Using Genres to Customize Usability Evaluations of Video Games

David Pinelle
School of Computer Science
University of Nevada, Las Vegas
Las Vegas, NV 89154-4019 USA
+1 702 895-5886
pinelle@cs.unlv.edu

Nelson Wong
Department of Computer Science
University of Saskatchewan
Saskatoon, SK S7N 5C9 Canada
+1 306 966-2327
nelson.wong@usask.ca

Tadeusz Stach
School of Computing
Queen's University
Kingston, ON K7L 3N6 Canada
+1 613 533-6050
tstach@cs.queensu.ca

ABSTRACT
Video games are varied, with vastly different visual layouts and interaction styles; however, most games that share a common genre still have many user interface similarities. These similarities suggest that genres can be used as a conceptual framework for examining design issues in video games, and for developing a deeper understanding of how the design process can be specialized for specific types of games. In this paper, we consider how genre relates to one aspect of design—the usability of games, which deals with players' ability to learn, control, and understand a game interface. We report results from a study where we coded usability problems in reviews of 108 commercial video games. The review set included 18 games from each of six major game genres. We statistically analyzed the problems from each genre, and found significant differences between many of the genres. We present usability profiles for each genre based on the problem distributions that we found. The profiles describe both common and infrequent problems in each genre and provide details on how they commonly occur in games. The profiles can be used to specialize usability evaluations by helping designers focus on common problems seen in games from each genre.

Categories and Subject Descriptors
H.5.2 [**Information Interfaces and Presentation**]: User Interfaces – *graphical user interfaces, evaluation/methodology, theory and methods.*

General Terms
Design, Human Factors.

Keywords
Usability evaluation, heuristic evaluation, video games, game genres

FuturePlay 2008, November 3-5, 2008, Toronto, Ontario, Canada.

1. INTRODUCTION
Many video games emphasize design innovation as developers look for new ways to engage and challenge players [5]. This focus on novelty over consistency means that games do not usually use windows interfaces and standard user-interface libraries that define the look and feel of most traditional applications. This has led to significant variability in game interfaces, where striking differences can be seen in both the visual and interactive aspects of designs.

In spite of the variety seen in games, most games from the same genre still have many similarities. For example, many real-time strategy games have similar navigation schemes and input mappings. Even distinctly different strategy games, such as Warcraft III, which has a fantasy theme, and Company of Heroes, which has a World War II theme, have almost identical user interface components and mouse mappings. The use of game genres makes game design simpler since designers do not have to reinvent every facet of the game from scratch, and they can partially base new designs on older games in the same genre.

Genres provide a useful conceptual framework for examining design issues in video games. The similarities seen between games in a genre, and the differences seen between genres, suggest that game designers may need to take a slightly different approach to each. For example, role playing games and adventure games usually emphasize storyline, but sports and racing games usually emphasize twitch game play, where a rapid response is needed from the user.

Our recent work has focused on one aspect of video game design: the usability of games, which we define as *the degree to which a player is able to learn, control, and understand a game* [20]. In games, usability problems are either uncovered using usability inspection techniques, where experts review the interface, or using playtesting, where people play a functional prototype to identify design flaws. Our research has focused on understanding game usability in more detail, and we have worked to develop usability evaluation techniques that focus on common problems found in games.

This paper builds on our past work by examining whether usability evaluations can be specialized for video game genres. In recent work, we analyzed usability problems found in 108 reviews of PC games [20]. Based on our analysis, we developed a

classification scheme for usability problems that describes 12 common problem types found in commercial games. We used the problem categories to develop 10 usability heuristics that can be used to evaluate video games.

This paper considers how usability problems differ by genre. We used the same review set that we employed in our previous work [20]. The 108 reviews in the set are made up of 18 games from each of six major genres. We reanalyzed the data to determine the differences in problem distributions seen between the genres. We used the results to develop a usability profile for each genre. The profiles list the problems that are common and those that are rare, and they summarize the main ways that problems occur in games from the genre. We believe that the profiles can help designers to specialize the usability evaluation process by enabling them to focus on important aspects of the genre, and they can also help them to avoid wasting time covering issues that may not be as relevant.

In the next section, we present a detailed discussion of usability issues in video games, and then we describe the six genres that we used in our analysis. We describe the twelve problem categories, and we discuss our methodology and the results of the study. We close by presenting usability profiles for each genre and by discussing the implications that our findings have for the design of video games.

2. VIDEO GAME USABILITY

One of the main goals in video game design is to entertain and engage the user. This can involve several aspects of design, including game story, pacing, challenge level, and game mechanics [4]. However, since most games require constant interaction, game designers must also pay careful attention to usability issues. Failure to design usable game interfaces can interfere with the larger goal of creating a compelling experience for users, and can have a negative effect on the overall quality and success of games.

