information behaviour in massively multiplayer online role-playing games (MMORPGs). Both address information needed by players and the related actions they take to solve problems, make decisions and overcome obstacles. However, these studies only reflect information needs and behaviour that occur during gameplay, and not information needs and behaviour that might occur around information about video games, such as selection for play or purchase. As a result, we lack empirical information on users' sources of game-related information and information-seeking behaviour outside of games. Previous studies tend to also be limited solely to game players, ignoring the possibility that video game information may also be sought by others. For instance, a small study of the information needs and behaviour of art students studying video game design revealed specific instructional needs and use of particular web and personal sources [24]. Game collectors, industry employees, parents of young gamers, educators, scholars conducting game-related research and curators or librarians managing collections that include video games may all exhibit video game-related information needs and behaviour [25].

### 2.2. Game-related studies

Previous research in domains including human-computer interaction, game and media studies, and psychology explore various aspects of video games and people's interactions with them. In particular, previous human-computer interaction work related to video games can be grouped into five categories:

- (1) design of games, including hardware and software (e.g. [26, 27]);
- (2) understanding of players, player interactions, motivations, behaviours and experiences (e.g. strategies or behaviour within the game [28, 29]);
- (3) evaluation of the usability/playability of particular interfaces, features or controls for games (e.g. [30, 31]);
- (4) gamification and the use of games for specific purposes (e.g. education, music, health and exercise, assistive technology) or targeting user groups (e.g. children, elderly [32–34]);
- (5) relevant methods for game user research (e.g. how to collect user data or evaluate usability [35, 36]).

In particular, works belonging to the second category are most relevant to our study. Studies investigating player behaviour focus on one or more of various aspects, such as player behaviour within the game, behaviour associated with different aspects of gameplay, behaviour associated with game-related activities in other media or behaviour around the gamer community, to name a few. A large proportion of studies on player behaviour within games and gameplay tend to focus on technical aspects, such as from which server players connect, the length of a gameplay session, the number of players in a game or a series of actions players take within a game (e.g. Henderson and Bhatti [37], Moura et al. [38], Conroy et al. [39]). These lead to ideas for improving certain aspects of gameplay through the implementation of a new feature in the game, improvement of the AI, or design of the game infrastructure. Some focus on more specific types of behaviours such as socializing or cheating. These types of behaviours can be observed in multiple gaming environments: for instance, Paul et al. [40] identifies common themes in the context of socializing in mobile games including teamwork, competition, communication and recommendation, and Ducheneaut et al. [41] studied similar social dynamics but within the more constrained environment of *World of Warcraft*. Blackburn et al. [42] study users who are flagged as cheaters within the Steam community to understand who they are and how cheating behaviour spreads within that community.

While many studies focus on players' behaviour within games and gameplay, game-related behaviour often extends outside of the games themselves. For instance, Bullard [43] examines how video strategy guides for playing a video game are able to integrate playfulness in addition to supporting information needs for gameplay. She examines Learntoraid.com, one of the *World of Warcraft* player-authored information resources, and discusses it as a case where playfulness (e.g. using puns and jokes) actually helps to show the authenticity and credibility of the information in the guides, and at the same time serves as an entertaining information resource in its own right. However, the emphasis is on seeking information that can help guide the gameplay rather than information that can assist with the search and/or discovery of games as information objects, which is the goal of our work. Kaytoue et al. [44] and Hamilton et al. [45] also discuss the increasing importance of video game live streaming, specifically looking at the case of Twitch, one of the major websites supporting live gameplay streaming. They aim to predict the popularity of content and understand how communities are formed around live video streaming of gameplays and how people participate in those communities. Such streaming communities are a type of 'third place', an open place where people voluntarily go to socialize and play, become *regulars* and benefit from social interactions, as discussed in Oldenburg [46]. Cheung and Huang [28] even look beyond the typical game players as a study population and investigate other stakeholders, such as spectators, by identifying different personas related to the spectating experience. A gap in these behavioural studies is the lack of research focusing on behaviours associated with how users search and discover new games, which metadata and information resources they use to access games and how they organize and manage their personal game collections, which we aim to address in this work.

Articles dealing with player personalities and motivations are also of particular relevance, as we discuss various appeals of games identified from the user data in our discussion section. Works by Bartle [47], Bateman and Boon [48], Csíkszentmihályi [49] and Yee [50] all explore internal motivations and experiences that create the impetus for gaming, helping us understand why players choose to interact with certain games. Factors affecting player enjoyment and motivations have been well-studied in prior literature. Mekler et al. [29] reviewed 87 quantitative studies to develop a systematic understanding of how to measure player enjoyment. In addition to more traditional measures of fun and enjoyment, Ryan et al. [51] developed the Player Experience of Need Satisfaction (PENS) measure to study video game player motivations, based on the applied self-determination theory. They suggest that people's basic psychological needs such as competence, autonomy and relatedness can predict game enjoyment and future gameplay. Johnson and Gardner [52] applied the PENS measure in an online survey to explore relationships between game genre, personality and gaming experience. While these studies provide insights into *why* users select specific games and *what* makes them enjoyable, they do not tell us *how* users are able to find these games and what kinds of information may be necessary to connect users to games that align with their reasons for playing.

Several articles from the fourth category are also related to our work, as they discuss the user needs of additional video game stakeholders beyond typical players. Gerling et al. [32] explore the use of full-body motion games to help keep the elderly physically active and mentally engaged. Hernandez et al. [33] and Kam et al. [34] deal with using games for

specific user groups: disabled children and children in the developing world, respectively, analysing design implications and offering design strategies to reach these user groups.

Finally, while information systems within games (e.g. inventory systems) have seen some investigation [23, 53], there is little work on how users search/browse video games or how to design information systems for video game access, organization and retrieval. Until recently, video games were not considered objects of academic studies, and therefore little research has been done on how to organize, describe and provide access to such materials. Recently, several research initiatives, such as 'Preserving Virtual Worlds' [54], GAMECIP (Game Metadata and Citation Project) and our own project 'Video Game Metadata Schema'<sup>2</sup> [25], have focused specifically on describing and preserving video games. We expect our work to augment such research efforts by providing useful insights informing the design of information systems for video games.

