Collaborative games: Lessons learned from board games

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Collaborative mechanisms are starting to become prominent in computer games, like massively multiplayer online games (MMOGs); however, by their nature, these games are difficult to investigate. Game play is often complex and the underlying mechanisms are frequently opaque. In contrast, board games are simple. Their game play is fairly constrained and their core mechanisms are transparent enough to analyze. In this article, the authors seek to understand collaborative games. Because of their simplicity, they focus on board games. The authors present an analysis of collaborative games. In particular, they focus on Reiner Knizia's LORD OF THE RINGS, considered by many to be the quintessential collaborative board game. Our analysis yields seven observations, four lessons, and three pitfalls, that game designers might consider useful for designing collaborative games. They reflect on the particular opportunities that computers have for the design of collaborative games as well as how some of the issues discussed apply to the case of computer games.

KEYWORDS: *board games; collaboration; collaborative games; cooperation; computer games; decisions; game design; individuals; lessons; multiplayer games; LORD OF THE RINGS; payoffs; pitfalls; teams; utility*

Although the vast majority of games played all over the world are collective in nature, practically all electronic games are individual (Zagal, Nussbaum, & Rosas, 2000). Many reasons have been proposed for this dichotomy such as high costs of technology (Zagal et al., 2000), the isolated location of computers in homes (Bunten, 1996), and the inherently single-user nature of the personal computer (Costikyan, 1998). The good news is that this is changing. Faster always-on Internet connections together with cheaper technology have witnessed an increase in the amount of games that can no longer be played alone. Multiplayer is now an important part of computer games.

However, the design space for computer collaborative games remains largely unexplored (Manninen & Korva, 2005; Salen & Zimmerman, 2004; Zagal et al., 2000). Recent years have shown an increase of cooperative game mechanisms in games that do not always result in players collaborating to play the game. Li (2004) describes the "honor system" implemented in AMERICA'S ARMY (2002) as a system designed to

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"entice people to play as teams and lead." However, "everyone just kind of does their own thing. There is not really any consistent teamwork or leadership being displayed." Another example is LEGEND OF ZELDA: FOUR SWORDS ADVENTURES (2004). In a recent interview, Eiji Aonuma, producer of the game, stated that "although it's a game that four players have to cooperate to solve puzzles, when you play it . . . , you actually end up competing a lot more in that game than you do cooperating" (Moledina, 2004).

How can electronic games be designed so that collaboration is a worthwhile, interesting, and attractive option? In this article, we address this question. First, we focus on the problem theoretically. Using game theory, we classify games into three different categories: competitive, cooperative, and collaborative. We argue that collaborative games are particularly suited for encouraging collaboration. Yet, few electronic games are collaborative. For those that are, their complexity makes it difficult to extract design principles. So, we focus on board games, which are easier to understand. Our analysis yields seven observations, four lessons and three pitfalls, that game designers might consider useful for designing collaborative games. We apply these observations to computer games. By doing so, we demonstrate how board-game design can inform computer-game design.

Competitive, cooperative, and collaborative games

In traditional game theory, games fall into two basic categories: *competitive* or *cooperative*. Competitive games require players to form strategies that directly oppose the other players in the game. The goals of the players are diametrically opposed. Many traditional board games, such as Chess and Checkers, fall into this category (Jones, 2000). In contrast, a *cooperative game* models a situation where two or more individuals have interests that are "neither completely opposed nor completely coincident" (Nash, 2002). Opportunities exist for players to be able to work together to achieve a win-win condition. A cooperative game does not always guarantee that cooperating players will benefit equally or even benefit at all. Cooperative games include enforceable rules for negotiating or bargaining that allow players to identify a desirable outcome for the parties involved. The classic cooperative game is the iterative version of the prisoner's dilemma (Dawkins, 1989). In the traditional prisoner's dilemma, two prisoners are given deals if they defect and rat on their accomplice. Because of the reward system, both rationally defect and both end up with a harsher sentence than if they had collaborated with each other. In the iterative version, however, collaboration becomes a rational strategy. In a cooperative game, nice guys (collaborators) can finish first, as long as they make sure they are not being taken advantage of (Dawkins, 1989).

Though it was not acknowledged in game theory for a while, a third category exists. In a *collaborative game*, all the participants work together as a team, sharing the payoffs and outcomes; if the team wins or loses, everyone wins or loses. A *team*is an orga-

nization in which the kind of information each person has can differ, but the interests and beliefs are the same (Marschak, 1972). *Collaboration* as a team differs from *cooperation* among individuals in that cooperative players may have different goals and payoffs where collaborative players have only one goal and share the rewards or penalties of their decisions. The challenge for players in a collaborative game is working together to maximize the *team's utility.*

Competitive and collaborative models are at opposite ends of a spectrum. Competitive games preclude collaboration. Collaborative games necessitate collaboration. What about cooperative games? They lie between competitive and collaborative games. Can collaboration be a worthwhile strategy in cooperative games? At first glance, the answer would seem to be yes. However, because the underlying game model is still designed to identify a sole winner, cooperative games can encourage anti-collaborative practices in the participants such as *free riding* and *backstabbing*. *Free riding* (e.g., when they are being evaluated and rewarded as a group, individual group members do not pull as hard as they can) is a problem that causes group performance to suffer (Bornstein, Gneezy, & Nagel, 2002). *Free Riding* may appear in collaborative games as well, but cooperative games exacerbate the problem as defectors are often rewarded for their free riding behavior. Backstabbing, often unavoidable in cooperative games, is the act of defecting when your partner cooperates. If it is done at a particularly good moment, backstabbing can be an advantageous competitive maneuver in an otherwise collaborative game. For example, the key to DIPLOMACY (1959) is establishing the right alliances and knowing when to backstab your allies (Costikyan, 1994). In effect, the best strategy in a cooperative game is knowing when to behave competitively.