Game usability refers to the degree to which a player can learn, control, and understand a game. It does not address issues of entertainment, engagement, and storyline, which are strongly tied to both artistic issues (e.g. voice acting, writing, music, and artwork) and technical issues (graphic and audio quality, performance issues).

Game designers need methods for identifying usability problems both in early designs and in more mature prototypes [4]. Playtesting is one of the most common ways to uncover design problems [8], yet this method needs a playable prototype that only exists in the later stages of the development process. Few methods exist to allow designers to carry out less expensive usability inspections of games, and to evaluate early, non-functional prototypes.

Usability inspection techniques have the potential to improve the game design process. Unlike playtesting, they do not need user participation, so they can be carried out with early mockups as well as with functional prototypes. Usability inspections rely on skilled evaluators who inspect the user interface and identify usability problems. These techniques are inexpensive and can be carried out in a short amount of time, so inspections can be used iteratively during the design process [16].

Most current usability inspection techniques are not appropriate for games since the design considerations are significantly different from those seen in non-entertainment applications. Techniques such as cognitive walkthrough [19], pluralistic walkthrough [2], and task analysis [1,23] are partially based on the assumption that people will use an application to carry out predetermined tasks. However, the notion of task sequences is not necessarily useful in games since people play them differently depending on their strategy or motivation; further, some games are designed to promote unstructured exploration, which means that significant variability can be seen in how people choose to interact with game interfaces.

One technique that has the potential to be useful for evaluating game prototypes is heuristic evaluation. Heuristic evaluation is an inspection technique where evaluators explore an interface using a set of usability principles, called heuristics [16]. Heuristic evaluation does not make assumptions about task structures, and it is flexible enough to be adapted to specialized domains.

Several researchers have proposed heuristics for video game design [3,4,7]. However, their heuristics are strongly oriented around engagement and fun, and do not consider usability in detail. To fill the need for a set of usability principles for games, we recently developed a set of heuristics that describe how common usability problems can be avoided by designers [20].

Our heuristics were developed by first analyzing usability problems found in reviews of commercial video games. Our initial heuristic set considered general usability problems found in PC games, but did not address problems found in specific game types. In this paper, we examine the question of whether usability evaluations, including heuristic evaluations, can be specialized for video game genres.

3. VIDEO GAME GENRES

Myers points out that one of the main factors that unifies [12] a game genre is a similarity in the type of interaction that is supported between the player and the game. Overall, the classification of video games into genres can be seen as a subjective practice, and the number of accepted game genres has evolved in recent years as games become more sophisticated and diverse [22]. For example, increased processing power has led to significant evolution in the strategy genre since computers are now able to track the movement of large armies in real time. Furthermore, multiplayer games have evolved with improved network technologies, and massive multiplayer online role-playing games, such as World of Warcraft, have been introduced and have seen significant growth in the past decade.

In the analysis reported in this paper, we use genres that have been widely accepted in the video game industry. The genres were based on the main categories listed on the GameSpot website (www.gamespot.com), and are consistent with most of the major genres listed by the Entertainment Software Association [6]. We briefly describe each of the six genres used in our study below, and we provide examples from each category.

Role playing. Role playing games allow players to control a character, or party of characters, while they explore the game world, gather items, complete quests, and battle enemies. These games usually have a rich back story, often with either a fantasy or a science-fiction theme. Examples include the Neverwinter Nights, Baldur's Gate, and Elder Scrolls series.

Sports/racing. Sports games simulate real-world sports, such as baseball, racing, and basketball. Examples include the NBA Live, Madden NFL, and Tiger Woods PGA Tour series.

First person shooter/tactical shooter. First person shooters usually follow a single character using the first-person perspective. Tactical shooters use either first or third-person perspectives, and players often switch between several characters. In both types of games, players select from a series of weapons, and move through the game world while shooting enemies. Examples include the Half-Life, Quake, and Rainbow Six series.

Action. The action game genre is a diverse category, including games that can use either first or third-person perspectives. Their defining characteristic is that they are based on coordination and reaction time. Examples include the Tomb Raider, Resident Evil, and Prince of Persia series.

Strategy (both real-time and turn-based). Strategy games emphasize tactical planning and often involve building structures, managing resources, and overseeing a large number of units. Examples include the Starcraft, Warcraft, X-Com, and Civilization series.

Adventure. Adventure games are slow-paced games where players explore the game world, and they emphasize investigation and problem solving. Examples include the Myst, Syberia, and Monkey Island series.

