PLANS AND PURPOSES

HOW VIDEOGAME GOALS SHAPE PLAYER BEHAVIOUR

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"In football, everything is complicated
by the presence of the opposite team"

- Jean-Paul Sartre

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Abstract

Games shape player behaviour by presenting goals which players attempt to fulfil. This is the most common "folk" theory of the relationship between game design and player behaviour. It is also one central to most game design literature and to much work within the game studies field.

In this dissertation, the simple idea that players try to win is explicated through a "Rational Player Model", a tool for understanding the relationship between game goals and the behaviour of players who try to reach these goals. The model is discussed and applied in two capacities:

A) As a model for formal analysis which can used to understand and categorize certain aspects of games related to goals. Here, video games are studied through the lens of (economic) game theory in order to determine, for instance, the types of conflict dynamics the games will elicit given Rational Player assumptions.

B) As an ideal type of actual player behaviour. Here, the model is used to derive concrete predictions about video game player behaviour which are then compared to actual play in an empirical study of multiplayer console gaming.

The dissertation finds that the Rational Player Model is one of four models of player behaviour common in the game studies/design literature and that it is the predominant model within game design. Also, the model is found to often operate at so deep a level as to be unstated. Applying the model analytically, video games are categorized as competitive, semi-cooperative or cooperative and it is shown how the number of players influence a game's conflict dynamics. This leads to an analysis of "strategicness" of different game types; a combined measure of the degree to which other players matter to the choices of the "rational" player and the range of these choices.

Finally, deriving behavioural predictions from the model and comparing these to data from a study on multiplayer console play, players are found to behave "rationally" within the gamespace itself while working to fulfil various social functions in their verbal interaction.

Acknowledgements

A number of people have generously let me pick their brains over the recent years. Some have even gone beyond the call of duty and commented on this text in various stages (or *proto*-stages). Without their input, any error or opacity still hiding in this text would unquestionably still be surrounded by all-too-close kin.

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Those who have wrestled admirably to help improve the actual words (in some form or other) are: Thomas Wedell-Wedellsborg, Susana Tosca, Mark Danger Chen, and my two supervisors Anker Helms Jørgensen and TL Taylor. You can all be my *Dawn of War* team-mates any day (and exchange this page for single malt in an establishment of your choosing).

Finally, I am grateful to those who generously took time to participate in the study reported here.

I dedicate this, and everything else, to Marie Louise and Alma.

Contents

CHAPTER 1: INTRODUCTION

What is the relationship between game design and player behaviour? This, I think, is a reasonable question; and an important one. The pursuit of an answer – or a number of answers – holds the promise of bridging the gap between perspectives that focus on *either* formal properties of games or the social act of playing. It holds the promise of comprehending the relationship between *structure* (the game) and *agency* (player choice and behaviour) and thereby make our field relevant to other fields and vice versa. The question, in other words, is a good one. It is also far too broad, and indeed difficult, for one dissertation. The best approach, I believe, is not to try. Rather, the best approach towards *contributing* to our understanding of the relationship is to focus on a specific subset of the issues involved. I do so by taking seriously the most common folk theory of player behaviour: That players want to achieve the goals of a game. I examine in detail what this theory implies and attempt to determine to what degree it is accurate. My research question is: *Do video game players seek to win?*

Is the notion that player behaviour is a predictable function of the game goals at all controversial? Are we not fully justified in simply assuming that players want, and try, to win? Game designer Greg Costikyan certainly thinks so:

> Some things depend on the medium. In some games, he or she [the player] rolls dice. In some games, he chats with his friends. In some games, he whacks at a keyboard. In some games, he fidgets with the controller. But in every game, he responds in a fashion calculated to help him achieve his objectives. (Costikyan, 2002: 12)

The reader may want to note the phrase *in every game*.

But not everyone agrees that players are so easily described. Folklorist Linda A. Hughes, in her study of a group of *Foursquare* playing school girls (Hughes, 1999), notes how most games "are richly textured, and highly situated instances of social life" (94) and how players "may define 'success' very differently than the game defines 'winning'" (101). From her own observations she concludes:

> Regardless of what the game rules said, these players still played foursquare like a team game, with groups of friends vying for control of the game. In

> fact, much of what happened in the playing of this game would be totally inexplicable in the context of individual competition, even though this game has long been categorized that way. (Hughes, 1999: 120)

The reader may want to note the phrase *totally inexplicable*.

As we shall see in the next chapter, Costikyan and Hughes are representatives of larger positions and so, yes, we must concede that the notion of players as driven (solely or mostly) by the game goals is indeed controversial.

But of course, the mere existence of a debate does not preclude the possibility that one side is simply hopelessly wrong[1]. Perhaps we should consult our intuition on the matter; what does common sense tell us about player behaviour? Imagine a *Counter-Strike* match (an "average one", the details do not matter right now). What are the odds that several players will stay where they are to allow themselves to be gunned down by the opposing team or start touring the gamespace without any weapons? Knowing nothing specific about the players or the context, I would say that the odds exist but are not high. On the other hand, we can probably recall specific situations where the players-try-to-win rule-of-thumb did not apply. As a child, I had the pleasant experience of emerging victorious from my first encounter with the Chinese tile game *Mah-Jong*. The opposition had even consisted of older family members, all veteran players. Disregarding possibilities of beginner's luck or innate aptitude I may regretfully have to admit that these other players did not try to achieve the goals of the game. More abstractly, we can also readily understand the social principles at work. Players are unlikely to let themselves be guided (in the usual way) by the game goals, if they have a personal interest in not doing so. The *Mah-Jong* player may be trying to capture a child's interest, a boxer may be paid to take a fall, a *Counter-Strike* player may be trying not to scare off inexperienced

[1] Or as it has been polemically phrased: "[…] I think it's important to realize that when two opposite points of view are expressed with equal intensity, the truth does not necessarily lie exactly halfway between them. It is possible for one side to be simply wrong." (Richard Dawkins quoted in Parker, 1996).

friends. All in all, while players-try-to-win[2] may be a useful rule-of-thumb it clearly does not predict every possible instance of game playing. Even so, it may still be highly useful. Even acknowledging exceptions, one may still want to stand by a rule of thumb. Thus, while keeping in mind that this is "all else being equal" type of thinking, we might still stand by the original predictions about the *Counter-Strike* match. The Rational Player Model is not the capital "T" truth but an *approximation* and it is this approximation which is at the heart of this dissertation.

More formally, I do three things. **First**, I examine four models of player behaviour existing within the game studies field. This is done to clarify the position of the Rational Player Model (one of the four), to showcase its theoretical sources and to clarify its strengths and weaknesses. **Second**, I analyse the analytical implications (and applications) of the model drawing upon the field of economic game theory. This has two functions: To examine the analytical prowess of the model in terms of *games* and to specify the predictions of the model in terms of *players*. **Third**, and finally, I use the model as a baseline for understanding player behaviour in an experimental study of console players. The study indicates that the in-game behaviour of players conforms to the model (e.g. they play collaboratively in a game where the formal incentives favour collaboration) while outside the gamespace they are not behaving "rationally" in the narrow definition of the model (e.g. they help others understand the controls in a competitive game).

Motivation and contribution

Why study player behaviour and its relationship to game design? To begin, it is a rather unexplored area and most results which reveal (or document) larger patterns are significant for their novelty alone. But novelty, while important, is not the only reason to tackle the issue. The more important reasons is that the

[2] Henceforth the "Rational Player Model". The model is compared to other models of player behaviour in **Chapter 2: Visions of the player** and employed analytically in **Chapter 3: Games and the Rational** Player Model. When used for analysis, the model reduces a game to an incentive structure which presents players with certain inducements to attempt to achieve various ends. Thus, the term "incentive structure" refers to games seen through the perspective of the model.

relationship, *while* under-explored, is central to much game scholarship, whether this work explicitly sets out to study games or players. Underlying much work within the field is an implicit theory of how game design affects player behaviour; and becoming aware of the way in which such core assumptions shape research methodology and direction is important. Not least if the assumptions are wrong.

Regarding the more analytical side of this dissertation, the in-depth application of the Rational Player Model addresses the problem that while it is often employed in some form, there is in fact some confusion surrounding its details and predictions.

In terms of players and their concrete behaviour, the strength of assertions sprinkled generously over the literature stands in considerable contrast to the state of our (non-anecdotal, non-parochial) knowledge. While, undeniably, video game players and their interactions *have* attracted scholarly attention, this attention has mostly been explorative in nature and not directed towards the minutiae of player interaction or towards documenting behavioural patterns in a broader sense.

On this background, the contribution of this work falls in *three* categories. On a broad *theoretical level*, models of player behaviour within game studies are identified. This contributes to our understanding of discussions (and indeed conflicting results) within the field and underlines the potential bias of un-acknowledged assumptions. More concretely, a certain tension exists between those mainly interested in games and those mainly interested in players (discussed in detail in **Chapter 2: Visions of the player**). This tension is sometimes explicit and sometimes implicit but often entails a false dichotomy and, more problematically, sometimes creates two incompatible notions of games and play. This dissertation addresses this tension by pointing out its consequences and offering one attempt to bridge the gap between the two perspectives.

On an analytical level, the potentials of the Rational Player Model are formalized offering an analytical tool for understanding the relationships between goals, conflict types and player behaviour. On this level, the dissertation does not present new *results* in the strong sense although the case studies will pinpoint game aspects that are rarely made the subject of analysis. Rather, this part of the dissertation presents a systematic and elaborated *perspective* through which to understand games. It is a view of video games which will highlight design features related to goals. Most specifically this part of the dissertation presents a detailed theoretical account of the concept of "strategy". This concept is central to understanding video games and game play but has yet escaped close scholarly attention.

At the player level, this dissertation contributes to a remarkably limited body of knowledge by testing the degree to which observed video game player behaviour can be understood as shaped by the game goals and by presenting more general observations on the act of video game play.

Beyond these three categories, I hope that by exploring unacknowledged links between games and other phenomena and between game studies and other fields I may also make some small contribution towards widening the scope of the field. Examining relationships between artefact/text/structure and user behaviour from the perspective of decision making, this work may enable game studies to draw upon knowledge and theories from fields which have a long history of working with topics like rationality, choice, conflict and issues regarding the relationship between structure and agency.

A brief note on previous work

Needless to say, this work builds both directly and indirectly on the flurry of research conducted under the "game studies" heading in recent years as well as on work less directly game-related. Within games, I draw inspiration from mainly two quarters. The first is the handful of authors, typically with an active applied interest, who have examined the video game design/analysis potentials of economic game theory (e.g. Friedl, 2003; Rollings & Morris, 2004; e.g. Salen & Zimmerman, 2004; Zagal, Rick, & Hsi, 2006). The second is the subfield of "player studies" in which the gameplaying activity is foregrounded either by the researcher participating (more or less actively) inside the gamespace itself (e.g. Ducheneaut & Moore, 2004; Ducheneaut, Moore, & Nickell, 2004; Jakobsson & Taylor, 2003; Mortensen, 2003; Muramatsu & Ackerman, 1998; Pargman, 2000; e.g. Steinkuehler, 2004;

Steinkuehler, 2005; T. L. Taylor, 2006) or by researchers collecting data among players, i.e. outside the gamespace (e.g. Holmes & Pellegrini, 2005; Jessen, 1995; Jessen, 2001; Lawry et al., 1994; e.g. Lazzaro, 2004; Manninen, 2001). Finally, I draw upon work on decision making in economic contexts more generally (e.g. Camerer, 2003; Frank, 1988).

Tradition would perhaps suggest that I review these here, but I have chosen instead to review and discuss them in some detail in the appropriate context later in the dissertation. Thus, game theoretical approaches to video games are reviewed in **Chapter 3: Games and the Rational Player Model** and empirical studies of player behaviour in **Chapter 4: Player Behaviour**.

The theory of games

The topic of strategic conflict within clearly defined structures has been studied intensely, not within game *studies*, but within economics (and certain other fields) under the heading of "game *theory*". Game theory forms the theoretical foundations of this dissertation and is discussed in **Chapter 3: Games and the Rational Player Model**.

In brief, it is a series of techniques developed to model social interaction; most commonly situations where two or more agents are making choices with interconnected outcomes. These interactions are modelled as games using the full arsenal of ludic terminology. Participants are referred to as "players", their options called "strategies", their choices called "moves" and each player's result is known as his or her "payoff". This is best illustrated by example: Alice is driving down a poorly lit road and hears the sound of an oncoming driver (whose name, unbeknown to Alice, is Bob). Let's make a blunt model of Alice's options: She can either drive on the right side or the left side of the street. These options are her "strategies". Speeding through the night, she hurriedly ponders which one to choose. Crashing into Bob would be a terrible outcome to which Alice mentally assigns an outcome of zero happiness points. Meanwhile, passing him without incident would be the best outcome to which she assigns five points. The situation can be modelled as follows:

		Alice	
		Left	*Right*
Bob	*Left*	Bob: 5 point Alice: 5 point	Bob: 0 points Alice: 0 points
	Right	Bob: 0 points Alice: 0 points	Bob: 5 points Alice: 5 points

Figure 1 – *Alice and Bob's night-time driving*

In this model, Alice is plotted as the "column" player. This means that she can choose either of the two columns, respectively labelled "Left" and "Right". Bob is plotted as the "row" player and he too must choose either "Left" or "Right". Their aggregate choice ends them up in one of the four cells (representing the combinations *Alice: Left, Bob: Left* / *Alice: Left, Bob: Right* / *Alice: Right, Bob: Left* / *Alice: Right, Bob: Right*). These combinations yield either five points for each of them or zero points for each (their "payoffs"). Note that this model assumes that Bob attaches the same values to crashing and passing unharmed as does Alice. What will Alice do? First of all, it's clear which type of outcome she would prefer: Both drive on their (own) left side, or both drive on their (own) right side. But to the extent of the description above, this preference does not help us determine what she will do. Fortunately, for just this reason, all countries have laws stipulating which side of the road one should choose. It is not that right or left is inherently preferable, merely that drivers must coordinate on one of them. Alice remembers that she is in Australia, and chooses her left side. Bob does the same. All is well. Of course, as the reader may have pinpointed, there are unstated assumptions at work here. Alice's best choice depends not only on Australian traffic law but crucially on her perception of Bob. She must base her choice on her estimate of what *he* will do. What if Bob's payoffs were in direct contrast to her own (if Bob was suicidal or homicidal)? If that was Alice's belief she might want to choose "Right". On the other hand, if she believed that Bob believed that she believed that he was out to crash into her she should choose "Left". And so on. The point, for now, is that game theory models interaction as games in which choices are (typically) interdependent and where each player (typically) has to take into account the perspective of the other player(s).

This way of modelling strategic interaction enables us to pinpoint and analyze the conflict of a video game. To briefly illustrate, let us consider *Spacewar!* (see Figure 2) in this light.

Figure 2 – *Spacewar!*
Two spaceships engaged in torpedo battle around a star

To model the conflict of *Spacewar!*, we need to specify the available strategies. Clearly there are many things a player might do, but remaining on a general level let us simply specify that the two players (we'll stick with Bob and Alice) can choose between being "nice" (i.e. not attacking the other player) or "nasty" (attacking the other player). Let us also specify that winning is worth one point while defeat yields zero points (on an arbitrary scale meant to indicate only that winning is preferable to losing). Finally, we'll assume that Bob and Alice believe themselves to be of roughly equal skill. Thus, if both were trying to finish the other player off (they were both playing "Nasty") they could expect a 50% chance of winning. In this case, they each face an expected (average) payoff of 0.5 X 1 point = 0.5 point; given that they play "Nasty" and the other player does the same they can expect to win 0.5 point[3]. Now, let's map this onto a payoff matrix like the one used for their nightly driving (Figure 3).

[3] This is an example of the particular logic of game theory. I will return to this and other related issues.

		Alice *Nice*	Alice *Nasty*
Bob	*Nice*	Bob: 0,5 point Alice: 0,5 point	Bob: 0 points Alice: 1 points
Bob	*Nasty*	Bob: 1 points Alice: 0 points	Bob: 0,5 points Alice: 0,5 points

Figure 3 – *Spacewar!*

If one player plays "Nice" while the other plays "Nasty" the nice player will lose (get zero points while the other player gets one). If both play "Nice", sooner or later one of them will lose by mere chance (let's say). Thus, both *Nice* / *Nice* and *Nasty* / *Nasty* yield (an expected) 0.5 point for each. Now, we examine the game from Bob's perspective. Should Alice play "Nice", Bob would (expect to) get 0.5 point by playing "Nice" and 1 point by playing "Nasty". Should Alice play "Nasty" Bob would get 0 points from playing "Nice" and 0.5 points from playing "Nasty". In other words, no matter what Alice does, Bob would expect to do best by playing "Nasty". So Bob, wanting to win, tries to take down Alice's ship. And Alice, facing the same payoff structure, attacks as well. And this, of course, has been a complicated way of saying that *Spacewar!* is a competitive game in which players are meant to compete. We knew this from the start, so what is the point of such an exercise? The point is to arrive at a generally applicable language or notation for describing video game conflicts. A language which enables the distinguishing between games with different conflict types (or player relationships) and which enables us to specify clear predictions about player behaviour which can be tested. The analytical potentials and implications of game theory for video games are the topic of **Chapter 3: Games and the Rational Player Model**. Since game theory has seen only sporadic use in game studies to date I look closely at the foundations of the approach and provide an account which is, to some degree, introductory.

Approach

In the following, the approach of the dissertation will be outlined. Logically, the dissertation proceeds by first identifying different, sometimes conflicting, models of the player within game studies. It then goes on to discuss the relevance of applying the Rational Player Model to video games, to actually employ it and to discuss the implications and limitations of the perspective. The predictions of the Rational Player Model are then compared to data from an empirical study on the relationship between game type and player behaviour. These results show that the perspective does have relevance for understanding real-life play but also point to limitations and important qualifications of the behavioural theory inherent in the perspective. Based on these results, the dissertation concludes by discussing the relationship between game form and player behaviour and presents venues for further research which may further illuminate this relationship as opposed to further increasing the gap between the game level and the player level of analysis.

Concretely, the dissertation falls in five chapters:

1) **Introduction**: The present chapter describes the rationale behind the work, and the general approach (the concrete methodology of the empirical study is described later).

2) **Visions of the player**: Discusses the way in which players are understood within game design and game studies showing that four main notions of the player are widespread in the literature. These notions are shown to relate to one of two levels of analysis (game and player).

3) **Games and the Rational Player Model:** Develops and applies the Rational Player Model. Theories and techniques from economic game theory are adapted for use in video game analysis. In particular, the concept of strategy is shown to be a key analytical term. Building on the perspective, games are shown to range from the non-strategic to the highly strategic.

4) **Player behaviour:** This chapter compares actual player behaviour to the predictions of the Rational Player Model, i.e. it uses the model as an "ideal type" in Max Weber's sense. It also offers results of a more general nature on the issue of multiplayer gaming. Results are drawn from an experimental study of multiplayer gaming in which groups of

players played three different games representing dominant incentive structure types. The study shows that the incentive perspective captures certain elements of gaming but that other preferences may at certain times overrule outcome-maximization.

5) Conclusions and new perspectives: Summarizes the findings and suggests venues for future research both concretely and generally.

Focus

This dissertation is an attempt to answer the following question: Do players seek to win? This question is tackled as a manageable way of contributing to the larger: What is the relationship between game rules and player behaviour?

To measure the degree to which players try to win means first and foremost honing in on the rules of the game. The rules in question are primarily, but not solely, those which govern the evaluation of a certain outcome; what game scholars have termed the *ludus rules* (Frasca, 2001: 9), the *outcome valorization rules* (Juul, 2003: 66-67) or the *evaluation rules* (Egenfeldt-Nielsen, Smith, & Tosca, In press). In the perspective presented here, such rules represent the incentives of a game and thus shape the behaviour of a Rational Player. Other rule types, particularly those which constitute the "physics" of a gamespace are nevertheless of high importance as they constitute (or shape) the *means* at the player's disposal in the attempt to fulfil the game *goals*.

Game studies arguably works on four levels of analysis. Focus is on either *games themselves*, *players*, *culture* or *wider ontological questions* (Egenfeldt-Nielsen et al., In press). This dissertation speaks mainly to the first two, which tend to be somewhat strictly separated in most research, mainly because they appeal to different disciplinary backgrounds. In terms of the games themselves, the focus here is almost exclusively on rules. Figure 4 shows common analytical levels of a game.

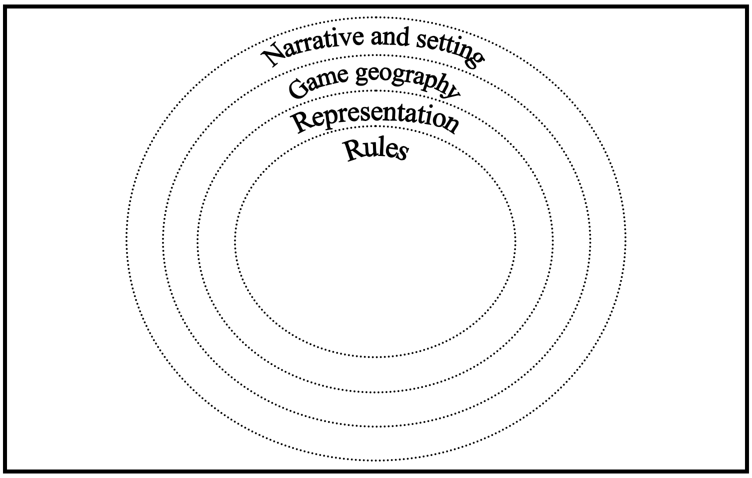

Figure 4 – The analytical levels of a game (following Egenfeldt-Nielsen et al., In press)

Representation refers to the way in which the game state is represented to the player. In the case of video games, this level includes graphics, sound and other sensory signals such as force feedback.

Game geography refers to the geography or topology of a gamespace, the way it is laid out. In *Grand Theft Auto: Vice City* the player navigates a city complete with houses, cars and roads (see Figure 5) and the layout of this city, along with the game rules, co-determines the options available to the player.

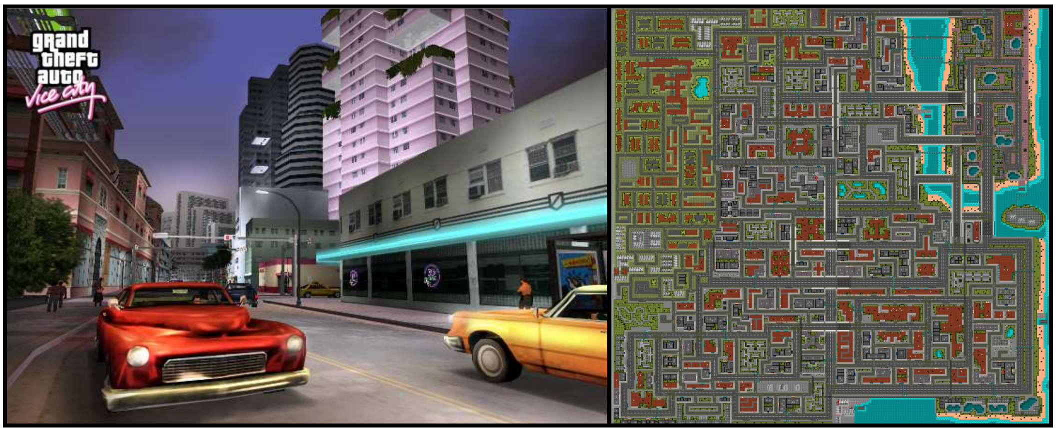

Figure 5 – *Grand Theft Auto: Vice City*
The player navigates a city which mostly confines her to going by the city streets (left). The gamespace may be modelled onto a map (right). The latter is useful since the view of the gamespace is limited at any time (a map of the *Pac-Man* gamespace would not be useful as the entire gamespace is displayed to the player).

Narrative and setting refers to entirely optional game elements. A game may include storytelling elements *and* a significant setting (e.g. *Half-Life*, *Gabriel Knight III*, *Champions of Norrath*). A game may also have a setting but no narrative (e.g. *Age of Empires II: The Age of Kings, Microsoft Flight Simulator, Mashed*). Finally, a game may have neither narrative nor setting (e.g. *Tetris*, *Mine Sweeper*, *Solitaire*). Though narrative and setting are closely tied to representation they are not the same. While representation refers to the audiovisuals in a concrete sense, narrative and setting is invoked in the mind of the player *through* the use of representation. For instance, a game designer may choose to put the player in control of a spaceship accompanied by an epically symphonic soundtrack thus drawing upon the player's interpretive repertoire to establish a space opera-like setting (to the extend that the player shares these connotations).

This dissertation focuses on the rules level though with an eye to the game geography level. The latter is important to player choice (in this context) to the extent which game geography shapes the player's possibility space, rather than merely serving as decoration (see Figure 6 and Figure 7).

Figure 6 – *Space Invaders*
The four squarish shields blocking fire until destroyed provide strategic possibilities and are thus relevant to the player's decisions.

Figure 7 – *Moon Patrol*
The player guides a purple buggy across a hostile landscape. Alien spacecrafts attack from above. The background buildings and mountains in *Moon Patrol* will not concern us here as there is no interplay between these graphical elements and the player's options

In other words, issues of representation, narrative and setting will receive little or no attention in the following. This choice follows from the perspective which I seek to develop here, rather than from any idea that these levels are unworthy of critical attention (which I have given them before, e.g. Smith, 2000a; which I have given them before, e.g. Smith, 2000b).

Furthermore, the dissertation focuses on a particular aspect of video game play (and indeed players): the goal-oriented playing style. Gameplay may of course be approached from a variety of angles, as one might be interested in the social function of play, the mental/personal function of play, play as a political statement, the ways in which players work to *subvert* rules, the player's reaction to various audiovisual styles etc.

As to the games themselves this work revolves around the evolutionarily recent branch of the ludic tree known as video games although the arguments here (mostly) apply equally well to other game types. More importantly, as I will present numerous observations of core rule aspects, I will draw liberally on analogue games for examples. The reason for this is a pragmatic one (see also Zagal et al., 2006: 1). Compared to *Counter-Strike*, *Monopoly* is transparent; the rules are simple and they are well-known. Classical board games are often pure examples of mechanics, whereas modern video games offer distinct game modes, allow great variations in settings, do not specify all mechanics etc. When video game examples are used, I will implicitly be referring to the most common game mode unless otherwise specified. For instance, *Age of Empires II* might be used as an example of a competitive game though it in fact has a fully cooperative (rarely used) game mode.

A note on terminology

This dissertation develops and clarifies a series of concepts, but I will briefly present initial definitions in order to enable initial discussion of core issues. *Objective goals* will refer to goals set up by the game designer, i.e. game states which the manual might state that the player is meant to achieve. This in contrast to *subjective goals*; goals sought by players (e.g. beautifully executed vehicle manoeuvres) which may or may not overlap with the objective goals. Objective goals determine the (objective) *player relationship*. As an example the player relationship is *cooperative* if the objective goal of two players is the same game state and *competitive* if objective goals are in opposition. Closely related to these terms, the *game contract* will refer to the social norm (whether real or hypothetical) that players are meant to (and partly entitled to) achieve the goals of a given game. Finally, *game theory* will always refer to the economic/mathematical variant.

CHAPTER 2: VISIONS OF THE PLAYER

This chapter identifies four prevalent "models" of the player evident within game studies and design. The core assumptions and theoretical affinities of these models are discussed and it is shown how one of these models, the Rational Player Model, is predominant (so much, in fact, as to be often implicit). It is this model, its implications and explanatory value which will be the topic of the subsequent chapters.

What is a player? Initially, this question may seem less than crucially important. After all, we all have experience playing games (digital or traditional) and it makes simple statistical sense to think of "a player" as someone who, at any given time, is playing a game. But such a view is deceptively simple. Conceptualisations of "the player", I will show in the following, differ widely and carry significant implications for research design and even (in some cases) the conclusions reached in game studies. Thus, what follows is an analysis of how players are conceptualised in game design and game studies and an explanation for the considerable variation and its implications.

The player in game studies

Ermi and Mäyrä proclaim that "…the essence of a game is rooted in its interactive nature, and there is no game without a player." (Ermi & Mäyrä, 2005: 16). This is a strong, but non-obvious, claim with strong methodological implications. The notion that there can be no game without a player is an invitation to lexicological controversy. Next to me is a *Chess* set, unused at the moment. The claim that this is not a game is one much needy of support. Also, appealing to "the essence" of a subject matter is rhetorically hazardous as it is apt to provoke simple contradiction.

It may be more prudent to acknowledge that our subject matter offers two types of "texts" for analysis[4]. One is the static game rules and/or game equipment. These can be submitted to "formal" analysis and thus categorized and dissected in any way desired (as I will return to in the context of the Rational Player Model in the next chapter). The other text type is actual instances of play. These instances are presumably somehow connected to the game rules but unlikely to be reducible to those rules in any simple sense.

There is no *necessary* conflict between these levels of analysis. Neither focus needs to build on the assumption that the other is somehow wrong or suspect. However, the latter approach is sometimes presented as a corollary to the former (as exemplified by the quote above and by the Hughes quote on page 6)[5]. Also, as we shall see below, the former does sometimes make assumptions about player perception or behaviour which are unsupported by the methodology (and not fully acknowledged).

While one may criticise concrete manifestations of each approach, a general rejection of either is misguided. The effort may be better spent facilitating compatibility between analyses on the two levels; e.g. in the form of studying how various *formal traits of the games* (the "structure") affect *player behaviour* (the "agency"). Also, any potential conflict will be alleviated by ensuring that work on both levels work with compatible models of the player. For instance, formal analyses of games which (explicitly or not) understand the player as primarily goal-directed may clash with play analysis which (explicitly or not) sees the player as primarily seeking entirely different things. Besides examining the general theoretical landscape of game studies, it is this tension that I will seek to address below.

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[4] Two "common" types, I should say. There are many other possibilities for data collection in game studies.

[5] Perhaps because it arrived later to the field than the purely aesthetic perspective.

Four models of the player

Much existing work in game studies operates with an "implied" player. These notions, which I will here refer to as "player models", tend to fall into four categories which I will describe in the following. The aim of this description is to understand the way models of the player influence the field in terms of methodology and conclusions and to clarify the implications of positioning the work presented within this dissertation inside the framework of the Rational Player Model. The four models identified specifically concern the relationship between *games and behaviour* (since that is my interest here) and do not encompass every possible or actual perspective on players (such as 'the player as citizen', 'the player as co-producer" etc.)

Theories or models of players have not attracted much attention within game studies to date. As an exception, Anne Mette Thourhauge has identified two main approaches to "the player" (Thorhauge, 2003). Those understanding games as rule systems tend to think of the player as "the one who acts in accordance with the rules" (2). On the other hand, those who understand a game as a separate frame of reference tend to understand the player as "the one who recognises the separate frame of reference and who acts in accordance with this knowledge." (2).

Though the former approach is comparable to what I will describe as the Rational Player Model below, these two categories are of a more general nature than those I explore here. And they do not truly encompass the spectrum of assumptions observable within the field.

I find it more accurate to acknowledge that game studies may be thought of as representing *four* separate models of the relationship between game design and player behaviour.

1. **The Susceptible Player Model**: Here the player is seen as having her post-game behaviour influenced predictably by certain features of a game.

2. **The Selective Player Model:** Here the player is seen as making a reflected choice between media in general, and specific types or works (i.e. games) in particular based on personal preferences and needs.
3. **The Active Player Model:** Here the player is seen as actively engaged with the game or gamespace in ways often not prescribed or predicted by the game designers.
4. **The Rational Player Model:** Here the player is seen as an entity optimizing her outcome within the game as defined by the objective goals.

The four models or theories are not all mutually exclusive. For instance, one may well hold the view that a player selects games because of personal preferences (the Selective Player Model) but that the game chosen affects the player according to its content or other characteristics (The Susceptible Player Model). The most obvious disagreement exists between 1 and 3 and between 3 and 4, although certain particularly phrased manifestations of 3 (generally those not interested in the *frequency* of certain behaviour types) need not clash with 4. The order in which they appear here is a reflection of the behaviour type they concern. The two former are concerned with *post-* and *pre-* game behaviour respectively while the last two are concerned with behaviour *during* play. This should not obscure another relationship: While the Susceptible Player Model and the Rational Player Model may be said to take the game as their starting point (they consider the game to be the dominant factor) the two other models delegate this power to the player(s) who are seen as making choices based much more strongly on their own preferences.

Below, I describe noteworthy examples of approaches within the models with no ambition of presenting full reviews of work inspired by these frameworks.

The Susceptible Player Model

An intuitively appealing, and in the context of media studies almost classical, idea of the game-player relationship is that of the relatively direct influence of the game on the player.

This model implies that the player's post-gaming behaviour is predictably influenced by features of a game played. Two main variations of the model exist as the influential game "features" are believed to be either (primarily) the perceived content or the game's reward model. In the former version, *Halo* may be considered problematic (as it is expected to produce aggressive behaviour due to its violence) while in the latter version concerns might be milder (since attacking violent alien aggressors needs not be morally disturbing). In the latter version, *Halo* might not have been deemed alarming at all if the game *included* violence but *rewarded* non-violent approaches

The model, and to a degree its variations, is one well known from older fields. Large parts of early media studies held it to be evident that the media products, or *texts*, contained the power to persuade the recipient or indeed significantly alter his or her behaviour (K. B. Jensen, 2002). Largely this influence was seen as a function of the media *content*, for instance in terms of a manifest and explicit message (i.e. "Join the US army!"), more indirect manipulation (i.e. "US army life is attractive"), desensitization or habituation (i.e. screen violence leading to violent behaviour), or subtle and sometimes wilful misrepresentation of the state of the world (i.e. women often portrayed as housewives, society portrayed as plagued by crime). Another, less generally influential, school of thought held media influence to be a question not of content but of far more opaque features of media form and the general media ecology. Proponents of this latter perspective are commonly subsumed under the heading "medium theory". Vocal spokesman of medium theory, Marshall McLuhan even went as far as to describe media content as "like the juicy piece of meat carried by the burglar to distract the watchdog of the mind" (McLuhan, 1964/1994: 18) famously stressing that "The medium is the message" (1964/1994: 7)[6]. The latter should be taken to mean that the medium form, that is its characteristics, mode of production, and place in the larger social system, is what matters in terms of the medium's effects on the individual and on society.

The overwhelming majority of studies within game studies investigate the relationship between game *content* and player behaviour; that is they hypothesise a relationship between features of "representation" or "narrative and setting" (see Figure 4 on page 17) and the player's observable post-game behaviour or skills. For instance, Anderson and Dill (2000) studied the effect on aggressive behaviour of playing *Myst* (an "interactive adventure game that was specifically designed to be nonviolent in nature") and *Wolfenstein 3D* (a game with "blatant violent content, realism, and human characters") finding that "violent video game play was positively correlated to increases in aggressive behaviour." (Anderson & Dill, 2000: 787). Studies on video games and aggression have generally moved beyond naïve behaviourism, acknowledging the need for a solid theoretical understanding of the proposed relationship. The most influential consequence of this development is the General Aggression Model developed by Craig Anderson and Brad J. Bushman (Anderson & Bushman, 2002; Bushman & Anderson, 2002) which attempts to integrate a number of theoretical perspectives. Although more sophisticated than earlier models, the General Aggression Model does not address the issue of reception/interpretation often seen by critics of the approach as essential to an understanding of media effects on individuals (e.g. Barker & Petley, 1997).

Recent work does, however, attempt to move beyond the limitations of the laboratory-based experimental approach. Studying the behavioural influence of *Asheron's Call 2*, Williams and Skoric (Williams & Skoric, 2005) chose a longitudinal method, as changes in player attitudes after one month of play time were mapped

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[6] Whereas McLuhan relied greatly on fanciful analogy and is often thought to be more inspirational than precise, other medium theorists published more rigorous analyses (Eisenstein, 1979; Meyrowitz, 1985; Ong, 1982).

(by surveying participants on attitudes towards aggression and on recent experiences with aggression). The authors found that

> […] game play—controlling for gender, age, and time one aggression scores—was not a significant predictor of aggressive cognitions. Compared to the control group, participants after the experiment were not statistically different in their normative beliefs on aggression than they were before playing the game. Similarly, game play was also not a predictor of aggressive behaviors. (226)

Other researchers have pointed out that discussing games in terms of representation may be somewhat inappropriate as players may be more inclined to be affected by a game's reward mechanisms (i.e. its ludus rules). Focusing on surface aspects, it is suggested, may be misleading in specific cases where certain acts of violence are in fact discouraged (Carnagey & Anderson, 2006) or may represent a more fundamental misunderstanding about how games work (Senn & Clatworthy, 2004). Whereas the traditional examination of relationships between content and behaviour may be seen as a direct continuation of effects research in the context of older media, the increasing focus on the relationship between reward mechanisms and behaviour may be seen as move towards classical behaviourist notions of learning.