Behaving competitively in a collaborative scenario is exactly what should not happen in a collaborative game. One of the problems of designing a collaborative game thus becomes one of dealing with the competitiveness that players bring to the table.

Our approach: Board games

Computer games represent closed systems that are highly complex as well as opaque to in-depth analysis. For example, most massively multiplayer online games (MMOGs) are open-ended virtual environments with extraordinarily rich possibilities for play. These games are played successfully using a wide variety of strategies. EVERQUEST (1999) could be called collaborative because many people play it that way. Yet, the same people could play it individually or competitively if they wanted to. The multifaceted nature of a complex game like EVERQUEST is problematic for our purposes of analyzing collaboration and game mechanics that foster it successfully. In contrast, the nature of board games implies a transparency regarding the core mechanics of the game and the way they are interrelated. This transparency makes them more accessible for in-depth analysis.

Our approach also attempts, in part, to address the need for a language and a unified vocabulary for describing the design of existing games and thinking through the design of new games (Church, 1999; Costikyan, 1994; Kreimeier, 2002; Zagal, Mateas, Fernandez-Vara, Hochhaleter, & Lichter, 2005). Our results are in many ways similar to design rules, which offer imperative advice and guidelines for specific design situations (Falstein, 2004). However, we are reluctant at this stage to categorize our observations as rules.

We surveyed a number of collaborative games, team-based games, and competitive games with interesting cooperative game mechanisms. We played these games and watched others play them until we felt we had a good understanding of the game mechanisms. A *game mechanism* is a physical artifact, rule, or type of interaction that implements an action in the game. Trading between players is an example of a cooperative game mechanism. Capturing territory with a token is an example of a competitive game mechanism. Many recent game designs feature balanced combinations of cooperative and competitive game mechanisms. For example, THE SETTLERS OF CATAN (1997), has the object of determining which player has built the best contributions to the island of Catan while allowing players to freely trade resources among each other to further their progress. A similar mechanism is also present in MMOGS such as EVERQUEST and WORLD OF WARCRAFT (2004) where players can trade and auction goods to other players.

Collaborative games: Toward a depth approach

To study issues of collaboration in game design, we investigated board games that encouraged collaboration and collaborative thinking and the design features of those games that allowed them to be both effective at encouraging collaboration and enjoyable to play. We focus on conventional board games, rather than paper and pencil role-playing games (RPGs).

RPGs, like DUNGEONS & DRAGONS (1974), are a successful genre of collaborative games. In them, a game master guides a group of players on an adventure. As the team has the same goals for completing the adventure, most RPGs fall squarely within the category of collaborative games. Yet, RPGs differ from other board games: There is added emphasis on playing a role. In a conventional game, a player might be represented by a piece or token. So, for example, a player might consider himself to be the king in chess. However, the commitment to that role is low. There is no need or impetus to behave like a king to play chess. In RPGs, the commitment to a role is much higher. Players in RPGs frequently seek to create a satisfying storyline for their character, rather than successfully complete the adventure (Fine, 1983). From a game-theory perspective, these players are not playing a game; instead, they are creating a narrative. Consequently, RPGs are often understood in terms of narrative theory, rather than game theory (Heliö, 2004). Because we are interested in game mechanics, we exclude RPGs from our analysis.

In our survey of board games, we came across a wide variety of games. Some, like DER TIGER IS LOS . . . and IM MÄRCHENWALD (2000) were interesting and enjoyable, but failed to encourage interesting collaborative practices; these games had been designed for young children and, consequently, their game mechanisms were simplistic. Others had interesting collaborative mechanisms, but failed to be enjoyable. A few proved to be successful on both fronts.

In this article, we focus on one: Reiner Knizia's LORD OF THE RINGS. This in-depth approach allows us to give a better description and feel for how a collaborative game works. Another reason is that LORD OF THE RINGS is an extraordinary game. It is the most popular collaborative board game ever. It received the prestigious game award *Spiel des Jahres* (Game of the Year) in 2001 for "Literature in Games." Furthermore, because of its Tolkien theme and the fact that it was designed by one of the greatest and most prolific game designers alive, it was one of the most anticipated games of all time (Levy, 2001). Many critics feared, with good reason, that an interesting collaborative game could not be made. As accomplished game designer Bruno Faidutti (2004) noted in his review, "it [LORD OF THE RINGS] is the first collaborative game that really works."

LORD OF THE RINGS: Detailing a collaborative game

> People say, you can't play with each other—you have to play against each other, otherwise there's nothing to do. Of course, that's not true. I actually believe that playing with each other and really facing a common opponent in the game makes a much richer playing experience. My challenge was to create an atmosphere in the game that pushed people together and made them naturally want to stay together. . . . The players realize after the first few turns that they get hit so quickly with so many bad things that if they want to just go off by themselves they have no hope. (Reiner Knizia, in Glenn, 2002)

In LORD OF THE RINGS, you are a hobbit. Together with your fellow hobbits (2 to 5 players total), you journey to carry the one ring to Mount Doom and destroy it. Along the way, you will face many obstacles and get corrupted by Sauron and the power of the ring. It is your decisions that will shape the fortunes of all.