### 3. Study design and method

This study is part of a larger research project aiming to create a standardized metadata schema and encoding schemes for describing and organizing video games [55]. The project was conducted in multiple phases over 4 years; one of the main research efforts during the second and third years was to collect empirical user data to inform us about users' needs and behaviour around discovery, access and organization aspects related to video games, which will in turn enable us to create a user-centred metadata schema (more detailed information about the larger project can be accessed in Lee et al. [55]). In our prior article [55], we presented the evaluation results of the metadata schema based on collaborative review, schema testing and the user feedback from both interviews and an online survey; in this paper, we focus on providing a deeper analysis of user interview data. Fifty-six semi-structured interviews were conducted over two phases with participants over 18 years old who find, play, purchase, collect or recommend video games. In the first phase, we interviewed 24 gamers. While reviewing the interview data, we recognized that, in addition to being gamers, some interviewees identified themselves with an additional role, such as a parent. Analysis revealed that these multi-role participants expressed different information needs, and thus we broadened our scope to a stratified sample to reach a wider range of user types. In the second phase, we interviewed 32 additional participants including casual and avid gamers, parents, collectors, industry professionals, librarians, educators and scholars. People representing these user groups were specifically sought because they would be the most likely people to benefit from a video game information system using a standard metadata schema.

We recruited interviewees by snowball sampling. Invitations were shared through a mix of physical and digital venues. Some examples include student, faculty and staff mailing lists at the University of Washington; game-related mailing lists and forums such as Reddit or Extra Credits; and researchers' social media networks on Facebook, Twitter and Google+. Users representing specific user groups were targeted via appropriate routes, such as librarians via the American Library Association's annual conference and the Young Adult Library Services Association listserv; scholars via emailing authors from game studies journals; and educators and game industry professionals via researchers' personal connections and references.

The interview protocol included approximately 40 sample questions about (a) users' game-related tastes, motivations and experiences; (b) attitudes toward physical and digital formats of games; (c) collection and organization behaviour; (d) game-related information needs and search behaviour; (e) feedback on current metadata; and (f) demographic information. Interviews for specific user groups included additional questions (e.g. asking librarians about the library game collection, parents about how they select games for their children). We also shared a draft of the current Video Game Metadata Schema<sup>3</sup> to get direct feedback on which metadata elements were most and least useful for the participants. The full interview protocol is accessible in Lee et al. [55]. All interviews were conducted in person, via telephone or Skype. Each interview lasted approximately 1 hour. Participants in the first phase agreed to do so without compensation. In the second phase, we compensated each interviewee with a US\$20 Amazon gift card, as it was more difficult to attract users representing user types other than gamers.

All interviews were transcribed and analysed to obtain a detailed qualitative description of needs and behaviour. The codebook was created through an iterative coding process by multiple coders, employing an approach similar to grounded theory [56]. Initially, we selected a subset of 26 interview transcripts representing different user types and collectively analysed them as a class exercise in a video game metadata course taught by the first author. Based on this analysis and discussion, a preliminary codebook was developed. In order to ensure consistent code application, we followed a consensus model [57, 58] involving two coders and an auditor. Using this codebook, two coders independently coded all of the transcripts once. This was followed by a series of meetings discussing code revisions. Several codes were added, modified or removed based on the initial coding experience so that they were well-defined, mutually exclusive and able to comprehensively cover the major themes in the transcripts. Afterwards, the two coders revised their previous coding

work to match the newly revised codebook. Once the coding task was finished, an auditor reviewed the coding work and identified any issues and/or inconsistencies in code application. Any questionable instances were discussed among all three until consensus was reached. The final version of the codebook resulting from this process contained categories related to six different aspects: gaming experience (e.g. user's gaming history, playing behaviour), collection and organization of games (e.g. collection behaviour, preference of physical or digital formats), information needs and seeking behaviour (e.g. game information resources used, game-related information needs), 43 metadata types, 17 appeal factors and user characteristics (e.g. age, gender, profession) plus an 'other' category to catch potentially interesting information that did not fit into any of the other categories.

## 4. Findings and discussion

In this section, we present key findings from analysing the transcripts as well as design implications for game information systems derived from the user data.

### 4.1. Designing for target user groups

Designing a universal information system that satisfies the needs of multiple user groups is challenging in and of itself. Interviews revealed the restricted nature of initial user type definitions. Our previous work on metadata for information systems describing video games identified six different user groups: Player, Parent, Collector, Academic/Scholar, Game Developer/Designer and Curator/Librarian [25]. New user groups were subsequently added to consider avid and casual gamers and educators, as well as a broader range of game industry employees [55]. The purpose was not so much to be able to derive a strict set of design requirements for each group, but rather to ensure that we comprehensively identified the various needs and behaviours of different stakeholders, not restricted to a very homogeneous group of game players. Our interviews reveal that distinctions between user groups are not definite; many participants considered themselves representative of multiple user groups (e.g. 'there were the kinds of two parts of me: the collector side and then the game designer side'; P8). For many participants, it was not always easy to clearly distinguish which needs and behaviour stemmed from which of the many roles they assumed (e.g. 'I'm also an academic so that informs what I do too, so this answer's [regarding the importance of different types of game metadata] going to be a hybrid'; P52, a game designer and also a scholar). Nevertheless, the basic descriptive information such as game title, platform, developer and genre were universally mentioned across multiple user groups as essential pieces of information.

Distinctions among types of gamers were particularly problematic. Some interviewees were uncertain if they should identify themselves as 'avid' or 'casual' gamers (typically defined as serious dedication to playing vs less-invested players). People's identification with player types was temporal and situational rather than representative of intrinsic personal characteristics, for instance, playing an RPG (Role-Playing Game) at home vs playing a puzzle game on their phone when riding a bus. This fluid persona-switching implies that users of video game information systems will have different information needs at different times, depending on which user type they currently embody. Juul [59] also discusses this fluidity between hardcore (avid) and casual gamers as many players experience work and lifestyle changes which affect their game playing behaviour. He argues that people can individually switch between being casual gamers and hardcore gamers, which is consistent with our data.

All the scholars interviewed were avid gamers who had significant amounts of gaming experience. Information on different styles and mechanics was considered useful for selecting which games to use in research papers or course assignments. Information such as the length of the game was considered relevant for particular instructional situations such as 'a bunch of new graduate students entering a master's program and they have to pick a game to play and write about, study player culture or something like that. So it would be useful for them to be able to pick a game that had some meat to it, probably, but then also wasn't 200 hours' (P51, scholar). The overall sentiment was to advocate for having more metadata in general: 'For me, as much metadata as possible is better than too little. Or, even if I'm never going to use it somebody else might, right?' (P51, scholar).