Whichever aspect of games is thought to cause the effect, work in this paradigm sees the player as a system which responds predictably (although the relationship is of course thought to be statistical rather than uniform across all individuals) to certain objective input which can be discerned in their entirety by the researcher.

While the model may underlie mere speculation it is also often tested experimentally. Ideally, efforts put into testing its merits would clarify the exact strengths of the model but studies in this tradition have tended to date to be methodologically controversial (Egenfeldt-Nielsen & Smith, 2004).

The Selective Player Model

In this model, the player actively selects games or genres of games to fulfil personal needs. It can be expressed linearly as: The player perceives a need -> The player chooses a game -> The game fulfils the need. Thus, the behaviour in question is one of pre-play selection; the model makes no suggestions as to actual playing behaviour.

The model is directly derived from a branch of media studies. Here, various schools of thought had vocally disagreed over the relative influence of content and medium form. However, both general views implied that the audience were somehow being influenced by media, that the audience was a passive part of the communication process. But in the 1970s, Blumler and Katz (Blumler & Katz, 1974) revived an earlier functionalist model of media as part of what is generally known as the uses-and-gratification (U&G) paradigm (K. B. Jensen & Rosengren, 1990: 210-211; McQuail, 1994: 318-321).

U&G represents an explicit opposition to the passive audience assumption of earlier models. In U&G, media use is seen as purposeful. Individual audience members are seen as making choices about which media (or which genre etc.) best fits their *needs* and *preferences*. Media users are often queried about the motivations for their media choice, a methodology which follows from the very assumption that media users are highly reflexive, conscious and rational in their media use. Reasonable objections to this research program are legion (for instance since media use and choice is a social indicator reported media use may not reflect actual use) but here it will suffice to note that its transfer of power from the text to the media user shapes both methodology and the topics of investigation.

In video game studies, this paradigm had influential early proponents. Selnow, in 1984 surveyed a group of children (n=224) on their media habits and asked video game players to grade a series of 27 statements about possible gratifications of their video game play, concluding that

> The adolescents observed in this study play games in videogame arcades for many of the same reasons that they watch television and for other reasons as well. They are temporarily transported from life's problems by their playing, they experience a sense of personal involvement in the action when they work the controls, and they perceive the videogames as not only a source of companionship, but possibly as a substitute for it. (Selnow, 1984: 155-156)

Two years later, Wigand and colleagues expressed a similar interest in an attempt to "explore why people play video games and why they go to video arcades by looking at what type of *gratifications* are obtained." (Wigand, Borstelmann, & Bostler, 1986: 277). Four-hundred-and-forty-seven arcade guests were asked to complete a questionnaire, stating their level of agreement with a series of statements. Data analysis showed that the players found the games to be exciting, satisfying and tension-reducing and also that video arcades served important social functions. The latter result leads the authors to critically question then-current regulation of video arcades.

Sharing this interest, Myers (Myers, 1990) examined motivations behind video game play by asking students to evaluate to which degree a series of statements described their attitude towards their favourite game. Of the study's four motivation criteria (fantasy, curiosity, fantasy, interactivity) "challenge was most crucial to a preferred game and fantasy the least." (379). Myers' study falls squarely within the paradigm as players are considered quite capable of analyzing and verbalizing their personal reasons for enjoying certain games. The methodology is somewhat non-traditional, however, as multiple tests of internal variable relationships are made.

Returning to the topics of these earlier efforts, John L. Sherry (Sherry, Lucas, Greenberg, & Lachlan, 2006) and colleagues have noted that game effects research is highly limited in scope and has not sufficiently addressed the "the reasons why people use video games and the gratifications that they receive from them." (Sherry et al., 2006). Based on a survey of 227 children they found that self-expressed top reasons for playing video games were ranked as follows: Challenge, competition, diversion, arousal, fantasy, and social interaction. They also found that a number of these gratifications were related to time spent playing (e.g. mentioning "diversion" as a strong motivator correlates with high playing time).

Work within this perspective is optimistic as to the autonomy and self-awareness of the player. Game use is seen as inherently need-fulfilling and what's more, players are considered as having introspective powers strong enough to verbalize their motivations for playing games (or certain genres of games). Thus, the player envisioned by this paradigm is an active one who is in little danger of being influenced or coerced by media, even if behavioural or other effects of content/form is not directly ruled out by this view of the player.

Compared to the Susceptible Player, U&G may be seen as indicating that media use cannot be understood externally to the perspective of the user. Simply measuring response does not explain patterns of media use nor the complex and multifaceted potential gratifications available to the media user.

It should be emphasised that U&G approaches to video game play, while clearly representing a particular theory of the player, do not concern themselves with actual play or player behaviour. U&G can thus be said to be a perspective on *game choice* rather than *gaming* and is therefore not incompatible with any of the other three perspectives discussed here (although its optimistic view of player agency is often framed as a corrective to Susceptible Player models). Also, it bears noting that the Selective Player Model is not self-correcting in the sense that work building on it cannot readily challenge the core assumption that game choice is a very selective process which satisfies needs and preferences.

The Active Player Model

This perspective has strong affinities with the turn within media studies in the 1980s towards poststructuralist, semiotic notions often inspired by reader-response criticism originating in literary theory (Tompkins, 1980). Many of these currents came together in the particular strain of critical theory embodied in the British cultural studies tradition, emerging from the Centre for Contemporary Cultural Studies at the University of Birmingham (McQuail, 1994: 100-101). From semiotics came the idea that signs (or texts) required an act of interpretation, that the activity of the reader was a non-trivial one and one not determined by the "preferred reading" of the author. From neo-Marxism (and more traditional critical theory) came the idea that mass media serve certain class interests, affirming a dominant ideology within a given society. And from empirical studies of actual "readings" of news programs, soap operas etc. came the observation that people in fact *did* often produce readings (or "uses" of media texts) that were unexpected, aberrant, oppositional or directly subversive when compared with the presumed indented reading (e.g. K. B. Jensen, 1986; Lewis, 1991). Since the intended readings of media texts were often seen as reactionary or biased towards a dominant perspective, these active/non-intended readings were sometimes seen (whether explicitly or not) as carrying emancipatory potential.

From this development came the idea of the reader's engagement with a text as a struggle over interpretation. The interpretive activity was often cast in positive terms; as a refusal to submit to a dominant ideology.

Within game studies, the activity of the player is rarely seen as a primarily interpretive one[7]. But an analogy to the oppositional reading is evident in the player's attitude towards the game rules. A game's rules may be said to represent its intended playing, in effect asking the player to submit to a highly limiting structure constructed by the game designer and to accept goals set up by others. Additionally, of course, game rules may be seen as representing a certain ideology, as when enemies must often be dispatched of in a violent fashion, as players often take the role of US soldiers, as female characters often play passive roles, as strategy games often reward colonial conquest while positing Western technological development as "natural" etc.

Work within this perspective often displays a *preference* for a certain type of behaviour, rather than explicitly claiming that this behaviour is the *norm* in a statistical sense. It also, in the spirit of poststructuralism, emphasises the complex nature of gaming, opposing simple context-independent descriptions.

For instance, Torill Mortensen, in her PhD dissertation on MUD life, asks "How do players influence games?" (Mortensen, 2003: 69), a formulation exemplary of an Active Player approach. Later, Mortensen notes that players may sometimes compete "But most wonderfully, MUD players can cooperate and create. They tend to form complicated social structures." (266). Here, the words "wonderfully" and "complicated" stand out as indicators of the perspective.

[7] Although it *is* often a highly inductive one, as players interpret processes and correlations in order to discern the specifics of the game affordances and rules.

Similarly underlining the complexity of the phenomenon in question, Squire and Steinkuehler, in a study of *Star Wars Galaxies*, note how MMOGs "constitute complex and nuanced sets of multi-modal social and communicative practices, tied to particular communities and consequential for membership and identity." (Squire & Steinkuehler, In press: 4) and later that "we find that MMOG participants are engaging in complex practices where they invent and reinvent themselves in powerful ways" (16). Again, *complexity* is foregrounded (with the associated "nuanced" and "multi-modal") as is the *activity* of the player who invents and reinvents.

Wright, Boria and Breidenbach, in their study of *Counter-Strike* players note that:

> When you play a multiplayer FPS video game, like *Counter-Strike*, you enter a complex social world, a subculture, bringing together all of the problems and possibilities of power relationships dominant in the non-virtual world. (Wright, Boria, & Breidenbach, 2002 unpaginated)

And while, like Mortensen, they acknowledge that conflict and competition were prevalent topics in player communication they "wanted to focus on **creative** game talk since it reveals the **complex** manner in which game technology **is used** to mediate popular culture and social interaction." (Wright et al., 2002 unpaginated, my ephasis).

The observation that players, or their behaviour patterns, are not shaped deterministically by aspects of the game is found in the writings of Carsten Jessen, who has ethnographically investigated Danish children's use of video games (e.g. Jessen, 1995; Jessen, 1997; e.g. Jessen, 2001). According to Lis Faurholt and Carsten Jessen:

> While the content of the game [*Doom II*] may be characterized as "violent", the children's way of being together is not characterized by violence or conflict, quite the contrary. They cooperate exemplarily and help each other to a large degree. It is a paradox which strongly questions some of the basic assumptions about the effects of media on children and youth. The idea that there is a direct connection between what the children see and what they do and learn from it does not correspond to what happens in the computer room. (Faurholt & Jessen, 1996 my translation)

The notion that player behaviour which goes against the intended behaviour indicated by the game rules is often unfairly stigmatised and in fact represents something positive is evident in the writing of Mia Consalvo when she concludes that "Cheating, or however these activities might be differently defined, constitutes players asserting agency, taking control of their game experience. It is players going beyond the 'expected' activity' in the game." (Consalvo, 2005: 7). The notion of taking agency is also evident in many approaches to modding. Cindy Poremba writes that

> Players hack and alter game code and graphics, play in new and undetermined contexts, and occasionally cross over the divide to produce their own games. In other words, they not only use the digital game as a mediated experience, but often as a medium in and of itself. (Poremba, 2003: 2).

Modding and similar practices, arguably a case of players appropriating the means of production rather than submitting to rules, is often seen as a challenge to dominant structures. Sue Morris writes that

> Study of the practices surrounding multiplayer FPS games can provide insight into new and emerging models of media production, consumption and distribution, play, community formation and **challenges to existing structures of social and economic power**. (Morris, 2003: 2 my emphasis)

and that

> As a co-creative media form, multiplayer FPS gaming has introduced new forms of participation, which have led to the formation of community structures and practices that are changing the way in which these games are developed and played. (Morris, 2003: 9).

It should be noted that researchers within this paradigm need not consider the player's activity in terms of resistance; that one can envision an active player who is not a subversive one. It should also be noted that there is nothing problematic in choosing to focus on particular aspects of video game play, particularly if one acknowledges the potential relevance of other perspectives (as do Wright, Boria and Breidenbach for instance). But it is also worth noting, that the emphasis on player creativity and the highlighting of the unexpected, the complex and the resistant is highly influential within game studies setting the discipline rather aside from the game design literature. I will discuss this situation further below.

The Rational Player Model

We come now to the model which will be the subject of the remainder of this dissertation.

Whereas authors within the previous paradigm envisioned the player as actively challenging the structure of the game by breaking the rules or using the game in ways not thought of as "intended", others think of the player as a goal-directed entity out to employ skills and strategies in the attempt to succeed in a game.

The player, here, is seen as a logical and rational individual whose main (or only) concern is to optimize his or her chances of achieving the goals. As with the other three models, this particular theory of the player is often non-formalized, being more often evident as assumptions clearly needed to support conclusions drawn.

Chris Crawford's early game design text *The Art of Computer Game Design* is a telling example of the model in use. Speaking of board game players, Crawford notes that

> Players maneuver their pieces across the playing surface in an effort to capture other players' pieces, reach an objective, gain control of territory, or acquire some valued commodity. The player's primary concern in these games is the analysis of geometrical relationships between the pieces. (Crawford, 1982: 5-6)

Should the player equally be engaged in complex social networks with co-players, revel in the tactile qualities of the game equipment or enjoy the random justice of the dice throw, Crawford leaves it unmentioned. Instead strategic analysis is the "primary concern" and the logic of "geometrical relationships" is at the fore. Similarly, the card player is mainly occupied with "the analysis of combinations" (12). Crawford does not ignore representational aspects of games, nor slight dramatic aspects, but he does find them subordinate to the rule system of the game (17) and claims that in all games "The player is actively pursuing some goal" (19).

Crawford's view of the player as an optimizing pattern-seeker is shared by game designer Raph Koster (Koster, 2005) who practically dismisses the 'narrative and setting' layer of Figure 4 (page 17) as only tangentially relevant. Koster's claim is that "games train us to see underlying mathematical patterns" and that a game's audiovisuals are "largely irrelevant to what the game is about at its core." (84). An extension of this view is that "The stories in most video games serve the same purpose as calling the über-checker a 'king.' It adds interesting shading to the game but the game at its core is unchanged." (Koster, 2005: 85). Koster's strong views are illustrative of a tendency for Rational Player thinking to be attached to a dismissive attitude towards representation, even if there is no necessary association.

Crawford's views are also echoed by game designer and theorist Greg Costikyan who is equally explicit (as mentioned in the introduction). Considering the activity of the video game player, Costikyan, in an essay entitled, *I Have No Words & I Must Design: Toward a Critical Vocabulary for Games* is adamant that:

> Some things depend on the medium. In some games, he or she rolls dice. In some games, he chats with his friends. In some games, he whacks at a keyboard. In some games, he fidgets with the controller. **But in every game, he responds in a fashion calculated to help him achieve his objectives**. (Costikyan, 2002: 12 my emphasis)

As is evident, Costikyan leaves little room for other perspectives than that of games as incentive structures and players as goal-oriented. We should note the mention of "his goals", as this seems to indicate that the player needs not be pursuing the goals set up by the game designer (that subjective goals are more important than objective goals). But Costikyan further explains that letting "the objective guide our behaviour in the game" is "the basic transaction we make with games" (12) and argues that "There's little point, after all, in playing a game without making that basic commitment" (12). This can only mean that the player must follow the *objective* goals. This conception of play leads Costikyan to suggest that

> It helps […] to think of a game's structure as akin to an economy, or an ecosystem; a complex, interacting system that does not dictate outcomes but guides behavior through the need to achieve a single goal: energy, in the case of ecosystems; money, in the case of economics; victory, in the case of a game. (21)

Now, Costikyan does not himself discuss the analytical or practical implications of this view (nor indeed likely objections), merely arguing by logic and example that it is one conducive to success in game design. Thus, his paper is a programmatic statement rather than a careful examination of different positions. It belongs to a group of work out to convince that the Rational Player Model is not simply *a* model, but in fact *the* perspective on gameplay (or at least the far superior one) but which does not go into details about its implications. Others are equally convinced of the privileged position of the perspective but supplement their enthusiasm with a discussion of analytical approaches. For instance, Fullerton, Swain, and Hoffman echo Costikyan when emphasising that "…the player wants one thing more than anything else, and that is to win." (Fullerton, Swain, & Hoffman, 2004: 271). The authors are convinced that game design is really the construction of situations where the players must make interesting choices, choices which directly influence the player's chances of success or failure in relation to the game goals:

> For a game to engage a player's mind, each choice must alter the course of the game. This means the decision has to have both an upside and a downside; the upside being that it advances the player one step closer to victory; and the downside being that it hurts the player's chances of winning. (271)

This quotation, taken alone, is an example of an argument which only works by building on the *assumption* that players are rational optimizers. Such implicit assumptions about players are far more common than the direct formulations in the examples above. The following examples show authors who hold the Rational Player assumptions to be so self-evident that they feel no need to mention them explicitly.

Richard Rouse in his *Game Theory: Design and Practice* (Rouse, 2005) presents a list of eight things which players want ("a challenge", "to socialize", "a dynamic solitary experience", "bragging rights", "an emotional experience", "to explore", and/or "to interact"). None of these things is "to win" or "to succeed" in Fullerton, Swain, and Hoffman's sense. But looking closer at his core definitions reveals that Rouse thinks of players as attempting to achieve the game's goals. Gameplay, to Rouse, is "the degree and nature of the interactivity that the game includes, i.e. how players are able to interact with the game-world and how that game-world reacts to the choices players make" (Rouse, 2005 page xx). According to Rouse it follows that

> In *Doom*, the gameplay is running around a 3D world at high speed and shooting its extremely hostile inhabitants, gathering some keys along the way. In *San Francisco Rush*, the gameplay is steering a car down implausible tracks while jockeying for position with other racers. (Rouse, 2005 page xx)

But of course this only follows under the assumption that players work towards the game goals. Without any behavioural assumption, the *Doom* player might be equally expected to turn around in circles or continuously fire his weapon into the nearest wall in the rhythmic patterns of his favourite song.

Meanwhile, Rolling and Morris, in their *Game Architecture and Design*, consider it useful to assume that any strategy available to a player must have both advantages and disadvantages: "If there's only a downside, no one will ever use that strategy so why bother including it in the game?" (Rollings & Morris, 2004: 61). While admitting that the player may have priorities not exclusively linked to succeeding in the game, Rollings and Morris maintain that features which do not further the player's success will soon be abandoned by players. Similar advice is found in Tynan Sylvester's discussion of the relationship between style and substance in games (Sylvester, 2005): "No matter how fascinating the style is (with a few exceptions), if an interactive element or system does not improve the game from a purely abstract lines-and-cylinders gameplay point of view, it needs to be re-evaluated" (unpaginated).

In a related argument, game scholar Jesper Juul is explicit that "A bad game is one where the player is unable to refine his or her repertoire or where a dominant strategy means that there is no reason to improve the repertoire." (see also Juul, 2002; Juul, 2003: 54). In other words, if a player has exhausted his or her strategic opportunities the game is of no further interest. This clearly implies that players want to succeed in the game, since a game with no further room for strategic development need not be bad if only players preferred tapping buttons to match the game soundtrack instead of optimizing their outcome.

The authors mentioned here all adhere to the notion that players can be expected to optimize their outcome within a game. None of them explicitly state that players cannot also have other concerns, but all imply that winning is chief among these. Two things are important to note. First of all, the idea that players optimize need of course not imply a more general theory of human behaviour. Rational goal-oriented behaviour may be seen as a result of a "contract" which players sign either with themselves, the game or with co-players that a certain style of interaction is to be expected in relation to the particular activity. Thus, as long as one admits that people *can* apply rational logic one may hold any theory of the dynamics of social (or mental) life and still believe that the idea of the player as rational goal-seeker is a sensible one. Second, game design literature is often normative. Thus, a friendly interpretation of the statements quoted above might emphasize that these writers think it wise to design games *as if* the player were a rational agent. That is, although players may care about representational elements and specific social conditions, what the game designer should be worrying about getting right are those game aspects which relate to the game as incentive structure. In this sense, viewing the player as a rational agent may be seen as a minimal assumption which, while not informative about all aspects of game design, must be respected to avoid games which will surely be uninteresting.

Regardless of the exact status of this player model, it is difficult not to be struck by the evident focus on the rule level of games. It is also clear that players are seen as entities which make informed and deliberate *choices*. This is perhaps most succinctly phrased in game designer Sid Meyer's oft-quoted *bon mot* "A game is a series of interesting choices" (quoted in Rollings & Morris, 2004: 61). The implications of this particular focus will be discussed in **Chapter 3: Games and the Rational Player Model**.

Discussion

Given the relativism implied in discussing approaches to games in terms of underlying theories of the player, one may reasonably wonder who is right. Do players submit to game rules, do they challenge these rules, do they use games to fulfil needs or do they perhaps become directly affected by the content or reward system of games? The answer, as indicated earlier, is that in all but their most extreme formulations, one perspective does not rule out any other. We can imagine a hypothetical *Counter-Strike* player who enjoys the game because it takes his mind of his busy work life, whose aggression level rises because of the violent content, who sometimes conforms to the spirit of the game and who sometimes tries to challenge the rules by cheating. Thus, the four theories may be seen as perspectives focusing on each their portion of the gaming activity, expressing perhaps an idea that one aspect is more important than others but not explicitly claiming that the other three are *wrong*.

This said, we can see (as mentioned above) that the first two perspectives operate on a slightly different plane than the latter two. The Susceptible Player Model and The Selective Player Model do not speak to the way in which players play, but rather to the causes and effects (respectively) of the playing activity. Any real (if sometimes merely latent) conflict lies between the Active Player Model and the Rational Player Model. To a certain degree at least, both perspectives seek to describe gaming and whereas one asserts that the player largely shapes the game to her liking, the other asserts that the game shapes the player.

Who holds what view? As hinted above, the Active Player Model is mostly found within game *studies* while the Rational Player model is most common in game *design* literature. As may be assumed, however, things are not that simple. Within game studies a certain divide is observable between "formalism" and "situationism". Whereas the former is an attempt to study and categorize formal aspects of games, the latter seeks to study concrete gaming practises sometimes arguing that gaming is context-dependent and cannot be studied in the abstract. The disagreement is sometimes voiced in the context of concrete studies, as when Ermi and Mäyrä (as quoted in shorter form above) argue that:

> There has been a relative boom of games research that has focused on the definition and ontology of games, but its complementary part, that of research into the gameplay experience has not been adopted by academics in a similar manner. This is partly due to the disciplinary tilt among the current generation of ludologists: a background in either art, literary or media studies, or in the applied field of game design, naturally leads to research in which the game, rather than the player, is the focus of attention. Yet, the essence of a game is rooted in its interactive nature, and there is no game without a player. The act of playing a game is where the rules embedded into the game's structure start operating, and its program

> code starts having an effect on cultural and social, as well as artistic and commercial realities. If we want to understand what a game is, we need to understand what happens in the act of playing, and we need to understand the player and the experience of gameplay. (Ermi & Mäyrä, 2005: 1-2)

But more frequently the disagreement is aired in less formal contexts. In a document accompanying her keynote speech at the 2005 conference of the Digital Games Research Association Janet Murray criticises the formalist position:

> According to [rule-oriented formalism], games in general and computer games in particular display a unique formalism which defines them as a discreet experience […] Proponents of this view sometimes admit the potential helpfulness of empirical player observation, but they are opposed to and even offended by game criticism that makes connections between games and other cultural forms such as paintings, films, digital art, or storytelling. Attempts by other scholars to discuss games as part of a larger spectrum of cultural expression are denounced as "colonialist" intrusions on a domain that belongs only to those who are studying games as abstract rule systems (Aarseth 2004). […] Because the game essentialists want to privilege formalistic approaches above all others, they are willing to dismiss many salient aspects of the game experience, such as the feeling of immersion, the enactment of violent or sexual events, the performative dimension of game play, and even the personal experience of winning and losing. […] Indeed to the true believer in game essentialism, even the voluptuous Lara Croft is perceived as merely another game counter, an instrument for engaging with the rules […] (Murray, 2005)

The formalism that both Ermy, Mäyra and Murray are attacking is one which has affinities with the game design literature in that it aims at constructing analytical tools for the non-situated understanding of fundamental game aspects. An example of this approach is Aarseth et al.'s paper *A multi-dimensional typology of games* (2003) in which games are categorized based on their adherence to a series of design aspects. Although rule-oriented, this paper does not downplay other perspectives. Yet it tends to become coupled with more provocative statements such as Aarseth's much-quoted claim (closely related to Koster's above) that "the dimensions of Lara Croft's body… are irrelevant to me as a player, because a different-looking body would not make me play differently… When I play, I don't even see her body, but see through it and past it." (Aarseth, 2004: 48) which is the butt of Murray's "even the voluptuous Lara Croft…" sarcasm. The so-called formalists tend to have no strong theory of the player, but when they do express such a theory (as in the case of Juul) it is often one more compatible with Rational Player than with Active

Player. In other words, far from all game researchers subscribe to the Active Player perspective.

Finding Active Player thinking in the game design discipline is more of a challenge. As mentioned above, Richard Rouse does not see players as driven exclusively by the desire to meet the game goals, noting how players have a series of other preferences. Similarly, in a presentation of the MDA model, “a formal approach to game design and game research”, Hunicke, LeBlanc, and Zubeck list eight types of game aesthetics. These aesthetics are described as “the desirable emotional responses evoked in the player, when she interacts with the game system” (Hunicke, LeBlanc, & Zubek, 2004: 2) (they are: Sensation, Fantasy, Narrative, Challenge, Fellowship, Discovery, Expression, and Submission). We saw how Richard Rouse clearly holds an unstated meta-assumption that whatever else players want, they generally pursue the objective game goals. Hunicke, LeBlanc and Zubeck’s account is of a different nature. They do not prioritize optimization, implying that it is not the *behaviour* of the player which the game designer controls, but rather his or her *emotional responses*. Thus, they are an example of game designers who fall outside the general pattern which I have described here. Notably, however, this does not land them in the Active Player category. Although the pleasures which players derive from games are seen as multifaceted, these pleasures are seen as features of game design which may be used and combined by the game designer. Thus, while the player is not defined as a rational agent optimizing her outcome she is not seen as neither actively nor subversively shaping the game experience. But perhaps this is not surprising. Since the Active Player perspective arguably highlights the ways in which the game designer may overridden it is difficult to derive normative suggestions from it.

Having established that game thinkers work with differing player models and having seen how these models sometimes can, but often do not, contradict each other we will now proceed to examine the Rational Agent Model in more detail. Although this means mostly bracketing the remaining three models, we have now seen how the Rational Agent Model relates to them and laid bare their core assumptions for possible future study.

CHAPTER 3: GAMES AND THE RATIONAL PLAYER MODEL

"It helps […] to think of a game's structure as akin to an economy, or an ecosystem; a complex, interacting system that does not dictate outcomes but guides behavior through the need to achieve a single goal: energy, in the case of ecosystems; money, in the case of economics; victory, in the case of a game."
- Greg Costikyan

The previous chapter identified four player models. This chapter has two aims. It seeks, as will be discussed further below, to *present the analytical potentials and implications of the Rational Player Model* and to *elucidate the behavioural predictions of that model.* The former can be seen as the development of a tool for game analysis whereas the latter is a means to study how actual player behaviour differs from purely "rational" play in **Chapter 4: Player Behaviour**.

In other words, this chapter applies, and derives conclusions from, the Rational Player Model. In particular, the following clarifies the strategic nature of video games. This is done in part by presenting a theoretical perspective, which given that it may be said to revolve around aspects which are central to video games, has been curiously absent from video game studies: The field of *game theory*, the formalized study of strategic conflict. Thus, a sub-aim of the chapter is to introduce, as well as evaluate the potentials and usefulness of, a theoretical perspective which has important things to say regarding games and gaming.

Initially this chapter shows, by example, the role and variety of conflict in video games. This is done through a brief historical analysis of types of conflicts which video games have set up, the aim of which is to highlight the aspects of games which will be analysed further later on in the chapter and to introduce games which will appear recurrently. After these examples, the Rational Player perspective is analysed in more philosophical detail than was given in the previous chapter, describing its core assumptions and theoretical roots. This leads to a description of game theory. In this description, particular weight is given to the concept of strategy which is central to understanding many other key concepts and which is often applied vaguely in video game research. Having introduced the theory it is applied to the examples which began the chapter (as well as others). This is organized by the following themes: *Conflict types*, *number of players, the role of information and communication,* and *the concept of equilibrium*. Finally, the chapter develops the notion of *strategicness*, which is a measure of the degree to which a game is strategic.

Game conflict and behaviour

To begin, let's return briefly to the Linda A. Hughes quote from the introduction. Hughes, based on her *Foursquare* study concludes:

> Regardless of what the game rules said, these players still played foursquare like a team game, with groups of friends vying for control of the game. In fact, much of what happened in the playing of this game would be totally inexplicable in the context of individual competition, even though this game has long been categorized that way. (Hughes, 1999: 120)

Now, Hughes in her study makes a number of pertinent observations and convincingly demonstrates how social relations shape the girls' game playing behaviour. In the language of this dissertation, she demonstrates how subjective goals are not identical to objective goals. But these worthwhile observations lead to unreasonable conclusions. *Foursquare*, Hughes claims, is formally a game of individual competition and the social considerations exhibited by the players are incompatible with the notion that the game conflict fully determines the players' behaviour. But noting that the Rational Player Model does not "fully determine" behaviour is some way from concluding that the observed behaviour is "totally inexplicable" from the perspective of the model. Few, if any, explanatory models of the social sciences would survive encountering criteria that taxing. Importantly, certain actions, had they occurred, surely *would* reveal the model as useless in this case. For instance, if the girls were to simply stand still without trying for the ball, if they gave no priority to landing the ball inside the square or if they chose to only play with their eyes closed their behaviour would certainly invalidate the model. Arguably, however, the Rational Player Model (stating that players try to achieve the game goals) is a *relatively* good explanation of their behaviour[8]. Particularly since the model, as we shall see, does not rule out the formation of coalitions in a multiplayer game with only one winner. The apparent confusion underscores the need for a better understanding of the way game conflict affects player behaviour according to the Rational Player Model. This understanding will hopefully result from the following pages.

An introduction to video game conflict

What follows is an introduction to two aspects of video game conflict. First, I discuss briefly the degree to which players are interdependent, that is the degree to which a player must factor in the other player(s) in deciding what to do. Next, I give an introductory account of player relationships. The aim of these sections is to concretely illustrate topics which will be presented more abstractly in subsequent sections and to provide a series of example games which will be referred to throughout the rest of the chapter.

Let's begin with *Frogger* (Figure 8). In terms of choice, the player of this 1981 arcade hit faces a simple task. In charge of a courageous amphibian seeking the refuge of green pastures beyond a dangerous road and a treacherous river he or she must exhibit considerable motor skill, react swiftly and move wisely. But in terms of *choice* the challenge is simple: act in a way which avoids collision with vehicles and an untimely end in the murky waters of the river using four available input types: Jump up, jump down, jump left, jump right.

[8] The argument here is not that the Rational Agent Model elegantly explains the behaviour observed by Hughes, but that her observations do not disqualify the model.

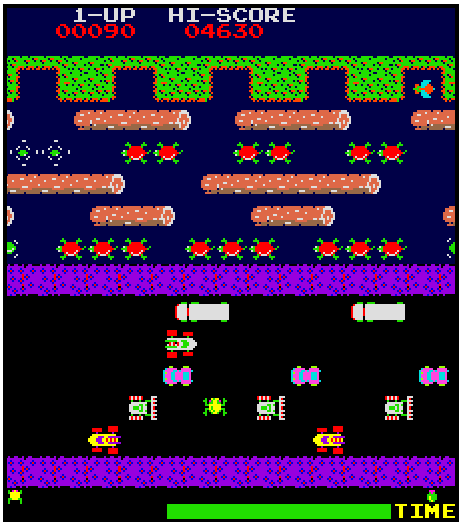

Figure 8 – *Frogger*
The player must guide the green frog (near road middle) across the road and the river to reach food on the other side.

This sets *Frogger's* limited world apart from the environment of the multiplayer race mode of *Super Monkey Ball*, in which players control monkeys encased within balls racing for the finish line (Figure 9). In *Super Monkey Ball,* the choices available to any one player, and the choices likely to improve that players' chances, are directly contingent on the behaviour and choices of other players. From the perspective of the player, the environment (now also including other players) responds non-deterministically to his or her actions. And yet, the *Super Monkey Ball* players are only vaguely interdependent. Essentially, there are good reasons to be racing towards the finish line at maximum speed dealing only with other players to the extent that they come close or get in the way.

Figure 9 – *Super Monkey Ball*
In the multiplayer race mini-game players control monkeys inside balls racing along the green track.

Player interdependence is much higher in the real-time-strategy game *Age of Empires II*. As players vie for control of the gamespace, the entire game is built to place maximum importance on any player choice and to make such important choices ubiquitous. For the *Age of Empires II* player, the value of almost any choice depends on the choices of the other players and on features of the gamespace which are only imperfectly known.

The difference in the importance of choice between these titles may be understood and further analysed by invoking the concept of *strategy*. If we understand a strategy as a plan of action which takes into account how the environment will respond, the games mentioned range from the non-strategic to the highly strategic.

Let us turn now from interdependence to the conflicts set up between players of a game or between player and environment. Most games involve conflict in some form at the least in the form of challenges. In a game, someone must usually work towards an end facing some sort of opposition. This opposition or obstacle may consist of the game system itself, or it may consist of a combination of other players and the game system. In *Solitaire,* the player plays against the game itself, trying to achieve the winning condition in spite of the difficulties presented by the game system. In *Chess*, on the other hand, the obstacle facing the player is primarily the other player. These two examples may be thought of as two ends of a spectrum. In one end, the player is challenged by an unthinking algorithm (and sometimes an element of chance) whereas in the other end the player is up against an opposition which may be unpredictable, which may adapt to her actions, which may have sub-goals and intentions and which may be attempting to construct a mental model of her own perception of the game. While this difference is significant it represents but one important dimension of game conflict as will be clear through the following historical account.

In terms of conflict, early video games were quite similar, and evidently took strong cues from the classical two-player all-out-conflict games like *Chess* and *Backgammon*. *Spacewar!* (see Figure 2) arguably the first video game, pitted two players against one another in an intergalactic shootout (the original version had no element of chance). Like *Spacewar!*, *Pong* (see Figure 10), the first successful arcade game, was a two-player-only game of pure competition as players would attempt to shoot the ball past the opponent in a *Tennis*-like setup. Following the trend, *Space Race* (see Figure 11) was a two-player racing game where the players moved their spaceships to avoid meteors as they raced for the finish line. The strength of the format is evident in games like *Gunfight* (see Figure 12) and *Tank* which were essentially variations on the two-player shoot-out introduced by *Spacewar!*.

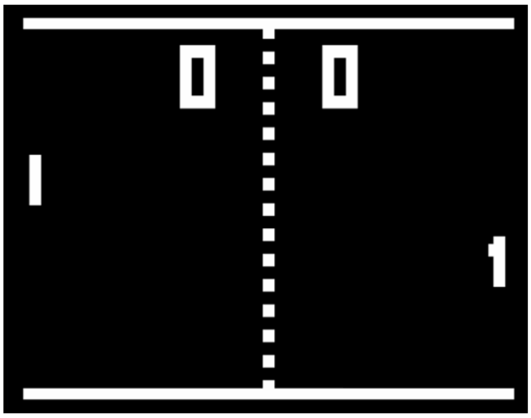

Figure 10 – *Pong*
Players try to shoot the ball past the other player's bat

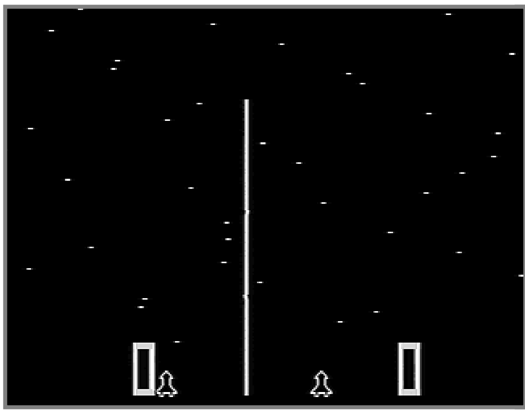

Figure 11 – *Space Race*
Players control spaceships racing vertically and must avoid meteors

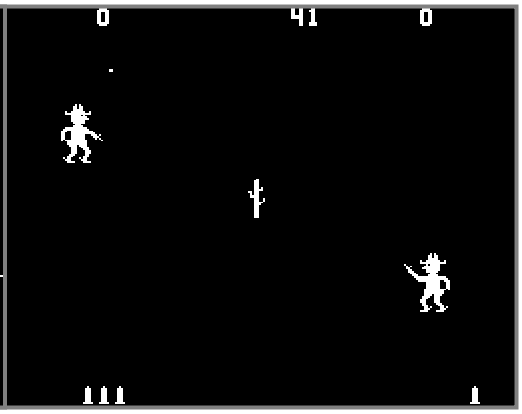

Figure 12 – *Gunfight*
Two cowboys in a shootout

In all these games[9] the two players were placed in an entirely antagonistic relationship: a player could only win if the other player lost. In other words, the problem facing a player of these games was very much the other player.