Regardless of whether they succeed, the entire fellowship receives a score determined by how much progress is made through the game; scores are recorded on a "Hall of Fame" sheet that comes with the game. Because all the players receive the same score, LORD OF THE RINGS is a collaborative game.

The game has two basic components, a main board that keeps track of the story and displays the corruption track that marks the progress of the individual hobbits toward Sauron (represented as an ominous black tower with a single, red lidless eye) and a scenario board that tells a part of the *Lord of the Rings* story. In this case (see Figure 1), the scenario is the journey through the mines of Moria. If Sauron reaches a hobbit on the corruption track, that hobbit (and the player) is removed from the game. If that

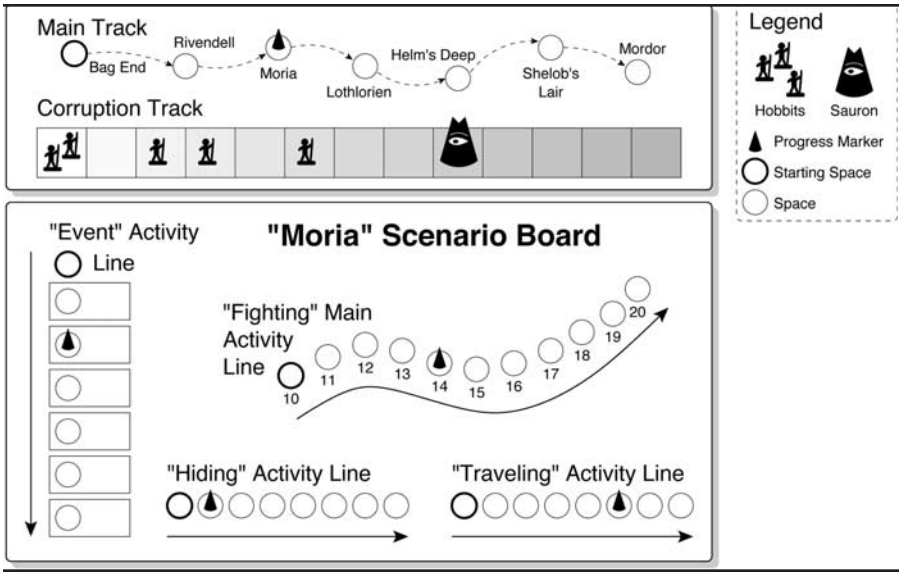

FIGURE 1: LORD OF THE RINGS Game: Moria Scenario Board

hobbit is also carrying the one ring, Sauron regains his ring and Middle Earth is plunged into a second darkness; the game is lost.

Each player has a hand of cards that either perform an action or have a symbol matching one along an activity line. Each turn, a player must first draw a tile out of a bag. These tiles have either good outcomes (advances a marker on an activity line earning the hobbits some progress or resources) or bad outcomes (requires the hobbits to sacrifice resources, move closer to Sauron, or triggers one of the scenario events connected to that particular board). Tiles and events can cause the hobbits to either advance toward Sauron or, worse, they cause Sauron to advance toward the hobbits. After drawing tiles, the current player can play up to two cards matching the symbols next to an activity line. Progressing on an activity line enables the hobbits to move closer to their final objective and/or gain resources that will help them later. Alternatively, they may draw cards to replenish resources or move themselves one space away from Sauron to avoid danger. When the hobbits reach the end of the main activity line (which also tells them their current score) or if the last event is triggered, they advance to the next scenario.

Why does LORD OF THE RINGS work?

LORD OF THE RINGS is an effective collaborative game because players are tempted to behave competitively but winning the game requires them to behave collaboratively (Knizia, 2004). Winning the game is possible with good luck and careful resource management but is more likely through good collaboration: Specifically,

active communication amongst the players and timely sacrifices for the good of the group. We have identified four lessons that can be observed:

Lesson 1: To highlight problems of competitiveness, a collaborative game should introduce a tension between perceived individual utility and team utility.

In LORD OF THE RINGS, there are many opportunities for selfish behavior at the expense of the team. Usually, selfishness is expressed in a player making a decision that has high utility for their hobbit but is not the best decision for the team. For example, a hobbit might choose to draw two cards to replenish resources or "heal" himself, moving further away from Sauron. A better decision might be to play the last card in the hand and take the consequences of an evil die roll. Competent play requires that players choose strategies that balance or forgo self-preservation to help the team.

For example, Frodo draws an "active hobbit moves 2 or Sauron moves 1" tile that requires that either he is corrupted two steps or Sauron moves one step closer, corrupting all hobbits one step. Frodo gets to make the decision. If he chooses the former, he will achieve the least total corruption for the team (2 steps) but the most corruption for himself (2 steps). If he chooses the latter, he will achieve the most total corruption for the team (5 steps, one for each hobbit) but the least corruption for himself (1 step). A selfish hobbit will choose the latter, a collaborative hobbit the former. Notably, Sauron achieves his best result (5 steps) when a hobbit is corrupted to behave in a selfish, competitive manner.

The design of the game accentuates the problem that the participant mistakes a collaborative situation for a competitive one. Because success in a collaborative situation requires a concentration on team utility over perceived individual utility, the individualistic approach is problematic. In LORD OF THE RINGS, players who behave individualistically are likely to run into difficulties, no matter how well they play according to their perceived individual utility (Knizia, 2004). When players discover this, they learn that a collaborative situation requires a fundamentally different approach than a competitive one.