Some avid gamers were also working in the game industry in some way, as a game developer, designer or tester. Naturally, some of their opinions were clearly influenced by their perspective of looking at video games as a commodity. For example, reviews, reception of games by consumers and also professionals (e.g. 'sometimes there are games that consumers totally ignore but still get crucial acclaim'; P36, industry professional), and user rating information were generally considered important. One participant mentioned that actual statistics regarding the popularity of games would be more interesting and telling than information about intended audience (P35, industry professional).

Some participants embodied both a *direct* player type (avid, casual, or both) and a *proxy* user – someone seeking information about games for the use of the game by another party. Proxy users – in this case, parents, librarians and

educators – have significantly different information needs than users seeking game information for themselves. They may be acting as a gatekeeper and trying to obtain ‘good’ games for their children, patron or other users, or they may be acting as an agent searching with an ‘imposed query’ [60]. While proxy users are interested in extrinsic game information such as cost and ESRB rating, direct players desire a variety of information about game content. Proxy users’ interest in content reflects very specific needs. For instance, parents were concerned with information involving levels of violence, gore and profanity:

Looking up **whether they are appropriate for my aged kids**. And looking up content ... if there’s cuss words, if there’s inappropriate attire. (P50, parent)

Such detailed content information is often not included in general game information sources or supplied in a single location, so participants consulted multiple sources. A few participants mentioned websites specifically designed for parental use, like Common Sense Media and Plugged In. While parents appreciated the tailored reviews from these sources, they also desired ways of filtering for these characteristics. Seeking some kind of external validation on the value of the game was also a commonly observed behaviour, as exhibited by the following quote:

If it’s an award for visual effect, the quality of the visual effect, or if it has the parent seal of approval – something from ISTE or another professional organization. **That type of award would tell me that this is worthwhile**. And I’m more likely to select something that speaks to the amount of critical thinking and problem solving that’s going to happen as a result of using the game. (P46, parent)

They also valued sources of information that allowed them to get to know more about the games secondhand: examples included Wikipedia, where they could learn more about other people’s thoughts and opinions about the game, and YouTube, where they could see how other people experienced the gameplay. Information on series, sequel or prequel was useful for parents because of some expectation that their children would enjoy playing the new games if they previously liked another related game. Price was obviously important information for making the final purchase decision (e.g. ‘In the end, it’s going to come down to price. That usually makes or breaks it.’; P47, parent).

Librarians were similarly interested in such information, as well as information related to a game’s popularity, platform availability, system requirements and number of players, all of which can be helpful for the collection development process. Unlike direct players, librarians need to purchase games that can accommodate multiple concurrent players during events. More detailed information about the content or experience of gameplay such as setting, narrative, mood, and temporal aspects was less of interest to librarians (e.g. ‘It wouldn’t matter to me as a librarian, but if I were a super-gamer, it might’; P41 responding to the question asking about the usefulness of mood). Video games often circulate for use by patrons, making digitally distributed games a challenge. Games also need to fit the library’s collection policy and support its mission:

We looked at popularity nation-wide, local requests, we looked at whether we could **use it in a program**, or does it somehow **fulfil some other collection goal**, like when we bought a bunch of educational DS games that taught you how to do Spanish or Japanese. (P39, librarian)

For educators, information such as the length of the game (e.g. ‘how long the game will take to complete’; P54, teacher), the goals/desired outcomes and format were also critical because of the way they would use the games in an educational setting:

You know, I have **tried some CD based ones, and just had more hassle with installation and portability** really ... I have ten kids, I have six computers, and I have a hallway full of teachers who are very ready to take my kids and let them play a game on their computer if the game is on their computer. So it seems **it’s a lot easier for the online games** and then to have up-to-date games, it’s much, much easier. (P54, teacher)

Other information they valued included prerequisite skills necessary to be able to play certain games and rating information, which some participants also mentioned as lacking details, especially for many online games. There were mixed opinions about the importance of the educational value of the game; for instance, one teacher (P54) stated that knowing ‘what knowledge [students] might have at the end of the game that they didn’t have at the beginning of the game’ was important, while another teacher (P55) responded that a game having some sort of educational value was not so important:

I believe **that most games, the more involved games, whether or not the educational value is inherent or obvious, I think that there's a lot of learning going on.** I am not, even with my kids, I'm not so much looking for them to play a math game that feels like a math game. I like when they'll play a game that I can kind of see that there's something behind it that's a little bit meaty, even a game like, let's say *Angry Birds*, the physics and things like that, I like to see that, but I don't really push that. I think it's hard to push that. That's why **it becomes important to find games that you can create the educational opportunity within the game rather than trying to make a kid like a game because of its educational value.**

However, all the educator participants emphasized the fun aspect of games, either because it helps students stay engaged throughout the gameplay or that it is simply okay to play games just for fun (e.g. 'I think it's really important for a game to actually be fun'; P54, teacher; 'There's a value for just having fun ... sometimes a game is just a game. And if they learn something accidentally, then there's an added benefit, but do you necessarily learn from everything?'; P56, teacher).

The design of any video game information system needs to consider the complex roles of users. Because the same user may have different information needs depending on the time and contextual situation, systems tailored to individual personal characteristics, such as those afforded by a personalized login or user profile, are insufficient. A system needs to accommodate not only different user profiles but also different user modes, such as seeking information for oneself vs seeking information on games for use by others.

In addition to temporally and situationally fluid user types, information seekers are also affected by demographics like age, gender, race/ethnicity and sexual orientation. Several mentioned feeling alienated or excluded when trying to find information from existing sources:

I don't frequent mainstream game sites because quite frankly **they aren't geared towards me**, they don't care about me ... Half the people who play games aren't even men and **yet they act like we don't exist**, not to mention queer people, trans people, people who aren't straight. It's disgusting. (P20, gamer)

Other issues with current information sources included questions of authority, reliability and bias. As video game stakeholders become increasingly diverse, game information systems should strive to be safe spaces for all players, and not discriminate or alienate based on user demographics.