4. ANALYSIS OF USABILITY PROBLEMS

In this section, we discuss how we analyzed a set of video game reviews to examine the differences in usability problems seen in each of six major genres. In the next two sections (4.1, 4.2), we briefly summarize work that was reported in a past publication [20]—we describe how we selected game reviews used in the study, and we present the scheme that we used to code problems found in the review set. Next, we report the results of an analysis where we statistically compared the differences between problem distributions seen in the game genres. Finally, we present a series of game profiles that describe both the frequent and infrequent problems seen in each genre.

4.1 Analysis Set

We identified and classified usability problems that were described in game reviews posted on the GameSpot website. GameSpot reviews are written by professional editors, and most reviews are relatively comprehensive, addressing a range of game design issues. The reviews usually consider how engaging and entertaining a game is, as well as the overall graphic and audio quality. Usability issues, such as control mapping and the understandability of visual representations, are also covered in most reviews. Analyzing games from the archive allowed us to identify common usability problems and to understand the common ways that the problems occur in game interfaces.

We used 108 reviews from the GameSpot website, and we restricted our selection process to reviews that were posted since 2001. The selected reviews included work from 24 different reviewers. To keep the scope of the study manageable, we restricted the review set to PC games, and we focused on single-player usability problems. Our goal was to identify usability problems that were relevant to current games, and that reflected recent trends in game design. Within the 108 reviews, we included 18 reviews from each of the 6 game genres described in section 3. Games were assigned to genres based on the classification that was assigned to them on the GameSpot website.

4.2 Usability Problem Classification Scheme

We assigned the reviews to three researchers, each of whom had significant experience with playing games and with conducting usability evaluations. Each person worked separately on the review sets to reduce bias, so that they could independently draw conclusions about the problem classes that are found in games. They identified single-user usability problems that were found in each review, and excluded technical problems and issues related to fun and engagement. They separately devised problem categories based on the problems found, and individually coded problems from the reviews using the categories.

Table 1. List of usability problems found in video games.

Problem category	Key issues
1. Consistency	poor hit detection, poor in-game physics, inconsistent response to input
2. Customizability	does not allow user to change video and audio settings, difficulty, or game speed
3. Artificial intelligence	problems with pathfinding, problems with computer controlled teammates
4. View mismatch	bad camera angle, view is obstructed, view does not adjust to user's action quickly enough
5. Skip content	cannot skip video and audio clips, frequently repeated sequences
6. Input mappings	bad input mappings, limited device support, limited control customization
7. Controls	oversensitive controls, unnatural controls, unresponsive controls
8. Game status	does not provide adequate information on character, game world, or enemies. visual indicators, icons, and maps are inadequate.
9. Training and help	does not provide default and recommended choices; does not provide suggestions and help; does not provide adequate documentation, instructions, tutorials, and training missions.
10. Command sequences	learning curve is too steep; requires too much micromanagement; command sequences are complex, lengthy, and awkward, making the game difficult to play
11. Visual representations	bad visualization of information, too much screen clutter, too many characters or game elements on the screen at the same time, difficult to visually distinguish interactive content from non-interactive content
12. Response times	slow response time interferes with user's ability to interact with the game successfully

After all reviews were coded, the researchers met to discuss the problem classifications, and to develop a common classification scheme. There were many overlaps in the problem categories that were found by each person. They aggregated the categories based on similarities between problem descriptions, and a total of twelve new problem categories were identified.

The researchers recoded the reviews using the new problem categories and tracked the number of times each problem type was found in the review set. They identified a total of 285 usability problems, an average of 2.64 problems per game, and at least one usability problem was found in each game review. Table 1 shows the problem categories that were developed from the reviews. The categories provide high level descriptions of problems that are seen in games, but they do not give concrete details on how the problems are instantiated. For each category in Table 1, several associated key issues are listed. These issues describe the main ways that problems in the category occurred.

4.3 Analysis and Results

We grouped the reviews in the set according to their genre, and we counted the number of times each problem occurred in each game type. The review set includes 18 reviews from each of the six genres, so each genre has equal representation in the set. Figure 1 shows the problem distribution, and a separate radar plot is shown for each genre. The problems are shown along the circumference of each graph, and the number of problems is encoded using the distance from the center of the graph. The figure shows that most of the genres have very different problem distributions.

We statistically analyzed the number of problems found in each category to identify differences between the genres. There were no statistically significant differences for seven of the problem categories (1, 2, 6, 8, 9, 10, and 12). In the rest of this section, we describe the analysis results for the five categories where significant differences were found.

3. Artificial intelligence. An analysis of variance (ANOVA) showed main effects of genre ($F_{5,101}$=3.87, p=0.003) on the number of problems found. Follow up Tukey tests were carried out to look for pairwise differences, and significant differences were found between strategy and adventure (p=0.003), and between strategy and action (p<0.001).