This lesson is similar to the definition of a social dilemma. Social dilemmas are situations in which individual rationality leads to collective irrationality (Kollock, 1998). In other words, they are situations in which individual rational behavior leads to a situation where everyone is worse off. What is interesting about LORD OF THE RINGS in the context of this lesson is how the tension between the individual rationality and the effect on the group is highlighted.

Lesson 2: To further highlight problems of competitiveness, individual players should be allowed to make decisions and take actions without the consent of the team.

In LORD OF THE RINGS, a selfish hobbit has the ability to act selfishly without the consent of the fellowship. In the previous tile example, Frodo makes the decision. If the game were designed so that the team, not the individual, makes the decision, the other four hobbits could vote for the "Frodo moves 2" (collaborative) option. But,

LORD OF THE RINGS is not ruled by votes or consensus. If Frodo wants to choose the "Sauron moves 1" (competitive) option, he can. Because there are no ways for the team to stop or override an individual, competitive choices can be made.

Also, an important design feature is that although it is the individual who makes the decision, it is the team who needs to work together for that decision to be properly informed. Because the other members of the fellowship can also evaluate the decision (from their perspectives), they have an incentive to persuade that hobbit to make the right decision for the entire fellowship. This encourages the kind of co-construction of meaning essential to good collaboration (Barron, 2003). That communication then turns into a way for the fellowship to convince the individual hobbits to behave in a collaborative manner.

Lesson 3: Players must be able to trace payoffs back to their decisions.

Players need to be able to reflect on the consequences of their actions. In particular, they need to experience *expectation failure*. They expect their decision to be a good one but later discover it to be problematic.

In LORD OF THE RINGS, the action one player takes often directly affects the next player. For example, each hobbit needs to collect a certain amount of "life tokens" for every scenario board. Often, a hobbit will take an action based on their individual perspective that inadvertently makes it hard for the next hobbit to collect any life tokens. Without consulting with that next hobbit, that hobbit could not have realized this. However, their mistake quickly becomes obvious. The next hobbit does not have a good action to take. In the game, the next player is likely to complain that the last action has just put him into trouble. So, the first player discovers that his individual and/or competitive decision making is problematic.

Axelrod (1984) notes that making interaction more durable or frequent, increasing information about an individual's actions, and increasing identifiability are all ways of facilitating strategic solutions to social dilemmas. In the context of games, these observations help players understand the consequences of their actions as well as those of their fellow players. This applies not only to decisions that affect themselves, but also others. In fact, Komorita, Sweeney, and Kravitz (1980) note that cooperation rates increase significantly as the benefits to others from one's cooperation increase.

Lesson 4: To encourage team members to make selfless decisions, a collaborative game should bestow different abilities or responsibilities upon the players.

First, the hobbits have individual abilities. Frodo is particularly good at using his resources, Sam is less vulnerable to corruption, Merry does not require as many life tokens, and Pippin is particularly good at playing many cards. For good play, it is important to recognize these strengths and use them accordingly. For instance, a useful strategy is for Sam to take the move that requires the active hobbit to roll the evil dice, as it has less effect on him. Eventually, somebody would have to take the dice roll and it makes sense for Sam to be the one to sacrifice. Unless Sam is particularly stubborn or

competitive, it is relatively easy to convince him to make the sacrifice. Though it is bad for his own utility, it is relatively easy to see that it is in his ultimate interest to sacrifice for the team.

Second, the ring of power can move from one hobbit to another hobbit after each scenario board. If the ring-bearing hobbit is captured by Sauron, the game is lost. As such, that hobbit is (often temporarily) more important than his comrades. So, occasionally (particularly late in the game), the correct decision regarding an "active hobbit moves 2 or Sauron moves 1" tile might be to have Sauron advance toward the hobbits, instead of the ring-bearing hobbit moving two steps closer to Sauron.

The events of one of the game sessions observed illustrate how selfless decisions result in an engaging, enjoyable and ultimately successful game experience. During this game, the players were on the second to last board, Shelob's Lair, and it was certain that the ring would pass to Pippin for the last board, Mordor. Unfortunately, Pippin was only one step away from Sauron and would have a hard time staying uncorrupted in Mordor. The fellowship discussed various options of how to help Pippin survive Mordor. Could we afford to hang around in Shelob's Lair and allow Pippin to heal himself on his turn? Should we purchase the Gandalf card that allows one player to heal 2 steps, depleting our resources? After 5 minutes of intense discussion over various approaches, the solution was arrived at: Pippin made the ultimate sacrifice and voluntarily got corrupted by Sauron before Shelob's Lair concluded and, thus, the ring could not pass to him. Instead, it passed to Frodo, who was least corrupted. Frodo and Sam stormed through Mordor and plunked the ring into Mount Doom. The game was won; every player rejoiced. Pippin sacrificed his life to save Middle Earth. If such a moment of self-sacrifice is interesting as a story, it is even more engaging when you are the one to make the decision (in the game).

Challenges in designing collaborative games

In this section, we shift our focus from *mechanisms that work* to *challenges that designers need to overcome*. We extract three pitfalls that illustrate some of the particular difficulties involved in the design of a collaborative game. These pitfalls are highlighted from the collaborative and team games surveyed.