A remarkably different approach was attempted with Atari's *Fire Truck* in 1978 (see Figure 13). As firemen racing towards an implied fire (never reachable in practice) a player could control either the front or the back of the truck while the other player controlled the other part. Their combined efforts produced a collective score and thus the relationship between the players was one characterised by entirely common interest. Neither player would in any way benefit from the other player doing poorly.

[9] Which in game theory terms would be considered *constant sum* (as we shall soon see).

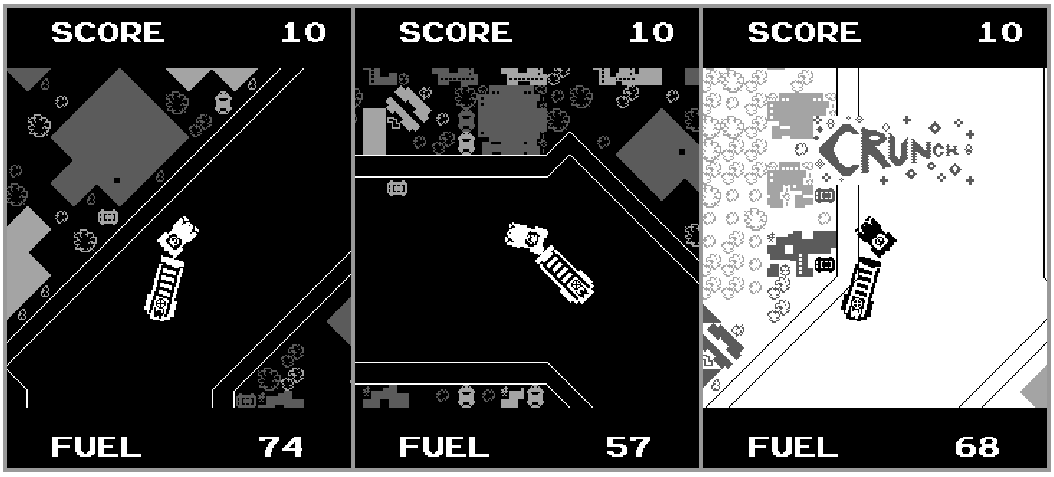

Figure 13 – *Fire Truck*
One player controls the front of the truck while the other player controls the rear

If *Pong* and its sibling fully competitive two-player games constitute one end of a spectrum on which *Fire Truck* constitutes the other end, many noteworthy intermediary variations were tried. In the 1982 arcade game *Joust* (see Figure 14), two players controlled bird-mounted knights facing hostile and equally air-borne enemies. Each player would score points by defeating a computer-controlled enemy but would also be rewarded for killing the other player. The game instructions did not propose a moral stand on suitable behaviour towards the other player advising merely that a player could "TOPPLE Buzzard-Riders and other player for points"[10]. Adding to this somewhat unclear player relationship, controlling one's bird was not an exact procedure and thus a *Joust* player would be quite likely to collide with the other player (in which case the highest lance would win). Since players could kill each other and were even awarded points for doing so we may want to place *Joust* closer to *Pong* than to *Fire Truck* on the competitiveness continuum. In this sense, the 1983 game *Mario Bros.* (see Figure 15) provides a counter-point. Again we have a two-player setup, even one visually very close to that of *Joust*, but here Mario and Luigi cannot kill each other directly and get no points for the other player's defeat. This is not to say that all need be bliss among the two brothers, since it is possible

[10] The game periodically introduced special "waves" with variations on the standard scoring rules. In these situations players would for instance be explicitly rewarded for being either nice or aggressive towards the other player.

to kill the other player indirectly by use of the enemy animals. Although possible, this behaviour is not rewarded and thus *Mario Bros.* can be thought of as inspiring more cooperation than did *Joust*.

Figure 14 – *Joust*
Players control flying knights battling enemies of various types

Figure 15 – *Mario Bros.*
Players control Mario and Luigi (top of screen) and must clear the pipes of intruders

In between *Joust* and *Mario Bros.* we may want to place the game *Gauntlet* (see Figure 16), a dungeon crawl taking many cues from *Dungeons & Dragons*-style table-top role-playing games. In *Gauntlet* (like in *Mario Bros.*) players cannot kill each other directly. Indeed, the players (up to four can play) are quite interdependent as they are placed on the same screen in a scrolling world and thus need to move in the same direction and as the player characters have different strengths and weaknesses. But while interdependent, the players also have separate scores (as in both *Joust* and *Mario Bros.*) and are placed in a world with plenty of treasure which each player would benefit from. In other words, *Gauntlet* players face a certain temptation to selfishly go for the treasure littering the monster-infested dungeon.

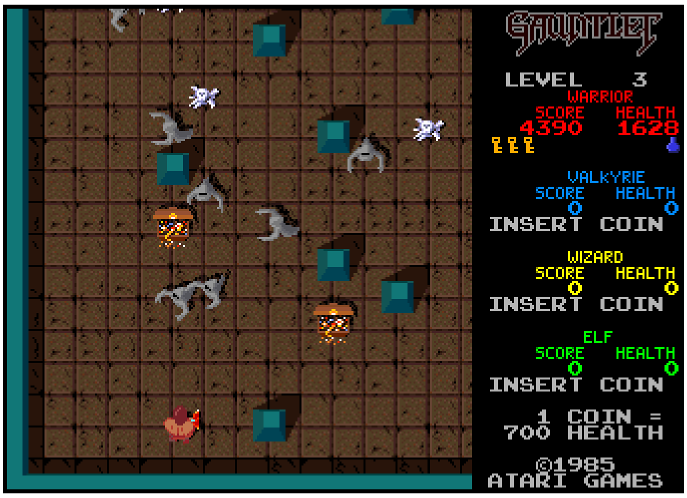

Figure 16 – *Gauntlet*
Players explore monster-filled dungeons in a tow-down perspective. In this image only one player is active (situated left of bottom centre) and ghostly monsters approach.

Later multiplayer games have often introduced more complex player relationships and often presented goals at least as ambiguous as those of *Joust*. In *Battlefield 1942*, for instance, players are placed on one of two competing teams choosing one of several character classes with different skill sets (like *Gauntlet*). The game manual notes that the objective is to defeat the other team but score is also counted within each team, and individual (ranked) statistics are shown at the end of each game round. Thus, the relationship between opposing teams (or team members) resemble that of *Pong* players whereas the relationship between team-mates in some respect mimic the relationship between *Gauntlet* players.

MMORPGs (having only vague objective goals[11]) feature even more complex relationships between players. In these games, certain resources are practically infinite. For instance, an item awarded players for successful completion of a quest

[11] For instance, the *World of Warcraft* manual is almost entirely descriptive never explicitly stating objectives. One of few exceptions is the positive description of the act of leveling up, and even here the valuation is modest: "The experience you earned from killing monsters and completing your quests should fill up your experience bar. If not, kill a few more monsters or try to finish another quest. When your experience bar fills up, a congratulatory sound and a flourish of light tell you that you've just leveled up. Your chat log also congratulates you on gaining a level. Every time you level up, your character increases in power. Not only do you gain extra health, but you also gain increases to one or more of your primary attributes, such as agility or stamina. Spellcasters also gain mana when they level up." (Blizzard Entertainment, 2004: 27)

may be given to any player finishing that quest[12]. The same goes for experience points, where one player's points do not influence other players' points. This means that in a certain sense players are not competing for resources. Most MMORPGs however, have formalized social structures beyond the basic each-person-on-a-quest structure. Thus a player may be a member of a fixed faction (determining certain aspects of her relationship to other factions) and a particular guild (determining certain aspects of her relationship to other guild members and to members of other guilds) and a particular group (determining her relationship to other group members) before even considering the number of non-formalized ties she may have to other players. For instance, a *World of Warcraft* player may be a member of the Alliance faction (one of two in the game), a member of a particular player-run guild and at a given time be part of a group having gathered to complete a particularly difficult quest. The game rules (and specific settings such as loot sharing within the group) will partly determine what she can and cannot do to other players and will encourage and discourage certain types of behaviour[13].

So far we have seen how multiplayer games feature very different player relationships and conflict types. We have also seen that certain recent multiplayer games feature relationships that are more complex than those of early two-player arcade games. But of course single-player games also set up conflicts; conflicts which also can be said to vary widely.

The simplest type occurs in games which may be likened to an obstacle course in the physical world. Here, the player faces a challenging environment which takes skill to best but which does not adapt to her presence or actions. An example of this type is *Paperboy* from 1984 (see Figure 17). The player navigates the paperboy through suburban streets where various moving dangers rush towards him. But these moving threats do not aim for the paperboy as they simply move between two

[12] Even though some objects may be practically infinite they are not entirely non-rival since they take time to regrow and thereby inspire competition.

[13] Generally speaking, player-versus-player game servers place players in a more competitive relationship than the one described here.

points at a specified point in game time. Thus, the player can simply memorize the exact behaviour of the enemies (also at least partly the case in games like *Kung Fu Master* and perhaps most evidently in *Dragon's Lair*).

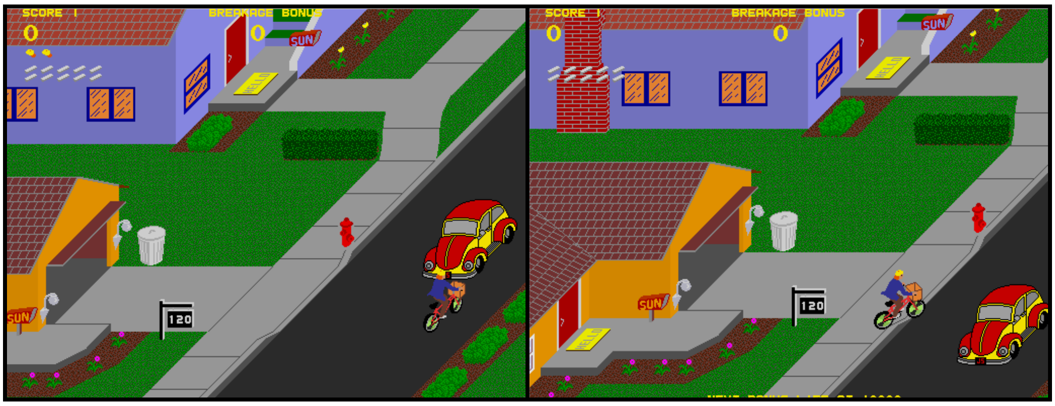

Figure 17 – *Paperboy*
The images show the same obstacle (the red car) which moves down the street whether the bicycling player character is there (left) or out of harm's way (right)

But in terms of early arcade single-player games another approach was more common. Often, the enemies would behave with a certain sense of randomness and sometimes with a certain sense of apparent purpose derived from being attracted towards the player character to some degree. Randomness without purpose is evident in *Space Invaders*, where the incoming alien armada fires missiles downwards in unpredictable patterns not related to the player's position. Similarly, the *Scramble* rockets would launch with a certain randomness not timed to match the player's position or course. Other games would combine randomness with a tendency for enemies to move towards the player character. In *Moon Patrol* (Figure 7) for instance, alien spaceships are directed towards the horizontal position of the heroic buggy although they do not necessarily always hit a player who stays at the same position. Similarly, in *Time Pilot* (Figure 18) and *1942* (Figure 19) enemy aircrafts will tend to move towards the player's position although even a player not evading will not always be hit. In *Spy Hunter* (Figure 20) certain particularly marked cars will notice and attempt to harm the player's car. A variation of the general theme is seen in *Pac-Man* where the enemy ghosts will only give chase if they come within a particular distance of the player character.

Of course, the enemies in these games are capable of only very simple manoeuvres. In general they simply tend to move in the general direction of the player character without consideration for what the player is doing (e.g. firing in their direction or likely to be changing direction due to other approaching enemies). In more recent single-player games, enemies have become more unpredictable. In terms of action games, enemy units took a great leap from *Doom* to *Half-Life*. In the former, enemy monsters would typically merely charge the player head-on while in *Half-Life,* enemies would make use of environmental features and seem to adapt their attack strategies according to local conditions. This behavioural complexity was increased in *Half-Life 2* and *Far Cry* where enemies were capable of a number of strategies in response to the player's actions. Essentially, of course, such behaviour is algorithmic and likely to be predictable by a player who plays through the same sequence many times. But due to the large number of interacting variables the enemy behaviour achieves a sense of purposefulness which surpasses that which one might wish to ascribe to the enemy fighter planes in *Time Pilot* (I will discuss the issue of attributed purpose later in this chapter).

Figure 18 – *Time Pilot*
The player controls a fighter plane (centre of screen) and must shoot down enemy aircrafts.

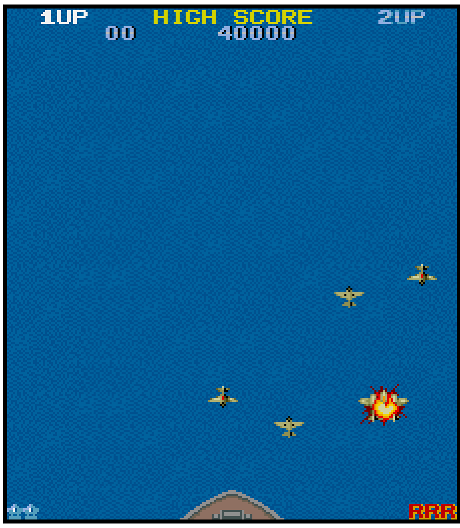

Figure 19 – *1942*
The player controls a WW2 fighter plane moving vertically to take on waves of enemy aircrafts.

Figure 20 – *Spy Hunter*
The player controls an armed car moving vertically and must avoid obstacles and aggressive co-drivers.

Above I have sketched the spectrum of video game conflict, pointing out some of the many relationships which a player may be placed in in terms of other players and the game environment. Later in this chapter, these relationships will be illustrated graphically but for now we should merely acknowledge that video games can be categorized as either competitive, semi-cooperative or cooperative. These categories are defined as:

> **Competitive game**: A competitive game is one where the objective goals specify that the end states which participating players should strive for are mutually exclusive[14].
>
> **Semi-cooperative game**: A semi-cooperative game is one where team-work is rewarded over mutual non-cooperation but were individual players are faced with temptations to act selfishly.
>
> **Cooperative game**: A cooperative game is one where the objective goals specify that players should strive for the same end state.

[14] Alternatively one might simply say that players have different objective goals, but this is slightly imprecise since players may in fact have the same objective goal (e.g. "Destroy the other player's spaceship").

The perspective applied may be said to be a common sense one chosen to merely begin discussing the differences between games as regards the conflict which they set up. The conflict categories and games mentioned will be revisited later in this chapter in order to provide a systematic perspective on video game conflict. But first, the Rational Agent Model will be given more careful attention than was awarded it in the previous chapter.

The Rational Player Model revisited

The discussion of conflict types in video games above rested on the assumption that players are attempting to maximize their score. In other words, it implies a model of the player with close affinities to the Rational Player Model discussed in **Chapter 2: Visions of the player**. In the following section, I will examine this perspective in depth in order to fully understand its assumptions and its explanatory value.

The Beliefs/Preferences/Constraints model (BPC)[15], a close relative of the Rational Player Model, is at the very core of economics. In neoclassical economics, which is essentially mainstream economics as usually taught, (economic) behaviour is understood as the consequence of agents maximizing their utility. In that context, it is held to be universally true that in a situation of choice, any human being will make the choice which he or she believes will provide the largest personal benefit (or satisfaction). This has important implications for the understanding of behaviour. Given the assumption of benefit optimization, any action taken by a person will be a direct function of these perceived benefits and thus actions or choices *reveal* a person's preferences. If a person picks up an apple from a bowl of fruit containing both apples and bananas then we can infer that person prefers an apple to a banana. This is the theory or assumption of *revealed preferences*. In the above, *utility* and *benefit* are synonymous, the former being the common term for the happiness or satisfaction which a person derives from a certain outcome. Sticking

[15] Better known as the "Rational Agent Model". I use the name suggested by Herbert Gintis (Gintis, 2006) to distinguish it from the Rational Player Model.

with the fruit, the apple choice has a greater expected utility than the banana for the person in question. It should be noted that this is axiomatically true. One might object that, hypothetically, a person might *actually* prefer a banana but since apples outnumber bananas in the bowl he or she may be choosing the apple for reasons of politeness. This may well be true in a broader sense of the word preference, but to a neoclassical economist the satisfaction gained from being polite is merely a part of the utility equation. If the expected joy of eating a banana *plus* the dissatisfaction of violating the social rule is greater than the similarly combined satisfaction of getting the apple the person will choose the banana. Otherwise he or she will choose the apple. It is simply true by definition (Binmore, 1994: 27).

The idea of preferences implies certain assumptions while, importantly, certain things are *not* assumed. It is assumed that preferences are *reflexive*, i.e. that they are non-contradictory: Identical choices or outcomes are equally preferred. It is assumed that they are *transitive*, i.e. that they can be ordered from "least preferred" to "most preferred" (and if someone prefers A to B and B to C then that someone also prefers A to C). Finally, it is assumed that they are *complete*, i.e. that all choices or outcomes can be ordered. But it is *not* assumed *what* people prefer. Essentially the economist does not assume that people prefer certain things (such as money) to other things (such as leisure time). People merely express their preferences (e.g. by buying a certain product) and by this process goods etc. attain their price. The price of a product is determined by people's preferences[16].

In the game theory examples discussed in the introduction, the utility of outcomes was specified in absolute numbers. This may seem at odds with the claim above that it is not assumed *what* people prefer. But in analytical game theory, one assumes that the players have certain utility functions; a game is an interaction between two (or more) players with particular utility functions. This is different from claiming that "people" place certain values on certain outcomes in certain situations. Two actual drivers moving towards each other on a poorly lit road may

[16] At least in an idealized world of perfect competition.

place any sort of value on the outcomes but in the introductory example we wanted to know what might happen under the assumption of certain payoffs.

To discuss the merits of models based on individual rationality it is practical to focus on two related aspects: The nature of rationality and the notion of methodological individualism (the latter being the idea that social life should ultimately be understood and/or studied as the consequence of choices made by individuals).

Rationality occupies a problematic position in the social sciences; perhaps even a "schizophrenic" one (Simon, 1945/1997: 87). While clearly at the heart of economics, models of rational choice meet more opposition in fields like sociology and psychology (see also Cook & Levi, 1990; Friedman, 1996). This general disagreement is further confused by cross-discipline variations in the definition of rationality.

In sociology, following the foundational writings of Durkheim, certain branches have adhered to principles of social (or methodological) holism; the notion that society can*not* be understood as the mere sum of its parts (see also Baert, 2005: 16; Durkheim, 1895/1982; Udehn, 2001: 35). Also, following Max Weber (arguably an early proponent of a form of methodological individualism) and the critical theory concerns of the Frankfurt School (e.g. Adorno & Horkheimer, 1947/1989), rationality and the process of rationalization became the subject of critical attention of its own[17]. Later, game theory itself, for some a cross-disciplinary approach to social behaviour, has had a very mixed reception within the field. Richard Swedberg (Swedberg, 2001) mentions as a telling example how sociologist Robert K. Merton did not mention game theory in any of the three editions of his book *Social Theory and Social Structure* and has recently found it worth stating that he was and is "wholly unconnected with game theory." (Merton quoted in Swedberg, 2001: 304).

[17] Which, strictly speaking, did not have any methodological implications but which further made the rationality concept a highly charged one within the field.

In psychology, social psychologists in particular have demonstrated how test subjects, virtually without effort, can be made to act inconsistently and base decisions on features of situations which one would logically assume to be irrelevant (in "payoff" terms). The most striking of these demonstrations – and the ones most explicitly challenging the BPC – have been performed by Kahneman and Tversky who have shown how such things as order of presentation and word use influence choice (Kahneman & Tversky, 2000; see also Nordberg & Røgeberg, 2003: 3). The implication is that if the mere order or form in which various fruits are offered affects choice, then preferences cannot be said to be stable nor based on expected outcome in any straightforward sense.

In other words, there are clearly problems with assuming that the neoclassical model of agency is a precise model of choice under all circumstances. I will discuss the implications of this imprecision in the following section, but first, to further reveal the model's theoretical foundations, we must briefly consider what is actually meant by "rationality."

Imagine being ill and having purchased a particular type of medicine which you believe will cure you, while in fact it will make you feel even worse. Is the choice of taking the medicine a rational one? The rationality of the neoclassical "rational agent" refers mainly to the individual acting in accordance with his or her preferences. In this sense, any choice you make may be considered rational. Phrased in another way, no choice you make could be classified as irrational. This view is sometimes referred to as the "present aim theory", in which "rationality is taken to be the efficient pursuit of whatever aims one has at the moment of deliberation and action." (Frank, 1988: 67). An example is Janssen's statement that "I will say that individual agents behave rationally if they choose the most appropriate action to achieve a certain goal in the light of the information they possess." (Janssen, 1993: 11). Robert Frank contrasts this with a "self-interest model" which calls "rational" those actions which promote the (objective) interests of the agent. Examples of this perspective are widespread in classical economics, among philosophers like Hobbes and Bentham as well as more recent thinkers like William Niskanen (e.g. Niskanen, 1971). Others, often following Ferejohn (Ferejohn & Satz, 1991) refer to the former views as the "thin-rational" account and the latter as the "thick-rational" one (Green & Shapiro, 1994: 17-18). Uses of the term also differ as to the extent of the rationality assumption which may be either *universal* (applying to all behaviour in all situations), *partial* (applying to some type of behaviour in all situations), or *segmented* (applying to only certain situations). Finally, rationality may be thought of as *complete* or *bounded*. Complete rationality implies that the agent is able to take in and correctly process all information while if rationality is bounded the agent chooses rationally within limits. These limits may be cognitive, physical, material etc.

How exactly does the Rational Player Model fit into this scheme? First of all, it differs from the core neoclassical model by ascribing preferences (and a utility function) to players. Where the neoclassical paradigm sees preferences as revealed through choice, the Rational Player Model sees preferences as determined by the game goals. But it also diverges from the logic of game theory. Game theory, while operating with hypothetical players with known preferences, does not presume that *everybody* shares these preferences. Nevertheless, that would be the exact implication of the core Rational Player Model: Every player will seek to fulfil the game goals.

The rationality type implied is "thick" as actions which further one's chances of achieving the game goals are deemed rational. The player has objective interests which can be stated externally. The rationality is also segmented as there is no reason to extend the rationality claim beyond the act of video game playing. The model makes assumptions about game play but does not make assumptions about rationality in other situations[18]. So far, we have not touched upon the question of the limits of rationality, i.e. whether it is seen as complete or bounded. I see no reason to suggest that the model usually employed in game design is one of complete rationality since games are usually designed to accommodate players of various skill levels. But here we should distinguish between the two functions of the

[18] Analogous to claiming that people tend to maximize their personal earnings/benefit in economical transactions but not necessarily in other types of situations (such as family life, parties, stamp collecting, or music practice).

model. When used as an analytical tool (as in this chapter) various degrees of "completeness" can be used (e.g. we can assume that players have perfect memory). But when used to predict or explain actual behaviour one must necessarily take into account limits to information processing, varying skill levels etc[19].

The status of the Rational Player Model

Having just considered the assumptions and theoretical affinities of the Rational Agent Model, it is time to specify its exact status in the context of this dissertation.

As mentioned, the model is used in two capacities. In this chapter it is used as a tool for formal analysis: As a perspective on formal properties of video games. As such, it is comparable to any other tool of formal analysis in game studies or other fields (such as a "close reading" in literary analysis or a "shot-for-shot analysis" in film analysis). It is used to focus attention on certain formal aspects of aesthetic works in order to understand how these features are used or function in relation to other structural elements. As analytical tool, the Rational Agent Model *can* be employed in any game analytical context. It could (of course) be employed to analyze a game with strong strategic elements and clear goals but it could also be drawn upon to understand a game without objective goals in order to formally describe what it means to be goal-less on a more fundamental level. Thus, *whether* the model is relevant in a particular case hinges on the purpose of the analysis. If one's purpose is to understand features related to goals, choice or strategy, the model may lend a useful perspective. If one's aim is to analyze, for instance, socio-cultural aspects of game character appearance, the use of representational motives across genres or approaches to the generation of dynamic game music, one must look for other models.

Importantly, the model works by explicitly positing a particular "ideal" player (in the non-normative sense). Such a hypothetical user is common to most

[19] Unless one is interested in the effects on choice of skill level variation etc. in which case one might well want to assume complete rationality and treat observed behaviour as variations thereof.

analytical models also in other fields. For instance, an analysis of how narration works in a movie typically builds on certain generalisations about the human perception apparatus. But while assumptions about users are often implicit in such models, they are quite apparent in the Rational Player Model. This means that the form of game notation employed here is in fact player-agnostic. One could keep the general format while altering one's "ideal player", for instance by assuming that the player had different priorities than those specified by the objective goals.

As a tool for formal analysis, the model can be neither wrong nor right. It can, at best, be "compelling" or useful in the sense that it may bring out aspects of games that are non-obvious yet worthwhile. Also, it should be consistent in the sense that it should able to distinguish between game features without leaving too much unspecified. An analytical model which does not allow for relatively easy categorization of elements is a poor one. Taken together, these criteria mean that the model should be easy to apply but not at the cost of relevance: It should be accessible yet not state the obvious.

The other capacity of the model in this dissertation is to function as a tool for understanding actual player behaviour. Here, the model is used as a simplified specification of a core gameplay aspect: Goal-directedness. The logic of its application is to derive predictions from its simple but non-arbitrary assumptions (the idealized player behaviour), to compare these to empirical reality (the actual player behaviour) and to attempt to explain the differences between the two. In this sense, the model is used as what Max Weber called an "ideal type". To Weber, the ideal type was an analytical construct which accentuated particular aspects of a phenomenon (chosen on the basis of the researcher's theoretical interests) (Weber, 1904/1999: 248). Its purpose was to enable "the comparison with empirical reality in order to establish its divergences or similarities, to describe them with the *most unambiguously intelligible concepts*, and to understand and explain them causally." (Weber, 1949: 43). The ideal type is a yardstick, then, for comparing empirical reality to a simplified model of it which one-sidedly emphasises a certain side (Parkin, 2003: 29).

This approach is not unproblematic, since the alleged "core" aspect of the phenomenon is not tested. With the ideal type approach there is no direct comparison of the predictive strength of models, nor indeed falsification. But, crucially, the model is unfalsifiable not by virtue of it being protected by omni-explicatory powers but by making no claim to be true in any one case. To make a simple analogy, a traditional model may specify that a man will take the shortest route between two points. This model would be falsified if the man were observed to take a longer route. But if the model specifies that a man will take whatever route he fancies, no route the man takes can (by itself) falsify the model. In contrast, an ideal type which specifies that, for analytical purposes, we will assume that men may be thought of as taking the shortest route between two points is merely a tool for comparing actual strolls to something precise. If, however, the predictions of the ideal type were completely unrelated to actual behaviour (e.g. if the ideal type predicted that pedestrians would move through a city by jumping on one leg) it would lose its explanatory potential. Virtually everything measured by its yardstick would be "off" and it would be little better than having no yardstick at all.

Thus, when used in the next chapter the aim is to pinpoint the degree to which it actually predicts behaviour in order to better understand which factors (player types, contexts, group dynamics etc.) cause variations from the behaviour predicted by this most dominant game design player model.

Implications for video games

What does it mean to apply game theory, as a formal model, to video games? Essentially, it means viewing games through a formalized perspective which foregrounds conflict and certain types of interaction above all else. In subsequent sections I will model video games in terms of the utility functions that they prescribe. In other words, I will discuss what behaviour they are likely to elicit under the assumptions of the Rational Player Model.

Game theory, like all other approaches to the description of a general topic like video games highlights certain aspects while depreciating others[20]. In other words, the perspective introduced here sees only certain aspects of games and does not capture the experience of playing a game. Thus, it may it may group games together which in fact feel quite different in terms of play (but which have similar incentive structures).

Though hardly a problem inherent in the perspective itself, this approach to games tends to lure scholars and designers towards considering only a subset of all games, writing as if these particular game types were representative of the entire population. Let's look more closely at Sid Meier's famous statement "A game is a series of interesting choices". First of all, unless we want to claim that games cannot be boring, Meier must be referring to good/interesting games rather than just games. But more importantly, the notion of choice (and interesting ones being those that are non-obvious and have consequences) as central to gaming is not *always* an obvious one. It works well when considering games like Meier's own *Civilization*. In *Civilization*, the player is faced with a slow-paced turn-based conflict in which alternatives can be carefully compared and where any situation can be analysed in a probabilistic fashion based on an understanding of the game rules (e.g. the odds of being able to aid a semi-distant city soon to be attacked are highly calculable, and the player has as much time as she wants). It breaks down when considering *Wonder Boy*. In Figure 21 (left) Wonder Boy faces an obstacle. He needs to move right but the path is blocked by fire. The obstacle can be tackled in one way only: by jumping. There's nothing interesting about this choice. There is but one solution and it is obvious; it is a given. The same goes for most other aspects of the game (the player *must* move right always, *must* jump over rocks, *must* avoid or shoot enemies etc.). Yet, the game is not necessarily boring as shown by its popularity and it shares these aspects with many popular games like *Super Mario*

[20] Others have presented analytical schemas or approaches with either general (e.g. Consalvo & Dutton, Forthcoming; Konzack, 2002) or more particular ambitions (e.g. Tosca, 2003). For a brief review see (Aarseth, 2003)

Bros., *Space Invaders*, and *Tomb Raider*. These games require *skill*, rather than careful deliberation[21]. They are, as will be further explained below, largely unstrategic.

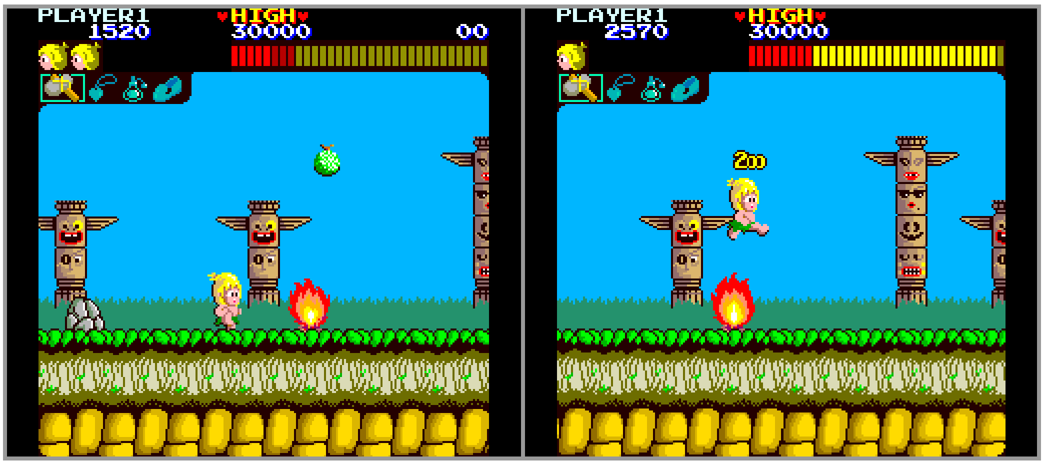

Figure 21 – *Wonder Boy* (Sega, 1986)
The player is faced with an obstacle in the form of a fire blocking the way (left) with one obvious solution (right)

The entertainment value here lies not in choice and its consequences but rather in mastery, and the hectic/intense action putting the player's hand-eye coordination to the test. And of course there are a number of other pleasures which may be facilitated by games and which have nothing to do with cerebral processing of options and strategies[22].

Given that these games provide a challenge for the Rational Player perspective (even though they can be addressed inside it) it is problematic that most authors invoking the perspective do not acknowledge this bias but simply limit their examples to strategy games.

Game goals

In the previous section, we saw how the Rational Player Model derives player preferences from objective game goals; the model assumes that game goals more or

[21] I use "skill" to signify motor skill and hand-eye coordination and as contrast to deliberative choice, even though the latter of course requires cognitive skills.

[22] While often noted (e.g. Kennedy & Giddings, 2005; Swalwell, 2005), this remains somewhat sporadically addressed in the literature.

less directly shape player behaviour[23]. But this is at best shorthand for a process which involves a large number of aspects. For instance, how exactly can we identify the goal of a game? And how can the player identify it?

First of all, a goal is that which the player strives for (for more basic discussions of goals see Juul, 2005; Salen & Zimmerman, 2004). Game rules assign values to events, a subset of which may be end conditions that, once reached, terminate the game. A two-player "road rage" battle in *Burnout III* (see Figure 22), has two end conditions: *A player takes down ten enemy cars* or *a player is the "last man standing"* (as the other player's car is destroyed). These end conditions are binary; they have either occurred or not occurred. Meanwhile, each time a player takes down an enemy car his number of takedowns increases by one. The event of a player taking down an enemy car is thus assigned a specific quantified value and in that sense the player who has nine takedowns can be said to be doing better than the player who has none, even if that first player has not won. Since taking down an enemy in *Burnout III* (apart from the 10th one) is in itself a means to a larger end we can distinguish between ultimate and proximate goals. Ultimate goals are end conditions while proximate goals are steps towards that end. The latter can have a specific numeric value (i.e. killing an end-level boss releases a 1000 point reward) but they are always binary in the sense that they must simply be reached in order to progress (i.e. killing an end-level boss is imperative to proceeding to the next level and so the goal is merely reached or not reached).

[23] The "more or less" should be stressed since it is the preferences that are determined, not the behaviour per se.

Figure 22 – *Burnout 3*

An event can be advantageous to a player, without constituting a proximate goal. This is the case in *Chess*, for instance, where game states do not represent unambiguous "scores". One cannot look upon the capture of a particular *Chess* piece as an event with a certain value. Capturing an enemy rook needn't indicate progress towards the goal (of checkmating the enemy king)[24]. Similarly, in *Far Cry,* eliminating certain enemy soldiers is not a proximate goal as sneaking by or outrunning them need not hinder one's progress in terms of the game's hierarchy of objective goals (see Figure 23).

[24] Although the derived *progress* (as opposed to the absolute *value*) of the move could, in principle, be determined if one had a complete decision tree showing all possible games of *Chess*.

Figure 23 – *Far Cry*
Eliminating the drivers of the enemy jeep (left) is not an objective proximate goal but finding a way to lower the rubber boat (right) is, as the boat is necessary in order to proceed.

Games differ significantly as to their use of proximate goals and this difference is linked to player freedom. In *Space Invaders* (see Figure 6) the player *must* eliminate every alien spacecraft on the screen to proceed. But in *Age of Empires II* the player is only presented with an ultimate goal (e.g. total world domination) and is free to achieve it in any way desired. Table 1 shows examples of ultimate and proximate goals.

	Ultimate goal	*Proximate goals*
Space Invaders	Destroy all aliens (impossible to actually achieve)	Destroy every alien spacecraft on each level
Age of Empires II	Dominate world (in different ways)	None
Far Cry	Escape tropical island	Many (e.g. find particular objects, lower rubber boat)
World of Warcraft	None	None

Table 1 – Examples of ultimate and proximate goals

Summing up, goals are that which the player tries to achieve and in terms of the Rational Player Model that means the objective goals of the game. Goals may be ultimate or proximate and both types may have quantifiable values attached to them and are always also binary.

But how are the goals communicated to the player? Game designers use a series of different techniques. Many early arcade games specified the game goal on the cabinet or as on-screen instructions (for instance the *Rally-X* player was told to "By dodging red card and rocks. Clear 10 flags before fuel runs out."). Although later games have grown more complex such succinct and explicit statements are still common.

Often, however, goals are communicated at least partly by convention. The arcade game *Out Run* is a racing game in which the player races against the clock to reach certain specified check points. But this goal is only stated indirectly. No on-screen instructions are shown as the player is told to “get ready” and is placed in control of the car. Noticeably, the time starts counting down which is an indirect indication that the player should drive as fast as possible (as opposed to, say, ramming enemy cars). If missing the goal, the player is told that the game is over (without further explanation) and shown a map of the entire course on which checkpoints are indicated by red squares without description (see Figure 24). In other words, the player who wants to progress in the game needs to either inductively discover the goal by playing multiple times or interpret the game as belonging to a certain category of games characterized by certain ludus rules.

Figure 24 – *Out Run*
The player starts out with “Get ready” as the only instructions (left) and if unsuccessful is told that the game is over (middle) to be shown his end position on a “course map” with red squares symbolizing check points (right). Time left to reach checkpoint is displayed in the upper left corner (left and middle).