## 4.2. Desired game-related information and metadata

Systems designed to support a wide variety of information needs require robust and diverse metadata. Information needs across user types ranged from highly objective information, such as price and platform, to subjective metadata like game reviews, genres and visual information. In the following subsections, we discuss a number of these different types of metadata in detail. The specific terms for referring to each metadata element were adopted from the Video Game Metadata Schema.<sup>4</sup>

**4.2.1. Subject and content metadata.** Genre<sup>5</sup> was by far the most discussed metadata element, mentioned in the interview responses over three times more than any other game-related information. The importance of genre was evident in interviewees' comments (e.g. 'If it's a new game I know nothing about, genre is the most important thing that makes or breaks my purchasing of it'; P6, collector). In a follow-up survey, genre was also identified as the third most useful information when people seek new video games, after price and platform [55]. Yet, despite the popularity of genre information, users seem to have difficulty describing game genres and often conflate genres together:

And as far as ... **action adventure** games ... they're kinda like **a combination of both of those types of games**. So, you know, you have the story of a role-playing game, you have a vast open world, but it's also more action-oriented, more like a fighting game, in most cases. (P10, collector)

Additionally, genre preferences vary widely. While some preferred specific genres (e.g. 'I prefer the old-school RPG. Of course I also like *Dungeon Crawler* and what I don't like that much are strategy RPGs'; P7, collector), other participants advocate a more egalitarian approach to genre preferences:

I think it's really **important to like different genres**. I sort of think of it as similar to movies – you like the story telling movie that can engage the audience and sort of teach them something and you like the sort of balls-out action movies that are pure

entertainment. I don't think I'd be able to say I have a specific favourite genre. I think it'd be kind of **an empty experience without more than one**. (P30, gamer)

While genre is often used as a guide to determine interest level in a game, some participants find it to be a limiting designation. This may be due to inadequate understanding of specific genre labels or that not all video games can easily fit into a specific genre type:

I **don't really understand** a lot of times when like a game is a platform game and a game is an RPG game and I'm like, I kinda think that is RPG, so **if there was a different way to categorize them**. (P2, gamer)

One difficulty with genre is that it is often conflated with the subject or theme of a game. Theme was the second most commonly discussed information by interview participants. Representing different themes and tropes separate from genre may offer increased subject access to games. Violence, in particular, was mentioned as a theme that would be avoided by participants across user types. Additional themes and tropes mentioned by participants included cyberpunk, female protagonists, gender, race and sexual orientation. Information related to region and cultural traditions was also of interest. However, these kinds of themes can be difficult to represent effectively. For instance, to what exactly are users referring when they say 'cyberpunk' games? When including theme information, it is important to ensure that it is understandable to the majority of users by providing definitions and sample games.

It is evident that, although most users favour genre information, just adding more genre and theme metadata is not the answer. Current genre labels for games are overloaded with information beyond just genre descriptions, lacking in formal definitions and confusing to users [61]. While additional subject information such as themes or tropes are desirable, there are difficulties in determining the boundaries among genre, subject and theme. Simple subjective metadata may not suffice to help users connect with games of interest; new approaches to genre, such as classifications based on prototype theory, facet analysis or other approaches may be of more assistance to users. We discuss problems with subjective genre metadata as well as potential solutions in more depth in additional work [62].

Other important, yet complex content information concerned the educational content and value of games, especially for proxy users. Parents and educators often wanted to find games that were both educational and entertaining (e.g. 'I'll definitely look for announcements of things that are both educational and fun, and if it hits the mark, I'm super excited'; P47, parent). However, as previously noted, the entertainment value of games often takes precedence over the perceived educational value:

Some type of game ... even though it might be an RPG, it might help them with some deductive reasoning or whatnot. I know the **active educational ones**, well, I only remember the ones from my youth, and those ones are **pretty bland and boring**. (P48, parent)

Proxy user interviewees noted educational value as an important component, but not necessarily the most essential need when determining game choices for others. Educational value is of lesser importance to general gamers, without proxy needs to fulfil:

The purpose, **as long as it is entertaining I don't care**. It could be started as an education tool and turned over to something else. (P22, gamer)

Taken together, these comments suggest that the current categorization of games based on purposes of educational value vs entertainment is less effective than offering the more nuanced and indirect educational values a game may have. We envision that simply categorizing some games as *educational* games (akin to categorizing some books as textbooks) with an underlying expectation that making students play those games will lead to some learning experience is less useful. Rather, providing information that can help educators craft a learning experience based on a wide variety of games, including commercial off-the-shelf games, would be more valuable, just as a variety of books can be effectively used in a well-designed lesson plan. Although more detailed educational information requires more complicated descriptive representation, models might be drawn from existing sites like Common Sense Media, or aligned with contemporary educational standards based on age and/or grade level. This is also reflected in some proxy users' desire for information related to the intended audience level for a particular game's content. Target audience information may not only reflect some of the desired educational considerations of parents and teachers, but also other needs, such as those of librarians who need to represent a wide range of ages in their collections:

[W]e tried to mix it up and make sure there was **enough variety in the age groups and the ratings for each platform, so that somebody would always find something** ... Our client base for videogames are mostly adults. And so we can't leave them out by dropping, by not offering mature games. So what we do is, I make sure there's a balance. (P40, librarian)

More complex descriptions of educational content could then be used in conjunction with additional descriptive metadata like target audience and ESRB ratings to provide a more holistic and thorough picture, which would be especially relevant for proxy users less familiar with gaming overall. Knowing the difficulty level or estimated time of completion was also important for proxies (e.g. 'you can put a 19 year old vs an 8 year old, and if the 8 year old can keep up with him then the 19 year old is happy'; P39, librarian).