Pitfall 1: To avoid the game degenerating into one player making the decisions for the team, collaborative games have to provide a sufficient rationale for collaboration.

It is easy for a collaborative game to degenerate into a *solitaire game*. A solitaire game is one that can be abstracted to one player performing all the actions, or giving orders, to achieve the win condition set out by the game. This was a major problem in many of the collaborative and team games surveyed. One person, the most competent player, could direct the entire team. For example, SCOTLAND YARD (1982) can become boring as one person can tell everyone what to do (Aleknevicus, 2002). Avoiding this solitaire feel can be accomplished by several design techniques.

One technique is to give the players different roles and abilities so that optimal game-play depends on good coordination and decision making on the part of the players. LORD OF THE RINGS gives different abilities to each of the hobbits so that each hobbit has a useful role to play at various points in the game. Furthermore, resources are hidden so that each player only sees their own. From an optimal information-awareness perspective, this design choice might be considered a problem. But, from a game-play perspective, it is a good choice as it forces communication. A better (or dominant) player is unable simply to command the other players, as it is difficult to make good, informed decisions without the help of the others.

Another technique is to make the problem sufficiently difficult so the players need to work together to solve it. In collaborative games, players work together by sharing knowledge and resources, exploring the information space as completely as possible to identify the best strategy to use. If there are insufficient information or resource-management requirements, the collaboration becomes forced and it usually falls on one player to make the majority of the decisions. In LORD OF THE RINGS, there is enough variability of play and in the resources held by the players to require individual management. Communication among the players about the available resources for a particular task becomes more efficient than a single player trying to marshal all the resources at one time.

Another collaborative game that manages this well is EAGLE EYE AGENCY (1999). In that game, the players are detectives gathering clues to solve a caper. They have limited resources, so there are only so many places they can visit to pick up clues. The detectives have to work together to gather the right clues and then analyze them to solve the mystery. As there are many clues and several red herrings, it is useful to discuss theories with others. The collaboration feels natural and useful.

Pitfall 2: For a game to be engaging, players need to care about the outcome and that outcome should have a satisfying result.

This pitfall applies to all games; however, we feel it is particularly important for collaborative games. If players do not care about the outcome, then they are not motivated enough to help each other or improve on their performance. If players find the outcome to be unsatisfying (either boring or random), they are unlikely to learn anything, understand the consequences of their actions, or want to play it again. Games require a good narrative and flow to be entertaining to the players. A good game can be like a good story. A good collaborative game can be even more entertaining because it involves the collective contributions of all the players. It also helps if the outcomes have some variability to them to promote surprise and tension. Yet, the outcome should still be largely accountable to the decisions made by the players.

> Watch a Lord of the Rings player as he flips over a tile during the last part of the game. Some inhale sharply or wince or close their eyes . . . [This game seems] to involve people in a way more than the quiet mental gyrations of Chess or Go. (Branham, 2001)

The story of the hobbits as they journey through Middle Earth and face a myriad of dangers combined with the limited randomness provided by the cards, tile, and die creates a very engaging experience for the players. Because the outcome is often uncertain until the very end, the game manages to maintain (and often build) interest and tension. A well-played adventure that fails at the edge of Mount Doom is often as exciting as one that succeeds.

Pitfall 3: For a collaborative game to be enjoyable multiple times, the experience needs to be different each time and the presented challenge needs to evolve.

Although this pitfall also applies to all games, it can be particularly prevalent in collaborative games because these games face unique problems in *replayability.* People learn skills through practice. To put in more practice time, they need to be able to repeatedly play the game. However, if a collaborative activity has an easily learned deterministic solution, then the participants will find it pointless to repeatedly play the game. The repeatability of a game can be enhanced by random elements in setup and randomization of the resources and obstacles through the course of the game. Too much randomization and the players will have no reliable information to formulate and discuss strategies. LORD OF THE RINGS is a game of controlled chance, as the main mechanism is drawing from a bag filled with evil and good pieces (Branham, 2001). Unlike completely deterministic games, like Chess, LORD OF THE RINGS cannot be played exactly the same way twice. It maintains good replayability by having constrained randomization of the tiles and cards, which leads to different decisions and situations each time the game is played.

Competitive games are most engaging when opponents are closely matched. Two novice Chess players will have competitive games. Likewise, two expert players will have competitive games. However, an expert playing a novice is not a competitive situation. If we expressed playing ability numerically, a challenging situation in a competitive game occurs when the difference in the players' abilities is close to zero. In contrast, a challenging situation in a collaborative game is better modeled by the sum of the players' abilities being close to the difficulty of the game. If two intermediate players find a collaborative game challenging, a novice and/or expert pair might find it challenging, particularly when the expert's additional skill balances the novice's lacking skill. That same game will be too challenging for two novices and too easy for two experts.

A collaborative board game only has a set of static goals and rules to provide obstacles and counterstrategies. As a result, after multiple playing sessions, the players can become more familiar and better at the game until it is below their combined abilities. The game becomes unchallenging as the team is able to easily beat the game. So, unlike competitive games, like Chess, collaborative games need to adapt to the players' abilities to maintain replayability. In LORD OF THE RINGS, the players can adjust how many steps Sauron is away from the fellowship at the beginning of the game. This provides an easy, relatively flexible manner to increase the difficulty of the

game. Once a fellowship has mastered beating the game at 15 corruption steps to Sauron, they can try it at 12 steps.