While somewhat opaque, the goals of *Out Run* are unambiguous. In case the player does not work towards reaching the next checkpoint on time, the game simply stops. Thus even a player who might have the subjective goal of enjoying the scenery is forced to accept the objective goal (if she wants to play for more than 75 seconds). Thus, with the exception of the relatively unclearly stated goals, *Out Run* conforms to Jesper Juul’s observation regarding goals in many early arcade games (Juul, 2005): 1) goals are explicitly communicated, 2) there are dual goals of progressing in the game and getting a high score, 3) the game strongly punishes the player who tries not to reach the goal, ending the game, and 4) the range of playing styles offered by the game is relatively narrow.

In general, arcade games have simpler objective goals than computer and console games. The former are constructed to part arcade guests from their quarters and thus provide highly focused, intense and brief experiences. But within the larger set of computer and console games considerable variation exists. In particular, the difference is great between arcade-style games like *Burnout III* and process-oriented games (Egenfeldt-Nielsen et al., In press) such as *Elite*, *Sim City* and to some extent the more recent *Grand Theft Auto* games. The latter type does not clearly specify game objectives letting the player herself decide what to aim for. For instance, in *Elite* the player is a space merchant who is merely told that she is docked at the Lave space station and is then set free to explore or seek her fortune by trading, smuggling, pirating or completing small jobs. *Elite* has no end condition, no way in which the player can objectively win and while this is technically also the case for many arcade games, *Elite* does not even need to end as the player may continue until she becomes bored or decides to start over.

How does this relate to the Rational Player Model? In the model, the player pursues objective game goals. Thus, the *Out Run* player is assumed to attempt to reach the check points before time runs out. In the language introduced above, only one utility function is generally compatible with the game (up and above the first 75 seconds): *The prescribed utility function* (reaching the checkpoint is preferable to pleasure cruising or bumping into trees etc.). Or put slightly differently, the game strongly *urges* the player towards accepting a particular utility function but does not of course ultimately *decide* how the actual player behaves. We may compare this to the way a house with a kitchen "urges" inhabitants to cook food in the kitchen but does not ultimately restrict them from cooking in the living room.

The fact that a game is process-oriented means that it has no prescribed utility function. *Elite* does constrain the player (only a subset of all imaginable actions are possible in the gamespace) but it does not clearly communicate the value of any action or event[25]. Thus, the game is compatible with a far larger set of utility functions such as travelling-randomly-between-systems-is-preferable-to-smuggling or completing-missions-is-preferable-to-smuggling-which-is-preferable-to-trading. In other words, regarding the *Elite* player the Rational Player Model has no real predictions apart from the general one that *Elite* players are likely to exhibit a far broader range of playing styles than *Out Run* players.

At this point, a few qualifications are in order. Firstly, the examples above have largely been single-player games in which the goal is often to work towards an end condition, whether that condition is real or implied (*Space Invaders*, for instance, implies that one can defeat the alien attackers and thus win while in fact such an event is not possible in the game). In multiplayer games, victory or defeat is generally relative; such games are not about doing *well* but by doing *better* than the opposition (simplifying somewhat, I limit this discussion to competitive games. I'll have more to say on alternative forms in the following sections). This is decidedly the case in *Chess* where a player's effort is not readily quantifiable beyond the win-lose-draw end state[26]. Other games have multiple (quantified) score systems. In *Age of Empires II* a player wins by defeating the opponents but each player's individual effort is also constantly evaluated and displayed as a combined score in one corner of the screen. In this case, one can far more objectively be said to be doing well or poorly at any point in the game. Finally, whereas the *Age of Empires II* scores are partly relative (e.g. the player who has collected the *most* gold at any one time has a score bonus) other multiplayer games simply display scores representing the cumulative result of the player's past efforts. This is the case in *Super Monkey Ball* where a player's score is mostly independent of that player's relative position and therefore can serve as a measurement of success in itself. Even outside the context

[25] Although it may be virtually universally accepted that death is *bad* and earning money to buy larger spacecrafts is *good.* Also, the player is awarded a "status" based on achievements (the highest being "elite").

[26] While not objectively quantifiable some agreement exists about the quality of one's play. For instance, someone lasting for *many* rounds against a grandmaster is doing better than someone lasting only *few* rounds.

of that specific game round, a high *Super Monkey Ball* score can be said to be better than a low one. Thus, the "running" score in multiplayer games can be either:

1. Unquantified: The score is not specified until the game ends (as in *Chess*)
2. Ordinal: The score conveys the relative ranking of the players (as in *Age of Empires II*)
3. Cardinal: The score represents the substantive achievements of the players (as in *Super Monkey Ball*)

Another important qualification concerns the player's relationship to the game goals. Clearly, a full understanding of a game's ultimate and proximate goals is not magically transferred into the player's mind when running the game. Understanding goals is a matter of interpreting information, whether by reading instructions or by making inferences based on genre cues and previous experience. This active reading of the game system in order to understand goals and the interaction with the game in order to decide on sensible strategies to reach these goals is largely unstudied. We do not have a systematic understanding of how these processes take place but the fact that they are largely bracketed in this dissertation does not mean that they are trivial (see **Future perspectives** in **Chapter 5: Conclusions and new perspectives**).

Let me summarize this discussion of goals. The notion of goals is central to the perspective of this dissertation as they are that which the player strives for (and in the context of the Rational Player Model player goals and objective game goals coincide). Most games have ultimate goals, i.e. they have victory conditions. Games also typically have proximate goals; objectives which must be achieved in order to meet the ultimate goal (e.g. completing level one in *Far Cry*, taking down your first enemy car in *Burnout III*). But this is not always the case as for instance *Chess* has no proximate goals[27]. Certain process-oriented games such as *Sim City* have no ultimate goals and they can be said to accommodate a broader range of utility functions than do games with clearly specified ultimate goals. Multiplayer games handle the

[27] Arguably, *Chess* has *abstract* proximate goals such as *position your pieces in such a way that you are likely to be able to check mate your opponent as quickly as possible* or *strengthen your own strategic position.*

assignation of "running" score in different ways but in general, competitive multiplayer games have two sets of goals: Ultimately, the player wins by besting the other player(s) but individual score is also displayed.

Having seen how games use different goal types we turn now to the actual application of game theory to video games in order to derive models for the analysis of conflict types.

Game theory and video games

Two prisoners. Those are the primary ingredients for almost every introduction to game theory, and this one will be no exception (another basic ingredient is cake, but in this dissertation that only comes later). As mentioned in the introduction, game theory is the study of strategic conflict. It is a formalized way to analyze the dynamics of interaction between agents who have certain options available and where each person's choice affects the other person(s). Such abstractions convey very little, which is why, after a short survey of the use of game theory in game studies to date, I will bow to tradition and begin with the prisoners. After this initial example, the chapter discusses briefly the nature and historical context of game theory. Following that, I examine the relationship between game theory and video games which leads to an analysis of the general landscape of video games from a game theoretical perspective. Finally, I focus on the crucial notion of strategies asking whether, how, and what games are strategic ending with an index of strategicness.

Analytical game theory in game studies

Being a formalization of ideas concerning strategic thinking in situations of conflicting interests, we should not be surprised that analytical game theory has already lent inspiration and concepts to work on video games. Indeed, discussions of conflict in other arenas often implicitly build on game theoretical models. For instance, concepts like zero-sumness (or non-zero-sumness) have been assimilated into even non-technical language to the extent that the speaker need not be aware of their disciplinary origin.

To game designers, analytical game theory is sometimes seen as both providing useful tools for thought due to its general analysis of the dynamics of conflict and concrete mechanisms for achieving certain ends in game design. These latter mechanisms may be either computationally precise as in the case of plotting expected frequencies of game units into payoff matrixes or more heuristic as in discussions on how certain design features may inspire certain playing styles.

An example of the latter is found in Elina M. Koivisto's study of group formation in MMORPGs (2003). Koivisto points out that in games such as *Anarchy Online* "The non-zero sum experience sharing seems to encourage players strongly to form teams" (8). This refers to the design choice that an effort accomplished as part of a group is rewarded more liberally than the same effort would have been if performed single-handedly. In other words, the relationship in payoff between a play-alone strategy and a play-together strategy has been altered in favour of cooperative play (assuming that players are "rational").

Designers Andrew Rollings and Dave Morris consider game theoretical concepts useful for ensuring game balance and discuss the problem of dominant and dominated strategies; strategies that have no effective counter-strategies and strategies that are never effective respectively (Rollings & Morris, 2000). They suggest that variations of the rock-paper-scissors principle (no strategy is inherently stronger than others) can be applied to ensure balance and mention informative examples of games that have succeeded or failed in this account. I'll return to these issues below.

On a more general level, Katie Salen and Eric Zimmerman, in their ambitious examination of game ontology and design (Salen & Zimmerman, 2004) have described how the tools of game theory may provide a fruitful perspective on games. Through a summary of important game theoretical terms they argue that the perspective may help video game designers understand the anatomy of choice but the authors do not address many concrete implications for video game understanding or analysis, musing that "Game theory is a curious thing. It promises to be a detailed theory of decision making in a game context. At the same time, its relationship to real-world games seems incidental…" (243).

Offering a more concrete suggestion, game designer Markus Friedl proposes that the Prisoner's Dilemma (to which we will return promptly) may serve as a guideline for the design of situations of non-violent conflict in multiplayer online games (Friedl, 2003). He stresses that the tension imbedded in such situations can create interesting choices and dramatic situations as players consider whether to trust one another in dangerous circumstances[28]. Friedl, then, is arguing that game theory games themselves, and not just the concepts and tools of the discipline, may lend inspiration to designers attempting to create or inspire dramatically compelling situations. Others have made very similar proposals (Bocska, 2001; Fullerton et al., 2004).

In a recent example of game theory employed as an analytical framework (Zagal et al., 2006), the authors examine mechanics meant to encourage player cooperation through a case study of the *Lord of the Rings* board game. The authors present an analytical model distinguishing between three objective player relationships and identify pitfalls in the design of cooperative games. As the model proposed is closely related to the analytical ambition of this dissertation, it will be briefly addressed below.

So far, the meta-argument has been that other disciplines (in this case economics) can be enticed to produce game research or design tools; an argument central to this dissertation. Recently, Edward Castronova has maintained that the opposite is equally true; that games may hold lessons for other fields. In *On the Research Value of Large Games*, Castronova makes the case for MMORPGs as dramatically potent contexts for testing social science hypotheses (Castronova, 2006). As illustrations of the methodological potentials, Castronova shows how the cross-server emergence of market locations in *EverQuest* and popular battle fields in

[28] One might add that such situations of interpersonal uncertainty may serve to inspire communication, something many players enjoy (Smith, 2003), as players look for cues of trustworthiness (or the opposite) in each other.

Dark Age of Camelot are evidence of large-scale coordination effects predicted by coordination game theory (discussed on page 94). The possibility of gathering such strong evidence of coordination effects, in this MMORPG-as-petri-dish view, is a consequence of the unique multi-server setup in fact meeting near-utopian methodological wishes of many social scientists. Thus, Castronova both applies game theory to explain a gaming phenomenon and uses games to study game theory.

In sum, the works mentioned show that game theory lends inspiration, if only sporadically, to game thinkers, particularly in normative (i.e. design-oriented) contexts. Exceptions to this rule are Salen and Zimmerman who attempt to examine the wider analytical value of game theory beyond single aspects of game design and Castronova who sees game theory as having explicatory value for game sociality and video games as having great implications for game theory itself.

Brief introduction to game theory

Back to the prisoners. As Peter Kollock notes, *The Prisoner's Dilemma* (*PD*) is "the game that launched a thousand studies (actually, several thousand)." (Kollock, 1998: 3); it is an extraordinarily well-studied abstraction. It is often presented in terms of a narrative which, while potentially slightly confusing, serves its purpose of illustrating the core issue. Here is one version containing the standard elements: Two persons (say, Bob and Alice) are pulled over in a car, found to be carrying an unregistered firearm and charged with committing a recent armed robbery. The district attorney realizes that he cannot have them convicted without a confession and so offers each of them, now in isolated cells, a deal: If one confesses while the other remains silent, the confessor will go free while the other will spend five years in prison. In case both confess, both will face a diminished sentence of three years. Everyone understands that should there be no confession, Bob and Alice will both serve one year in prison for possession of the unregistered firearm. What happens then? For any real-life pair of prisoners we cannot know. But in the logic of game theory, soon to be specified, the following happens: Bob examines his possible outcomes, being unable to predict what choice Alice will make. First he considers the situation if Alice confesses. In this case, should he also confess he would face three years in prison while, should he remains silent, he would face a five year sentence. Assuming that Alice confesses, Bob would prefer to also confess given that he wants to minimize his sentence. Secondly he considers the situation where Alice remains silent. In that case, should Bob confess he would walk free, while if he also remains silent he would have to spend one year behind bars. Bob confesses. And in her cell, faced with an exactly symmetrical choice, so does Alice. The result is a sentence of three years for each. And that is generally considered the most interesting feature of the game: By acting selfishly they both achieve a sub-optimal outcome. If only they had trusted each other they would have been able to do better.

Before we model their dilemma as a game, we will change one important thing. In the story above, Bob and Alice want to *minimize* their sentence but the convention when it comes to games is to convert the strived-for resource (or whatever) into positive point values (e.g. an outcome which desirably *minimizes* pain is assigned a high payoff). Thus, we will now forget about the years in prison and simply talk of outcome in points.

Based on the above, here is a *PD*[29] in standard form (Figure 25):

[29] Game theory games are defined by their general attributes. Thus, the games with specific payoffs shown in this section are *examples* of the games in question.

		Alice	
		Cooperates	*Defects*
Bob	*Cooperates*	Bob: 3 points Alice: 3 points	Bob: 0 points Alice: 5 points
	Defects	Bob: 5 points Alice: 0 points	Bob: 1 point Alice: 1 point

Figure 25 – A *Prisoner's Dilemma*
Numbers indicate points given (the more points the better). The overall maximum is achieved through mutual cooperation (6 points) but the individual maximum (5 points) is achieved through defecting while the other player co-operates. To qualify as a *PD* points need only follow the relative ranking showed.[30] The result of the game is marked is grey.

Alice and Bob here both have the opportunity to either cooperate with each other or defect on one another, corresponding, in terms of the prisoner narrative, to staying silent or ratting on the other player.

This table presents the game in it *normal* or *strategic* form showing the four possible outcomes of the game each including the *payoff* for each player (just like the two games in **Chapter 1: Introduction**). Bob chooses one of the two rows while Alice chooses one of the two columns.

We're assuming certain things about how the players think. Importantly, they care only about their own outcome. For instance, it doesn't matter to Bob how many points Alice gets; he just wants to maximize his own payoff. This is different from saying that Alice's points are unimportant to Bob. Quite the contrary, since in many games the other player's payoffs will be part of the analysis of what is likely to happen and thus what one should do. We're also assuming in a "single-shot game" such as this that the players have no expectation of future interaction whatsoever or, alternatively, that they have no way of recognizing each other if they do meet again. And even though the *PD* narrative talks about the two being separated we are in fact also assuming that they are entirely unsusceptible to non-binding promises or communication in general. If two players were allowed to speak together before

[30] Though when studying iterated versions of the *PD* it is generally specified that the sum payoff of cooperate-cooperate (3+3=6 in the figure) must exceed that of cooperate-defect (5+0=5 in the figure).

making their choices in a *PD,* we are assuming that this conversation would have no bearing on their choices whatsoever[31].

Based on the assumption that the only thing they want to maximize is their own payoff we see that both players defect since that is the best solution for both of them no matter what the other player does. We can also see that in a sense they "should" have cooperated. Even from an individual point of view that would have been preferable in retrospect, but in the *PD* the two players have no way of implementing measures (say, a contract) to establish trust. The payoffs shown represent each player's utility function and this deserves a clarifying note: In a sense the *PD* is defined by these payoffs. Strictly speaking, the *PD* is a model of a certain interaction type between two individuals with a certain relation between their respective payoffs. Returning to the armed robbery narrative, it is perfectly possible that any alternative Bob is not tempted to defect on Alice; perhaps he fears retribution from her violent brothers (lowering all Bob's defect payoffs) but in that case he is not playing a *PD*.

This analysis presupposes another crucial feature of the players' mindset. In game theory, players are typically assumed (unless stated otherwise) to be risk neutral; that is, players care only about maximizing their expected payoff. In the *Spacewar!* example on page 14 we saw that expected payoff is simply the probability that a certain event will occur multiplied by the payoff of the event (e.g. if a die roll of six on a standard die yields 10 points while one-through-five yields nothing, the expected payoff of a roll is $1/6$ X 10 + $5/6$ X 0). To take another example: A player of a racing game faces the choice between the main road and a risky shortcut knowing that crashing the car means losing (i.e. getting zero points). The player believes she has a 90% chance of taking the main road without incident which would give her 20 points. She also believes that she has a 20% chance of safely using the shortcut which would give her 150 points. To find out what the risk neutral player will do, we calculate the expected payoffs:

[31] That communication is irrelevant may seem objectionable (or just plain unrealistic). I'll return to the issue in **Communication and trust** below.

Expected payoff from main road: 0.9 X 20 points = 18 points

Expected payoff from shortcut: 0.2 X 150 points = 30 points

Caring nothing about risk, and only about expected payoff, the player chooses the shortcut.

The *PD*, the reader might agree, is clearly a curious little illustration of a situation where selfishness leads to a suboptimal outcome. But what is so extremely important about it that numerous fields devote such extravagant effort to its implications? To answer that, we need to briefly consider the larger issue of game theory.

As noted, game theory is a formalized approach to strategic interaction; it generally tries to model situations where the agents are interdependent and where each agent's best choice depends on the choices of other agents[32]. In such general terms, of course, game theory is an ancient pastime. Aristotle, in his *Politics*, noted tension between individual and collective interest and the ensuing problems (see Kollock, 1998: 190) and in the same period the set of laws known as the *Talmud* contained principles concerning estate division that baffled scholars in later millennia until these principles were shown to be based on game theory (R. Aumann & Maschler, 1985). Yet unformalised, political thinkers Jean-Jacques Rousseau and Thomas Hobbes based much of their analysis on logic which, in retrospect, is game theoretical. Hobbes, in fact, arguably envisioned human social life as (akin to) a Prisoner's Dilemma and argued that the only solution to the misery of the *PD* dynamics was an all-powerful state which would essentially change the game by lowering the payoffs for defection (Hobbes, 1651/1997). Later, various advances in mathematics and economics would be precursors of later concepts and proofs but it was not until 1913 that the first actual game theory theorem was published by Ernst Zermelo, working on *Chess* (Zermelo, 1913/2001). Johan von Neumann, in 1928, maintained this focus on games in the classical sense in his

[32] More precisely, these are the situations that game theory was developed to study. The framework can also encompass simpler situation as we shall see later.

article *Zur Theorie der Gesellschaftsspiele* but it was only with Neumann and Morgenstern's *Theory of Games and Economic Behaviour* (Neumann & Morgenstern, 1944/1972) that the game theory subfield came onto its own. One ambition behind this work was to further place economics on firm mathematical ground but game theory is also a *challenge* to traditional economics. In classical and neo-classical economics the individual is typically seen as making choices based on personal preferences alone: You are willing to pay that sum for a loaf of bread which corresponds to its value for you (and what others do or think has no bearing on that value). But game theory has a different focus. Here, analyses usually deal with situations where the correct, or best, choice to make depends on what others do or are likely to do. Using the simple example from the introduction: Will you be best served by driving on the left or the right side of the road? It depends on what others do. Another simple one: Should you dash madly for exit in the burning theatre or walk calmly in a line? If others stay calm you should most likely do the same, whereas if others panic you might be trampled if you don't join in the race for the exit. More complex: Should you buy stock in an upcoming bio-tech? That depends on your evaluation of other similar companies, on the way you think that other potential stock-buyers perceive information divulged by the particular company and even on the way you think those other potential buyers perceive your perception of that same information and so on. The *PD*, as discussed above, is a special case in that each player *will* consider how the game looks to the other player, but will make the same choice (defect) regardless of what the other is believed to do.

As mentioned earlier, the game theorist thinks of all such situations as *games* because they get modelled "as if" they were games. Game-like terminology is used and thus, the agents in such a situation are called *players* and their options or actions are called *moves* or *strategies*. In this sense, game theory is not typically about games; in the recreational sense that is. Nor is it in fact a theory. It is rather an approach to modelling a certain type of social situations in a formal way in order to understand their behavioural dynamics.

This approach has found application in a wide range of fields. It is deeply ingrained in mainstream economics but also plays an important role in political science (e.g. Hardin, 1968; Ostrom, 1990), a less prominent one in sociology (see review in Swedberg, 2001) and anthropology (e.g. Barth, 1959; e.g. Boyd & Richerson, 1985), and a rapidly growing one in computer science (Chatterjee, 2002). Of particular note, is the importance of game theory for evolutionary biology (and, through this, for evolutionary psychology). At a glance, the latter may seem puzzling since game theory is so often thought of as the study of strategically intentional, even deliberative, social action whereas biological evolution is generally thought of as the opposite (non-intentional, non-deliberative occurrences). But game theory has a number of sub-fields. First and most important, we can distinguish between cooperative and non-cooperative game theory. The former deals with situations in which agents may make binding agreements whereas the latter deals with situations in which that is not possible[33]. The *PD* is an example of the latter. By far the most commonly studied is the non-cooperative variant, and "game theory" typically (as is the case in this dissertation) is simply shorthand for "non-cooperative game theory". Another split runs between game theory in the social sciences, which I'll refer to as *social game theory*, and in the natural and biological ones, which I'll refer to as *evolutionary game theory*. In evolutionary game theory there is no out-guessing the other player(s) as there is typically no mental work going on at all. Instead the evolution of biological traits, species or algorithms is seen as the consequence of a selection process working upon some variation which is modelled in terms of strategies. For example, the basically equal gender distribution of human babies (which provided a conundrum to early evolutionary thinkers since it seemed to imply some sort of agreement favouring the species) is seen as the result of a situation without stable strategic advantages of "playing" either "male" or "female" (Skyrms, 1996: 1-21). If females begin dominating the population the relative advantage of playing "male" increases and vice versa. Another example is Robert

[33] When players of non-cooperative games in the following are said to "cooperate" they display cooperative *behaviour* without having entered a binding agreement.

Axelrod's seminal work on modelling how cooperative behaviour can arise in a world governed by the survival of the fittest; Axelrod let algorithms (thought of as strategies) compete in a repeated *PD* with an evolutionary reward for doing well (Axelrod, 1984). Finally, game theory can be either analytic or behavioural. *Analytical game theory* is the classical logical/mathematical approach which works with models and their logical solutions, an example being the very brief analysis of the *PD* above. *Behavioural game theory* is part of the larger movement towards increased attention to empirical testing of economic models (for a review of behavioural game theory see Camerer, 2003; Kagel & Roth, 1995) and seeks to study the ways in which actual people act in situations of strategic conflict. For instance, test subjects might be asked to play through the *PD* in order to understand the ways in which such play fits with the model and in order to look for patterns in play behaviour.

Game theorists are generally interested in game results. Having modelled a game, they ask how it will play out, i.e. what strategies the players will use and what payoffs they will receive. This is often referred to as the "solution" of the game. For instance the Defect-Defect condition is the solution of the *PD* as described above. More generally, this attempt can be interpreted in three ways: A) It is a purely logical exercise. If game theory games are seen as purely mathematical problems then their "solutions" are purely mathematical. B) They seek to explain or predict actual behaviour in which case game payoffs are thought of as reflecting the payoffs of actual players. C) They seek to model real-life situations in order to provide advice on how one "should" play them to maximize payoff[34]. A dramatic example of C is the use of game theory to provide council on how to best "play" the nuclear standoff of the cold war[35]. In epistemological terms, B is the most problematic of the three because it touches directly on the above discussion of assumed preferences.

[34] For discussions on the core logic of game theory see (Bruin, 2004; Rubinstein, 1991).

[35] Severely parodied in Stanley Kubrick's film *Dr. Strangelove or: How I Learned to Stop Worrying and Love the Bomb* (1964) and more ambiguously treated in John Badham's *WarGames* (1983).

In a general criticism of the notion of agency in economics, Herbert Simon scathingly noted that the economic agent

> has a complete and consistent system of preferences that allows him always to choose among the alternatives open to him; he is always completely aware of what these alternatives are; there are no limits on the complexity of the computations he can perform in order to determine which alternatives are best; probability calculations are neither frightening nor mysterious to him… [game theory and other developments] has reached a state of Thomistic refinement that has a great intellectual and esthetic appeal but little discernable relation to the actual or possible behaviour of flesh-and-blood human beings. (Simon, 1945/1997: 87)

Colin Camerer notes that the standard reply to such critiques is that game theory is

> a body of answers to mathematical questions about what players with various degrees of rationality will do. If people don't play the way theory says, their behavior has not proved the mathematics wrong, any more than finding that cashiers sometimes give the wrong change disproves arithmetic. (Camerer, 2003: 5)

Of course, Simon is arguing that game theory is B on the list of game theory interpretations above while Camerer notes that it can be seen as A. Thus, both claims are right, but the "standard reply" tends to relegate game theory to the area of mathematical abstractions. The assumptions of game theory, consequently, are to some degree a matter of its application. For social game theory of the analytical type, the general assumptions are those of neoclassical economics. While game theory presupposes utility functions unlike neoclassical economy, a model like the *PD* should not be read as "People in this social dilemma will do so and so" but as "Players in this social dilemma *and who have these exact utility functions* will do so and so".

While this chapter is aligned most closely with A, the next chapter builds on B but only in the sense that the model is applied predicatively and then compared to the reality of player behaviour in the study.

Modelling games

We can now more concretely address the actual modelling of games. A "game", in game theory, is a model of a social situation kept intentionally simple to highlight core dynamics, being "a mathematical x-ray of the crucial features" (Camerer, 2003: 2). Games come in two forms. The *PD* discussed above was shown in its strategic form (also known as the normal form) displaying the payoffs of strategy combinations. The assumption behind this illustration type is that players make, or at least reveal, their choices simultaneously. In some games, having one player make and reveal his choice first might alter the outcome. This is (or might be) the case in what is commonly known as the *Stag Hunt* game based on an example given by Jean Jacques Rousseau (extensively discussed in Skyrms, 2004), and illustrated in Figure 26.

		Alice	
		Stag	*Rabbit*
Bob	*Stag*	Bob: 10 points Alice: 10 points	Bob: 0 points Alice: 8 points
	Rabbit	Bob: 8 points Alice: 0 points	Bob: 7 point Alice: 7 point

Figure 26 – A *Stag Hunt* game
Bob and Alice are on a hunting trip. Cooperating to kill a stag provides the best outcome for both (10 points each), but neither wants to waste time hunting stag if the other chooses to go for an easier rabbit kill (0 points for the stag hunter and 8 for the rabbit hunter).
Here one player's best choice depends on the other player's choice. If Alice were allowed to choose last, she would choose the strategy which Bob had chosen. Being able to make his choice first would be an advantage for Bob who could safely choose to hunt stag.

However, this is not the case in the *PD* where the second player would still defect no matter what the first player had chosen. An example of an asynchronous *PD* type is the so-called *Farmer's Dilemma*, so named after an example given by philosopher David Hume. Hume imagines two farmer neighbours:

> Your corn is ripe to-day; mine will be so tomorrow. It is profitable for us both, that I should labour with you to-day, and that you should aid me to-morrow. I have no kindness for you, and know you have as little for me. I will not, therefore, take any pains upon your account; and should I labour with you upon my own account, in expectation of a return, I know I should be disappointed, and that I should in vain depend upon your gratitude. Here then I leave you to labour alone: You treat me in the same manner. The seasons change; and both of us lose our harvests for want of mutual confidence and security. (Hume, 1739/2003 Book II, Of Morals)

We can present the *Farmer's Dilemma* in a different way from the normal form of games shown till now. A game in its *extensive* form is a way of showing the game's dynamics over time in situations with series of choices or where choices are not made simultaneously (see Figure 27).

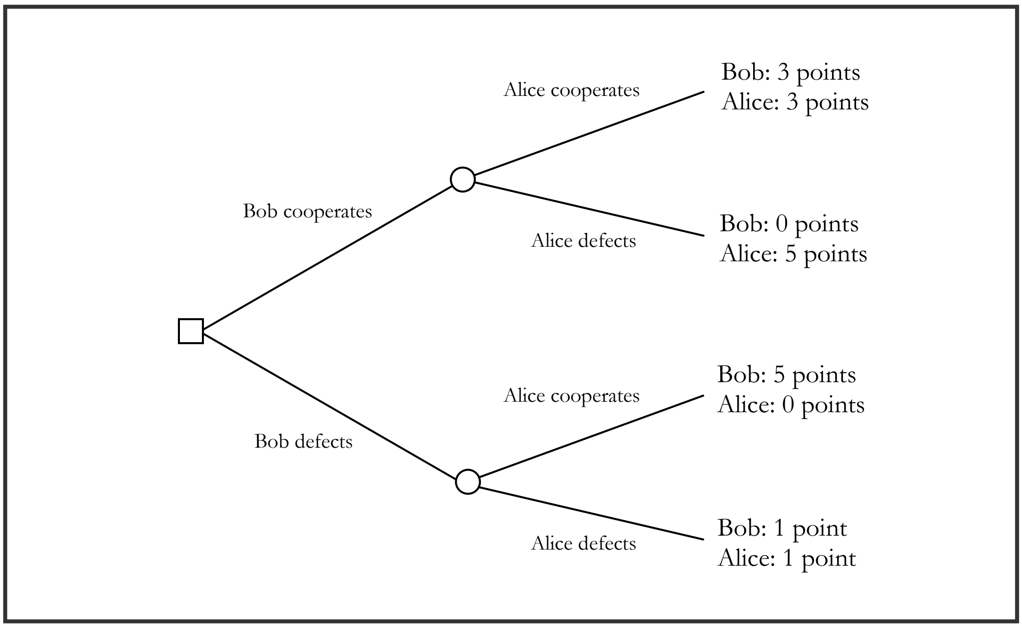

Figure 27 – A *Farmer's Dilemma*
One farmer, in this case Bob, chooses first (at the square) and the other farmer , Alice, chooses second (at the circles). Payoffs follow those of the **PD** shown in Figure 25.

Game theorists, in latter years, have increasingly relied on extensive form models (Sandler, 2001: 52). This allows for more complexity and has certain other advantages. In the following sections, however, I will exclusively use the strategic form representations. This simplified format is preferable here as I will (as a rule) be focusing on core strategic dynamics and categories rather than detailed descriptions of how single games play out. The approach will I will take is an informal one. I will rely on prose to analyse games, and based on these analyses I will model a limited number of strategies and assign hypothetical payoffs. All of this is best explained by example, so let us return to the two-player arcade game *Joust* (see Figure 14 on **page 51**).

From the perspective of the *Joust* player, the gamespace holds two types of dangers. One is the AI-controlled enemies and the other, as mentioned earlier, is the other player. The other player is dangerous because players cause as much damage to each other as to the enemies. Now, this would be bad enough in itself since unplanned collisions are quite frequent in the highly limited wraparound gamespace but the other player also has an *incentive* to come after you as killing the other player yields 2000 points which is actually more than the reward for finishing off an AI knight[36]. But clearly the other player represents another opportunity for maximizing one's score as teaming up against the bird-mounted opposition means having to deal with one less enemy at a time (and likely one much more dangerous than the behaviourally unsubtle AI opponents). Of course, if you fear that the other player is not cooperating fully or that he is too unskilled to be safe you may be better off trying to finish him before he finishes you. Thus, in *Joust* there is a trust issue and the combined score of the players depend on how they choose to play[37]. Although a player may of course choose a variety of mixed strategies, the above description can be tentatively modelled as shown below (Figure 28).

		Alice	
		Cooperate	*Defect*
Bob	*Cooperate*	Bob: Best Alice: Best	Bob: Bad Alice: Good
	Defect	Bob: Good Alice: Bad	Bob: Mediocre Alice: Mediocre

Figure 28 - Tentative model of the prospective *Joust* pay-offs.

Modelled in this way, we can see that *Joust* shares the trust issues of both the *PD* and the *Stag Hunt* games (no one wants to cooperate if the other player defects) but that it mostly resembles the latter as the temptation to defect does not outweigh the gains of mutual cooperation. Thus, the game will tend towards mutual cooperation but the alliance is unstable if Bob: A) Does not trust Alice (i.e. has doubt about her utility function), B) Does not trust the Alice's ability to cooperate or C) Does not believe that Alice trusts *him* regarding the aspects of A and B. The latter problem might theoretically be an endless chain where Bob does not believe that Alice believes that Bob believes etc.

We should note that modelling video games in this way means highlighting the game's essential conflict as if that described the relationship between players in its entirety. But while the *Stag Hunt* game only involves one instance of choice, our

36 The game cannot be said to feature "friendly fire" as there really is only limited indication that the players are "friends" (as would be the case, say, for a *Battlefield 1942* team). The description above only concerns the standard game; various game rounds have different scoring conditions.

37 Of course, the combined score also depends on what the players are capable of doing (i.e. their skill).

Joust players are actually facing a series of choices over the span of one *Joust* game (or several games). Consequently, a choice made at any one point should be made with respect to its likely influence on one's future prospects. If we think of *Joust* as a series of *Stag Hunt*-like mini-games, defecting may well become less attractive to the player who fears retribution. The fact that iteration may affect game dynamics only applies to a certain game type. In *Pong*, even though the players are playing an iterated game (trying to reach ten points first), this does not affect the attractiveness of defection. The *Pong* player does not *fear* retribution, he positively expects it. But it does mean that a model like Figure 28 can potentially be made more precise if one wishes to more adequately capture this aspect of the game.

It is also worth noting that the strategies made available to players in the models correspond to choices in the actual game as the two *PD* strategies correspond to choices available to real-life prisoners in a *PD*-like situation. In this perspective, they are "compound strategies" meant as distillations of what is in fact a multitude of small choices of various types. I will return to this issue under **Strategy and equilibrium** below.

Sum and conflict type

Having seen how to model games, we can now appreciate the features which set games apart from each other from the perspective of the model. After considering, in this section, how game dynamics are affected by the relative distribution of payoffs we will see how the number of players affects these same dynamics.

All the games mentioned until now share a feature: The total payoff to be distributed among the players when the game ends is not fixed. In the *PD*, total payoff could be 2, 5, or 6 and in the *Stag Hunt* game it could be 8, 14, or 20. In one sense, this payoff structure resembles that of traditional games which award points for certain events from an unlimited pool of points. For instance, *Mah-Jong* players receive points based on their hands after each game round (a hand yields a fixed number of points regardless of the other players' hands). The same goes for soccer, where the competing teams can score a (theoretically) almost unlimited number of goals. And for multiplayer *Tetris* in which one can finish as many lines as one is able to. But of course, the objective of these games is generally never to achieve the highest possible score, but rather to achieve a score higher than that of the other players. "The object of the game is to become the wealthiest player…" as the rules of *Monopoly* specify (Hasbro, 2006: 1). Thus, for these games the end result is in fact fixed from the start: One player will win and other player(s) will lose.

In game theory, games in which the total payoff (for both players) does not depend on player choices are known as *constant sum games*[38]. The more general point about constant sum games is that players are diametrically opposed in their interests regarding final outcomes. In general, a soccer match is constant sum and therefore the two teams will have no incentive to cooperate. The same goes for a two-player *Age of Empires II* death match: From a game theory perspective one player wins as the other player loses and teaming up (however temporarily) simply makes no sense. Sticking to *PD* terms, any player/team cooperating with the other player/team makes herself vulnerable to defection.