4. View mismatch. An ANOVA ($F_{5,101}$=2.66, p=0.027) showed significant differences between the genres, and follow up Tukey tests showed significant differences between action and shooter (p=0.006).

5. Skip content. An ANOVA ($F_{5,101}$=3.41, p=0.007) showed significant differences between the genres, and follow up Tukey tests showed significant differences between adventure and four other genres: shooter (p=0.01), role playing (p=0.01), action (p=0.01), and strategy (p=0.01).

7. Controls. An ANOVA ($F_{5,101}$=3.91, p=0.003) showed significant differences between the genres, and follow up Tukey tests showed significant differences between action and three other genres: adventure (p=0.003), role playing (p=0.001), and strategy (p=0.002).

11. Visual representations. An ANOVA ($F_{5,101}$=3.65, p=0.005) showed significant differences between the genres, and follow up Tukey tests showed significant differences between adventure and three other genres: sports (p=0.002), shooter (p=0.007), and action (p=0.008).

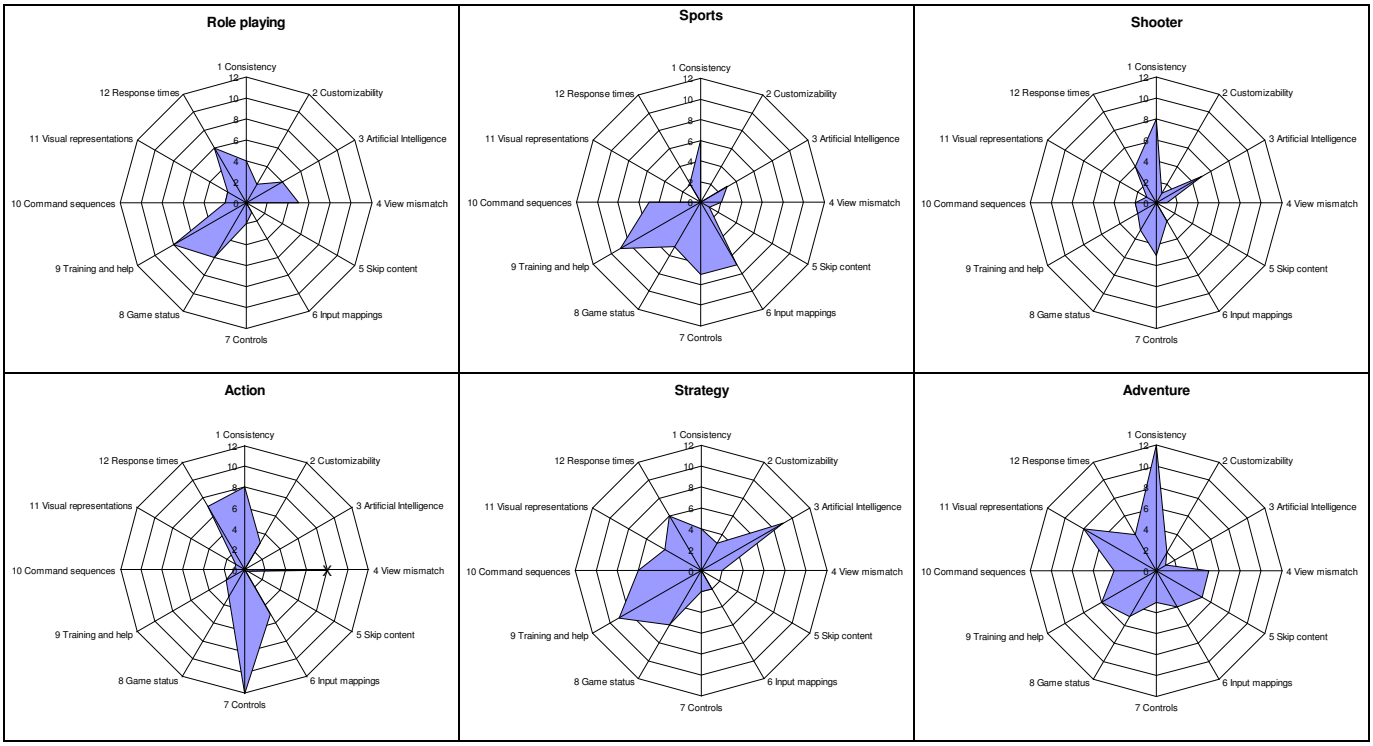

Figure 1. Usability problems found in games from each genre. Problems are shown along the circumference of each radar plot, and the number of problems for each genre is shown by the distance that each problem is plotted from the center of each circle.