Implications for computer games

Because of their transparency and simplicity, we have focused on board games. In this section, we aim to apply those lessons learned to computer games. Computers open the game design space as fairly sophisticated computation can be done quickly and accurately (Lundgren, 2002). They can display information in different (and often more meaningful) ways. They can even be used to analyze how players are doing and provide just-in-time help or make dynamic adjustments to the difficulty of the game.

In addition, computers offer communication flexibility. Whereas board games are limited to open face-to-face communication, computer games can be more flexible because, amongst other things, players no longer need to be co-located. Communication is of particular importance to a collaborative game, as players have to coordinate their actions and strategy. Changing the medium for communication can vastly change how participants work together (Clark & Brennan, 1991). Restricting some types of communication while supporting others can be quite powerful in changing the nature of collaboration in games (Dillenbourg & Traum, 1999; Scott, Mandryk, & Inkpen, 2002). A computer program can support conflict resolution and group decision making in ways that may be superior to face-to-face discussions (Nuñez, Aguero, & Olivares, 1998). Thus, the computer also significantly opens the design space for multiplayer games (Manninen, 2002), in particular those that are collaborative.

However, unlike the case of the board games studied, the use of the computer can also have negative effects on communication between players. Many basic cues of identity, personality, and social roles are absent in the online world (Donath, 1998), making it harder for players to understand each other and agree on plans of action. In addition, there is an increased risk of deceptive practices by players. This problem is particularly evident in modern MMOGs where it is commonly referred to as "grief play" (Lin & Sun, 2005). Typical uncollaborative practices include "taking over" badly injured monsters from other players, stealing treasure from recently killed monsters from the players who did the kill, and using bots. This last point is particularly problematic because for many players it raises the issue of whether or not they are even playing with other human beings at all! To compensate for the fact that players may not be physically co-located, they are many times forced to resort to out-of-game sources such as bulletin boards to inform themselves of the reputations (positive or negative) of their fellow players (Lin & Sun, 2005). It is thus critical that computer games take careful consideration of how they will communicate game information to the player as well as how players will communicate with each other. After all, computer games have to account for much of the feedback and communication that happens naturally in a face-to-face setting.

The communication issues discussed are especially relevant in the context of Lessons 1 and 3 (introduce tension between individual utility and team utility, play-

ers must be able to trace payoffs back to their decisions). For instance, in WOLFENSTEIN: ENEMY TERRITORY (2003), aside from the final result (Allies win or Axis win), there are few affordances for players to have a proper sense of the team utility of certain actions. If a player wants to play the game as a gung-ho loner soldier, he is not only perfectly capable but, if skillful enough, can win the game single-handedly. There are not any explicit bonuses for "sticking together." Usually a player will try to "get an extra kill" unaware of the fact that his actions resulted in the death of two of his teammates. Not only is he ignorant of the implications of his actions, but his fellow teammates do not have a means to easily communicate these to him. The problem, as Sellers (2001) notes when referring to the four-player arcade classic GAUNTLET (1985) is "If only that darned narrator would have said something to scold players like 'Wizard isn't pulling his weight'."

Computer games also make Lesson 3 more important. The amount of time it takes to play a board game can be orders of magnitude less than what a collaborative computer game could allow. In computer games, players must have some way to understand the impact of their decisions over a time span of 10s, 100s, or even 1,000s of hours (MMOGs being a good example of the latter). Computer games can explore these issues particularly well if we consider the number-crunching involved in the logging and evaluation of a player's performance. Computer games could provide continuous in-depth individualized feedback in a timely fashion.

There are games that have taken other approaches to solving this problem. BATTLEFIELD 1942 (2002), a modern-day militaristic first person shooter, allows a few players to assume the role of commanders and squad-leaders. Commanders can coordinate battles by issuing orders to squad leaders, place waypoints for soldiers to follow on the map, and also scan for enemy activity. Players in leadership roles have options available to help them monitor the success of their fellow players and, through the use of voice-over-net communications, talk directly to the players in their units. This game allows players to trace the payoffs of their decisions by having other players play roles whose responsibility includes monitoring and providing feedback. As Gillen (2005) comments, "My favourite squad leader utilised the voice-over-net systems regularly, and his caring, encouraging tones ('Get down, Medic! I need you alive, man') forged one of my favourite memories of BF2 so far."

We speculate that these games could also benefit from assigning bonuses to actions such as providing good covering fire, saving a teammate from enemy fire, or even showing good leadership. Perhaps other players could also report teammate actions that resulted in negative team utility. Another innovation could be to provide for postgame analysis where players could explore how their actions affected the outcome of the game.

Lesson 2, individual players should be allowed to make decisions and take actions without the consent of the team, is not usually a problem in computer games. This is probably due to the real-time nature of many computer games as well as the prevalent use of individualized input devices. In other words, each player has his own controller and the other players have no means of impeding its use. Thus, we could say that com-

puter games tend to be excellent examples of individual decision making in collaborative games. However, we have observed games in which a related problem appears: Due to the extreme freedom enjoyed, players are forced to "collaborate" under contrived situations.