This deserves a qualifying note, of course. We can imagine all sorts of reasons why actual concrete soccer matches are not constant sum. The game could be rigged, for instance. But more generally, specifics of scoring and the dynamics of competitions or tournaments may influence incentives for a specific game or match. In tournament play, for instance, soccer strictly speaking is not a constant sum game. We'll make a few assumptions and model the game. First, we assume or simply define that cooperation in this context means passivity or extreme defensiveness (not attacking the opposing team's goal; i.e. playing for a draw). Next, we assume that the teams are of equal skill (or have no idea which is the better team). Victory in tournament soccer yields 3 points and each team can expect a 50% chance of victory if both attempt to achieve it. In this case we can simply use this percentage to arrive at an expected payoff for each team in case of mutual

[38] Of which a subset is known as *zero-sum games*; those games in which the total payoff always equals zero.

defection (both teams try to win) of 3 x 0,5 = 1,5. And in that case, tournament soccer looks like Figure 29**.**

		Team Alice	
		Cooperate	*Defect*
Team Bob	*Cooperate*	Team Bob: 1 point Team Alice: 1 point	Team Bob: 0 points Team Alice: 3 points
	Defect	Team Bob: 3 points Team Alice: 0 points	Team Bob: 1,5 points Team Alice: 1,5 points

Figure 29 – Tournament soccer

As we can see, no matter what he thinks Alice will do, Bob will defect (and vice versa). Notably, this particular distribution of points is a relatively new invention. Prior to the 1994 World Cup, the soccer points were: 2 for victory, 0 for defeat and 1 (each) for a draw. The 2-points-for-a-win convention was changed due to widespread criticism over the high number of draws and the pervasiveness of non-aggressive play[39]. And we can see why from Figure 30 showing the pre-1994 setup.

		Team Alice	
		Cooperate	*Defect*
Team Bob	*Cooperate*	Team Bob: 1 point Team Alice: 1 point	Team Bob: 0 points Team Alice: 2 points
	Defect	Team Bob: 2 points Team Alice: 0 points	Team Bob: 1 point Team Alice: 1 point

Figure 30 – Tournament soccer (pre-1994 rules)

Using the old rules, cooperation still wasn't safe but incentives to be offensive were more modest.

Actual soccer matches, even under the new rules, are affected by concrete circumstances. Consider a situation where each teams needs one point (and one point only) to proceed in the tournament. In that case, the outcome of winning the match is no better than getting a draw; i.e. the game only has two outcomes for each team (win or lose; one or zero)[40]. 50% chance of losing in the defect-defect outcome then equals 0,5 points and this in fact makes mutual cooperation more

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[39] The British were the first to make the change (in 1981) and gradually other countries, leagues and tournaments followed (Wikipedia, 2006a)

[40] Since both a "drawn" match and a "won" match constitutes a win.

attractive providing strong incentives to attempt to reach a draw. Thus while a hypothetical stand-alone soccer match is constant sum, actual matches may not be.

The alternatives to constant sum games are generally known as non-zero sum games (of which we have seen many examples already). These are games where the combined score depend on the aggregate choices of these players (or, if you will, the size of the cake to be split is not fixed). Even in simple two-player cases, such games may inspire the players to cooperate as seen in the *Stag Hunt* game and in the pre-1994 rules soccer game.

In summary: sticking to two-player games for now, constant sum games never inspire cooperation while non-zero sum games may do so. Constant sum situations are recipes for all-out conflict, while in non-zero sum games, the exact payoff distribution can shape the conflict dynamics. In the *PD* the 5 points awarded for defection when the other player cooperates are often labelled the "temptation to defect". In general, the higher this number (in relation to the other payoffs) the more difficult it becomes to sustain cooperation.

Let us return briefly to the video game examples discussed above in the light of sum type and payoff distribution (since certain aspects require a discussion of what happens when the number of players is not two, this brief analysis will be expanded after the following section).

As mentioned, seminal early video games were completely competitive two-player games in the style of traditional games like *Chess* and *Backgammon*. In other words, they were constant sum. Thus, remaining true to the *PD* structure, *Spacewar!* (Figure 2**,** page 13) can be modelled as Figure 31 (as described in the introduction).

		Alice: *Peaceful*	Alice: *Aggressive*
Bob	*Peaceful*	Bob: 0,5 point Alice: 0,5 point	Bob: 0 points Alice: 1 points
	Aggressive	Bob: 1 points Alice: 0 points	Bob: 0,5 points Alice: 0,5 points

Figure 31 – *Spacewar!*
Defining victory as yielding 1 point and defeat as yielding 0 points.
Players are assumed to be of equal skill and in the case of mutual peacefulness one player is assumed to win at some point through chance. In this model, the players select between two loosely named strategies implying a non-aggressive stance where no attempt to harm the other spaceship is made ("Peaceful)" and an aggressive one ("Aggressive").

In *Spacewar!*, then, if Alice plays aggressively then Bob will want to play aggressively (0,5 points rather than 0 points) and if she plays peacefully he will still want to play aggressively (1 point rather than 0,5 points). The models for *Pong*, *Space Race*, *Gunfight* (see figures on page 48) and similar games would look the same.

These models could include any feasible strategy (e.g. for *Spacewar!*: "remain passive", "full boost to the right, then rapid fire in direction of star" etc.) but at this point, I am merely pinpointing core conflict types.

As noted earlier, *Fire Truck* (see Figure 13**,** page 50) players were in a remarkably different relationship. Here, players' utility functions were identical; their interests were exactly aligned (they even had a collective score count). From the perspective of either, hurting the other player means hurting oneself. This is shown in Figure 32.

		Alice: *Cooperate*	Alice: *Defect*
Bob	*Cooperate*	Bob: 1 point Alice: 1 point	Bob: 0 points Alice: 0 points
	Defect	Bob: 0 points Alice: 0 points	Bob: 0 points Alice: 0 points

Figure 32 – Fire Truck (core conflict)
Mutual cooperation does not mean victory on the larger scale, but does spell success in the concrete situation.

As we see, the choice to cooperate here is a no-brainer. But when playing *Fire Truck*, things are not always bliss and to see why we can look closer at what it takes to cooperate. Simplifying somewhat, each player wants to do what the other person does; i.e. they want to conform to each other, particularly in certain ambiguous situations as shown in Figure 33.

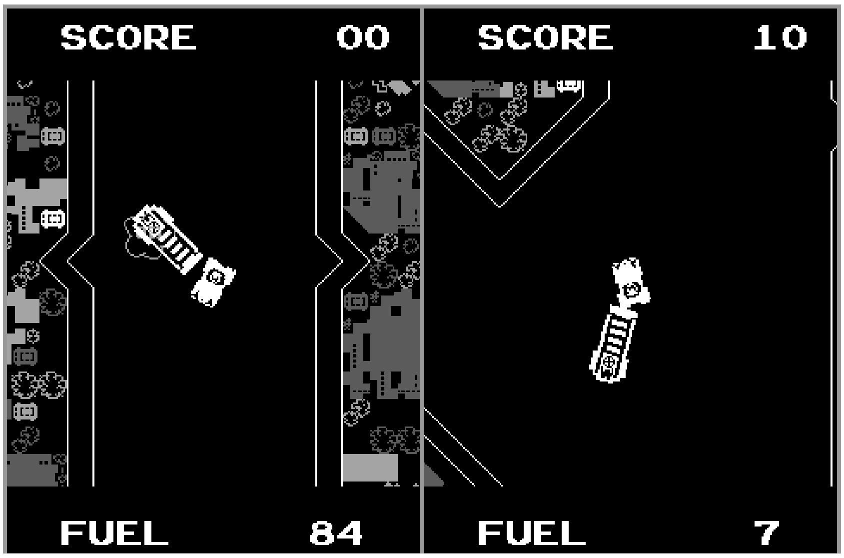

Figure 33 – Ambiguous situations in *Fire Truck*
Two ambiguous situations, in which the players should choose the same strategy (either "left" or "right")
The screenshot on the left shows the truck facing in the wrong direction, having hit an oil slick. The right screenshot shows the road diverging.

Modelled these situations look like Figure 34.

		Alice	
		Right	*Left*
Bob	*Right*	Bob: 1 point Alice: 1 point (outcome A)	Bob: 0 points Alice: 0 points (outcome B)
	Left	Bob: 0 points Alice: 0 points (outcome C)	Bob: 1 point Alice: 1 point (outcome D)

Figure 34 – *Fire Truck* (as coordination game)

Fire Truck, then, is an example of a game type which game theorists call "coordination games". A classic example, and one we saw in the introduction, is traffic: it doesn't matter as such which side of the road one drives on as long as all choose the same side. The *Stag Hunt* (Figure 26) is also a coordination game but of a different class where the two points of coordination are not equally attractive. In *Fire Truck* A equals D while this is not the case in the *Stag Hunt*. A game of *Fire Truck*, in other words, is an exercise in coordination in which there is no reason to distrust the other player. From the game theory perspective one should expect communication, but there is no one necessary solution to the problem of what to do (or indeed to the problem of who should decide what to do).

Spacewar! and *Fire Truck* represent two ends of a spectrum. We can say that one is fully competitive while the other is fully cooperative. But there are myriads of hybrids. As already noted, the alliance between *Joust* players was an unstable one; the game includes a sizable temptation to defect. *Mario Bros.* left out this temptation. Here, if the other player defected for some reason (e.g. ignorance of the rules or sheer spite) defection was probably the best course but generally the players could do better by collaborating (see Figure 35).

		Alice	
		Cooperate	*Defect*
Bob	*Cooperate*	Bob: 1 point Alice: 1 point	Bob: 0 points Alice: 1 points
	Defect	Bob: 1 points Alice: 0 points	Bob: 0,5 points Alice: 0,5 points

Figure 35 – Mario Bros.
Killing the other player (by defecting while he or she cooperates) here yields 1 point. Arguably this number should be smaller as the game becomes more difficult without the other player (on this view the defect-defect payoff should also be smaller)

Things become slightly more complex with *Gauntlet* (see Figure 16**,** page 52). Let us briefly consider one of its core conflicts by considering it a two-player game. In *Gauntlet* each player chose a character with special abilities constituting a break with the tradition that player characters shared the exact same characteristics (*Spacewar!*, *Pong*, *Gun Fight*, *Space Race* etc.). The available characters were:

- The wizard who was the most able user of magic potions
- The warrior who did the most damage in close combat
- The elf who did little damage but was fastest
- The valkyrie who was a combination of speed and strength

Thus, the special abilities of the characters were complementary, creating interdependence between players. The relationship between them was non-zero-sum in the way of classical comparative advantages: by creating surplus value through specialization. The setup was also blatantly inspired by the game's role-playing game ancestors such as *Dungeons and Dragons*.

Another feature, not present in most of the games discussed above, underscored player interdependence. Players were confined to a single screen while the gamespace scrolled omni-directionally. In other words, to get anywhere, all players had to cooperate by moving in the same direction.

But other features pull in the opposite direction. Players have separate scores and separate health counts. A health count of zero means death but health can be replenished by taking certain potions strewn around the game space (or by adding coins to the machine). Thus, while advancement in the game requires mutual cooperation, each player may well be tempted to gobble up resources without sharing.

		Wizard	
		Cooperate	*Defect*
Valkyrie	*Cooperate*	Valkyrie: 2 point Wizard: 2 point	Valkyrie: 0 points Wizard: 3 points
	Defect	Valkyrie: 3 points Wizard: 0 points	Valkyrie: 1 point Wizard: 1 point

Figure 36 – *Gauntlet* modelled as a two-player game

While this point distribution is certainly debatable (as it the poverty of the strategy selection), it does arguably capture the tension inherent at the small scale between greedily chasing down resources and nicely sharing both the work load and the rewards.

What have we seen regarding conflict types? We can now describe the three conflict categories (described on page 56) in game theoretical terms:

A) **Competitive games**: Competitive games are constant sum games (the total payoff is fixed). In two-player competitive games, no incentives for cooperation exist at all, while for games with more players, such incentives may occur transitorily.

B) **Semi-cooperative games**: Semi-cooperative games are non-zero sum games which reward team-work over mutual non-cooperation but provide temptations for individuals to act selfishly.

C) **Cooperative games**: Cooperative games are non-zero sum games which reward players for coordinating their strategies; i.e. they reward team-work and provide no temptation for selfish play.

A few notes on terminology are in order. First, it was mentioned earlier that game theory consists of a cooperative and a non-cooperative variant. It should again be emphasised that this distinction has nothing to do with the three categories; all three are instances of non-cooperative game theory. That non-cooperative *game theory* may deal with cooperative *games* may be conceptually unfortunate, but at least the reader has now been warned. Second, others have classified the game types in question differently. To Zagal, Rick and Hsi (Zagal et al., 2006), the categories were Competitive, Cooperative, and Collaborative. This distinction between cooperation and collaboration is not standard game theory parlance and hardly intuitive (thus difficult to remember). Also, the authors, in their definitions, choose to conflate a number of distinctions (such as objective and subjective goals) which I have chosen to maintain to avoid confusion.

The three categories should not obscure the fact that games fall on a spectrum of competitiveness. Or rather: Category B contains significant variance. Semi-cooperative games differ as to the strength of their cooperativeness. This difference can be modelled as shown above (e.g. Figure 35) but it is also worth focusing on the actual design features which tend to affect cooperativeness. The most powerful of such features are shown in Table 2 alongside a series of example semi-cooperative games.

	Collective score	Shared resources	Friendly Fire	Award for eliminating players (on same team)	Player characters have complementary skills
Spacewar!	No	N/A	N/A	N/A	No
Joust	No	No	Yes	Yes	No
Double Dragon	No	No	Yes	Yes	No
Mario Bros.	No	No	No	No	No
Gauntlet	No	No	No	No	Yes
Champions of Norrath	Yes (but ambiguous)	No	No	No	Yes (optional)
Counter-Strike	Yes (but ambiguous)	No	Yes (but with penalty)	No	No
Battlefield 1942	Yes (but ambiguous)	No	Yes (but with penalty)	No	Yes (optional)
Age of Empires II (same team)	Yes (but ambiguous)	No	No	No	Yes (optional)
Dawn of War (same team)	Yes (but ambiguous)	Yes (as default)	No	No	Yes (optional)
Top Spin (tennis; same team)	Yes	N/A	No	No	Yes (optional)
Fire Truck	Yes	N/A	No	No	N/A

Table 2 – Examples of semi-cooperative games in order of cooperativeness from *Joust* (most competitive) to *Top Spin* (most cooperative) based on criteria which affect cooperativeness. The presence of “Collective score” and “Shared resources” tend to increase cooperativeness while “Friendly Fire”, “Award for eliminating other players” and “Player characters have complementary skills” tend to decrease it. *Spacewar!* (competitive) and *Fire Truck* (cooperative) are included for reference.

Of course, this order is not based on any objective (or readily quantifiable) measure. In particular, the relative weight of the variables can be debated. But if this interpretation is accepted, games plot onto the following “conflict spectrum”:

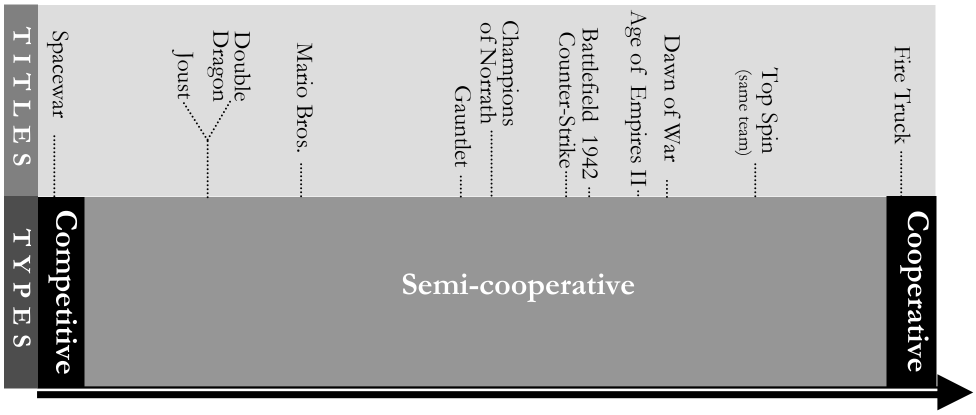

Figure 37 – The conflict spectrum

Almost all multiplayer video game maps onto this spectrum although one often needs to specify the exact game mode referred to. The exception is games in which the incentives shift radically over the course of the game. A well-known non-electronic example is the quiz show *The Weakest Link* in which players in early stages need competent players in order to increase the point pool but are encouraged by the rules to eliminate these same players later. As to video games, an illustrative example is *Double Dragon* (Figure 38).

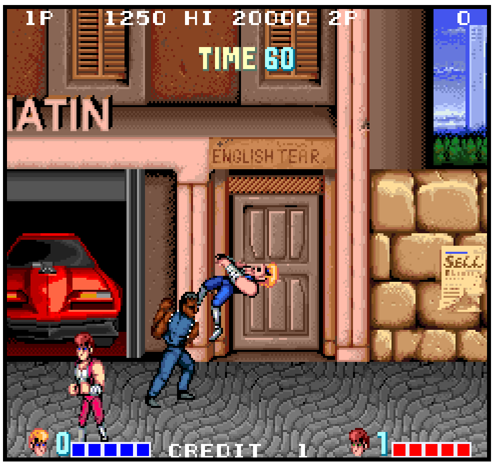

Figure 38 – *Double Dragon*

Now, I've plotted *Double Dragon* on the spectrum above but this placement ignores an important aspect of the game. When the two heroes have dealt with the numerous villains blocking the way to the kidnapped girlfriend of one of the protagonists, they must fight each other to decide who gets the girl. In this light, since only one player can in fact fulfil the ultimate goal, the game could be classified as purely competitive. But since actual *Double Dragon* play rarely ends with one player actually achieving this goal (most players meet violent ends long before this final showdown) most instances of *Double Dragon* play can be classified as semi-cooperative. The larger point to acknowledge here is that some games shift the player relationship over time and thus move across the conflict spectrum[41].

Players

The previous section discussed how different games offer different incentives to players who act accordingly. But until now the word "player" has been used somewhat liberally to include both individuals and teams. Also, I have so far opted for the luxury of only discussing two-player game situations. It's time to be more precise.

Strictly speaking, a player in game theoretical terms is an agent with preferences. As mentioned earlier, these preferences are noted as utility expressed in "points" (in the *PD*, Bob's preferences are C>A>B>D). Typically, game theorists are interested in situations with two or more players. But in so-called parametric models, or *games against nature*, one player is trying to optimize against an indifferent opponent; i.e. one without preferences. Although they can be modelled, such situations fall within the purview of traditional economics and are thus rewarded limited attention from game theorists. An example of such a game is shown in Figure 39.

[41] In this sense *Double Dragon* can be thought of as increasingly competitive as the probability that players will be required to fight each other increases the further they progress.

		Nature		
		Behaviour A	*Behaviour B*	*Behaviour C*
	Strategy A	1	0	1
Player	*Strategy B*	5	0	3
	Strategy C	3	1	2

Figure 39 – A game against nature (parametric model)
The player's payoffs are shown, as nature does not care about outcomes.
Adapted from (Bruin, 2004)

In this game an individual (the player) is faced with a situation of choice where "nature" may behave in one of three ways. Assuming that the player has no way of predicting which behaviour nature will display (i.e. the likelihood of A, B, or C are occurring are considered equal) it is certain that he will discount Strategy A (as it never gives a the best result). Faced with the choice between B and C, our player will choose B as it gives a higher expected payoff (1/3 X 5 + 1/3 X 0 + 1/3 X 3 = 2,66) than C (1/3 X 3 + 1/3 X 1 + 1/3 X 2 =2)[42].

Boudewijn de Bruin (Bruin, 2004) instructively compares this game to a two-player version (Figure 40) in which the row player's payoffs are the same as in the former game.

		Alice		
		Strategy 1	*Strategy 2*	*Strategy 3*
	Strategy A	Bob: 1 point Alice: 5 points	Bob: 0 points Alice: 1 point	Bob: 1 point Alice: 3 points
Bob	*Strategy B*	Bob: 5 points Alice: 0 points	Bob: 0 points Alice: 0 points	Bob: 3 points Alice: 1 point
	Strategy C	Bob: 3 points Alice: 3 points	Bob: 1 point Alice: 1 point	Bob: 2 points Alice: 2 points

Figure 40 – A two-player game

As before, Bob will not play Strategy A, since no matter what Alice plays, he would be better of playing C. But unlike before, Bob can go further. Looking at the game from Alice's perspective, it is clear to Bob that Alice will never play her Strategy 2 (since 3 is always better). Thus, knowing that he is up against an optimizer and knowing her payoffs enables Bob to narrow down the outcomes to

42 Note that this is only true under the standard assumption of risk neutrality (a point gained is as important as a point lost). If, for instance, the player was out to maximize his worst outcome, he would have chosen C (the worst case scenario would yield 1 point rather than 0).

those marked in grey (light and dark). This in turn enables him to confidently choose Strategy B as it always yields a better result than C (leading to the outcome marked by dark grey).

This example shows both the difference in thinking between parametric games and actual strategic games and the fact that making a game strategic does not necessarily make it less predictable. Later in this section, I will discuss changes brought about by having more than two players. But at this point the status of singleplayer video games is unclear. Are they, for instance, generally comparable to parametric models in which case game theory will have little of interest to add? In fact, they provide a degree of variation which severely taxes the simple categories leaned upon till now as I will discuss in the following.

Singleplayer games

If we include non-electronic game design, singleplayer video games represent a historical anomaly; a remarkable break with game design tradition.

As a consequence, many analytical frameworks either divert attention away from singleplayer games or shed little light on their variety. But, at least from the game theoretical perspective, this variety is considerable. Most crucially, some games react to the choices of the player while others do not. Thus, while the latter are akin to obstacle courses the former are close to multiplayer games from a strategic point of view. Let's look at some examples of the variables.

Dragon's Lair (see Figure 41) is a game unlike most. The player, in the role of Dirk the Daring, is faced with a completely scripted challenge without randomness of any sort. The player is only allowed to move at specified points and typically only one move is the correct one (all others lead to death). Thus, the challenge is one of quickly guessing the correct move and in principle the entire sequence of moves can be memorized[43]. Nothing the player can do will change the gamespace in any way

[43] Or written down, see http://www.dragons-lair-project.com/games/related/walkthru/lair/easy.asp

(beyond the proceed/die alternatives) and the obstacles faced will not react, beyond simple scripting, to the player's choices.

Figure 41 – *Dragon's Lair*

Dragon's Lair, as an extreme example of the progression game (Juul, 2002), shares many features with adventure games such as *Blade Runner* or *Gabriel Knight* but these games at least allow for some freedom of choice regarding the movement of the player character in the gamespace and the order in which proximate goals are reached.

As mentioned earlier, *Paperboy* is structurally similar although the player is given slightly more choice and may deal with obstacles in more than one way (e.g. swerve either left or right to avoid an oncoming car).

Other games have gamespaces where no-one or nothing displays any human-awareness of the player but where scripted enemies are eschewed in favour of randomness. In *Asteroids* (see Figure 42) the player's spaceship faces deadly asteroids floating dangerously around the gamespace and changing direction as they are broken into smaller pieces either by the player's torpedoes or by collision. The game environment is a dangerous one, but it does not act as if it *cares*. With the exception of the enemy UFO (see figure caption) the player has no reason to worry about how her actions will be interpreted; she can be assured that they will not.

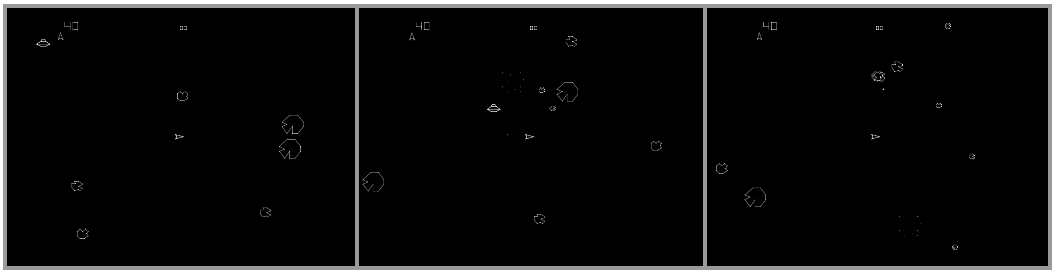

Figure 42 – *Asteroids*
On the left an enemy UFO enters the screen, but even though the player remains passive (centre), the UFO does not eliminate the spaceship but instead changes direction and crashes into an asteroid (right)

Whether employing randomness or not, games like *Dragon's Lair* and *Asteroids* are examples of games against nature. A player optimizes against an indifferent environment; the game worlds are entirely *non-adaptive*.

While most obvious in *Asteroids*, such situations can be understood in terms of knowledge or assumptions about physical laws. Philosopher Daniel Dennett (Dennett, 1987) has suggested that people use three core interpretive schemas to make sense of, and predict the future of, their environment:

> **The physical stance**: We understand many things in terms of "folk physics", "the system of savvy expectations we all have about how middle-sized physical objects in our world react to middle-sized events." (Dennett, 1987: 7-8). We (i.e. human adults) expect a glass to break if hurled against a stone wall and we do not expect an attempt to remove spilt water with a fork to be successful (even if we have no direct experience of either activity).
>
> **The design stance**: It is sometimes more convenient to understand things in terms of what they were *made* to do. We can predict that a lamp will be able to provide light even if we have no knowledge of photons whatsoever and we can understand a bird's wing as made to enable the bird to fly.
>
> **The intentional stance**: Another class of objects or behaviour are more practically understood as consequences of intentional behaviour. By attributing beliefs and desires to people (or other agents) we can

> predict their likely future behaviour. And by observing their behaviour in light of its context we can infer their beliefs and desires (e.g. by watching a man walk through a door, we can infer that he prefers going through the door to remaining outside and that he believes that one can go through doors).

In the case of video games, experience with "middle-sized physical objects in our world" may not be applicable, of course. The game designer may choose to suspend or alter any "physical" law governing objects in the gamespace. It rarely happens, in a dramatic way however. Based on existing non-abstract games, it is a safe assumption that Newton's First Law of Motion (the Law of Inertia) will be in effect and that Earth-like gravity will exert a downwards pull in appropriate (i.e. Earth-like) settings. Thus, Mario does not fall upwards, *Gran Turismo* cars lose speed unless the accelerator is pressed, *World of Warcraft* avatars cannot jump to great heights. A video game counterpart to Dennett's physical stance may be phrased as *the expectation that game objects act in accordance with physical-world physics and that, above all, the laws of nature governing the gamespace are consistent.* The behaviour of the asteroids in *Asteroids* is understandable from this perspective. Do the other two stances provide any additional advantages? The design stance might. If we ask, *why* the asteroids are there the answer is that they are there to provide a challenge, to make sure that the game is not too easy (and in turn that the player must add more money to keep playing) and yet not impossible which would make the game unattractive. The player can use this information to conclude that if the game seems impossible then she might well be missing something. Most likely, there is a feature or strategy that he or she has not discovered. Sticking with *Asteroids*, the player might start off by firing at random thus quickly cluttering the gamespace with deadly and difficult-to-hit rock fragments. If this created impossible odds she could, assuming the design stance, guess that she was doing something wrong. In other words, the game behaviour of the *game objects* could be interpreted using the physical stance while the *game challenge* is understandable through the design stance. Similarly, at one point in *Resident Evil 4*, the protagonist Leon arrives at a mysterious lake rumoured to be inhabited by the even more mysterious "Del Lago". Del Lago turns out to be sea serpent which attacks Leon's boat. At one point the player is put in charge of Leon who has equipped himself with a harpoon (see Figure 43). What can the player assume? It is not obvious that real-life sea serpents, were there any, would be killable by a harpoon. But the player can be almost certain that this one is, since the *problem* is designed and is likely to be solvable (without the design stance, it would be equally thinkable that killing the serpent was impossible). Should the player assume that merely hitting the serpent with a number of harpoons was the solution, she would discover that her assumption was wrong. Although the player is not told this, hitting the body of the serpent has no effect; it is only vulnerable in or through its mouth. But seeing that the harpoon has no effect, because of the design stance, the player can assume that success is merely a matter of changing her strategy.

Figure 43 – *Resident Evil 4*

As discussed previously, gamespaces (or objects/agents in them) may display more awareness of the player than was the case in *Asteroids* or in games like *Scramble*. The minimal manifestation of such awareness is the attraction force centred on the player character in games like *1942*, *Moon Patrol*, *Spy Hunter*, *Time Pilot* etc. In game theory terms, this shift is significant. No longer is the environment completely blind to the actions of the player; it has become what we can call *1st order adaptive*. And yet, while one can surely assign intentionality to the enemy bird of *Bomb Jack* (see Figure

44), it only "wants" to kill the player character in the sense that a ball thrown into the air "wants" to return to Earth.

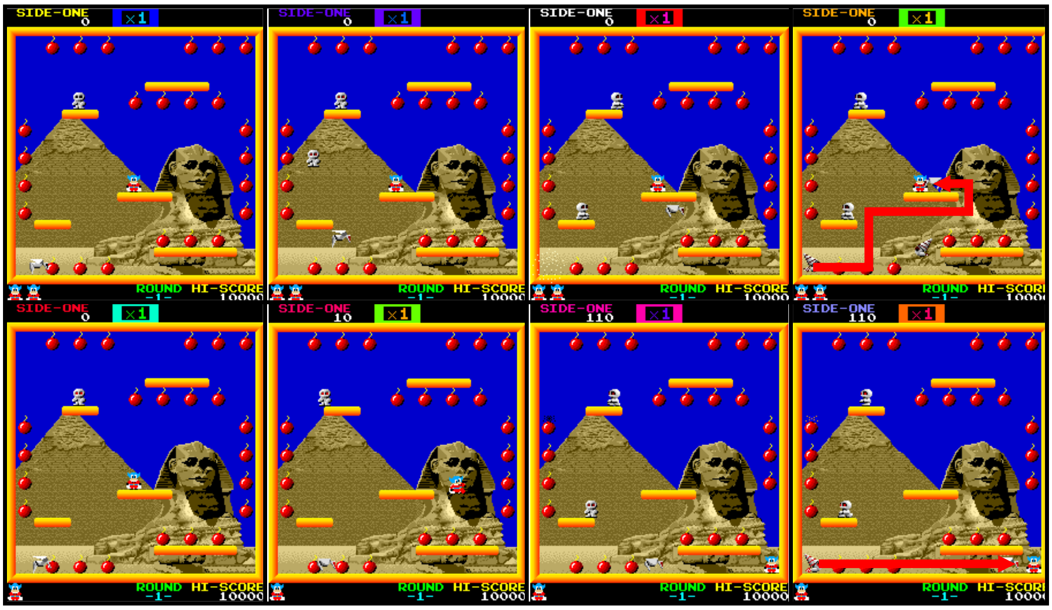

Figure 44 – *Bomb Jack*
The top row shows the player remaining passive. The bird travels from the bottom left corner and catches Bomb Jack by a (relatively) direct route. In the bottom row the player moves Bomb Jack to the bottom right corner of the screen and the bird travels there instead. The route of the bird is indicated by the red arrow on the rightmost screenshots.

From the design stance, we can understand why the bird is there. It keeps the player moving, making her unable to calmly survey the situation or stand too long waiting for the right moment to jump in order to avoid the other enemies. But the *behaviour* of the bird is fully understandable from the physical stance; it is merely mindlessly drawn towards the player character and the player needn't waste time wondering what it could be up to at any point. Nothing about the bird is better explained or predicted from the intentional stance[44].

Turning to more complex specimens, game journalists often point out how recent games have made great leaps in terms of artificial intelligence (e.g. Johnson, 2002). In general, this refers to an increase in complexity brought about by having agents interact based on individual preferences and a spectrum of tactics beyond

[44] Which is not to say that players couldn't possibly adopt the intentional stance or speak/analyze *as if* they considered the bird to be sentient.

those of the *Bomb Jack* bird and its arcade game brethren. These more complex single-player games, which I will refer to as *2nd order adaptive,* resemble, from a strategic perspective, many multiplayer games more than they resemble non-adaptive or 1st order adaptive single-player games. An example: In *Far Cry*, behavioural dynamics within the gamespace are entirely algorithmic. But as the game state is largely hidden from the player (who only knows what the player character "knows" and what previous attempts have taught her) and as any action can set of behavioural chain-reactions among the enemy units (see Figure 45) the dynamics become somewhat unpredictable. The enemy soldiers are able to take advantage of the terrain, attempt to hide or provide moving targets for a player aiming their way and show a desire to kill the player. Their reaction patterns are less than sophisticated and they commit mistakes of reasoning below the cognitive capacities of house cats (although they see the player hide under a bridge they will often not understand that he may be hiding under it making utterances like "Where did he go?" as he vanishes from sight). But in *Far Cry* it does make sense to adopt the intentional stance. The question "What would *I* do?" is relevant when reading the gamespace to look for hiding places, ambush points and when trying to lure enemies into vulnerable positions by tricking them into "believing" that the player is somewhere else.

Figure 45 – *Far Cry* sequence

1) The player is told to move past the enemy base up ahead. No contact so far.

2) Following the coastline, the player is spotted by an enemy soldier (centre of image) who gives a shout of warning. The meter (bottom left) shows that the player is "visible" to the enemy.

3) Having disposed of the soldier, an enemy helicopter appears increasing the "visibility" of the player to the enemies.

4) Trying to hide from the helicopter, the player moves into the line of fire of another enemy soldier (centre) who moved into a favourable hiding position when the player was spotted before.

In other words, a player might advantageously think of the *Far Cry* enemies *as if* they were forming beliefs to act in accordance with their preferences. On the other hand they are clearly doing nothing of the sort[45].

Thus, *Far Cry* and other single-player games in which the gamespace adapts to the actions of the player, where the player may assign intentionality to the enemies (but where the game's agents are not strictly forming opinions about the player's

[45] This brief analysis of how different game types may require different interpretative stances leaves aside the question of how players actually perceive game opposition (i.e. how the brain reasons given varying degrees of oppositional "intelligence"). This is a worthwhile question for future research.

perceptions) can be classified as *2nd order adaptive*. The three general single-player game types are shown schematically in Figure 46.

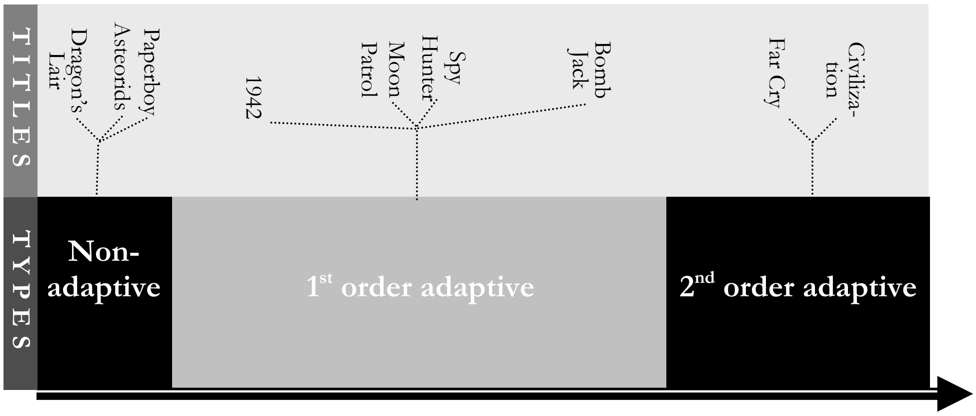

Figure 46 – Singleplayer games in order of adaptiveness (with example games)
While average level of adaptiveness in large-scale games may have increased through video game history, the spectrum more precisely ranges between simple (casual) games on the left to more complex games on the right. The category box sizes informally indicate the relative number of games which fall into each category.

Later in this chapter, the singleplayer game categories will be discussed in the larger context of varying degrees of "strategicness".

N-player games

Game theory distinguishes between parametric games, two-player games and games with more than two players, called n-player games. The latter can be modelled but quickly become highly complex. Thus, the more famous examples are often based on non-technical prose (and often have fictitious back stories some of which are as problematic as that of the *PD*) although a common technique is the use of computer simulations. Perhaps the most prominent of the former is Garrett Hardin's analogy entitled *The Tragedy of the Commons* (Hardin, 1968). Garrett imagines a common pasture on which herdsmen may place cattle. Since each herdsman receives the full sales price for an animal and only vaguely feels the deterioration of the commons on himself, each (rational) herdsman will keep adding cattle until the commons is destroyed. Extending the analogy, Hardin puts it dramatically: "Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all." (Hardin, 1968: 3). On a larger view, Hardin provides an example of a phenomenon often discussed under the label "collective action". Mancur Olson, in 1965, attacked prevailing notions of groups as basic political units springing up spontaneously around common interests (Olson, 1965/1971). Collective action, in Olson's view (essentially standard-fare methodological individualism) was non-obvious and represented an analytical challenge. For instance, the fact that labour unions provide benefits for all workers does not ensure that all workers will want to pay the membership fee; even better than having these benefits would be having them without personal cost. Similarly, just because everyone may benefit from public goods like roads and hospitals it doesn't follow that everyone wants to pay taxes. And in Hardin's logic, this can result in the benefits not being procured at all. Thus, what is often referred to as "the problem of collective action" is the tendency of individuals to free-ride on the efforts of others (and/or the ultimate consequence that no-one will be willing to make the effort at all)[46]. Phrased even more generally, the problem of collective action, is a "social dilemma", a situation where "individually reasonable behavior leads to a situation in which everyone is worse off than they might have been otherwise" (Kollock, 1998: 183); a situation where one is tempted to do something, which, if all chose to do the same, would lead to disaster (see also Dawes & Messick, 2000). Although social dilemmas can be present in two-player games – we saw a clear case in the *PD* – group size, as Olson stressed, is often a crucial factor (generally, the larger the group the bigger the problem). Thus, social dilemmas may often be more of an issue the more players a game has.