4.4 Genre Profiles

Even though we did not find statistically significant differences between all problem types, many genres show distinct problem patterns. These problems are often directly related to the aspects of game play that are emphasized in the genre. For example, some twitch style games, where users must respond to the game in a very short timeframe and where interaction occurs constantly, have significant control and input problems that are not seen frequently in other types of games.

In this section, we provide profiles that describe the patterns of usability problems that we found in each genre. For each genre, we list the problems that have a high frequency (5 or more, approximately 28% of games) and those that are very infrequent (2 or less, approximately 11% of games). We also present a summary that gives additional details on how the problems usually occur in games from that genre. For the frequent problem types, we provide example problems from the review set.

4.4.1 Role playing

Low incidence problems: skip content (0), input mappings (1), command sequences (2), controls (2), visual representations (2), customizability (2)

High incidence problems: training and help (8), game status (6), response times (6), view mismatch (5)

Summary: Most role playing games are extremely complex, and usability problems primarily deal with issues related to learning and understanding the game. A large number of role playing games have problems that deal with the need for additional training or context-sensitive help. Issues related to the need for more information on the status of the game, such as information about the character, quests, and the game world, are also common. Other common problems include slow response times and views that are obstructed by objects in the game world, including the use of inappropriate camera angles. Control and input mapping problems are very uncommon, presumably because many role playing games do not emphasize twitch aspects of game play.

Example (training and help): "…Silverfall lets you recruit various NPC companions to join you on your journey. However, the game never explains what to do if one of them dies, so at first you'll zone from one area to the next to find that your henchman's erect but lifeless body accompanies you." [30]

Example (game status): "Quests are routinely introduced with no preamble, leaving you to wonder what you're supposed to be doing." [28]

4.4.2 Sports

Low incidence problems: customizability (0), visual representations (0), skip content (1), view mismatch (2), response times (2)

High incidence problems: training and help (9), input mappings (7), controls (7), consistency (6), game status (5), command sequences (5)

Summary: Most sports games require a high level of interaction, where a rapid response is needed from the user. Many of the usability problems found in these games show this emphasis—problems related to input mapping and control sensitivity are common. Issues that address the need for better training and help also occur frequently, presumably because the heterogeneity of the genre (e.g. football games are significantly different than racing and baseball games) means that users often cannot transfer previous learning to new games.

Example (training and help): "A tutorial and a better online manual are sorely needed. There is a really nifty feature where you can ask specific questions of your wrestlers and booking team, but it's just not enough." [27]

Example (input mappings): "Indeed, this inconvenient control setup continues even during a contest, where you're never really sure which device you should use to scroll the menus or make selections. Sometimes your mouse will do the trick, sometimes the keyboard, and sometimes your gamepad." [9]

4.4.3 Shooters

Low incidence problems: skip content (0), visual representations (1), view mismatch (1), customizability (1), training and help (2), command sequences (2), input mappings (2)

High incidence problems: consistency (8), controls (5), artificial intelligence (5)

Summary: Many shooters have a similar look and feel. Games use identical key and mouse mappings, and the visual design is also similar, with health, armor, and ammo indicators shown at the bottom of the screen. Common usability problems seen in shooters, therefore, do not deal with input mappings, but instead address the sensitivity of controls. Another common problem is the need for consistency in responding to users' actions, often relating to inconsistency in responding to input or inconsistencies in applying physics models and hit detection (this is very similar to problems found in action games). There are also frequent issues related to the need for better artificial intelligence and pathfinding to improve users' control over their avatar(s).

Example (consistency): "The aliens, it seems, can even shoot through walls, and you'll often see a disembodied arm shooting at you through a closed door. They don't need to aim their weapons either, because even if an alien isn't facing you, its blasters will somehow manage to shoot right at you." [11]

Example (controls): "For instance, the first dream level includes lots of platform-jumping and sliding-log avoidance (all while being shot at) that would be frustrating in a first-person shooter with solid controls, much less one with Psychotoxic's 'Armageddon on Ice' style of movement." [31]

4.4.4 Action

Low incidence problems: artificial intelligence (0), skip content (0), command sequences (1), visual representations (1), training and help (2)

High incidence problems: controls (12), view mismatch (8), consistency (8), response times (7), input mappings (5)

Summary: Unlike other genres, action games are highly inconsistent in their visual and interaction design. However, they are usually twitch games that require rapid interaction with the user. Most of the problems seen in action games stem from these demands, and include oversensitive or unresponsive controls, poor input mappings, and slow response times from the application. They also have an unusually high incidence of view mismatch problems, where the view used in the game does not provide the player with the visual information that they need to carry out actions successfully. In some cases, views are

inappropriate for the task, and in others, they do not adjust quickly enough to input provided by the player. Action games also often suffer from consistency problems, where the game has poor hit detection and physics, or where users' actions do not reliably result in the expected outcome.