In some ways, a corollary to Pitfall 1, provide sufficient rationale for collaboration, there are many computer games in which players are required to collaborate in situations that are arbitrary and contrived. For example, in THE ADVENTURES OF COOKIE & CREAM (2000), two players each control a character that must race as fast as possible to a goal. Their progress is constantly hindered by closed barriers that must be opened by having the other player step on a switch or button. This cooperative mechanism is unfortunately rather common in computer games, with some games going so far as to require four players to simultaneously step on separate buttons in order to proceed. These situations also tend to ignore Lesson 1 because, due to the fact that none of the players can proceed without all of them performing an action, there is no tension between individual and team utility. Additionally, these sorts of situations tend to fall prey of Pitfall 2, players need to care about the outcome and that outcome should have a satisfying result.

Lesson 4, bestow different abilities or responsibilities upon the players, is also prevalent in many computer games with cooperative mechanisms. For example, online games such as BATTLEFIELD 1942 and WOLFENSTEIN: ENEMY TERRITORY are online first-person shooter games in which the players choose different classes (or kits). These vary with each game, but generally allow the players access to different abilities such as healing teammates and planting explosives. A successful team in these games is usually one in which all the classes are represented, with their respective players taking the most advantage of the particular abilities they offer.

Pitfall 3, the experience of a collaborative game needs to be different each time and the presented challenge needs to evolve, should be easier to avoid in the case of computer games. However, despite the computational capabilities of computers, few commercial developers have implemented dynamic difficulty adjustment systems to address this (Hunicke & Chapman, 2004). Although these systems have mostly been used in single-player games, there have been some approaches for dealing with the additional complexities of multiplayer games such as large MMOGs (Carpenter, 2003).

To conclude, we maintain that games have a unique potential to engage people in collaborative activities. On the other hand, collaborative games are rare and extraordinarily difficult to design. This article has hopefully illustrated some of the particular difficulties inherent to the design of these games as well as showing that simply having cooperative elements is generally insufficient for collaborative play. We have noted how many computer games do apply some of the lessons we have identified, though most tend to fail when it comes applying them all. We believe that computer games not only have the potential for addressing many of the issues discussed but also many affordances to solve them. We are hopeful to have provided insight that game designers might be able to use to create more and better collaborative games.

References

Aleknevicus, G. (2002). Player interaction in games. *Counter Magazine*, (16). Retrieved from http://www.thegamesjournal.com/articles/PlayerInteraction.shtml

AMERICA'S ARMY: OPERATIONS. (2002). U.S. Army.

Axelrod, R. (1984). *The evolution of cooperation*. New York: Basic Books.

Barron, B. J. S. (2003). When smart groups fail. *Journal of the Learning Sciences*, *12* (3), 307-359.

BATTLEFIELD 1942. (2002). Electronic Arts.

Bornstein, G., Gneezy, U., & Nagel, R. (2002). The effect of intergroup competition on group coordination: An experimental study. *Games and Economic Behavior*, *41* (1), 1-25.

Branham, F. (2001, September). What is the goal? *The Games Journal*. Retrieved from http://www.thegamesjournal.com/articles/WhatIsTheGoal.shtml

Bunten, D. (1996). *On-line multi-player games*. Retrieved 4 August 2005 from http://www.anticlockwise.com/dani/personal/biz/online.htm

Carpenter, A. (2003). Applying risk analysis to play-balance RPGs. *Gamasutra.com*. Retrieved 10 August 2005 from http://www.gamasutra.com/features/20030611/carpenter_pfv.htm

Church, D. (1999, August). Formal abstract design tools. *Game Developer*. Retrieved from http://www.gamesutra.com/features/19990716/design_tools_01.htm

Clark, H. H., & Brennan, S. E. (1991). Grounding in communication. In L. B. Resnick, J. M. Levine, & S. D. Teasly (Eds.), *Perspectives on socially shared cognition* (pp. 127-149). Washington, DC: American Psychological Association.

Costikyan, G. (1994). I have no words & I must design. *Interactive Fantasy*, *2*. Retrieved from http://www.costik.com/nowords.html

Costikyan, G. (1998). *Why online games suck (and how to design ones that don't)*. Retrieved 4 August 2005 from http://www.costik.com/onlinsux.html

Dawkins, R. (1989). *The selfish gene*. New York: Oxford University Press.

Dillenbourg, P. J., & Traum, D. (1999). *Does a shared screen make a shared solution?* In C. M. Hoadley & J. Roschelle (Eds.), *Proceedings of the computer support for collaborative learning (CSCL) 1999 conference* (pp. 127-135). Palo Alto, CA: Stanford University.

DIPLOMACY. (1959). Calhammer, A. Avalon Hill.

Donath, J. (1998). Identity and deception in the virtual community. In P. Kollock & M. Smith (Eds.), *Communities in cyberspace* (pp. 29-59). London: Routledge.

DUNGEONS & DRAGONS. (1974). Gygax, G. & Arneson, D. TSR, Inc.

EAGLE EYE AGENCY. (1982). Deacove, J. Family Pastimes.

EVERQUEST. (1999). S. Clover, B. McQuaid, & B. Trost. 989 Studios.

Faidutti, B. (2004) *Le Seigneur des Anneaux*. Retrieved 20 July 2004 from http://faidutti.free.fr/jeux/articles/lotr/lotr.html

Falstein, N. (2004). *The 400 project*. Retrieved 29 October 2004 from http://www.theinspiracy.com/400_project.htm

Fine, G. A. (1983). *Shared fantasy*. Chicago: The University of Chicago Press.

GAUNTLET. (1985). E. Logg. Atari.