N-player games differ from two-player games in a more striking way. Even in zero-sum cases, players of n-player games may be inspired to form coalitions. Imagine, for instance, a game of *Age of Empires II* with three players of whom only one can win. If, for whatever reason, one player pulls significantly ahead of the other two it will be clear to all that the stragglers are faced with a new situation. Bringing down the superior player will now represent a proximate goal on the way

[46] The literature supporting, or accepting, Olson's logic is vast. But for critical views, see (Frank, 1988; Green & Shapiro, 1994).

to victory and the interests of the two stragglers will suddenly converge. Their interests will not, however overlap fully. Rather, they will be faced with a social dilemma: Each is tempted to let the other perform the task (or at least to not commit fully) knowing well that whatever happens it will be best not to overextend one's reach if possible. In alignment with Olson's observation about group size, the social dilemma is apt to be even stronger if the game has, say, six players and one pulls significantly ahead of all the others. The combined strength of the five threatened players may be far superior to that of the leading player, but it will not be obvious who should sacrifice himself for the greater good.

Of course, the situation need actually not be disequilibrial to inspire coalitions. In a three player *Age of Empires II* game, assuming equal skill etc., each player has 1/3 chance of winning. If Bob and Alice were able to agree on eliminating Eve, their odds would be improved. Of course, such an agreement would be extremely vulnerable to mistrust and likely to become increasingly unstable as the predictable moment of its dissolution approached[47]. Although real players would be likely to bear grudges and be unlikely to trust again, from a formal point of view, the breakdown of Bob and Alice's alliance would lead to Eve's score rising to a point where Bob and Alice would again want to team up and so on (see Figure 47).

[47] See Robert Axelrod's discussion of the relationship between trust and "the shadow of the future" (Axelrod, 1984).

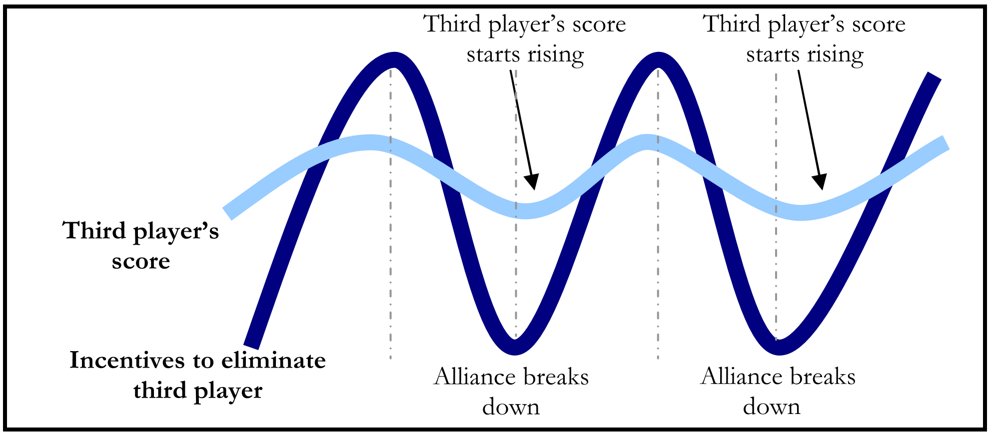

Figure 47 – Incentives over time for two players to team up against a third in *Age of Empires II* (a three-player zero-sum game)

The tendency of certain game types to gravitate towards certain states will be further discussed below under the heading **Strategy and equilibrium** below.

We have seen above that in n-player games, the conflict dynamics sometimes become more complex. Importantly, we have also seen that merely because several players have identical overall game outcome preferences (e.g. they share the desire for their team to win) they need not agree on the best way to reach this end state. If there is any personal cost involved in actively pursuing the team interest, a social dilemma has materialised.

Information

Above we saw how conflict type as well as the number of players shape the incentives facing a player, and thus his or her preferences. We turn now to the issue of what the player knows and, sometimes more importantly, does not know. Information about various aspects of a game is clearly important to making choices about preferable courses of action. If you know that an enemy player is marching his longbowman army towards you, prudence dictates a different approach than if you think your enemy is busy fortifying his cities. Nevertheless, under the Rational Player Model, the core aspects of information are not related to particular behaviour patterns. Thus, the first sections of the following discuss aspects of games which help understand the *issue* of choice in videogames without directly helping us see *what* those choices are likely to be. The relationship between behaviour and (a certain kind of) information, however, is the topic of the section on **Communication and trust** below.

To play a game is often to be ignorant. What lies behind that hill? Where is the enemy hiding? What do I need to open this door? What series of moves will bring me to the other side? How will the dice roll?

There are many types of ignorance and the following are merely examples:

> **Ignorance about the game state**: The player does not now everything about the current state that the game is in (e.g. the position of enemies).
>
> **Ignorance about the past actions of others:** The player does not know what other players have chosen (to the extent that these choices have been implemented, this type of ignorance can be seen as a subset of "ignorance about the game state").
>
> **Ignorance about the properties of objects:** The player does not know how objects interact or how they respond to certain actions (e.g. the player does not know if a certain key unlocks a certain door, does not know if he can jump across a gap unaided).
>
> **Ignorance about the outcome of an action:** Outcomes of isolated actions are less than fully predictable (e.g. the game has elements of randomness such as dice rolls).

Of course, the ignorance is rarely complete. In many situations, *uncertainty* is more precise.

As an example, consider *Chess* (see Figure 48). The *Chess* player knows all the formal aspects of the game: What moves are allowed, how to win etc. She also knows everything that the other player has done. The latter information is technically not too important: the entire game state is known and information about how it came to be does not provide an advantage. But of course this knowledge might give her a clue about what the other player is planning[48]. The *BattleShip* player, on the other hand, does not fully know the game state (see Figure 49) which is only gradually unveiled as a consequence of his actions. But he does know everything that the other player has done since the game started.

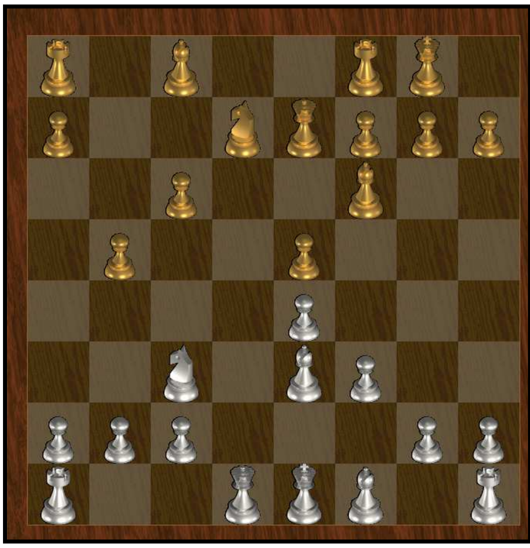

Figure 48 – *Chess* (Thomas Starke's *Pawn*)

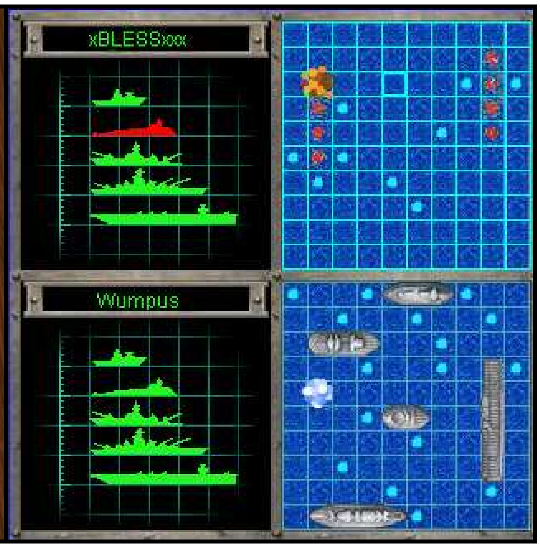

Figure 49 – *BattleShip* (at Games.Com)
The screenshot shows the perspective of the bottom player (having sunk one enemy ship and found another)

Video game designers have tried out many variations. For instance, many strategy games employ "fog of war", often illustrated as an actual fog covering areas of the gamespace which have been explored but which are not currently in a friendly unit's line of sight.

Game theory is usually concerned with two types of information, distinguishing between games of complete/incomplete information and games of perfect/imperfect information. These terms, or axes, are closely related but not identical.

A game of *complete* information is one in which all players know everything about the game structure (the rules including everybody's goals, layout of the

[48] Of course, knowing that the other player remembers his past moves might give a player a reason *not* to do what he would appear to be planning to do. It also opens the door to *bluffing*.

board/gamespace, type and position of pieces etc.)[49]. For instance, a player of a *PD* knows the options and payoffs available to himself and to the other player. Similarly, a player of the board game *Diplomacy* knows the rules of the game and what the other players are after. Any single game of *Risk* is a game of *incomplete* information, as each player does not know the other players' payoffs. The incompleteness arises as each player draws a secret "mission" before the game starts[50].

Meanwhile, a game of *perfect* information is one in which the full history of the present game is known to all. In practice, every change in the game state must be observable to everyone (and only one player may make a choice at a time). *Chess* is a common example. On the other hand, *Risk* is a game of imperfect information as players draw resource cards which are kept secret from other players.

Combining the two axes we get a two-by-two matrix (Table 3).

The players…	… are informed about every change of the game state	… are not informed about every change of the game state
… know everything about the game state before the game starts	**Complete and perfect information** E.g. Chess, Checkers, Parcheesi, Croquet	**Complete but imperfect information** (rare)
… do not know everything about the game state before the game starts	**Incomplete but perfect information** E.g. Battleship, Master Mind, Monopoly	**Incomplete and imperfect information** E.g. Risk, Mafia, Mah-Jong, Poker

Table 3 – The four information types (traditional games)

Chess is a game of *complete* and *perfect* information and *Risk* is a game of *incomplete* and *imperfect* information. Meanwhile, *Battleship* (Figure 49) is a game of *incomplete* but *perfect* information as the players do not have full knowledge of the gamespace but are informed of everything which happens inside it.

[49] An alternative definition is simply that all players know each others' payoffs (Morrow, 1994) but this can be argued to amount to the same thing (Myerson, 2004).

[50] In game theory terms a game starts the moment players interact, i.e. the moment where they are able to influence each other.

Almost all card games are games of incomplete and imperfect information while almost all physical sports are games of complete and imperfect information. Elements of randomness have no bearing on which category a game belongs to (e.g. *Parcheesi* players roll dice but all players are instantly informed of the outcome).

The game examples used above are all non-electronic. How do video games map onto the matrix?. In Table 4 we see that many of the games discussed here fall into the complete-but-imperfect cell. This difference between video games and traditional games arises as the former are (relatively) rarely turn-based.

The players…	… are informed about every change of the game state	… are not informed about every change of the game state
… know everything about the game state before the game starts	**Complete and perfect information** E.g. Scorched Earth, Worms	**Complete but imperfect information** E.g. Spacewar!, Need for Speed Underground, Fire Truck, Tekken 5, Counter-Strike
… do not know everything about the game state before the game starts	**Incomplete but perfect information** (rare)	**Incomplete and imperfect information** E.g. Age of Empires II, World of Warcraft

Table 4 – The four information types (video games)
Games with multiscreen gamespaces give "complete information" to the extent that a player *can* know the initial state of the game (as discussed briefly below).

Video game players will often not know the *extent* of their ignorance. The *Risk* player sees other players picking up secret cards and thus knows that she is not privy to a certain aspect of the game state. But a video game state change need not be communicated to the player. As an example Figure 50 shows two screenshots from *Ghosts'n Goblins*. In the first, the on-screen gamespace is devoid of enemies, while in the second (taken two seconds later) a zombie is emerging from the ground. In the first situation, the player could not know *if* the game had "decided" that a zombie would emerge from the ground by the tomb stone in two seconds. In other words, the video game player often does not know what he doesn't know.

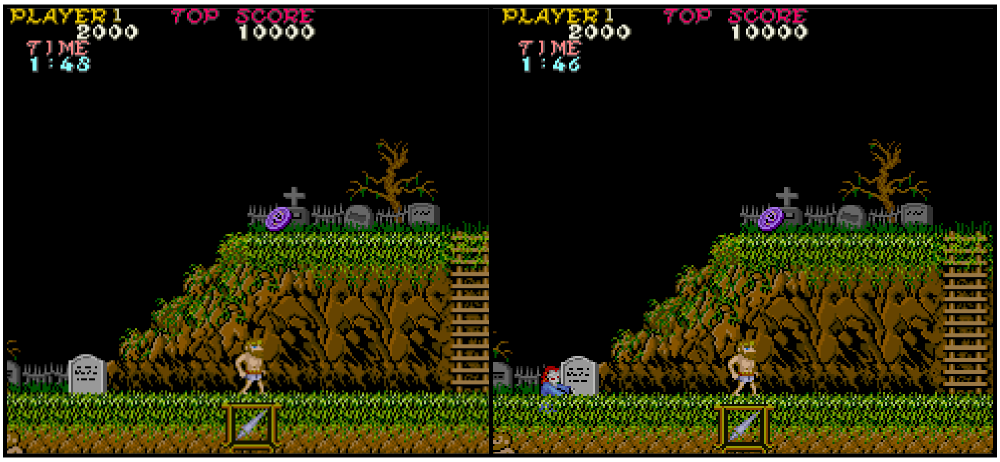

Figure 50 – *Ghosts'n Goblins*
The gamespace is empty of enemies (left) and then a zombie appears by the tomb stone (right)

A few more examples: In *Spacewar!,* the player can be said to have complete but imperfect information. The gamespace is confined to what's on the screen at any time; nothing happens outside the players' view. Each player knows where everything is located and knows exactly what the other player wants. Nothing happens without being instantly visible to both players but choices are made simultaneously.

Things become more complicated when gamespaces are not confined to single screens. In *Spy Hunter* (Figure 20), the player sees only a portion of the gamespace. The layout of the road may be learnt by repeated play but when and where other cars will appear is not known. Does something then happen in the gamespace which the player does not know? This is similar to the question of the *Ghosts'n Goblins* zombie. If nothing happens outside the player's perspective then the game is one of complete and perfect information. On the other hand, if the game in fact processes parts of the off-screen space then the game is one of imperfect information. This is clearly the case in *Far Cry* where enemy units in fact act outside the player's perspective, even if these action patterns are simple until the player sets things in motion by revealing himself.

Of course, the question of whether the game "makes decisions" that are not communicated instantly to the player in simple as *Ghost'n Goblins* and *Spy Hunter* is of little consequence to anyone. We must ask whether the knowledge that hidden things are happening can affect the player's choices. While not the case with the appearing zombie it is clearly the case in many strategy games where ignorance of enemy choices is a complex strategic factor. In such games players can often choose to minimize his ignorance but only at a cost (e.g. the cost of scouting). More generally, strategy video games tend to display the most strategically important variations in the dispensation of information. Such games often let players decide which type of information should be revealed. Typically, however, the initial state of the game is not fully known as the layout of the gamespace will be generated with a portion of randomness, and events outside the player's perspective tend to be hidden. For instance, *Age of Empires III* is commonly played on maps randomly generated and with two levels of ignorance: Ignorance of stable features of the gamespace (the gamespace must be explored before it becomes known) and ignorance of unit and building positions (see Figure 51).

Figure 51 – *Age of Empires III*
Shows unexplored territory with unknown stable features (black), territory covered in 'fog of war' with unknown units and buildings (ghosted) and fully known territory (bright area to the right)

The randomness of the gamespace is illustrated in Figure 52.

Figure 52 – *Age of Empires III*
Screenshots of minimaps from two games with identical settings. The topography of the gamespace, and thus the position of enemies etc., is different.

Of course, actual video game players often do not know the entire state of the game even if that is technically possible (given repeated play and super-human memory). Thus, it may be more meaningful to talk about video games as having "completable" information or not. A game of *completable* information is one where the initial game state is always the same and is either fully revealed or discoverable through repeated play. *Resident Evil 4* is such a game. Here, the first-time player does not know the layout of the gamespace, but that layout does not change on subsequent play-throughs and can be memorized[51]. Games of completable information confer great advantages to experienced players.

The most extreme example of video games in which the player cannot discern the game state is MMORPGs. Most decidedly, the initial game state (i.e. the state of the particular server when the player spawns) is not fully known to the player and changes without her knowledge. Even so, given the design of most current MMORPGs much of the game state can be predicted as many objects are only allowed very slim margins of change. For instance, although a particular monster may at any one time be dead it will most likely respawn (be reset as if nothing had happened) after a brief period. Thus, as all computer-controlled entities and objects tend to be attracted towards a certain state, the range of unpredictable factors in

[51] Other examples are racing games like *Gran Turismo* and most adventure games.

MMORPGs pertains mostly to the actions of other players (and the state of other avatars).

Communication and trust

In the discussion of information above, one type of information was consistently ignored: That which is conveyed by other players: Communication.

Consider the following examples:

> 1) A group of players gather for a game of *Age of Empires II*. Before the actual game starts one player suggests that no attacks should be made until twenty minutes of game-time have passed. The other players acknowledge agreement and the game starts.
>
> 2) Two *Diplomacy* players secretly agree to not attack each other in the coming round.
>
> 3) A *Croquet* player proclaims that, should anyone "croquet strike" her ball, she will devote all future turns to ruining that player's chances of winning even if that will leave her no chance of victory.
>
> 4) A *Counter-Strike* player sends the message "Let's wait for them by the gate" to all players within the game (both friends and enemies).

As conceptualised above, neither of these communicative acts change the game state[52]. They leave no observable mark on the gamespace. And yet they clearly may have significant implications for the development of the game.

To economists, communication such as that exemplified above is "cheap talk" (R. J. Aumann & Hart, 2003; Binmore, 1994: 191pp; Morrow, 1994: 136pp; Skyrms, 2002). The logic is easy to follow: In a game, players may freely talk about their strategic intentions. For instance, in the *PD* Bob may promise Alice that he will cooperate (if they were allowed to speak). This communication is "free" in the sense that it costs Bob nothing and "cheap" in the sense that Alice has no reason to

[52] Number 4 happens inside the game, but has no effect on the gamespace.

believe it (in fact she has every reason not to; talk is cheap). In a sense, the communication carries no meaning; it certainly would not be expected to change the outcome of the game (it is payoff-irrelevant). Other game types, however, would seem to inspire communication. For instance, it would seem that in a coordination game like the *Stag Hunt*, players would be greatly helped by being able to communicate their intentions. To understand the role of communication in game theory this section will discuss *when* communication alters the outcome of games. This discussion leads to an examination of the role of trust and reputation.

Before we start, it is worth acknowledging two things: First, communication may be the aspect of analytical game theory which most dramatically clashes with empirical reality. It has been repeatedly shown, and continuously emphasised, that the effect of communication in experimental games differs from the formal theoretical predictions. Communication matters, even when it "shouldn't". Real *PD* players, for instance, consistently do better when allowed to communicate (Camerer, 2003: 46; C. Jensen, Farnham, Drucker, & Kollock, 2000). Without a doubt, this should be humbling to anyone subscribing to the interpretation that game theory models reality (see page 84). On the other hand, we can easily understand that the trustworthiness of a message *does* often depend on the game type. The *Diplomacy* players in example two above may not return unaffected from their secretive scheming but their communication will not have transported them to a state of everlasting mutual trust; they will be well aware that the game's payoffs may tempt the other player to treason. While the prediction that communication in some games will not matter *at all* is falsified by the evidence, that communication does not completely change the core dynamics (cooperation is still harder among players with opposing interests). The second thing to acknowledge is that the economist's idea of communication is a particular one. The focus is not on the mutual exchange of messages or signs but rather on the transmission of signals[53]. These signals may require interpretation (i.e. they may be indirect) but this

[53] Indeed "communication" in this section might well be exchanged for "signalling".

interpretation is based on objective features that are considered universal and intersubjective. Also, while this isn't always acknowledged, a signal requires no communicative intention. An example: Sociologist Thorstein Veblen famously interpreted wealthy Americans' "conspicuous consumption" as a signal of wealth (Veblen, 1899/2000). By publicly spending large sums members of the upper class were *showing* their wealth. In this logic, the status of the signal does not depend fundamentally on the actual intentions of the sender and nor does it depend on the interpretation of certain members of an audience. The signal is simply there and it has a certain meaning[54].

Signalling and commitment

All communication is not cheap talk, but staying with that category, game theorist Ken Binmore has succinctly noted that "Cheap talk will never persuade rational people to act contrary to their own interests. However, it may help rational folk to coordinate their endeavours" (Binmore, 1994: 192). In a two-player constant sum game of complete and perfect information Bob can say whatever he wants; Alice is not going to change her strategy[55]. But if Bob isn't sure about what Alice is after (doesn't know her exact payoffs) communication might be beneficial. The same is true in coordination games, where communication may help the parties decide on a course of action. In *Fire Truck*, for instance, Player 2 has no reason not to believe Player 1's claim that "I will turn right at the intersection".

As a signal, cheap talk is untrustworthy if there's any reason to be sceptical. But if a player is willing (in the broadest sense) to pay up, she may send a signal which is credible[56]. The alternative to cheap talk is a *costly, honest* or *trustworthy* signal and it is the question or problem of such signals which generally draws scholarly attention; be it within economics, sociology, or evolutionary biology. The problem is obvious:

[54] It's quite possible to model misunderstandings etc. but as a rule signals are considered received.

[55] The very availability of pre-play communication may alter game dynamics in certain circumstances in which case cheap talk becomes significant even in the *PD* (Skyrms, 2002)

[56] Some authors use "signal" to indicate only untrustworthy ones. I do not follow that practice.

In the face of scepticism, how does one send a trustworthy signal? To show the pervasiveness of this problem I will present a few examples from game theory and then proceed to real-life examples.

The *PD* has a close cousin called *Chicken*. This game derives its name from the alleged historical habit of a certain American youth demographic of racing two cars towards each other, each driver daring the other not to swerve. The first driver to swerve would lose the game, having revealed himself as "chicken". Thus, the two drivers each have two available strategies: They can be "nice" and cooperate (swerve) or they can be "selfish" and defect (not swerve). Cooperating while the other player defects is bad (1 point) but mutual defection is terrible (0 points) as the cars crash killing both drivers.

The game is shown as Figure 53.

		Alice	
		Cooperates (swerves)	*Defects* (does not swerve)
Bob	*Cooperates* (swerves)	Bob: 2 points Alice: 2 points	Bob: 1 points Alice: 3 points
	Defects (does not swerve)	Bob: 3 points Alice: 1 points	Bob: 0 point Alice: 0 point

Figure 53 – A *Chicken* game

Alice considers her options. It would clearly be wonderful if she could convince Bob of her extreme bravery or foolishness; if she could send a trustworthy signal that no matter what, she would defect. In that case the possible game outcomes from Bob's perspective become limited to the right column and he will cooperate (1 point rather than 0). If she could only be more convincing, Alice's success would be certain. A sometimes heard solution to her problem is to tear off the steering wheel and throw it out the window for Bob to see[57]. Incidentally, this example also shows how a player may sometimes have an interest in the other player knowing as much as possible (i.e. information asymmetry is not always an advantage to the best informed). If Bob had not seen Alice discard the steering wheel, the result of the game might well had been the opposite.

[57] This "solution" conveys the logic of honest signalling, but does technically constitute cheating since "Visibly discard steering wheel" is not an available strategy in the game as modelled.

The most ubiquitous example from evolutionary biology of honest signalling is the peacock's tail. The problem is a similar one: How can the peacock male convince the peahen that he is quality genetic material? He could "tell" her somehow. But the impressive and extremely costly (in terms of immobility and vulnerability to predators) tail *shows* that despite incurring this cost he is able to survive. The signal carries its own proof; it is unfakable. This analysis is usually attributed to Israeli biologist Amotz Zahavi (Zahavi, 1977; Zahavi & Zahavi, 1999) who described the wider implications as "the handicap principle" (see also Smith, 2005)[58].

We have already seen an example from sociology in the form of Veblen's conspicuous consumption. Telling someone "I'm rich" would be cheap talk, while visibly spending large sums is a trustworthy (and costly) signal of wealth.

In a more mundane perspective, signalling issues are all around. Any test or request for documentation concerns honest signalling. You can *tell* someone "I'm good at math and I have a PhD in theoretical physics" but if you can pass a math test and display graduation papers, you have sent honest signals[59]. This example shows that the trustworthiness of a signal is sometimes one of degrees. A signal need not always be entirely unfakable to be trustworthy as we might imagine ways in which someone could pass the test and present papers without having either math skills or degree (trustworthiness will then depend on how much is at stake for the sender; i.e. if the signal may be faked at a small cost compared to what may be gained by faking).

While all examples of the same signalling principle, *Chicken* differs from peacocks, conspicuous consumption etc. in one respect. While the other examples

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58 Following Zahavi's analysis, cheap talk type signals are sometimes referred to as "conventional signals" while trustworthy/costly signals are known as "assessment signals", but here I will stick with "cheap talk" and "trustworthy signal" respectively.

59 Other everyday examples include banks visibly communicating that the staff is unable to open money reserves quickly, leaving one's credit card with the bartender to signal willingness and ability to pay later, demonstrably choosing a direction and then looking *away* when about to collide with someone on the sidewalk.

concern documenting attributes of the sender, the *Chicken* player is attempting to establish her commitment to a future cause of action[60]. For players of recreational games this is the more common problem and the one at play in the first three examples given on page 121. The *commitment problem* is that if, at a later point, one will face a temptation one may not be able, in the starting position, to commit credibly to another cause of action. This is exactly the problem which Alice, be tearing out the steering wheel, solves in the *Chicken* example above; she does something which will make it impossible to follow what might be her best interests in the standard game. When committing, you burn your bridges. Or, as a famous example goes, you burn your boats as was the choice of the Spanish conqueror Cortez upon landing in Mexico (Miller, 2003). The boats were burned to prevent his men succumbing to the temptation of fleeing the numerically superior Aztecs *and* in order to display Cortez' confidence to his enemies who would then be disinclined to attack. The logic of commitment is at the centre of Stanley Kubrick's *Dr. Strangelove*. Here, the Soviets have built a doomsday device which will automatically and irrevocably detonate, destroying the world, should the Americans attack. Without this device, once the Americans had launched their warheads there would be no reason to respond in kind (at this point nothing would be gained). Thus, the threat of retaliation would be a non-credible threat. And this in itself would motivate the Americans to attack first. The logic of the doomsday engine, of course, depends on the Americans being in perfect control of their own actions which incidentally happens not to be the case in *Dr. Strangelove*.

Commitment highlights a difference between parametric games and strategic games: In the former, more options are always preferable, while in the latter being restrained is sometimes advantageous. The implication of the latter is that too much self-control, restraint (or rationality in one sense of the word) is often problematic. Being rational is often irrational and vice versa. This observation has led economist Robert Frank and others (e.g. Frank, 1988; Haidt, 2003; Ridley, 1997; Trivers, 1971)

[60] Technically, of course, one could argue that the *Chicken* player wants to communicate that she is endowed with the attributes of someone who would not swerve.

to suggest that the evolution of certain human traits like the capacity to blush[61] and emotions like anger, jealousy, vengeance might be explained by their commitment capacity. In one of Frank's examples "A blush may reveal a lie and cause great embarrassment at the moment, but in circumstances that require trust there can be great advantage in being known to be a blusher." (Frank, 1988: 9).

Finally, the value of commitment may sometimes be provided through a player's reputation. A player may invest in a certain reputation by publicly proclaiming to have certain traits and by having proven this to be the case in past situations. In this case, not living up to the reputation means incurring a great cost as the player will then be revealed as a liar. In other words, the player will have changed his own incentives to avoid short-term temptation at a later time. As an example, the US government proclaims that it will never yield to terrorist demands. In the case of a hostage crisis the temptation to yield will be outweighed by the disadvantage of the accompanying loss of the hard-liner reputation. The goal of investing in this reputation, of course, is to avoid the hostage crisis developing in the first place[62].

The effects of reputation depend on the interaction being somehow extended through time, in the sense that reputation (obviously) cannot affect the interaction between two complete strangers. In the case of the two scheming *Diplomacy* players, knowledge of the other player's previous reaction patterns can affect choices. Players with clear reputations as being tolerant, gullible or retaliatory will have different negotiation options. The historically retaliatory player will be able to commit far more credibly to a threat of revenge in case of betrayal.

And with that we return to the introductory examples. In the *Age of Empires II* case, which I will focus on here since it can be extended to several of the other

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[61] Blushing when embarrassed (say by lying) needs explanation as the trait would seem to contribute negatively to the individual's fitness and therefore should not have evolved, or once evolved should have been selected against and therefore have vanished.

[62] The strategy has a weakness, however. The terrorists will know that it would be too costly for the US government to *publicly* yield to demands, but that the government will still face a great temptation to *secretly* do so. Of course, not all demands can be secretly fulfilled.

examples, one player is asking for a promise that a range of strategies be considered off-limit (Figure 54 shows a related situation[63]). The problem with the request, of course, is that if the other players make such a promise there is little to hold them to it (assuming that they have no game-external relationship). And the player making the request might himself be trying to gain an unfair advantage (if the other players think themselves safe they will not invest in defence). Thus, the mutual promise not to attack early is an example of cheap talk and it will not motivate sceptical players to change their play. Even if they wanted to, the players could not verbally commit credibly to not attacking early.

[63] For an in-depth discussion of the *Age of Empires II* pre-game interaction system in a game theoretical perspective see (Smith, Forthcoming).

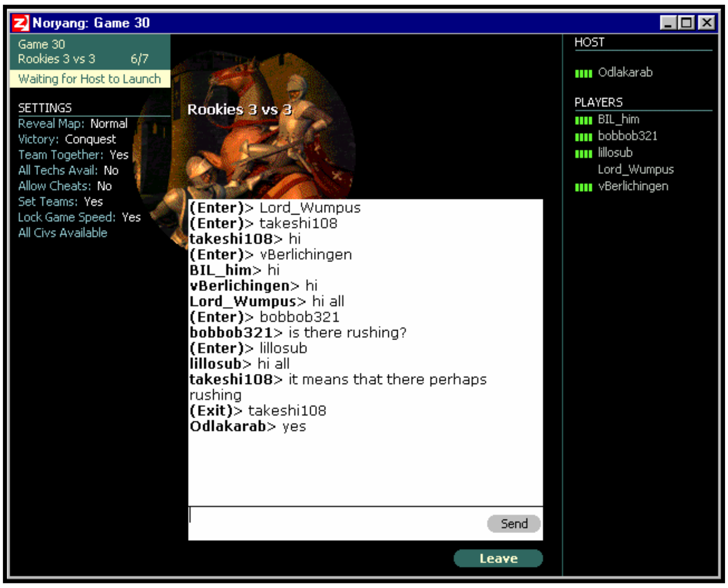

Figure 54 – An example of pre-game *Age of Empires II* interaction
Six players are in the same pre-game "Room" (their user names are displayed to the right). The central chat window shows people entering, leaving and speaking. The dialogue goes:
takeshi108: hi
BIL_him: hi
Lord_Wumpus: hi all
bobbob321: is there rushing? [i.e. are early attacks OK?]
lillosub: hi all
takeshi108: it means that there perhaps rushing [commenting on a period of silence following bobbob321's question]
Odlakarab: yes [agrees with takeshi108]

Might other measures help? Following Frank, irrationality might go a long way. At a glance, the rational player might merely be expected to not even waste time on cheap talk. But anger and the shadow of the future may form a potent cocktail. The following is a real *Age of Empires II* player reaction to others not honouring a cheap talk agreement (from vpc1988, 2005):

> … i just put a rule "no attack until all on imperial" maybe [it] is a silly rule but i put it, and before launching game they accepted it [..] just 15 minutes [after] launching [the] enemy was building a castle in our island. (floche007) and 15 minutes later, and not all were on imperial, another nice castle from enemy in our island. well, if you play with any rules (no siege, no rush... any rule) DONT PLAY WITH THIS PEOPLE: flooche007 AND war_mutt1. I ALLWAYS RECORD GAME, IF SOMEONE WANTS THE RECORD GAME AS AN EVIDENCE, I WILL LINK IT. THE LIST WILL INCREASE DONT WORRY, AND I WANT YOU TO PUT ALL NAMES OF PEOPLE LIKE THIS, HACKERS, PEOPLE WHO BREAKS RULES... LET'S SEE IF WE CAN STOP THIS!!!!!...

And in a later post to the same thread:

> increasing the list of cheaters...now on team islands again, well, i said no rush and of course they rushed me...well, here are the names, _Beliasar_ , Staind_Fan and stoulisteelman

The poster here is clearly enraged. In crude game theoretical logic, he should not have expected cheap talk to have an effect on play but he wanted to play a certain version of the game and feels betrayed. As noted in the discussion on commitment above, becoming emotional has two strategic functions here[64]. The player establishes a reputation as someone who will not tolerate broken promises; to the extent that he will go out of his way (incur a cost) to publicly expose the transgressors. And he puts co-players' reputation on the line, as it is now evident that not honouring a cheap talk agreement may put *their* future game-play prospects at jeopardy.

Besides such individual endeavours, there are more institutionalised ways in which players may commit to responsible *Age of Empires II* play. One is willingness to let the game about to be played be recorded (a pre-game option). In this case, one faces the threat of exposure if cheating as affronted players could document the entire game, sending the file to administrators etc. But while letting the game be recorded might raise credibility, willingness to record is not a clear signal of commitment just as unwillingness to record is not a clear signal of foul intentions[65]. The recording only contains the actual game and not the pre-game chat or the free-text game description referred to by vpc1988 above, so one may still speak cheaply of one's noble character before the game starts without committing to file. Meanwhile, mere *un*willingness to record does not necessarily mark one out as a ne'er-do-well. As *AOE II* is a competitive strategic game of imperfect information in which players often spend considerable time perfecting personal strategies, many may be unwilling to have their entire efforts retrospectively revealed in detail.

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[64] It is a prerequisite for the commitment logic that anger etc. should not *feel* strategic; it must be a spontaneous reaction to being slighted which one has little control over.

[65] If either had been the case the situation would have fallen under the *full-disclosure principle* (Frank, 1988; Frank, 2006: 191-195) that if someone can gain an advantage from showcasing some quality then everyone will be forced to reveal their attribute in that area.

Another commitment device is the clan. Players surely join or form clans for a multitude of reasons, to socialize with likeminded, to achieve a sense of in-game group identity etc. In MMORPGs, players also join clans (or "guilds") because of the benefits bestowed on members. Clans may have pools of equipment and other collective resources like guild halls. Also, being a clan member may be the only way to feasibly strive for certain in-game objectives (such as large castles etc.).

In addition to all the other reasons a player may have for joining an in-game association, clan membership makes a player more trustworthy since clan membership is a trustworthy signal. To join a clan (or remain a member) you need to prove yourself worthy. In return you are vouched for by an institution with which other players within the game are likely to have a relationship affected by the long shadow of the future (even if they don't expect to meet *you* again).

Of course, much depends on the actual clan. Not all institutions can provide the same level of backing. In the real world, having a platinum Master Card is different from having an obscure credit card issued by a small local bank. Thus, the trustworthiness gained from joining a clan is a function of the general respect enjoyed by the clan itself. And the larger the benefit, the larger the handicap (or cost) associated with the signal. Jakobsson and Taylor report that in *Everquest*

> …reputation plays a significant role in a gamer's success. In über guilds this lesson is doubly important and indeed it might be said that reputation is everything. At a very basic level ones reputation forms an important component in even being admitted into a high level guild. Potential members generally undergo a process in which they petition to join, often listing their equipment and skills. Sponsorship scenarios are common and applicants are often only considered for guild membership after being vouched for by a current member (Jakobsson & Taylor, 2003: 5)

Once one passes the barriers to entry, of course, one still has to respect the restrictions put upon one's autonomy by the group. The *Star Wars Galaxy* player's association (PA) Knights of the Force list the following member rules (among others):

> - There is by common sense a code of ethics within KotF, No member shall bad mouth another member or shall be given a demerit, two demerits shall warrant a vote of dismissal and three demerits warrants automatic dismissal.