**4.2.2. Descriptive metadata.** While a large number of objective metadata elements are useful to users across the board as we confirmed in our prior study [55], several specific elements have significant implications for inclusion in game information systems. While information related to technical aspects such as platform or number of players was important to most participants, some specific user types were interested in even more minute technical details about the game. Collectors were especially interested in such detailed information (e.g. 'Things that I like to see in games are on the technical aspects, things like frames per second, digital fidelity, like the resolution, like 1080p'; P6, collector). However, most of the proxy user types, especially educators and librarians, were also interested in technical descriptive information, as much of it was used to determine a game's functionality in the given setting. For example, librarians made decisions about purchasing games based on the ability to accommodate extraneous hardware:

We didn't circulate *DJ Hero* because the **only way to play DJ Hero was with the turn table thing** that came with the game. So we were like, **no one would want to check this** out because no one would be able to play this unless they already owned the equipment, which they wouldn't own unless they bought the game. (P39, librarian)

In addition to technical descriptions, participants also expressed interest in game company information such as developer, publisher and franchise metadata. Many direct gamers and proxies alike relied on company and brand recognition when searching for games:

I think **name brand, or company brand, recognition** is a big thing. If it's from Atlus it would probably catch my attention more than if it was from somebody I didn't know ... company recognition is first and foremost for catching my attention. (P9, collector)

Brands and companies quickly became stand-ins for more detailed and subjective information. Certain companies inspired fidelity in gamers, who were more likely to show interest in an upcoming game associated with a familiar company:

[I]f I have US\$60 for a game and Bethesda has made a game and so has some other company I've never heard of, chances are I'm going to get the one made by Bethesda because I'm already **familiar with their work and what they do**. (P12, gamer)

If users were unfamiliar with a specific company, they at least wanted to know if it was AAA or indie, traditional or non-traditional. Any video game information system, at minimum, needs to include metadata about basic technical composition and function as well as the responsible corporate body. The former would require detailed identification of technical specifications along with standardization of measurements and units while the latter necessitates some sort of database of authorized names or other identifiers.

**4.2.3. Relationship-based metadata.** Relationships among video games and related media are complex and difficult to disentangle [63]. Series, franchise and sequel information were certainly of interest to participants, in some cases because they were already familiar with this information:

So the thing I probably look for most would be the franchise, universe and the series ... **I'm more inclined to buy a sequel than a brand new game**. (P22, gamer)

Other game relationships mentioned by participants included games that recreate, influence or are inspired by other games, as well as a game's relationship to any additional content such as modifications ('mods'). Charting the impact of game titles on one another over time was especially interesting to designers, collectors and scholars:

We don't really have people in games who cite their inspirations that much ... I think that's very important in games, because to a certain extent **a lot of games are pretty derivative of each other**, and that's ok. That's how things become refined and tracing the different paths of these strains of influence, tracing the directions they go is really great, but we need more people to write down, or **in some ways record, where they're getting their influences from**. (P20, gamer)

In addition to relationships among games, many video games connect to other media, such as music, books and art. Participants indicated a need for these relationships to be represented in information systems as well. While some of these media objects are published and easily accessible (e.g. strategy guides, soundtracks), others may not be (e.g. products from the game creation process such as concept art).

The **music** is something that is **often neglected**, especially in RPGs where it makes a huge difference. (P7, collector)

If there were **design documentation, or concept artwork, or sketches**, like things that actually show the development process, I think that would be really interesting. (P52, scholar)

Determining which games were inspired or were influenced by pre-existing games and game-related media (and vice versa) is incredibly difficult. Participants acknowledged many challenges inherent in representing relationship information, such as determining the intellectual boundaries between games and modifications of games:

Mods for *Half Life 2*, are those considered games of *Half Life 2*, or are they considered games of another format? ... So there's a **lot to consider for games that are sort of built on other games**. (P5, collector)

Interest in relationships among games and related media was not limited to any one particular user type, but it was more noticeably of interest to direct users like gamers, scholars and collectors. While proxy users mentioned that they used relationship designations like sequel information to make decisions about games for others, they rarely mentioned more in-depth relationships in the context of proxy information seeking. Many direct users were passionate about ways in which such in-depth information might be recorded and communicated via information systems, such as one gamer who suggested a trifold description based on mechanics, themes and culture:

I would say in no particular order, but **mechanical influence**, side-scrolling, you know, various mechanics, maybe like, computer concealing knowledge from the player which can create kind of an unreliable narrator kind of thing ... **thematic influence**, for instance, maybe things like *Doom*, influencing an entire genre of men shooting things in the face. [And] maybe [a game's] **reception in the gaming landscape, and its effect on our culture**. Like, for instance, *Super Mario* becoming a really huge thing in all over the world and sparking like *Mario Mania* ... And that leads into Mario's influence on other kinds of, on books for instance, things like *Ready Player One*, or things like that ... **So that would be mechanical, thematic or subject matter, and cultural**. (P20, gamer)

Other ways of recording and conveying relationship information may rest with the preservation of contextual information about the creation and reception of video games:

[A]n interesting thing that can be done now, that might be impossible 100–200 years from now, is asking people who make the games what their influences were ... And you can **trace this making of games via influence** ... That sort of thing would be fascinating ... there's tons of this information that is still out there that could be in this museum, and **200 years from now you can actually map it out**. (P38, industry professional)

This kind of contextual information can offer concrete insights to help determine relationships like influence, history and associated media. However, much of this contextual information remains inaccessible: it may not be preserved by a game's creators or distributors, and even if such information is recorded, it may be anecdotal and lack the level of reliability necessary to build robust metadata for access.

**4.2.4. The four Rs: reviews, ratings, rankings, and recommendations.** Metadata related to reviews and ratings were mentioned by numerous interviewees. Reviews were of particular importance across all user types, but especially for proxies, since they could look for key aspects of interest in the text of the reviews:

I'll usually look at the reviews in the iTunes store and see what people are saying about and its rating. And also to see **if it's kid-friendly** through the reviews. If the reviews and the rating don't seem to match, then I'll take a closer look at what **the maturity level** might be for the game. (P46, parent)

Participants were divided as to whether professional or user-contributed reviews were preferable. User reviews were valued by many gamers for reflecting personal experience and interaction with a game:

I like to see what **normal people who aren't getting paid** to be journalists have to say about the game, what their opinion is on it. (P6, collector)

Proxies, however, tended to prefer more professionally created reviews. While parents and some scholars relied on reviews from sites like Common Sense Media that specifically tailored to their needs, librarians felt a distinct lack of availability for reliable, professional reviews:

It would be really handy if in the professional magazines there were **regular game reviews**. I know there's irregular game reviews at this time in, I think, *Library Journal* but ... [I wish] that would talk about things like **DRM and privacy issues** and **all these other things in relation to libraries and gaming**. (P43, librarian)

The effect of genre preference on reviews was also noted. One participant responded that users should 'not be able to post a review unless it [was] a review of a game in a genre that [the reviewer] loved, because [that way], you're going to get the most honest opinion' (P12, gamer). When user-contributed reviews lacked authority, even direct users sought information from professional sources. However, the line between users and professionals was not always clear and some participants expressed concerns with bias:

I go to IGN ... I have a love/hate relationship with them because their journalism is terrible. The stuff is absolutely awful and it just has this mere appearance, **like they're being paid** by developers and publishers **to give things good reviews**. (P6, collector)

In contrast, some participants noted that reviews were less important to them, especially regular game players. This was partly due to trust/reliability issues (e.g. 'As far as reviews go, I don't put any stock in them'; P12, gamer) but also because less popular titles tend to get neglected (e.g. 'Say an independent gaming studio puts out a game vs Nintendo putting out a game. The game put out by the independent studio might not get reviewed and they wait months and they still haven't reviewed it'; P13, gamer).