Example (controls): "…it's entirely too easy to get shot to pieces while fiddling with the zoom toggle to get a proper aim on anything." [13]

Example (view mismatch): "The main frustrations…stem from the fixed camera the game uses. Because of the way it angles shots, it sometimes makes it impossible to properly judge the distance of a jump, leaving you to guesstimate and trial-and-error your way through certain sections." [14]

4.4.5 Strategy

Low incidence problems: skip content (0), view mismatch (2), controls (2), input mappings (2)

High incidence problems: artificial intelligence (9), training and help (9), game status (6), command sequences (6), response times (6)

Summary: Most strategy games require users to manage a large number of units (e.g. armies, squads, etc.), and the user interface is designed to help them handle the inherent complexities involved in game play. Most of the usability problems seen in strategy games are the result of design decisions that interfere with users' ability to learn, interpret, and interact with the game. Artificial intelligence problems are common since users usually issue commands to troops, and the computer handles pathfinding for individual units. Troop actions are often initiated by issuing keyboard control sequences, but problems occur when games require too much micromanagement or when key sequences are difficult to execute and/or remember. Many games also do not provide adequate information to the user, making it difficult for them to track their units and to understand what is happening in the game.

Example (artificial intelligence): "Troops insist on walking so close together that at least two members of the platoon have their shots blocked at all times. And missions sometimes can't even be started because the team members get stuck in the doorway of their landing craft." [26]

Example (training and help): "The .pdf manual included with the game doesn't explain much of anything, and the in-game tutorial only shows you how to use a handful of different units." [10]

Example (game status): "…it's quite possible to suddenly lose the game by popular rebellion without getting much of a hint, let alone any solid data on why things turned so badly just a few years into a scenario." [18]

4.4.6 Adventure

Low incidence problems: artificial intelligence (1), customizability (2)

High incidence problems: consistency (12), visual representations (8), training and help (6), skip content (5), view mismatch (5), game status (5)

Summary: Adventure games are usually slow-paced games where users explore the game world while collecting items and trying to solve puzzles. The game play is usually significantly different from other major genres, and the problem distribution reflects these differences. Many adventure games make extensive use of audio clips and cut scenes, but do not allow users to skip the content, often forcing them to watch the same clip repeatedly when they enter the same room or talk to the same character. Another common problem is that the visual display of the game world does not provide the appropriate cues needed for users to differentiate between interactive and non-interactive elements on the screen, forcing the user to conduct a "pixel hunt." Many games also do not respond to users' actions in a consistent manner, leading to unintended actions and errors.

Example (skip content): "…you can't skip over any of this blah-blah-blah wordiness and often have to exhaust all of the dialogue options to open up new discussion topics or the ability to solve a problem." [24]

Example (visual representations): "You typically have to roam the cursor all over each screen to make sure that you're not missing an object or a hot spot, which makes progressing through the game incredibly tedious." [25]

Example (consistency): "…he frequently gets snagged on objects and sometimes spins about wildly. This is, at best, annoying and, at worst, is a contributor to your character's death as he gets caught up while trying to evade moving traps." [17]

5. DISCUSSION

In this section, we discuss the reasons for the differences that we discovered between the game genres. We consider the implications our findings have for the design of video games, and we discuss the issue of scope and generalizability, and the limitations of our study.

5.1 Reasons for Genre Differences

Our results show that there are many differences between the genres. Some differences were more marked than others, and were seen in the statistical analyses that we ran for each problem category. When we consider overall patterns seen within each genre, a more complete story emerges about how problems occur in certain types of games.

The patterns that we found are largely the result of the different styles of interaction supported by games. While all games do not strictly adhere to a fixed interaction style, some similarities are pervasive in genres, so it possible to make some generalizations about common usability challenges faced by designers. For example, games in some genres tend to require users to react quickly (action, sports, shooters), but games in other genres do not (adventure). Games in some genres impose a significant cognitive load on the user (strategy), but games in other genres do not (shooter).

Several additional factors play a role in shaping the usability problems that are found in games. For instance, the level of standardization seen in game genres seems to play a role in problem distributions. Games in twitch genres that have varied interaction schemes tend to have a high number of problems related to input mappings (action 5, sports 7), where users have to learn new mappings for different games. However, most shooters use standardized input: a set of keys on the keyboard control movements and actions, and the mouse controls the player's view of the game world. This seems to contribute to the low number of input mapping problems seen in shooters (2); however all three genres have a relatively high number of control problems, where

the controls are either under or over-sensitive—a problem which is not necessarily related to standardization and previous learning.