> - Remember that you are a member of the Knights of the Force and each action you do is a mirror of our PA. With luck and a good group we can become a great PA but each member must be willing to help make this a great PA. (Knights of the Force, 2002).

The clan, in this perspective, is a mechanism which (among other functions) enables players to each surrender personal autonomy in return for mutual trust within the clan and the ability to send a trustworthy signal of trustworthiness to non-members.

The connection between clan membership, trust, and reputation in *AOEII* is witnessed by sites like the AoC[66] Site of Fair Play which proclaims its objectives to be in part (Unknown author, 2005a):

- To educate AoC Players on the symptoms of cheating, and how to avoid playing with those who cheat.
- To expose the cheaters and their clans such that they can be shunned by the community. If nobody will play with them, this will encourage them to stop cheating.
- To promote fair play in AoC such that the game we love to play is not ruined by cheaters[67].

In *AOEII*, a player may easily discard an account and appear with a new username. Thus, clans are a way to achieve a certain permanence. The Site of Fair Play takes it upon itself to gather evidence of cheating, to contact administrators of the cheater's clan threatening to list the clan as one soft on cheating unless it excludes the offender. The website elaborates: "When a clan is shamed here, it's harder for those members to hide. Naming a clan in this list is not taken lightly, but if a clan harbors cheaters, that clan's reputation does not deserve to remain unharmed." (Unknown author, 2005b).

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[66] *Age of Empires II: The Age of Kings* with the *Conquerors* expansion (*Age of Conquerors*).

[67] Cheating, in this context, does not include going back on cheap talk promises. But the "problem" and the "solution" is much the same.

Another feature arising from players' desire to regulate their games even if it means incurring a personal cost are anti-cheating applications such as Punkbuster. Punkbuster which today is a commercially produced program, is installed on the client and then continuously monitors the player's machine for signs of cheating applications. Players limit themselves because they are given a guarantee that others limit themselves in the same way. This gesture echoes Hobbes' "social contract" in which I give up the right of

> governing myself, to this man, or to this assembly of men, on this condition, that thou give up thy right to him, and authorize all his actions in like manner. (Hobbes, 1651/1997: 132)

Only those who limit themselves in a similar way enjoy the fruits of your self-limitation as a Punkbuster-running client will only connect to clients also running Punkbuster.

Punkbuster, in other words, is a mechanism by which players limit their autonomy (they cannot cheat) by incurring a cost (they have to download and install the program and subsequently are limited in their action range) in order to form a subgroup within which members can trust one another. In contrast to the clan system, running Punkbuster is not so much a way of gaining credibility among non-members as it is a way of simply keeping these non-members away. *Like* the clan system, however, Punkbuster has increasingly been integrated into actual game architectures as modern shooters in particular let players filter out game servers which do not require Punkbuster and may even come bundled with the application.

Commitment, as we have seen, depends on communicating one's constraints to other players who will then be faced with altered incentives. Is commitment then entirely irrelevant in single-player games? In terms of parametric games, that is often seen to be the case (e.g. Ross, 2004). But there are complications. It is not difficult at all, for instance, to think of situations where one may gain an advantage from committing to a certain cause of action even if no other person is involved (Schelling, 1984: 57-82). For instance: A man leaves his credit card at home to avoid over-spending; someone living in a warm country buys a small waste basket to avoid being tempted not to take it out frequently (and thus risk insect invasion);

someone trying to quit smoking throws away all cigarettes in the house; someone needing to get up early places the alarm clock far away from the bed to avoid the temptation to turn it off before waking up properly. Notably, a test subject in the study reported in **Chapter 4: Player Behaviour** at one point moved a bowl of sweets outside easy reach to avoid eating any more. Similarly, if more epically, Odysseus had himself tied to the mast to avoid succumbing to the alluring song of the Sirens (a parametric game as the Sirens, although presumably humanoid, were not about to change their behaviour no matter what Odysseus did). Models of these phenomena may take many shapes. But in game theoretical logic, we are arguably dealing with sequential games in which a player is up against her future self, with the awareness that the preferences of this future self will differ from her present ones. In Odysseus's case (Figure 55):

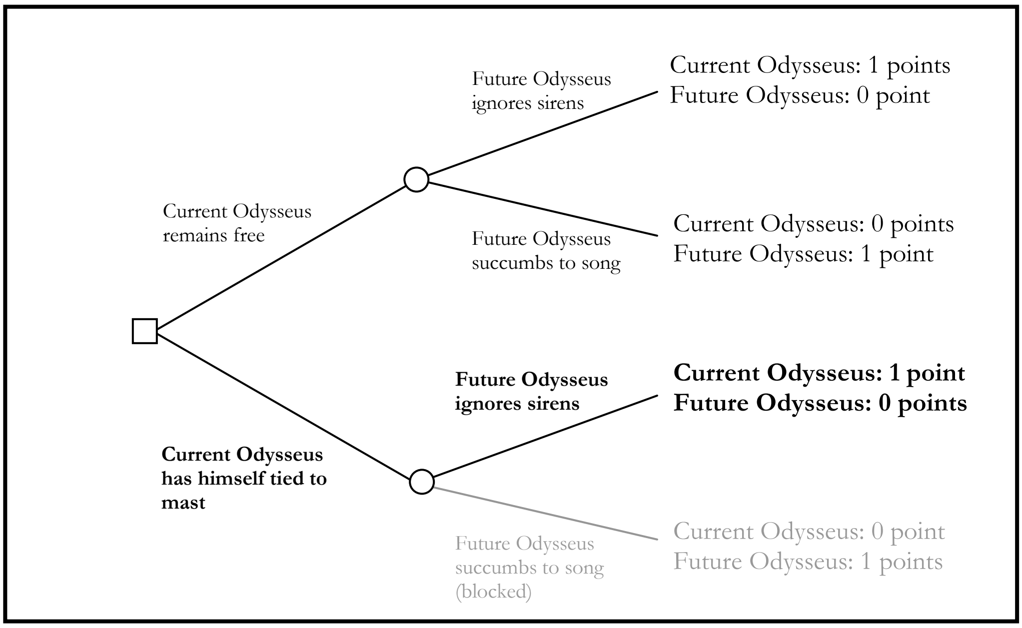

Figure 55 – Odysseus against his future self
Should Current Odysseus choose to remain free, Future Odysseus would succumb to the Sirens. By having himself tied up, Current Odysseus constrains the actions of Future Odysseus and comes out with 1 point (rather than 0).
The game illustrates that points in game theory games are measures of the strength of preferences; they do not necessarily indicate how much the player will actually enjoy having moved in a certain direction.

Though technically possible for a player of a standard single-player game to feel the need to restrain himself from certain courses of action, such as choosing an easy way through the game or resorting to cheats, this is likely to be uncommon[68]. It takes one of two conditions to make commitment truly pertinent in single-player games: The game environment must be 2nd order adaptive in the sense that it builds a model of the player's reaction patterns and/or the player must face a future loss of agency within the game.

An example of the former could be the AI player in a strategy game interpreting the human player's actions to plot him onto a scale from easily cowed to highly vengeful. As to loss of agency, a sudden discrepancy between the preferences of the player and the preferences of her player character (or other representation) is a rare thing in video games. What would such a discrepancy

[68] Although many single-player "help" the player restrain herself in the sense that, once the game is started, the level of difficulty cannot be altered.

entail? Essentially, we would need a situation where the player character used the available means (i.e. made choices) in a way which the player did not approve of: A rebellion of the avatar. We can imagine that one's *Battlefield 1942* soldier began acting against one's will, that Pac-Man started moving in a different direction than the one requested and (more abstractly) that the player was helpless to prevent the "mayor" of *SimCity* from zoning in unwanted ways. There are borderline cases. One's spaceship in *Scramble* arguably "prefers" to fly towards the right (it just *will not* go left); Wonder Boy (see **Figure 21**) "refuses" to stand still when he has the skateboard, and one's *EverQuest* avatar does not move as requested if intoxicated. These are borderline cases because the player characters are arguably not exerting any type of choice. It's not that one can *usually* stand still on Wonder Boy's skateboard only sometimes he doesn't want to: the game system simply will never allow it. There are also clear cases, although not many. In *Baldur's Gate 2: Shadows of Amn*, the player character is slowly revealed to be descended from an evil godly being. Far into the game, the player character begins feeling sick when suddenly he/she transforms into a powerful monstrous entity which begins attacking the hero's friends using his/her abilities, equipment etc.[69] In this case, if the player is able to predict what is about to happen she will be able to advantageously constrain herself, e.g. by transferring highly powerful objects from the (primary) player character to one of the other party members.

Thus, the concept of commitment is not irrelevant for single-player games although it applies much more broadly to (non-zero sum) multiplayer games.

The *Counter-Strike* example in which a player sends the message "Let's wait for them by the gate" to everyone, friends (Team A) as well as enemies (Team B), does not concern commitment. As a member of Team B, the message invites multiple interpretations:

[69] In *Baldur's Gate II* as well as in its predecessor, a similar event occurs whenever party members are affected by certain magical spells during battle. When this happens, the affected character's preferences no longer reflects those of the player (who loses control) but instead those of the player's enemies.

- The speaking player made a mistake. She wanted to propose a strategy to her own team members and accidentally sent it to everyone. In this case, members of Team B have to consider that Team A may have realised what happened and subsequently have changed their plans.

- The speaker is trying to fool Team B into thinking that they now know the enemy team's plans. In this case, Team B should not expect Team A to be waiting at the gate.

Of course, both interpretations can be extended indefinitely. In the second version, Team A may believe that Team B believes that it is being tricked and thus in fact wait at the gate after all. With one more level of beliefs about beliefs Team A should *not* wait at the gate and so on. Thus, it is in fact quite difficult for Team B to make use of the signal received as they cannot be sure what to make of it. *Counter-Strike* is (largely) a zero-sum game between two players/teams and thus any communication between the teams is likely to be regarded as cheap talk. In games with more than two players, communication, or the very possibility of communication may be a source of distrust. In a competitive three-player strategy game any two players may be tempted to cooperate and at any time you don't know if the other players are right now plotting to destroy you. Similarly, in *Diplomacy* the fact that *other* players communicate can be a cause of unease. If Bob and Alice just agreed to gang up on Eve in the next round, seeing that Alice and Eve have a secret talk may make Bob worried no matter what Alice and Eve are in fact talking about.

Strategy and equilibrium

I have used the term "strategy" frequently above. The time has now come to discuss more general principles of strategic interaction and thus to be more precise about what is meant by the term. In everyday language, a strategy is a plan of action meant to achieve some goal. For instance, one might have a strategy for reaching one's career goals or a scientist might have a strategy for the long-term development of a new type of medicine. In game theory, the term has a more precise meaning (as continuously exemplified in the above): A strategy is a complete plan of action specifying one's choice for *every decision node* of the game (Morrow, 1994: 66; for discussion see Rubinstein, 1991). In principle, a player could write down his strategy in advance and another person, or a computer, could enact it. The other player(s) could do the same and, again in principle, the outcome of the game would be a mere question of calculation. A strategy can be either "pure" or "mixed". In the former case, the player simply chooses a fixed course of action to begin with, while in the latter she chooses between strategies with a certain fixed probability. An example of a mixed strategy is *Rock-Paper-Scissors* where the best a player can do, in each game, is to choose each of the three available strategies with a probability of 1/3.

Sometimes, specifying one's strategy is a simple task. In the *PD* it merely involves choosing between two alternatives. In other cases, the task is one of gargantuan proportions. Take *Chess*. From the opening position, *Chess* may develop in a number of ways so vast that the possibility tree of the game has not been mapped. And yet, in principle it *could* be mapped as *Chess* is a game with a finite number of possible states. The exact same goes for all video games. Each one is a finite state machine, and every possible state of a video game could technically be mapped and a complete strategy specified. But if the task of mapping *Chess* was gargantuan, then that of mapping many video games is even more impossible (if you will). Consider the case of *Halo* (see Figure 68). Every alternative position (measured on the lowest possible level) of *anything* within the gamespace, as well as speed, direction and all other characteristics of these objects would constitute a separate game state and would thus have to be included in any strategy. Thus, the case in which, in a certain setting, Small Alien 3 moves one pixel to the right, while Large Alien 14 moves one pixel to the left is different from the state in which the aliens make these moves but the player character is placed one pixel further to the left. And so on. Actually specifying a complete strategy for *Halo* would be humanly (though not theoretically) impossible.

Figure 56 – *Halo*
Though highly similar, these images show different game states

The distinction between the everyday and the technical use of "strategy" is not always clear in the game design literature. Andrew Rollings and Dave Morris, in an account of game balance based on game theory tools, specify that "Strategy simply means the way the player uses the available game choices—the sequence of moves in a beat-'emup, the mix of units in a wargame, and so forth." (Rollings & Morris, 2004: 120). This is clearly not a strategy in the strict game theory sense. However, such technically imprecise terminology is defensible. Indeed, as illustrated in the *Halo* example, insisting on strict adherence to lexicological orthodoxy leaves one at an analytical impasse. But it does alter the scope of one's analysis as we will see in the following discussion of strategic equilibrium.

The notion of equilibrium is derived from physics and describes a condition which a system tends towards; a stable state. If a volume of relatively warmer air is let into a room, the average temperature in the room will rise until it reaches a new stable state (assuming that nothing else affects the room temperature). Two common types of equilibria are relevant to video games:

- **Equity equilibrium**: The game tends towards player equity; i.e. it is more difficult to be ahead than behind.
- **Strategic equilibrium**: Players will converge on certain strategy sets; i.e. the game inspires players to converge on certain choices.

Equity equilibria may be considered negative feedback loops keeping players close in terms of score or position (Salen & Zimmerman, 2004: 214-226). Alternatively, games may have positive feedback loops which amplify instability or they may have neither feature. *Table Tennis*, for instance, has neither type as the winner of an individual ball has neither a greater nor smaller chance of winning the next ball (in normal play). Meanwhile, *Pool* has both: While the player who pockets a ball gets an advantage in the form of an extra turn, pocketing balls means decreasing one's chance of an easy shot in the following turn as one's range of opportunities is diminished. In video games, pressure towards the equity equilibrium is commonly associated with racing games. Some such games, such as the *Need for Speed Underground* series, have (a sometimes optional) catch-up feature which gives advantages to whomever is behind the other. But beyond this "non-realistic" feature, these games (presumably like real-life racing) favour the player struggling to keep up in other ways. As one's perspective is placed at a low angle to the road making it difficult to see turns up ahead, seeing the leading player's car follow the road makes it easier to prepare for upcoming turns (for further examples and analysis see Salen & Zimmerman, 2004).

More generally, regardless of a game's specifically designed feedback loops, having more than two players in a constant sum game often creates a push towards the equity equilibrium. We saw an example of this with the fluctuating incentives to cooperate in a three-player *Age of Empires II* game (Figure 47, page 113)[70]. But as we shall see in the following section, this particular dynamic is a function of the type of interaction between the players.

Equity equilibria and their counterparts are independent of both rationality and intentionality; they are purely mechanical (or rather: cybernetic). Disregarding the special case of player coalitions, they are simply things which will *tend* to happen regardless of what a player aims for and regardless of each player's understanding of the other player's perspective.

[70] In these cases, equilibrium should be understood as a state which the game tends towards (sometimes in an oscillating manner), rather than an actual stable state.

Strategic equilibria, on the other hand, are consequences of optimizing players considering the perspectives of all players (or, alternatively, of players learning over time). They may be thought of in the context of an undeniably important part of game theory: Solving games. How can one, more generally, determine which outcome (rational) players will end up with? A number of techniques exist, some only relevant to specific game types. One of these we have already used. The *PD* (Figure 25**,** page 79) and the generic strategic game (Figure 40**,** page 101) were (at least partly) "dominance solvable". It was possible to reduce the outcome space greatly by eliminating those strategies which a player would never use. Such strategies are "dominated". Technically a strategy is "weakly dominated" if its result is always worse or equal to that of another strategy, and "strictly dominated" if its result is always worse than that of another strategy. Symmetrically, a strategy is strictly dominant if it always yields a better result than all other strategies.

The *PD* is special in the sense that we find a unique solution (defect-defect) by iterated elimination of strictly dominated strategies. Such a solution is sometimes referred to as a game's "saddle point". In symmetrical games (i.e. games which would look the same from either player's perspective), it is found by

- locating the worst outcome for any of the row player's strategies and then selecting the highest of these and

- locating the best outcome for any of the row player's strategies and then selecting the lowest of these

If these two steps hit upon the same number, the saddle point has been found. It gets its name from being at once the highest point of something and the lowest point of something else (like the top of a saddle's seat). In more general terms, this point is the game's unique Nash equilibrium. The Nash equilibrium, which gets its name from game theorist John Nash who showed its general nature, is a strategy set where no one player can gain by changing his strategy unilaterally. It leads to the conclusion "I can do no better, given that the other player keeps doing what he is doing." and an example could be driving down a road in which all other drivers drive on the right side (as illustrated in the introduction).

Sticking to pure strategies a game may have a number of Nash equilibria (NE) between zero and the number of strategies available to the players (and if we include mixed strategies then every finite game must have at least one NE).

The NE is one of the most important concepts in game theory as it is a broadly applicable approach to solving games. How does one find a game's NE? In a strategic form game such as that in **Figure 57** one may use the following procedure: Look for a cell in which the row player's payoff is the highest in the column and where the column player's payoff is the highest of the row. The game in Figure 57 has three (pure strategy) NE.

		Alice		
		Strategy 1	*Strategy 2*	*Strategy 3*
	Strategy A	Bob: 2 point Alice: 2 points	Bob: 10 points Alice: 8 point	Bob: 19 point Alice: 12 points
Bob	*Strategy B*	Bob: 5 points Alice: 0 points	Bob: 22 points Alice: 70 points	Bob: 3 points Alice: 3 point
	Strategy C	Bob: 40 points Alice: 30 points	Bob: 5 point Alice: 5 point	Bob: 10 points Alice: 2 points

Figure 57 – Game with three pure strategy Nash equilibria (marked in grey)

Looking at earlier games, the *PD* (Figure 25, page 79) had one NE while the *Stag Hunt* (Figure 26, page 86) and the *Chicken* game (Figure 53, page 124) had two. Meanwhile, *Tic-Tac-Toe* had no pure strategy NE.

And what does it mean? First of all, strategic form games imply that players act simultaneously and in this light it seems curious to talk about equilibrium as there is no development. The label, in fact, is part convention and partly based on the logic that players will be "drawn" to certain collective positions in the game matrix. If Bob has the least idea about which strategy Alice might prefer in Figure 57 his own choice will be determined and Alice could safely bind herself to a certain cause of action; Bob will not be able to take personal advantage of this knowledge.

At a glance, both dominance and pure strategy equilibria may seem synonymous with poor gameplay as it is obvious what to do and obvious how the game will tend to play out. This argument (although clearly hinging on one's definition of good/bad gameplay) is a respectable one. But it applies almost solely to a particular type of games: Those in which possible actions are obvious and in which implementing one's choice is trivial. To spot the limitations to the idea that dominated strategies and pure strategy equilibria should be avoided, let's return to some of its most well-known proponents. In their book *Game Architecture and Design*, Rollings and Morris note how "A well-designed game shouldn't contain an option that is never worth using […] A dominated option is worthless. You wasted your time putting it in your game. A dominant option is worse. It means that all the other options are worthless." (Rollings & Morris, 2004: 62-63)[71].

First of all, virtually all games necessarily "contain an option that is never worth using."; i.e. most video games by necessity offer the player a plethora of dominated strategies. And it makes no sense to suggest that they should all be avoided by designers. For instance, in *Gran Turismo*, the following strategies are dominated: "Do nothing", "Drive the wrong way till the race is over", "Collide continuously with the sides of the road", "Stay closely behind opponent car throughout the race", "Stay half a lap behind opponent car till the race is over" etc. All these strategies guarantee defeat against a more sensible (rational) player. In *Age of Empires II*, the same is true for "Send all villagers to mine gold and build no structures", "Force all army units to stand still in the upper left corner of the map to form the shape of a heart" and a practically infinite number of others. Thus, the point that dominated strategies should be avoided applies only within a certain subset of possible strategies.

Second, some conceptual slippage results from vagueness about the meaning of "strategy". Many games modelled in this chapter have had dominant strategies (e.g. "Aggressive" in *Spacewar!*). But in terms of the actual *Spacewar!* game, "*Aggressive*" and "*Peaceful*" are "compound strategies" specifying a core conflict by conflating a multitude of smaller choices. At such a general level, video games with objective goals can be said to have dominant strategies but this is unproblematic in Rollings and Morris' sense, since these strategies do not specify what the player

[71] The authors offer significant addenda but here we'll be addressing the core argument.

must do more specifically. Also, strategic dominance (at a less general level) is mostly an issue in the case of easily available choices. When Rollings and Adams note how building orc warlocks in *Warcraft* was a dominant strategy (Rollings & Adams, 2003: 247) they are referring to particular branches high up on the *Warcraft* decision tree which, if reached, heavily favoured the construction of orc warlocks. Even at that point, of course, things are apt to depend on what one in fact did with those warlocks and whether the other player was able to cleverly counter these powerful units. The powers of orc warlocks might well unbalance the game, but such a late trump would be equally likely to simply change the incentives of the game so that the non-orc player would concentrate on attacking early to avoid getting to those higher branches of the tree. While superior orc warlocks may be a case of poor game balance, the general principle that superior options at late game stages are unfortunate would be a curious one.

Third, and perhaps most importantly, the notion of strategic dominance as a general problem faces the issue illustrated by the *Wonder Boy* jump scene on page 66: Obvious choices can be fun as long as they are a challenge for the player to implement. This underlines a particular aspect of video games; they are often *about* finding that dominant (or at least near-dominant) strategy and then attempt to perform it well. Or, in more or less cooperative multiplayer variants like MMORPGs, they are about arriving at a joint interpretation of the situation and then coordinating one's actions.

This does not mean that the general game design principles are faulty, merely that they apply most directly to a certain type of games: Those in which the interesting challenge is *choosing* between alternatives rather than *discovering* one's options or *implementing* one's choice.

From this discussion on equilibrium, I now turn to the larger question of how games vary in the degree to which they are strategic.

Strategicness

We saw above that what formally sets apart strategic games from parametric games is that, in the former, more than one player has preferences. Yet, not all situations (or sub-games) in such games are strategic in the same sense. Sometimes one will have to construct elaborate multi-level models of what the other player thinks that one thinks that he thinks (etc.) and at other times one can essentially ignore the other player and simply act (more or less) as one would if one were playing a single-player game. And this difference is not strictly tied to opponents having preferences or not just as it is not directly tied to the game falling within what is traditionally known as the strategy genre.

To explore this difference, this final part of the chapter on games and the Rational Player Model introduces the concept *strategicness*. *Strategicness* is a combined measure of how much one has to factor in the perception of other players into one's own choices (*strategic interdependence*) and of how many choices are in fact open (*strategic range*). Thus, strategicness is a measure of the interdependence between players and of the strategic freedom of these players.

In this particular sense, games are strategic to the extent that the other player *matters* and to the extent that you have options to deal with it. Superficially, this sounds like just another description of games with only mixed strategy equilibria. In games with a unique pure strategy NE, the other player's choice doesn't matter to the choice one will make. The idea of mixed strategy equilibria does not cover the *scope* of the strategic interaction. A few examples:

Pong is a two-player constant sum game. The options available are *move up* and *move down* as well as *hit the ball downwards* and *hit the ball upwards* (with the latter two, the player can control the angle to some degree). By way of these simple alternatives, a player can attempt to make the next shot as difficult as possible for the opposition. Options are few, but one's best response is continuously affected by one's assumption of what the other play will do.

Now, *Pong* can be modelled from the generalized peaceful/aggressive perspective applied to *Spacewar!* on page 93 and in that model the game does have a unique pure strategy NE. But what makes *Pong* more strategic than a non-strategic game like *Dart* is that zooming in on more concrete player interactions in *Pong* will call for a model in which each player's best choice does depend on one's perception of the other players' intentions[72].

Strategic interdependence is straightforward (assuming one has read the previous 80 or so pages). But strategic range is not. For what constitutes an option, or a choice for that matter? The *Time Pilot* player may choose to turn left or right (and/or shoot). In itself a very limited option set, but he may make the choice every millisecond (or whatever the minimum time one needs to move one's hand). And from a slightly higher perspective he may also "choose" to make any combination of moves, to approach the enemy blimp from an angle of 33°, of 36°, of 60° etc. This is reminiscent of the discussion of strategies in **Strategy and equilibrium** in which we saw that the concept of strategy, for analytical purposes, must often be applied in a manner not technically precise. The number of options open to a player is debatable and will be applied in the following in an informal way rather than via any bullet-proof analytical schema. For instance, I will assume the strategic range of *Pong*, *Time Pilot* and of most racing games to be limited (due to the highly limited types of input the player can make) while that of strategy games is high (due to the many options available in terms of small-scale and large-scale strategies).

The strategicness spectrum

All multiplayer games by definition have player interaction. But this interaction need not be strategic in nature. I mentioned *Dart* above in which one player throws the darts to reach her own goal after which the next player throws the darts to reach his own goal. Essentially, the second player could have closed his eyes while the first one played; what happened has no bearing on his best course of action[73]. The

[72] Or rather: This feature of a game is what tells us that it has some strategicness (a feature of the game which can exist quite comfortably without any models).

[73] This is only true from the perspective of the rational player; the achievements of the first player may well have a strong psychological impact on the second player. Also, depending on the exact scoring details, the second player may have to take more chances if he falls very far behind.

same is true for *Bowling*. It is also true for the card game *War*. In *War* each player holds half the deck and each round the players simply play their top card and the player with the higher card wins both cards. Whoever is unable to play a card in a round loses the game[74]. In *War*, the strategic interdependence is nil as is the strategic range (the latter was low but larger than zero in both *Dart* and *Bowling*).

Within the group of more physical sports, disciplines with no strategicness exist as well. In lap swimming and sprint each participant must stay within his own lane and cannot influence the others. Thus, virtually whatever the other participants may do (or be expected to do), the best choice is to move as quickly as possible towards the finish line. Strategic interdependence is nil and strategic range is highly limited. The rules of the International Association of Athletics Federations clearly disallow sprinter interaction as "Any competing athlete who jostles or obstructs another athlete, so as to impede his progress, shall be liable to disqualification from that event." and as "In all races run in lanes, each athlete shall keep within his allocated lane from start to finish" (International Association of Athletics Federations, 2005: 108).

From a strategic perspective, the athletes are almost coincidentally co-present (though in terms of the competition that is not the case, since the fast*est* person wins).

In terms of multiplayer games with no (or very little) strategic thickness, video games have their fair share. For instance, many racing games have this quality (being structurally close to sports described above). In *Super Monkey Ball* (Figure 9, page 47), you need to reach the finish line as quickly as possible. Although there are moments of strategic interaction, the player mainly needs to guide her monkey quickly through the lap. A similar situation faces the *Gran Turismo* player. Unless the players are of almost identical skill, they are apt to become separated turning the game into a non-adaptive single-player experience (strategically speaking). Clearly,

[74] For exact rules, variations, and discussion of possible ways of improving one's chances see (Wikipedia, 2006b).

Super *Monkey Ball* and *Gran Turismo* differ from athletic sprint since the video game players actually occupy the same portion of gamespace. Because of this distinction, these games are closer to marathons although both video games grant their players even further interaction options (as the monkeys and cars are actually allowed to aggressively ram into each other etc.).

The above distinctions illustrate that strategicness is actually a very fine-grained spectrum. This is underlined by a closer look at individual titles which will show that the level of strategicness can vary greatly even within one and the same game. But first, let us more formally approach the spectrum as it applies to video games.

As indicated, games with a strategicness of zero allow for no consequential player interaction whatsoever. Strategicness is zero if either strategic interdependence is zero (the choices of the other player do not matter) or the strategic range is zero (there are no choices) or both. Clearly, if the strategic range is zero, the strategic interdependence is also always zero but not the other way.

For single-player games, 2nd order adaptive games in which the environment adapts to thwart the progress of the player (as opposed to, say, a game where the environment adapts its colour scheme to the player's actions) can reasonably be considered strategic. Thus, strategicness is zero in *Space Invaders*, *Wonderboy in Monsterland*, *Paperboy* etc. since the environments are non-adaptive. It would also be zero in versions of such games where players take turns; essentially serial single-player games (though often known as two-player modes). The same goes for more modern turn-taking games such as turn-based competition in *Sing Star*. Strategicness is also zero in games such as (certain versions of) multiplayer *Tetris* which use split-screen (see Figure 58) but not in *Pit Stop II* although that also uses a split-screen setup (see Figure 59). The difference is that the *Pit Stop II* players exist in the same gamespace while the *Tetris* screen in practice shows two separate gamespaces.

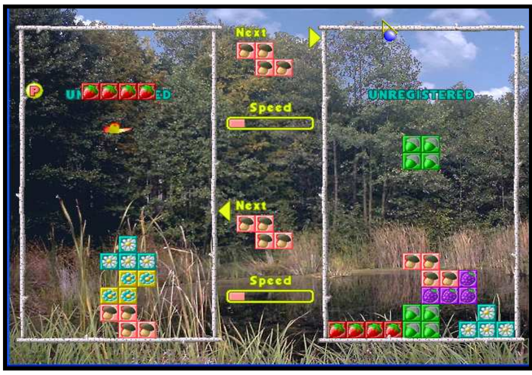

Figure 58 – *Animate TetBlox* (*Tetris* clone)
In this game mode (two-player "Classic Tetris" race) the players simply play side-by-side with no interaction between the two sections of the screen

Figure 59 – *Pitstop II (C64 version)*

Pitstop II, comparable to *Super Monkey Ball* and *Gran Turismo* in these respects, has low (but above-zero) strategicness.

The choices of players placed close to each other in the same gamespace tend to be more strategically interdependent. In *Jetmen Revival* (Figure 60), the players are forced to pass each other (since each has a reason to try to reach the other's base) and while players *can* practically ignore each other and merely go for the enemy flag as quickly as possible there is the constant danger that the other player might change strategy. At the same time, the strategic range is broader as players can choose between several paths to victory and can manoeuvre far beyond the range of options in a game such as *Pitstop II.*

Figure 60 – *Jetmen Revival*
Two players control spaceships and must either shoot down each other or capture enemy flags. The spaceships are marked by red circles.

At the high end of the strategicness spectrum, the best choices depend on one's perception of other players' likely action and one has a broad range of options. Such is the case (appropriately enough) in most so-called strategy games such as *Age of Empires III*. Here, the value of almost any choice depends on the choices made by others; choices which can be known, unknown or guessed at. And the options available to the player are legion both in terms of directing individual units and selecting the broader developmental direction of one's nation on a variety of variables. But perhaps less intuitively, a certain action game subgenre also belongs in the high end of the spectrum. One-on-one fighting games often offer players a variety of attack styles, the efficiency of which depends on the choices of the other player

Figure 61 – *Tekken 5*
Players fight one-on-one battle using a variation of moves the effect of which depends on the other player's choice

In any moment of such a one-on-one battle, the player must choose a move based on assumptions about the likely choice of the opponent[75]. In other words, we are back at the hallmark of strategic situations; Bob must consider the likely move of Alice in the light of Alice considering the likely move of Bob etc. In practice, of course, this may lead to a degree of attempted randomization particularly on the part of a player who fears being outguessed (due to inferior skills, for instance).

[75] If such thinking is not required the game may well be considered poorly designed

It may seem as if game types fit quite smugly into neat slots on the spectrum. This may be true for games with relatively "pure" mechanics in the sense that the interaction form varies little. But of course, if the player relationship varies, then so may the level of strategicness. This is evident in the case of MMORPGs. Sticking to the example of *World of Warcraft* we see a remarkably inconstant player relationship. Just spawned, the player is placed in relatively secure surroundings, given manageable quests by taciturn NPCs. Nearby mobs will react in a fashion reminiscent of Pac-Man's ghostly nemeses, i.e. they will approach aggressively. As to the required resources, they are mostly non-rival; one player's retrieval of a quest item does not affect the next player's retrieval of the same item in any way beyond a possible delay. Essentially then, the players are strategically independent. This can be unsurprisingly modelled as Figure 62.

		Alice	
		Retrieve item	*Do not retrieve item*
Bob	*Retrieve item*	Bob: 1 points Alice: 1 points	Bob: 1 points Alice: 0 points
	Do not retrieve item	Bob: 0 points Alice: 1 points	Bob: 0 point Alice: 0 point

Figure 62 – Early *World of Warcraft* quest example
To any two players, early quests are non-zero sum situations with a unique pure strategy NE.

However, even in the beginning of an avatar's virtual life, this description is not entirely precise from a larger perspective. Whereas the early quest items were non-rival, other resources are rival as both powerful objects and coins are limited. Thus, the larger game of collecting unique items is constant sum (or nearly so): If Bob has the Blessed Blade of the Windseeker, then there is one less item in the world for Alice to procure.

This addendum aside, early *World of Warcraft* play can, strategically speaking, resemble a single-player experience. Later, quests are encountered which require group action. Suddenly, players are made interdependent in a *Gauntlet*-like manner and face the collective action problem of taking on enemies and of fairly distributing found objects[76].

Whereas groups are ephemeral, guilds are more stable organizations. Guild members choose to share portions of their fate with other members achieving certain personal advantages by taking on certain responsibilities (as discussed on page 53; see also discussion on page 131). Since the potential of a guild is partly a function of its reputation, members become co-dependent. Finally, as the player progresses in levels she may increasingly come into contact with the official opposition, i.e. the enemy "faction". Thus, a high-level player will have a largely non-strategic relationship with mobs and NPCs, a slightly strategic relationship with players of the same faction in the same area (as they may be competing for the same rare resources), a social dilemma-style relationship with group members (one depending on particular settings) as well as guild members, and a constant sum relationship with members of the other faction. Despite this general complexity, we can see that for an individual player progressing through the levels, the journey is one of increasing strategicness. Such variation within a single game is not uncommon. It is also often related to the existence of an equity equilibrium as the following examples will show.

Taking a game in which strategicness is low, consider this sequence from *Need for Speed Underground II* (Figure 63).

[76] The intensity of the latter issue has been continuously tweaked by the game's developers. The original choice was to avoid the dilemma altogether as objects were distributed randomly but in subsequent versions alternatives were introduced.

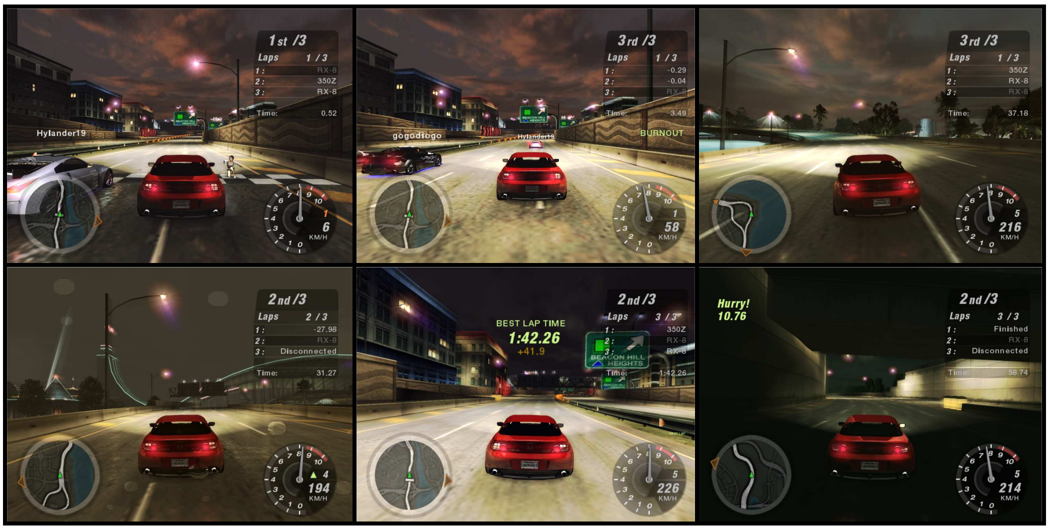

Figure 63 – *Need For Speed Underground II*

The sequence shows a race in which the player controlling the red car is quickly left behind by the two other players (silver and black). At one point, one opponent disconnects from the game and towards the end, the player is told to hurry (as the remaining opponent has finished the race). But essentially, the player has no strategic interaction with the other players beyond the very first seconds as illustrated in Figure 64. The curve would look the same for a game of *Super Monkey Ball*, *SSX 3* and similar racing games[77].