Participants also mentioned the value of having metadata related to game ratings, rankings and recommendations. For many, only one type of such information was not enough to lead them to obtain a game (e.g. '*Crysis* was recommended to me, but I think I didn't buy it until I started playing someone else's copy of it'; P31, gamer). Several proxy participants mentioned using a combination of these different types of information to make final purchase decisions:

I rely on **listservs**, the YAAC programming one where people will put if they did a video game program. A lot of it really is a **combination of word of mouth and patron requests and Amazon rankings**. Those are the three things that weight the heaviest. (P39, librarian)

Although most participants (direct and proxy users alike) triangulated information among the four Rs, gathering the information from multiple sources could be challenging. Additionally, participants indicated they would be interested in having aggregate review information, such as that provided by Metacritic, but they wanted to see it on the websites they already regularly visited:

So maybe there could be something ... where **it would aggregate reviews** from a bunch of other places so that maybe if these people hadn't reviewed the game yet, someone at Game Spot did or someone from somewhere else did so it would pull in another critic's review, so you would be able to see things that maybe they don't get around to. (P13, gamer)

Additional difficulties stem from the difference in the structured nature of ratings and rankings vs the unstructured information in reviews and recommendations. Ratings and rankings are often given in integers or stars, or other simple standardized scales, which are much easier to implement in information systems. However, these standardized approaches lack the detail that many users want and for which they turn to reviews and recommendations. These tend to be free-text or word-of-mouth, and thus offer fewer affordances for standardization and more difficulty in system implementation.

**4.2.5. Visual metadata.** When users discussed experiences with existing game-related information sources, it was clear that website aesthetics and presentation of information played an important role in their source selection. Visual information including visual style, representative art, screenshots, gameplay videos and trailers was desirable to users of all types.

Interviewees mentioned that visual information immediately helps them make decisions to purchase or play games, often much more accurately than reading a description.

You see an ad, you see the design elements, the visual designs and you kind of **get a feeling of the characters, their setting and the time period** as well, whether it's western, sci-fi, modern day. (P9, collector)

Definitely the **gameplay video. That is going to sway me one way or the other** ... There were so many times in the past where I've bought a game based on something else and I thought this was not something I thought it would be. But this way, you get to **test drive a game**. (P22, gamer)

Different types of visual information had different values to users. Screenshots were perceived to be useful for learning differences between multiple versions of the same games. Interviewees also clearly distinguished between trailers and gameplay videos: trailers help catch their attention and get them excited about the game, but looking at the gameplay videos – or spectating in the actual gameplay itself – provided more accurate information about the game.

I actually look at the trailer which is **entertaining** but it is usually just the CG animated thing that is **not even related to the game**. (P22, gamer)

I definitely think gameplay videos are really useful ... if I want to see also [if the game is] too simple and **you can only get that from seeing someone actually play** and that would also get at possibly how difficult controls are and how difficult it is to actually play the game. (P2, gamer)

For obtaining this kind of information, participants preferred non-game-specific sources like YouTube ('Definitely YouTube. You gotta see the actual gameplay'; P17, gamer). Services like Twitch are also becoming increasingly important as spectating becomes more common. Given that visual metadata plays such a significant role in game seeking and selection, information systems for discovery and access need to emphasize its inclusion.

**4.2.6. Level of engagement.** Information related to game engagement, investment and attention, such as pacing, was of particular interest to some participants, especially casual gamers. Participants preferred games that could conveniently fit into their busy schedules:

With *Fruit Ninja*, I like it because it is something fast I can do, like if I'm waiting at a dentist appointment or something, it is fun, but **I don't have to invest all this time in it**, I can just **do it real fast** and see what my score is. (P2, gamer)

I usually **play pretty heavily, like several hours at a time** instead of just here and there. But I also like portable games which are more **pick up and play**. (P13, gamer)

For these participants, games can ideally be played during down time throughout the day, between meetings or during one's commute. One casual gamer noted self-imposed limitation on particular types of games:

When I was in college, I really liked the RPG game after *World of Warcraft* – it's my favourite genre. At a certain time, I just stopped playing the game to study and I just cut off these game habits ... now I only play the puzzle game and I'm not sure if I can play MMORPGs normally because **I will be addicted if I play RPG, so that's why I don't play it at all**. Now I only play pause-it game, so that I can cut off or I can stop playing game whenever I want. (P4, gamer)

In this case, going from RPGs to casual 'pause-it' games allowed the gamer to gain control over his/her own behaviour and personal time. This suggests that information about the pacing of the game, game session length and ability to save is useful for such users. Engagement level is also important for parents, as the inability to pause is seen as an inconvenience ('We'll be like, "pause your game" and [my child] will react like "I can't pause this game," and I'm like, there has to be a pause feature on every single game, it's really hard to believe there's not'; P47, parent).

### 4.3. Recommendation of similar games based on appeals

When asked how they search for video games, participants responded that game title was key information necessary to begin an active search. When participants knew a game's title, searching for related information online was easy. However, when participants did not know or could not remember the title, the difficulty of finding information increased significantly as they often relied on broad genre labels:

[If I don't know the title] I would probably Google 'role-playing games' which is actually probably **not specific enough** because then it will come up with a bunch of Japanese role-playing games that I'm not as into at all. (P19, gamer)  
When I type in a genre like 'card game', there are like hundreds of card games. I always have **trouble sorting through all the results** out of the things that I'm looking at. (P16, gamer)

Relationships among games became important in such cases. One common technique when the title of a game was unknown was to search for other games with similar characteristics in the hopes that it would lead users to the game they sought, either a specific game, or a new game of interest ('Usually I already know a game that's close to it, and then I'll go and I'll look at games that are said to be related to it'; P17, gamer).