Other problems also seem to have similarities based on the game play style seen in the genre. Artificial intelligence problems are usually seen in genres where people rely on the computer to help them move multiple units. They are common in role playing games and shooters, where players may have to manage a party or team of characters, and in strategy games, where players control a large number of units. Problems relating to inadequate information about game status seem to be tied to genres where players have to manage a significant amount of complexity, tracking multiple events and information sources. A high number of these problems are seen in role playing, strategy, and adventure games. There are also a large number of these problems in sports games, where players may have to track multiple events while controlling an entire team in real-time (e.g. a football team, basketball team, etc.).

5.2 Implications for Design

The problem distributions found in our analysis suggest that new approaches can be developed to add consideration of genre to the game design process. We believe that the profiles presented in this paper can be useful tools for game designers when they are evaluating the usability of prototypes. The reviews that were used during the analysis are from games that were released commercially, so our findings address problems that were not corrected during the design process. While it can be argued that some of these problems would have been addressed if game studios did not have time pressures to release games without adequate testing, it can likewise be argued that failure to address many of these usability problems resulted in poor critical reviews of the product, which can potentially have a negative affect on the commercial success of a game.

There are several ways that our findings can be used while evaluating usability in video games. Early usability evaluations often use inspection based techniques where designers review the interface to identify potential usability problems. Several approaches can be used, including inspecting the interface with a checklist or a list of guidelines that help focus the designers' attention on issues that are important to the application domain [21,29]. We believe that the profiles can be incorporated into these inspections to help focus the evaluation on issues that are important in different genres.

It is also possible to consider how the game profiles can be used during more structured usability inspections. Our recent work has focused on defining a set of usability heuristics for games that can be used during formal inspection sessions that are similar to those described by Nielsen [15,16]. The heuristics that we defined map directly to the usability problems that we used in this study. For example, we define heuristics that deal with consistency, artificial intelligence problems, and visual representations. The mapping between problem and heuristic can be exploited when carrying out heuristic evaluations, and the game profiles can be used to emphasize those heuristics that are most relevant to the genre of the game that is under consideration.

5.3 Scope and Generalizability

The reviews that we included in this study covered PC games, and they focused on single-user usability issues. We believe that, in most cases, the findings will generalize to console games since there has been significant convergence in recent years in games released for different platforms. However, it is possible that there may be some additional design considerations for certain types of console games. For example, it is possible that new concepts may be needed to address recent changes in input devices used in consoles, such as the Wii remote, which uses motion sensing, vibration, and audio-feedback.

It is our belief that game genre is useful as an organizing concept in video game design, but that there are limitations to its usefulness. The profiles we describe in this paper highlight the most common and the most infrequent usability problems that occur in games. However, there are many problems that fall between these extremes—they do not occur frequently, but they are seen in a few games in the review set. Focusing exclusively on the most common problems could cause these to be overlooked.

There are also some games that do not clearly fit into any single genre, meaning that relying on problems that are common in a single genre could cause other important issues to be missed. For example, Diablo II combines aspects of both action and role playing games. In this instance, focus on a single genre, such as role playing, could cause important problems related to input and control to be overlooked.

We believe that game genres are useful in design, but that they should only be used to provide general guidance during the design process. While we have not used the profiles during evaluations yet, we believe that evaluators should spend time considering breadth during evaluations. However, they can also spend extra time considering those areas that are particularly problematic within the genre.

In this paper, we addressed only a single design dimension: the usability of video games. It is possible that other design dimensions in video games follow similar genre trends. For example, artistic elements, such as approaches to storyline, visual perspective, and artwork, may also show tendencies that vary according to genre.

6. CONCLUSION

Video games are surprisingly varied in their visual designs, but most games that share a common genre have many similarities. In this paper, we considered whether genre similarities can be used to help organize usability evaluations for video games. We report the results of a study where we analyzed usability problems from games representing six major genres, and we conclude that the similarities within genres, and the differences between genres, are strong enough to allow designers to consider genre when planning usability evaluations. We present a series of game profiles to provide information on the most common problems found in genres so that those areas can be given special consideration.

We believe that game genres can be used to provide general guidance during usability evaluations, but that designers must also consider usability in a more comprehensive way to safeguard against missing important usability problems. The descriptive statistics show that even though many problems are not common in some genres, they still occur, and therefore need to be addressed. While we have not used the profiles during evaluations yet, we believe that evaluators should spend time considering breadth during evaluations, but they can also spend extra time considering those areas that are particularly problematic within the genre. In the future, we will evaluate the use of genre profiles

further. We plan to conduct further testing, where several evaluators use the profiles to help tailor usability inspections of game prototypes.

7. REFERENCES

[1] Annett, J. and Duncan, K.D. 1967. Task analysis and training design. *Occupational Psychology* 12, 211-221.