Gillen, K. (2005). *Battlefield 2 review*. Retrieved 29 June 2005 from http://eurogamer.net/article.php?article_id=59758

Glenn, S. (2002). *Interview with Reiner Knizia*. Retrieved 30 June 2005 from http://web.archive.org/web/20030604142516/http://kumquat.com/cgi-kumquat/funagain/knizia2

Heliö, S. (2004). Role-playing: A narrative experience and a mindset. In M. Montola & J. Stenros (Eds.), *Beyond role and play*. (pp. 65-74). Helsinki, Finland: Solmukohta.

Hunicke, R. & Chapman, V. (2004). AI for dynamic difficulty adjustment in games. *Challenges in game artificial intelligence* (AAAI Workshop). Pittsburgh: AAAI Press.

IM MÄRCHENWALD. (2000). Nikish, M. Adlung Spiele.

Jones, K. (2000, August). Non-predatory games. *The Games Journal*. Retrieved from http://www.thegamesjournal.com/articles/Nonpredatory.shtml

Knizia, R. (2004). The design and testing of the board game Lord of the Rings. In K. Salen & E. Zimmerman (Eds.), *Rules of play: Game design fundamentals* (pp. 22-27). Cambridge, MA: The MIT Press.

Kollock, P. (1998). Social dilemmas: The anatomy of cooperation. *Annual Review of Sociology*, *24*, 183-214.

Komorita, S. S., Sweeney, J., & Kravitz, D. A. (1980). Cooperative choice in the N-person dilemma situation. *Journal of Personality and Social Psychology*, *38*, 504-516.

Kreimeier, B. (2002). *The case for game design patterns*. Retrieved 29 October 2004 from http://www.gamasutra.com/features/20020313/kreimeier_01.htm

Levy, L. (2001, September). Reinier Knizia: The special k's of German game design. *The Games Journal*. Retrieved from http://www.thegamesjournal.com/articles/SpecialK.shtml

Li, Z. (2004). *The potential of America's Army the video game as civilian-military public sphere*. Unpublished MA Thesis, Massachusetts Institute of Technology.

Lin, H., & Sun, C. T. (2005). The "white-eyed" player culture: Grief play and construction of deviance in MMORPGs. In S. Castell & J. Jennifer (Eds.), *Selected papers of the Digital Interactive Games Research Association's second international conference (DiGRA 205)* (pp. 91-100). Vancouver, Canada: Digital Interactive Games Research Association.

Lundgren, S. (2002). *Joining bits and pieces: How to make entirely new board games using embedded computer technology.* Unpublished Master's Thesis, IT University of Goteburg, Goteburg, Sweden.

Manninen, T. (2002, June). *Towards communicative, collaborative and constructive multi-player games*. Paper presented at the Computer Games and Digital Cultures Conference, Tampere, Finland.

Manninen, T., & Korva, T. (2005). Designing puzzles for collaborative gaming experience—CASE: eScape. In S. Castell & J. Jennifer (Eds.), *Selected papers of the Digital Interactive Games Research Association's second international conference (DiGRA 205)* (pp. 233-247). Vancouver, Canada: Digital Interactive Games Research Association.

Marschak, J., & Radner, R. (1972). *Economic theory of teams.* New Haven, CT: Yale University Press.

Moledina, J. (2004). *Doing mushrooms, Miyamoto-style (Special Edition).* Retrieved 30 June 2005 from http://www.gamasutra.com/features/20040707/moledina_pfv.htm

Nash, J. (2002). Two-person cooperative games. In H. W. Kuhn & S. Nasar (Eds.), *The essential John Nash* (pp. 99-114). Princeton, NJ: Princeton University Press.

Nuñez, G., Aguero, U., & Olivares, C. (1998, September). *Group decision-making for collaborative educational games*. Paper presented at the 4th International Workshop on Groupware (CRIWG 98), Buzios Brazil.

Salen, K., & Zimmerman, E. (2004). *Rules of play: Game design fundamentals*. Cambridge, MA: The MIT Press.

SCOTLAND YARD. (1982). W. Schlegel, D. Garrels, F. Ifland, M. Burggraf, W. Scheerer, & W. Hoermann. Milton Bradley.

Scott, S. D., Mandryk, R. L., & Inkpen, K. M. (2002, January). *Understanding children's interactions in synchronous shared environments*. Paper presented at the Computer Support for Collaborative Learning (CSCL) 2002, Boulder, Colorado.

Sellers, J. (2001). *Arcade fever: The fan's guide to the golden age of videogames*. London: Running Press.

THE ADVENTURES OF COOKIE & CREAM. (2000). Agetec.

THE LEGEND OF ZELDA: FOUR SWORDS ADVENTURES. (2004). Nintendo.

THE SETTLERS OF CATAN. (1997). Teuber, K. Mayfair Games.

WOLFENSTEIN: ENEMY TERRITORY. (2003). Wedgwood, P. Activision Publishing Inc.

WORLD OF WARCRAFT. (2004). Blizzard Entertainment.

Zagal, J., Nussbaum, M., & Rosas, R. (2000). A model to support the design of multiplayer games. *Presence: Teleoperators and Virtual Environments*, *9* (5), 448-462.

Zagal, J., Mateas, M., Fernandez-Vara, C., Hochhaleter, B., & Lichti, N. (2005). Towards and ontological language for game analysis. In S. Castell & J. Jennifer (Eds.), *Selected papers of the Digital Interactive Games Research Association's second international conference (DiGRA 205)* (pp. 3-14). Vancouver, Canada: Digital Interactive Games Research Association.

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