This suggests that recommending similar games based on games of interest would be useful, especially considering the specific characteristics of importance to users. For instance, the look of the game may be important to some gamers whereas the narrative of the game may be the key attraction for others. Previous literature discusses the reasons certain people are attracted to certain types of games as 'motivation/motive' [50, 52], 'gratifications' [64] 'core aesthetics' [65] or 'appeals' [66].

In our interviews, we asked about the core reasons people were attracted to playing their favourite video games and received a variety of responses. The most commonly mentioned appeal was *fellowship*, where the core reason for playing games was to enjoy playing with other individual(s) or group(s) of individuals (e.g. 'I played *World of Warcraft* when I was in college. I was so addicted for this game and I really enjoyed it because I could play with my friend, make a team and do the adventure and solve the quests and that was really fun, doing [it] with my friends'; P4, gamer). Sometimes what was important to participants was a specific type of co-playing, such as *competition*, where the core reason for playing games is to feel the satisfaction of competing and/or winning against other individual(s) or group(s) of individuals, or AI.

Appreciating the *sensation* of playing games such as visual, auditory and/or physical stimulation was also a commonly mentioned reason. Many participants highlighted the importance of graphics and music to set the particular mood for playing the game, and commented on being amazed by the quality of graphics in some games ('Graphics are key. I don't like cartoon games, I don't like cartoon-y looking games. If I'm playing an RPG, if I'm wearing metal armor, I want it to look like metal ... the more realistic, the better, which is why I play a lot of simulation games. Like *Formula One*, the graphics are astounding'; P12, gamer).

*Narrative* was also frequently mentioned as a reason participants were drawn to particular games: participants liked to experience and appreciate the story told by the game. These participants tended to like narrative-heavy genres like RPG, and described prior game playing experiences where they became emotionally invested in the characters and absorbed in the story (e.g. 'I think a lot of it for me is the character and the storyline. It has to be a character I like in order to grab me. And the storyline has to be somewhat inventive. Like, for instance, on *Assassin's Creed*, the first one, I couldn't get into because I hated the character that you're playing'; P14, gamer).

*Challenge*, *accomplishment* and *mastery* were also important to many participants, as they desired to feel the joy of overcoming challenges and the satisfaction of achieving, acquiring, accomplishing something and/or perfecting their skills. These participants consider difficulty levels, achievements and trophies, and leaderboards important. The main difference between *challenge* and *accomplishment* is that the former is focused on being able to overcome particular obstacles whereas the latter is often motivated by some additional rewards, status, scores or the desire to complete all possible options in the game. *Mastery* was more narrowly focused on practising something repeatedly until the game player can perfectly execute a particular game action (e.g. 'Where you get all the points and you not only get all the points but you eat all the ghosts that you're supposed to, that you can possibly eat and you know ... there's a skill involved and that makes you feel good to be skillful, right?'; P32, gamer).

For some people, the feelings evoked by playing the game were highly important: it could be *nostalgia* (i.e. playing games to have a chance to revisit or rethink a past experience) or just more generally to appreciate a particular *mood* such as happiness or excitement. These participants talked about enjoying games that were very 'immersive' and could make them feel that they were transported to a different world. The *submission* aspect was mentioned by several participants; these people liked playing games to pass time, turn off one's brain, and just unwind and relax. Gaming was an activity that helped these participants de-stress, and they tended to play games that had simple game mechanics or very familiar aspects to them.

*Fantasy* elements were also important to some. These participants liked to immerse themselves into a fantasy world and do things that are not possible (or will have negative consequences) in real life, such as being a wizard, creating new objects/places, engaging in actions that are violating laws, etc. (e.g. 'I was able to build hundred floor skyscrapers when I was eight years old and no one's going to trust me with the money to ever do that in real life. Probably even nowadays'; P31, gamer). Some people also enjoyed the sense of injecting themselves in the game world, in other words, expressing

themselves by customizing characters, settings and/or creating things in the game world. They valued various abilities for customization, and enjoyed making game avatars look like them or creating other desirable looks for their characters. Others played games because they liked the *exploration* aspect: exploring and/or discovering something new, like being in a new town, discovering new lands, meeting new people, or finding all the hidden objects or dungeons. These participants had definite preference towards open world or sandbox-type games where they were not restricted to places to visit and things to do during the gameplay (e.g. ‘it was the most open of an environment as you can have back then. I mean, that you can travel wherever you wanted to go, and you can spend hours chopping bushes down, and chasing the chickens, and throwing the chickens around, and the clay pots, and I think just being able to play around in that world instead of playing outside was really fun’; P22, gamer).

Many participants also discussed what we consider as *external* appeal factors that are extrinsic, practical reasons for choosing games, such as cost, accessibility or a user’s limited time for gameplay (e.g. ‘I spend a lot more time playing games on my mobile phone and on the 3DS because they happen to be experiences that I can take with me in the palm of my hand and play on the go’; P37, industry professional). Other appeals that were not as frequently mentioned included *learning* (i.e. playing games to learn something new such as new knowledge on a topic or new skill such as typing or math) and *creativity* (i.e. playing games to appreciate the innovative, novel or experimental aspect of a game).

While most interviewees responded with multiple reasons for liking certain games, they were still able to pinpoint the most important factor for them. Therefore, rather than a simple indication of ‘recommend everything in genre X’ or ‘give me something similar to game X’, allowing users to issue more sophisticated queries for recommendations such as ‘games that have a similar visual style to X’, ‘games that have networked features like Y’, or ‘games with stories like Z’ would be beneficial, as well as allowing users to specify their most important appeal factor for use as a basis for filtering recommendations.

#### 4.4. More options for automatic organization of games

Understanding how people organize their own collections provides strong insights into information system design (e.g. useful metadata or features). In addition, many systems providing game information to users increasingly also allow users to purchase, download and access games themselves (e.g. Steam), blurring the boundaries between ‘information system’ and ‘access system’. The abundance of digitally distributed games makes this critical, as now the system has to help users organize and navigate the digital games they acquire and own.