[2] Bias, R. Walkthroughs: Efficient collaborative testing. 1991. *IEEE Software* 8(5), 94-95.

[3] Clanton, C. 1998. An Interpreted Demonstration of Computer Game Design. *In Proceedings CHI 1998*, 1-2.

[4] Desurvire, H., Caplan, M., Toth, J. A. 2004. Using heuristics to evaluate the playability of games. *Ext. Abstracts CHI'04*, 1509-12.

[5] Dyck, J., Pinelle, D., Brown, B., Gutwin, C. 2003. Learning from Games: HCI Design Innovations in Entertainment Software. *Proc. Graphics Interface 2003*, pp. 237-246.

[6] Entertainment Software Association, Essential Facts about the Computer and Video Game Industry 2007, http://www.theesa.com/facts/pdfs/ESA_EF_2007.pdf

[7] Federoff, M. 2002. *Heuristics and Usability Guidelines for the Creation and Evaluation of Fun in Video Games*. Indiana University Master of Science Thesis.

[8] Fullerton,T., Swain, C., Hoffman, S. 2004. *Game Design Workshop: Designing, Prototyping, and Playtesting Games*, CMP Books.

[9] Goble, G. 2003. Review: Rugby 2004, http://www.gamespot.com /pc/sports/rugby2004/review.html.

[10] Mueller, G. 2006. Review: Emergency 3, http://www.gamespot.com/pc/strategy/emergency3/review.html.

[11] Mueller, G. 2006. Review: Terrawars: New York Invasion, http:// www. gamespot.com/pc/action/warforterranyinvasion/review.html.

[12] Myers, D. 1990. Computer game genres. *Play&Culture*, 3, 286-301

[13] Navarro,A. 2007. Review: Made Man, http://www.gamespot.com/pc/action/interviewwithamademan/review.html.

[14] Navarro, A. 2007. Review: TMNT, http://www.gamespot.com/pc/action/tmntthemovie/review.html.

[15] Nielsen, J. 1994. Enhancing the Explanatory Power of Usability Heuristics. *Proceedings CHI 1994*, 152-158.

[16] Nielsen, J., and Mack, R.L. (Eds.) 1994. *Usability Inspection Methods*, John Wiley & Sons, New York, NY.

[17] Osborne, S. 2003. Review: Traitor's Gate 2, http://www.gamespot.com/pc/adventure/cyphertsttg/review.html.

[18] Parker, S. 2003. Review: Pax Romana,http://www.gamespot.com/pc/strategy/paxromana/review.html.

[19] Polson, P., Lewis, C., Rieman, J., Wharton, C. 1992. Cognitive walkthroughs: a method for theory-based evaluation of user interfaces. *Int. J Man-Mach Studies* 36.

[20] Pinelle, D., Wong, N., and Stach, T. 2008. Heuristic evaluation for games: usability principles for video game design. *Proceedings CHI 2008*, pp. 1453-1462.

[21] Ravden, S.J., Johnson, G.I. 1989. *Evaluating Usability of Human-Computer Interfaces: A Practical Method*, Ellis Horwood.

[22] Sellers, M. 2005. Designing the Experience of Interactive Play. In *Playing video games: Motives, responses, consequences.* Edited by Vorderer, P. & Bryant, J. Mahwah: Lawrence Erlbaum Associates.

[23] Shepherd, A. 1989. Analysis and training in information technology tasks. In *Task Analysis for Human-Computer Interaction*, Diaper, D. Ellis Horwood, Chichester, 15-55.

[24] Todd, B. 2007. Review: Secrets of the Ark: A Broken Sword Game, http://www.gamespot.com/pc/adventure/brokensword4/review.html.

[25] Todd, B. 2006. Review: Barrow Hill: Curse of the Ancient Circle, http://www.gamespot.com/pc/adventure/barrowhill/review.html.

[26] Todd, B. 2005. Review: UFO: Aftershock, http://www.gamespot.com/pc/strategy/ufoaftershock/review.html.

[27] Todd, B. 2004. Review: Total Extreme Wrestling 2004, http://www. gamespot.com/pc/sports/totalextremewarfare/review.html.

[28] Todd, B. 2003. Review: Valhalla Chronicles, http://www.gamespot.com/pc/rpg/valhallachronicles/review.html.

[29] Vanderdonckt, J. 2001. Some preliminary investigation about the organization of user interface design guidelines, *Proc. HCI Int*.

[30] VanOrd, K. 2007. Review: Silverfall, http://www.gamespot.com/pc/rpg/silverfall/review.html.

[31] Wolpaw, E. 2005. Review: Psychotoxic, http://www.gamespot.com/pc/action/psychotoxic/review.html.