Responses about organization of personal game collections revealed the importance of providing different automatic organization methods for games. Many interviewees stated that they do not organize their physical game collections, but simply rely on rough categorization or designated physical space. This may be for several reasons, including small collection size as players trade-in, resell or delete games (e.g. ‘If I don’t like it anymore, I just delete it’; P4, gamer); infrequent need for re-accessing a game already played (e.g. ‘Once I am finished with a game, yeah, it goes in that cabinet’; P14, gamer) or ability to search digital games (e.g. ‘As far as organization and accessing, I think I mostly use search’; P18, gamer).

For digitally distributed games, interviewees did express organizational issues. With regular discounts on digital games (e.g. Steam sales, Humble Bundle) and the abundance of free games, some ended up with ‘messy’ collections that included games they were not truly interested in playing. Because there is no easy way to resell already played digital games, some users ended up with a large collection of digital games over time.

**I definitely feel overwhelmed** sometimes because of my digital collection especially, because there are **so many games that I haven’t played and a lot of them, I don’t ever want to play** ... most of the physical games I buy are really games I want, but most of the digital games I get are either they’re on some crazy sale and so I didn’t really ... you know, **they’re more impulse buys**. (P8, collector)

This suggests the need for an option to allow users to sort games into multiple subsets (e.g. games already played, games to play, games they might play). For digital games, users often resort to letting the system organize for them, because they do not have any personalization options (e.g. ‘The system allows me to do two types of organization for it. By title, alphabetically, [or] I could sort it by recent activity on it’; P6, collector). One interviewee mentioned how organizing digitally distributed games was complicated because the games can be acquired from different sources (e.g. EA Origin, Steam, Amazon), which resulted in the games going into multiple different folders (P10, collector). To address this issue, a game information system should be able to track different games downloaded through multiple services and create an automatic aggregated index.

Provision of more sorting options was also desired, as a lack of control over sorting methods resulted in user frustration. Automatic alphabetical sorting means that games that are semantically related (e.g. series, franchise, crossovers) will be scattered and not collocated:

Sometimes there's multiple games in a series. **They don't have the same title alphabetically, so they're kind of all over the place in the general alphabetical list.** Like, you know, one and two will be here but the third game will be way down the list, and I don't like that, so I just want to, so **I just wish I could drag it over and put it next to it so it's all nice and neat.** (P6, collector)

Understanding organization of physical game collections also helps identify desirable organizational criteria. For users who do organize their games (i.e. most collectors, librarians and some avid gamers or game industry professionals), platform was the most commonly used criterion, followed by title (alphabetically sorted). Frequency of use, region, genre, series and publisher were also mentioned as organizational criteria, but less frequently.

My collection is organized **by platform** ... and **I also organize them into region**, so I'll keep the American PlayStation games in their own section, next to the Japanese PlayStation games, so that I can kind of get to them easier. (P20, gamer)

Yeah, they're organized **by the console** that they're on, and **the manufacturer of the game**, like the studio that makes it, and then they're in **alphabetical order** from there. (P10, collector)

I tried to organize it **by genre**, but for the most part it's just **by system**. With **the ones that I'm usually playing** usually towards the top or the front. (P13, gamer)

For some users, not all games were treated equally. Games belonging to favourite series/franchises or games published by particular companies would be organized in a different way than the rest of the collection. Games that users had previously played might be placed in a different 'pile' or 'box'. Users who spent more time organizing and curating their collections did save certain games as 'favourites' or 'blocked' games so they would not clutter the list (e.g. 'I have my games saved in the Favorites ... then I decide I don't like them, I block them and get rid of them'; P1, gamer). Providing such features in addition to allowing multiple criteria for automatic sorting would help further facilitate search/browse activities for these users.

## 5. Conclusion and future work

We investigated the information needs and behaviour of people who interact with and/or purchase video games by interviewing 56 users interested in games for various reasons. From empirical user data, we derived and discussed nine design implications for video game information systems, summarized below:

1. Design in flexibility for target game user populations because their needs vary significantly. Proxy users, in particular, have distinct sets of needs compared with other game users.
2. Genre alone is insufficient, as many users found genres limiting or confusing. As games with strong narrative components become increasingly abundant, other subject metadata such as themes and tropes may bridge that gap. New approaches to genre classification may also help users search and browse for games of interest.
3. Metadata on technical composition/function and responsible corporate body, at minimum, should be provided. The former is basic information that is required for playing the game, and the latter helps users seek new games based on the reputation of development teams/companies. Create standards for technical data and unique authority identification for creators to afford better access via corporate information.
4. Information on relationships among games and additional content is highly desirable, yet complicated to describe and represent. Much contextual information will be lacking without cooperation from official sources.
5. The 4Rs (i.e. reviews, ratings, rankings and recommendations) are important, and often used in conjunction. Uniting and aggregating this myriad information in one location or system would offer great benefit to all user types.
6. Visual metadata (e.g. trailers, gameplay videos) is crucial for quick purchase/play decision making.
7. Including information about the length of game sessions and saving options benefits the increasing number of users of all types who prefer to 'pick up and play' and need to balance work and other responsibilities.
8. Similarity and appeals/motivations may work well for successful game recommendations and potential new access points.

9. Multiple automatic organization options are necessary for improved access to personal game collections. Digitally distributed games, in particular, introduce additional complications and issues.

These findings should be considered when designing a video game information system, lest designers risk reducing the ability to connect users with games and game information. This could have serious impacts on scholarly research, cultural heritage and the economic market for video games, since it will hamper users' ability to study, preserve or purchase video games.

Owing to the wide variety and sheer volume of video games as well as the background knowledge required to describe such complex metadata, some user involvement will be necessary to develop this metadata. We plan to continue working toward establishing a standard set of terms and definitions to assist this process, allowing for more consistent description of video games, which will lead to better search and retrieval. Additionally, to further improve our understanding on how we should design video game information systems, we are currently analysing responses to questions from a follow-up survey regarding users' favourite game-related websites, how they use them and what they like or dislike about them. We also plan to do a comparative analysis of the survey responses from different user groups to understand the relative importance of different game-related information to these users. Ideally this work will lead to future prototypes for new and improved video game information retrieval systems.

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### Notes

1. <http://www.newzoo.com/insights/global-games-market-will-reach-102-9-billion-2017-2/>
2. <https://gamecip.soe.ucsc.edu/>
3. [http://gamer.ischool.uw.edu/official\\_release](http://gamer.ischool.uw.edu/official_release)
4. Ibid.
5. Here, we are using the term genre to refer to the overall nature of a video game's interactivity based on its objectives, types of rules and manners of gameplay.

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