[77] Assuming that players are at significantly different skill levels. For players of equal skill, strategicness may be constantly higher (but not high as the rational thing to do is often still simply to go as fast as possible) or it may be periodically high as players come within range of each other. Both *Super Monkey Ball* (multiplayer race mode) and *SSX 3* have high initial strategicness as players start next to each other and are able to affect each other significantly by colliding (*Super Monkey Ball*) or hitting each other (*SSX 3*).

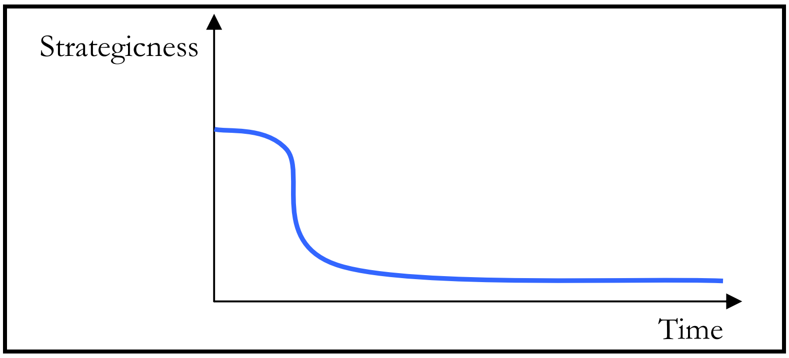

Figure 64 – Strategicness over time in *Need For Speed Underground 2* race shown in Figure 63

Note the striking contrast to the following race driven in "Outrun" mode; a game mode where the first player to outdistance the others by a certain number of meters is the winner. Outrun races enforce interdependence in two ways. First, the moment players are too far away to actually interact, the game simply stops and restarts. Second, by introducing pressures towards the equity equilibrium in the form of a golden arrow helping those behind locate the leading player, players are kept close as illustrated in Figure 65.

Figure 65 – *Need For Speed Underground II* (Outrun mode)
In "Outrun" mode, players compete to outdistance the others by a number of meters. Chasers are directed towards the leader by a golden arrow. In case strategicness drops, the game is over.

Strategicness remains constantly significant but oscillates somewhat reflecting the difference between attempting to catch up and moments where cars are battling for position (Figure 66).

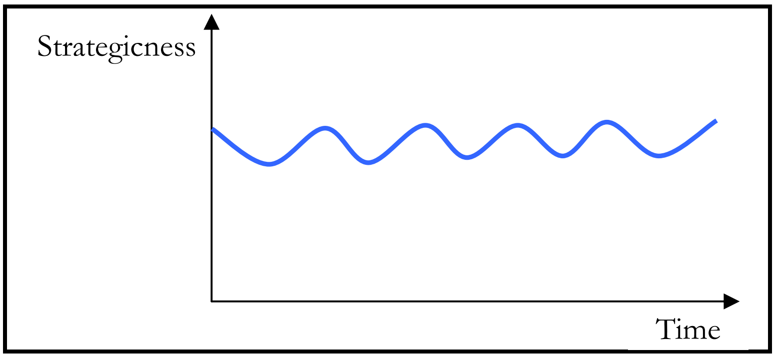

Figure 66 – Strategicness over time in *Need For Speed Underground 2* race shown in Figure 63

Returning to the *World of Warcraft* example, we see that (on a very general level) the life of an avatar is one of increasing strategicness as shown in Figure 67.

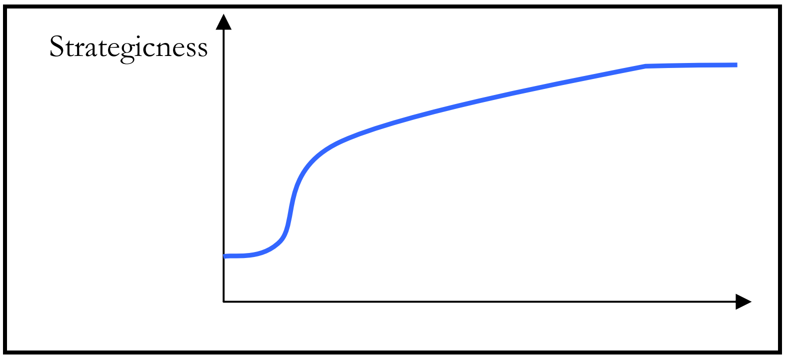

Figure 67 – Strategicness over time in *World of Warcraft*

A rising level of strategicness (to a point) characterizes most strategy games. In the beginning of such games, although the likely choices of other players do affect one's best choice, these choices cannot be known and even if they could, certain basic structures would need to be built anyway. For instance, virtually no matter what the *Dawn of War* player believes about the intentions of his enemies he will initially need to construct buildings such as power plants and barracks and to capture nearby strategic points.

In summary, video games differ not only to the extent to which they are strategic but also as to the ways in which strategicness levels develop throughout individual games. In terms of the latter, games may be

- **Strategically constant**: The level of strategicness remains at a fixed level. This is the case in fighting games like *Tekken 5* and high-paced one-on-one games like *Pong*, *Spacewar!* etc.
- **Strategically fluctuant**: The level of strategicness fluctuates, often because of a pressure towards an equity equilibrium. An example is certain racing game modes like the "Outrun" mode of *Need for Speed Underground 2*. Importantly, any strategically constant game can be considered strategically fluctuant if one looks closely enough at particular instances of interaction.
- **Strategically reductive**: Strategicness declines over the span of the game. This is often the case for racing games (and in particular if players are of unequal skill).
- **Strategically escalatory**: Strategicness increases over the span of the game. This is the case for MMORPGs which largely "protect" the player at early levels only to make her dependent on others to progress beyond a certain point. It is also descriptive of strategy games which force the player to go through certain initial motions before being able to interact strategically with enemy players.

Given these four categories, is it possible to derive any design lessons from the various approaches to strategicness? Probably only in the sense that certain design choices, such as equity equilibria, affect strategic interaction in certain ways and thus may be means to achieve such ends. It is not the case, for instance, that strategically constant games with very low strategicness are necessarily boring (e.g. competition modes in party games like *Sing Star*). In terms of strategicness as such, however, it is noteworthy that some recent multiplayer games have shown a tendency towards increased strategicness. Many racing games include game modes with intense player interaction and entirely separated gamespaces like that of *Animate TetBlox* (Figure 58) are not the norm.

Final remarks on games and the Rational Player Model

This chapter has introduced a "Rational Player" perspective on games. In this perspective, games are reduced to their strategic core and seen as frameworks for the interaction between forces. To this end, concepts and tools of economic game theory were brought to bear on video games which paved the way for a series of observations. Let us briefly recap:

Game theory is a way to make the Rational Player Model of player behaviour analytically salient. It implies specifying the game goals and the options available to the player, assuming that the player shares the objective goals and considering which type of behaviour the game in question is likely to produce. The advantage of such an approach may be the ability to pinpoint similarities between games normally considered quite different and the training of one's ability to "think strategically"; to understand the decision-making aspects of game play.

By use of the analytical model, video games were shown to range between the entirely cooperative (coordination games) and the entirely competitive (e.g. two-player constant sum games). In between those extremes, a larger number of games create incentives for semi-cooperative behaviour.

Furthermore, games were shown to differ as to the information available to the player. Generally, the video game player knows far less than the board game player since in the former, the computer can process the game state independently of the player. It was also observed how certain combinations of information types seem more common in game design than do others. Moving beyond design choices, the role of communication in multiplayer games was discussed and various ways in which players, and game designers, have dealt with commitment problems were identified.

Next, the notion of strategy was revisited showing how common usage in the game design literature refers to a rather imprecise (sometimes necessarily imprecise) concept of compound strategy. On this background, forms of equilibrium in games were discussed and their relationship to the Rational Player model identified.

And finally, it was shown how games can be said to vary in *strategicness* beyond their status as strategic/non-strategic in strict game theory terms. The strategicness of games was discussed as a spectrum leading from games with close-to-zero strategic interaction between players to games of many choices, all of which depended in effectiveness on the choices of other players. And strategicness was shown to often vary over time within individual games.

The analyses of this chapter provides a way of looking at games. And while it does not yield strong design suggestions it gives a direct way of understanding the relationship between game design and player behaviour. In the following chapter we will examine how this understanding compares to actual player behaviour.

CHAPTER 4: PLAYER BEHAVIOUR

“…it is convenient to treat all irrational, affectually determined elements of behavior as factors of deviation from a conceptually pure type of rational action”.
- Max Weber

In the previous chapters we saw how game designers tend towards a Rational Player perspective on the player and how this perspective can be formalized using techniques from game theory.

Within economics, experimental approaches have showcased the need for reconsideration of the agent’s priorities. Although many within the field believe that the core model survives these onslaughts, it is clear that concepts like fairness (that is, a certain other-directedness) plays a significant role in economic interaction (Camerer, 2003; Frank, 1988). This chapter examines whether something similar is the case for game studies. How do the predictions of the Rational Player model compare to the actual behaviour of players?

A secondary function of the chapter is to provide a more general insight into the interaction between players. The micro-level interaction of video game players has received quite limited scholarly attention and to remedy this, the chapter also asks: What is the content and function of communication between players of multiplayer games?

These questions are addressed through an experimental study of console players. These subjects were exposed to three games which differ radically in terms of the relationship in which they place players seen through the Rational Player perspective. The results of this experiment were unexpected. Within the limitations of the study, it turns out that the model has almost perfect explanatory value but only regarding one isolated aspect of gaming: The on-screen action. Turning to the off-screen verbal behaviour of the players, the model falls significantly short. This finding has significant implications, both theoretically and methodologically as it seems to indicate that players distinguish quite clearly between their in-game behaviour and their simultaneous behaviour outside the game.

Structurally, the chapter begins by discussing the findings of the existing literature on player behaviour[78]. It then goes on to describe the games used in the experiment followed by a discussion of predictions concerning the behaviour which these games should elicit (given Rational Player assumptions). After that, the experimental design is described and the results of the study are presented and discussed. Lastly, the validity of the results is addressed followed by a summary and brief discussion.

Previous studies of player behaviour

In order to build upon previous knowledge, the following is a review of studies of video game players with a particular focus on behavioural patterns and relationships between game design and player behaviour.

In one sense, video game playing is a quite well-studied phenomenon. A number of studies have attempted to reveal patterns in game-playing often documenting gender and age differences in terms of genre preferences, overall play time and/or attitudes towards gaming (e.g. Drotner, 1999; e.g. Funk, 2001; Inkpen et al., 1994; Jones, 2003).

Furthermore, the relationship between one aspect of game design and one type of player behaviour is undeniably well-studied. As mentioned in **The Susceptible Player Model** in **Chapter 2: Visions of the player,** a significant number of studies have tested the relationship between the level of perceived violence characterising the game content and subsequent player aggression (for recent examples see Anderson & Bushman, 2001; for recent examples see Bushman & Anderson, 2002; Williams & Skoric, 2005). To a large extent (although far from unanimously) these studies converge on the conclusion that violent game content sparks aggressive post-game player behaviour, although the general validity of many of these studies

[78] Some of the studies discussed were also mentioned in **Chapter 2: Visions of the player** but are revisited here in order to clarify their results on actual player behaviour.

is questionable (for a review see Egenfeldt-Nielsen & Smith, 2004). Even disregarding their debatable validity, these studies are tangential to the focus of this dissertation as they measure *post*-game behaviour and as they concern themselves with the relationship between an entirely different set of variables. Simply put, they are interested in the relationship between certain aspects of *representation* and *level of aggression* whereas this dissertation is concerned with the relationship between *rules* and *cooperative/non-cooperative behaviour*.

The following is a review of studies on how players actually play video games. I distinguish between two main levels of analysis:

1. **In-game player behaviour studies**: Studies where the researchers collect their data inside the game (with limited or no access to the behaviour of the players outside the gamespace). Data collection may be tightly focused on specific variables or it may be more ethnographic and explorative.
2. **Out-of-game player behaviour studies**: Studies of the behaviour of video game players unmediated by the game. These studies may take place in a "focused" setting, i.e. studies of concrete gaming sessions or examine player behaviour with limited reference to the actual game or games, typically using an ethnographic approach.

I exclude studies that discuss or categorize aspects of multiplayer gaming from a purely theoretical perspective. Nor do I include studies which study player behaviour indirectly, for instance by asking players to describe their playing style, their reasons for joining guilds etc. As a rule, these studies examine other levels of player behaviour than the ones I'm interested in here.

Before continuing, it is worth discussing briefly what is meant by "how players actually play video games". The question should not be thought of as indication that all players necessarily play in one and the same way regardless of personality differences and differences between games (indeed a core assumption of this dissertation is that they do not). It is in fact clear that people approach gameplay in different ways. There is variation in general strategies (some players are defensive some are aggressive) as well as in compliance with the scoring conditions as defined by the game (some players like to challenge the game system, some attempt to achieve "beautiful" effects etc.). Famously, Richard Bartle (1996), addressing variation in MUD players, argued that such individuals could be thought of as fitting into a four-category typology of *achievers*, *explorers*, *socialisers* and *killers*. Bartle's data was his long-time experience as a MUD admin and views expressed during a particularly heated discussion among experienced MUD players.

More recently, the issue of player variation has been approached as a question of *motivation* rather than static (or static-sounding) *types*. It is increasingly stressed that different games afford different pleasures or that the same player may have dynamically changing reasons for playing games. In design-oriented literature lists of motivations are often unsupported by empirical data, offered as suggestions or implicitly meant as distillations of the author's experience. For instance (as mentioned in an earlier chapter) Richard Rouse (2005) asserts that players want "a challenge", "to socialize", "a dynamic solitary experience", "bragging rights", "an emotional experience", "to explore", and/or "to interact". In a similar vein Hunicke, LeBlanc and Zubek's framework for understanding game design posits a (non-exclusive) list of eight components which makes a game appealing (Hunicke et al., 2004). Though hardly wrong in any strong sense such lists are only informally validated if at all.

More empirically grounded is the work of Nick Yee (2006) who has used factor analysis on survey data to identify five main categories of MMORPG player motivation (achievement, relationship, immersion, escapism and manipulation). Of course, the self-representation offered by players in a survey querying *why* they play does not inform us as to the minutiae of *how* they play but it does underscore that player motivations may be quite varied even within the same gamespace.

While players play for different reasons, they also play in quite different contexts likely to affect their behaviour. Presumably, Sunday morning console play is generally different from high-profile first-person-shooter tournament play.

Whereas the former situation may inspire casual, explorative play the latter is likely to induce more strictly competitive player behaviour.

While presumable, such truisms are not always adequately documented. Considering how poorly the idea that player motivation and behaviour shows strong variation matches the game designer conceptualization of players discussed in previous chapters it is difficult not to wonder at the under-developed state of our empirically grounded knowledge on the behaviour of video game players. The question about "how players play" should be interpreted as "are there noteworthy patterns within the universe of video game play and are these patterns related to the design of the game being played?". The following summarizes what we *do* know.

In-game player behaviour studies

When researchers collect data inside a game, they give attention to certain facets of video game play while (sometimes) ignoring others. The implications of this depend on the game type and, even more, on the play setup of the players being studied. For instance, the distinction between out-of-game and in-game behaviour may not be crucial if one studies particular MMORPG players who play alone and do not engage in much social interaction unmediated by the game (perhaps more common among players of small-scale casual online games). But for game types where players are physically co-present or communicate through third-party instant messaging services or voice systems, the out-of-game/in-game distinction attains significance. Here, the players are able to interact outside the communicative framework offered by the game and the data which the researcher can access is only that portion of the full interaction which the players saw fit or necessary to conduct through the publicly accessible features or channels of the game.

This is worth bearing in mind in the case of Wright, Boria and Breidenbach's examination of the "creative" use that players make of *Counter-Strike* (2002). Using mainly log file data, the authors argue that what goes on inside the gamespace is irreducible to any superficial reading of the game's content as *Counter-Strike* players "…enter a complex social world, a subculture, bringing together all of the problems and possibilities of power relationships dominant in the non-virtual world." (2002 unpaginated).

The authors choose an in-game focus to understand the innovations on traditional rules and interaction offered by the gamespace and thus present data on player behaviour only as mediated, shaped and restricted by the gamespace. They argue, essentially, that FPS players are not restricted (or determined) by the game system and that the limits of the gamespace are challenged or undermined by creatively expressive players. Although a worthwhile point, the study does not reveal the relative extent of various behaviour patterns nor the effect of the game in question in comparison to other games.

A somewhat similar approach, although without the strong focus on creative diversity, is evident in the work of Ducheneaut, Moore and Nickel (Ducheneaut & Moore, 2004; Ducheneaut et al., 2004). Here too, the authors analyze interaction through log file data (supplemented by video recordings of in-game interaction) as they consider how the concrete design of *Star Wars Galaxie*s influences social interaction. The efficiency of the game's intended social spaces (the 'cantinas') is commented upon and it is suggested that games have progressed in their use of architecture to promote certain types of social interaction but may benefit from looking more closely to the field of computer-supported cooperative work for design inspiration. As to player behaviour, the authors note how use of the cantinas is highly instrumental but emphasise that this may well be a function of particular design choices rather than a sign of generally asocial (or unsocial) player behaviour. They also report a conflict between general playing styles as "achievers" and "socializers" have conflicting objectives (Ducheneaut & Moore, 2004: 9) and thus echo a pervasive observation regarding multiplayer game worlds.

Ducheneaut, Moore and Nickel's work aims to have implications for game design by emphasizing social implications of certain design choices. A related focus is evident in the work of Manninen and Kujanpää (e.g. Manninen, 2001; Manninen, 2004; Manninen & Kujanpää, 2002) who have focused on the ways in which graphical game environments enable and restrict player communication and collaboration. Reporting on a qualitative study on player interaction within an experimental virtual world, Manninen and Kujanpää (2002) discuss how players put the available communication channels to use. The analysis builds on in-game video recordings (from one player's perspective) which also captured the entire channel of verbal communication as the players were able to communicate through headsets. Though rich in its descriptive scope, the study does not offer more general insights into how players interact as its main goal is to inform designers about possibilities for supporting rich player communication.

Others have retained the in-game focus but have employed less focused, more explorative approaches often inspired by ethnographic techniques.

In a 1998 study of a game MUD (Muramatsu & Ackerman) one of the authors performed a 6-month ethnography within the textual gamespace employing classical data analysis techniques. Directing their attention towards the character of social life on the MUD, the authors report great surprise that apparent non-instrumental communication was remarkably rare:

> Almost all attempts to deepen personal knowledge of other players were rebuffed... This directly contradicts the findings from studies of social MUDs and even some combat MUDs… and was quite surprising to us. (24)

Meanwhile conflict and levelling were far more prevalent as was cooperative behaviour within guilds and between players not affiliated with the same guild. In other words, players did not appear to use the game as a backdrop for non-game-related social activity but rather seemed to take the game objectives quite seriously. In his PhD dissertation Jack Muramatsu shifted the focus from MUD players to administrators in what is primarily "an ethnographic account of the work performed by the games' administrators, immortals, in order to regulate player behaviour" (Muramatsu, 2004: 3). Although obviously related to the issue of player behaviour the social life of the MUDs in questions is here observed from the perspective of the administrators and with an eye towards the everyday tasks of regulating the gamespace. Thus, general issues of how the MUDders behaved are only sporadically addressed.

Muramatsu's most recent perspective is shared by Daniel Pargman whose own PhD dissertation (Pargman, 2000) is a study of the interplay between administration (both "manual" and code-based) and community-formation in the Swedish game MUD *SvenskMud*. Again, although the work is thoroughly detailed the players are naturally delegated to a supporting role. But the writings of Muramatsu and Pargman share another feature. Though far from polemic, they both express a certain surprise that their findings seem somewhat at odds with (what the authors consider) common wisdom on MUD use. Thus, in a section entitled "Down the pit of confusion" Pargman notes his surprise that "the much-publicized boundary-crossing behavior seemed to be 'sadly' lacking in SvenskMud" (104). Claiming that this seemingly unusual finding originally made him doubt his methodological approach, Pargman later came to reconsider the validity of the anecdotal evidence supporting the "common wisdom". The same surprise-turned-to-skeptisism is evident in the section of Muramatsu and Ackerman's article quoted from above. These researchers, in other words, find that their results call into question previous studies emphasising experimental and/or highly sociable play[79].

A slightly different logic underlies a study which concentrated on the very formation of cultural norms in a virtual world. Using quasiethnographic techniques "[…] including observations, interviews, and analysis of player talk in online forums" (4) Squire and Steinkuehler (In press) analyse the emergent culture of *Star Wars Galaxies* a short while after its release. They are particularly attentive to the issue of how player practice intersects with design intentions and how playing successfully requires a demanding gamer "literacy" (a point further developed in Steinkuehler, 2004; Steinkuehler, 2005). The authors also emphasize (as did Ducheneaut & Moore) how the game design inspires two different playing styles, power gaming and role-playing, but does not fully manage to support the happy co-existence of these two player groups. They make the interesting observation that the

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79 Of course, since ethnographic accounts do not in general test hypotheses, the criticism is meant to suggest that the accounts in question do not convey a *reasonable* impression of MUD life rather than that they are *wrong*.

somewhat incompatible playing styles translate into a conflict regarding the preferred level of open-ended play. Power gamers prefer more strict structures (and storyline) than do role-players who value freedom and the unexpected. This observation indicates that the behaviour of the former group is better explained by the objective game goals than is that of the latter. Summing up, the authors emphasize the complexity of social life in *Star Wars Galaxies*: "[…] we find that MMOG participants are engaging in complex practices where they invent and reinvent themselves in powerful ways." (Squire & Steinkuehler, In press: 16). The point that players are engaged in complex cultural practices is elaborated upon in Steinkuehler's PhD dissertation:

> Gamers' own thinking about styles of play and the identities they underwrite are a conflation of design characteristics and emergent culture of the context of the MMOG they inhabit, situated within the myriad of contexts they themselves encounter with others, with some configurations of constructs evoked for sense-making in some social/material contexts, other configurations evoked in order to explain others. They are therefore complicated and necessarily messy. (Steinkuehler, 2005: 77)

I'll discuss the implications of this observed complexity briefly below.

The observed conflict between power-gamers and role-players rhymes well with a finding made by Jakobsson and Taylor in their study of social dynamics in *Everquest* (Jakobsson & Taylor, 2003). They describe an ongoing discussion regarding the social role of high-level hunting guilds which, to some, negatively impact the gamespace by their instrumental approach to the game (6)[80]. More generally, the authors offer a series of observations on the interplay between the design of *Everquest* and the social life of the gamespace which becomes highly organized around (more or less formal) groups. In particular they emphasize how the structurally embedded need to cooperate opens a series of mutual dependencies and vulnerabilities that render reputation and trust crucial for fully participating in the game. This point is further elaborated on in more recent work by Taylor (T. L. Taylor, 2006: 41pp).

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[80] But see also Taylor (2003) for the important qualification that power-gamers are no less "social" than more casual players.

A similar acknowledgement of the deep relationship between game design and behaviour is evident in Torill Mortensen's (partly) autoethnographic study of the *Dragon Realm MUD* (Mortensen, 2003). Mortensen reflects on what is means to play and offers analyses of player motivations addressing primarily ontological questions like the nature of the text-based online game experience. Thus, while offering a wealth of discrete observations (including log excerpts) it is not the ambition of the author to analyze the *behaviour* of the gamers in any direct sense.

To summarize these findings in the context of this dissertation we can concentrate on two aspects: *The complexity of multiplayer gaming cultures* and *the conflict between instrumental and non-instrumental play*. Several authors note the complexity of interaction and communication within multiplayer game spaces. For Wright, Boria & Breidenbach and for Squire & Steinkuehler this complexity is seen as a counterpoint to (allegedly) commonly held assumptions that the activity in question is somehow a simple one. Beyond this loose comparison it is difficult to evaluate the relative nature of the "complexity" but we can perhaps assume that game cultures are as complex as other types of cultures. What would that mean for the results of the study presented later in this chapter? It is worth bearing in mind how player behaviour in persistent game worlds (or on game servers with a persisting culture etc.) evolves over time and under fewer constraints than faced by players of console games, i.e. it is likely to be both more faceted and more unpredictable. In this sense, general behavioural patterns found in the latter game type might be less evident in persistent gameworlds. However, the fact that a certain interaction type is multi-faceted and complex from certain perspectives does not in itself illegitimize the application of simple explanatory models. To take a banal example, a model which suggests that car accidents can largely be explained by the driver's years of driving experience may be wrong but it is not invalidated a priori by the fact that there are many types of cars, two genders of drivers, and numerous makers of tires.

The other aspect of the studies above which is noteworthy in this particular context is the pervasive observation that game world inhabitants can be loosely grouped as achievers and role-players. In the terminology of this dissertation, the former group could be said to play “rationally” while the other group does not. However, as we have seen, MMORPGs do not have clear-cut objective goals and so would not be predicted by the model to elicit one particular behaviour type. The differing opinions as to what the game is about and should be played is interesting however, as it shows how vaguely stated objective goals may give rise to quite strong divisions based on subjective goals. Although this dichotomy hides significant variations (Steinkuehler, 2005) it is indication that even games as relatively goal-less as MMORPGs lead to observable behaviour patterns.

Out-of-game player behaviour studies

Studies of the gamespace external behaviour of co-present video game players which focus on the actual act of playing are less than abundant. The majority of game researchers with an interest in players have directed their attention to either the social dynamics *within* gamespaces (the studies reviewed above) or chosen an approach which downplays the actual connection between concrete game features and player behaviour.

To this date, small-scale out-of-game player behaviour has been most frequently addressed by researchers aiming to improve the usability of a given title or to arrive at more general principles for ease-of-use in game design. Such studies generally follow conventions from “standard” usability testing[81] (Microsoft, 2005; Pagulayan, Keeker, Wixon, Romero, & Fuller, 2003) as the ability of representative players to navigate a game’s interface is measured. Such studies may yield insight into how players devise strategies to overcome obstacles but generally they refrain from making general statements about player behaviour (they focus on the game features) and rarely do they take into account player interaction. The latter may probably be attributed to the disciplinary background of “classical” usability studies originating within a single-user focused HCI environment.

[81] For a somewhat different approach attempting to provide ways to measure the quality of the games themselves (not just their ease-of-use) see (Fabricatore, Nussbaum, & Rosas, 2002).

One study, the methodology of which closely resembles the one reported in this dissertation, was conducted by the privately held XEODesign in order to understand how games trigger enjoyable emotions (Lazzaro, 2004). The researchers analyzed the behaviour of 34 players in their normal play context gathering data in the form of video recordings of play and questionnaire responses and furthermore interviewed 15 non-playing friends and family members nearby during the play sessions. Although mainly focused on player motivations and the ability of different game types to invoke different emotions, the authors do make a number of observations on general player behaviour and the relationship between player activity and game type beyond the expression of emotions. Some such observations are less than surprising; for instance, players move very little when concentrating intensely and the presence of other players increase movement due to communication (12). Others, like the following, are less intuitive:

> To have more fun newbies 'act out' when paired with better players. In multiplayer games beginners use gross motor control to run into, shoot at, and push over more experienced players. They often ignore agreed on game goals and do something surprising for a few moments of laughter. Quin enjoys shooting the squad leader in Brute Force 'just because he can.' Experienced players such as Rob and Zachary handicap themselves by giving a newbie a long head start or by waiting for them to catch up so it is a 'close race.' If players cannot achieve the game's main goal they will often make up their own rules or stop playing. (21)

We are not informed of the prevalence of this behaviour in the data set but as regards newbies the observation that inability to reach the "game goals" may lead to behaviour which is otherwise "fun" seems plausible. Of course, such behaviour also unmistakably signals to both the better players and the observers that the newbies do not in fact accept the game contract thus lessening the embarrassment which would follow extreme failure to compete. Meanwhile the observation that skilled players handicap themselves is not really explained by ineptitude to "achieve the game's main goal". Rather, these better players seem to be adhering to other social norms pertaining to behaviour in situations of clear skill-inequality. Notably, the gaming contract is respected in a conspicuous way which signals to both opponents and observers that they are being honourable (again, lessening any embarrassment attached to losing according to the objective game goals). We should note that, although quite understandable and "likely", redefining the game goals is not compatible with the Rational Player Model in its most basic form. In the likely case that goal redefinition is a common occurrence, this calls for an explanation which falls outside the scope of the model.

The researchers also report that some players enjoy testing the boundaries of the game system interpreting this as a play style meant (both by game designers and the players themselves) to invoke awe and a sense of mystery (29). This behaviour is observed in relation to *The Sims* and *Grand Theft Auto: Vice City* which both emphasise player freedom in their design.

Finally, the study shows that:

> The presence of others changes how players react. Even negative events can take on a comic tone when experienced in context of group play. Players laugh at everything especially the mistakes. They also emote more strongly when winning if others are watching. Friends also add new content to game through trash talking and gestures frequently trying to out do each other with witty commentary. (35)

It is an interesting, if under-developed, observation that group play make players laugh at "everything". Laughing at one's own mistakes, of course, may be a way to emphasise that defeat is not terribly important and that one is not embarrassed. Also, the added layer of competition regarding "witty commentary" is an interesting feature of multiplayer gaming.

As mentioned, Lazzaro's observations seem to indicate that inexperienced players redefine the game goals and that as a whole everyone seemed to be having fun (at least they "laugh at everything"). A rather different observation is made by Lisbeth Klastrup in her experimental study of *Super Monkey Ball* play (Klastrup, 2003). Based on observations of two groups, one consisting of more experienced players than the other, Klastrup notes:

> […] the group of experienced players seemingly had more fun than the inexperienced group and quickly started shouting and yelling at each other, even though they did not know each other in advance […] It is tempting to relate this slipping quickly into 'having fun'- mode to the ease with which all players picked up the game and learned to control the ball. In the group of inexperienced players, the young women were not as fast as the present young men in picking up the game and throughout the test session

> they had problems with mastering the controls on the joypad and orienting themselves in the game [and this] in the long run made them appear less interested in playing than the men. (Klastrup, 2003: 388)

Thus, whereas Lazzaro observes how inexperienced players deal with their relative incompetence by redefining goals, Klastrup observes that they simply lose interest. This difference must likely be put down to the difference between the observed sessions. Lazzaro's players are engaged in a fully voluntary activity in the company of friends, whereas Klastrup's players are in an experimental setting with co-players that they know less well (although they are not complete strangers). This difference is of clear importance for my own study. Given that my concrete setup resembles Klastrup's rather than Lazzaro's, any observed resignation of inexperienced players may well be a consequence of the study setup (whereas attempts to redefine goals would be less likely to occur).

Klastrup makes another observation regarding the relationship between experience and communicative behaviour:

> [Players in the inexperienced group] shouted and yelled less at each other, and I surmise there must be a relation between the inequality of the players and the either more or less social acceptability of bragging of your winnings or mocking.

Klastrup suggests that it is socially acceptable to only criticize someone at your own level but it seems more precise to suggest that it is the very lack of experience which explains the lack of bragging and mocking. There could be various explanations for this phenomenon. For instance, bragging and mocking may be considered barriers to learning a new game as all cognitive capacity is needed to appropriating controls etc. The difference observed by Klastrup may perhaps also be connected to the mixed gender makeup of the inexperienced group. It may be that the (experienced) all-male group is more boisterous *because* it is all-male while in the other group, communication is more guarded since mixed-gender competitive game play does not fall as readily into a well-known frame of interaction (for a discussion of gender differences in interaction around computers see Jessen, 1995).

Importantly, while Lazzaro's work is a study of voluntary (although conspicuously recorded) play and Klastrup's is focused on an experimental situation, both session types were casual in the sense that no particular (external) focus was placed on competitiveness. Presumably such play varies somewhat from more directly competitive variants such as that reported on in a 2001 paper by Tony Manninen presenting a study of players gathered for a *Counter-Strike* LAN event (Manninen, 2001). Through a combination of observation and interviews Manninen finds that the players in question invent their own ways of communicating beyond those offered by the game, and that the intensity of communication outside the game itself was dependent on the level to which the playing was casual; in casual sessions no or very little out-of-game communication was observed. The author admits some surprise at how little communication takes place even during rated sessions but suggests that "The players have obviously played so long that they do not actually need to say or hear anything, they just observe other players and know what would be the best place to be in" (2001: 8). As players engaged in intense group strategizing between sessions it is fair to assume that the cognitively demanding nature of the action game in question explains the relative lack of communication during play.

In a manner methodologically close to my study, Holmes and Pellegrini have addressed the issue of behaviour during video game play (Holmes & Pellegrini, 2005). The authors rightly note that while post-game behavioural tendencies have been scrutinized intensively, "virtually no research has described the extent to which children are aggressive or cooperative **while they play** these games." (134, my emphasis). To remedy this, the authors have studied children playing violent and non-violent games focusing on "previously unexplored nonverbal and verbal behaviours". In one study, 66 children aged 5-10 played 10 different console games for six minutes each (in pairs) while being recorded on camera. The data was submitted to a coding scheme including both facial expressions, body movements and verbal content and based on this analysis the researchers conclude that game content did not significantly affect observed aggression levels: "[…]children's interactions during video game play are decidedly positive despite the content of those games." (137). The authors also make the interesting observation that boys were more likely to offer positive statements than were girls and they suggest that this is due to the higher play competency of the boys: "Perhaps the boys offer more positive comments in an attempt to help the other player become more skilled." (137). The implications of this observation will be addressed in relation to the study results below.

In a similar study, Holmes and Pellegrini studied 70 children (6-10 year olds) in three different playing conditions (including a board game condition). Again, the authors find that the "children's dyadic interactions during video game play, despite the content of those games was positive." (140) They also find that verbal communication is limited, which is ascribed to the need for concentration. When the children did speak, however, they "conversed positively about the game they were playing in all conditions." (141).

Summing up, the authors note that the studies do not necessarily extend to broader populations but that the results do suggest that children simply react positively to video game play (regardless of content). Well aware of the potentially controversial nature of the results, the authors note how

> These findings contrast sharply with the reported negative, short-term effects of playing aggressive video games on children's aggressive behaviour. In addition, it appears as though player competency and the features of the game may be partly responsible for how children behave while they are playing video games. (141).

The observation that game content does not predict player behaviour in any simple fashion is also evident in the work of Danish youth culture researcher Carsten Jessen. During the better part of the 1990s, Jessen conducted a series of inter-related studies on children's use of computer games (Faurholt & Jessen, 1996; Jessen, 1995; Jessen, 1997; Jessen, 1998; Jessen, 1999; Jessen, 2001). Very broadly speaking, Jessen found that playing computer games could not meaningfully be seen as a less active/creative activity than other forms of play and that

> …the prejudices that many adults have as regards computer games in particular were unjustified. Computer games are for example rarely an asocial or individual activity. They rarely place a child alone in front of a computer screen. On the contrary they are very much a social activity. (Jessen, 1997 unpaginated)

Jessen continuously stresses that the activities of the children in his studies are not a function of (what one might superficially consider) the game's contents. The observation is made in relation to in-game activity where players often apply unexpected interpretations and even create their own winning conditions: "It is not the computer or the software which sets the agenda. This [playful] type of activity with the computer demonstrates with all clarity that the children are active producers of the situation." (Jessen, 2001: 135 my translation). It is also made in relation to ex-game activity. Commenting on a particular episode in a study of a *DOOM II*-playing boy group in a youth club (Faurholt & Jessen, 1996) it is found that

> The contents of the game may be characterized as 'violent' but the children's way of being together is not characterized by violence or conflict, quite the contrary. They cooperate exemplarily and help each other to a large extent […] The idea of a direct link between what the children see and what they do and learn from it does not correspond at all to what happens in the computer room (Faurholt & Jessen, 1996 unpaginated, my translation)

In the perspective of this dissertation, Jessen's most important contribution is the concrete observations on how players negotiate the relationship between gamespace and play setting.

Sharing concerns similar to Jessen's, Lawry et. al. as part of the Canadian Electronic Games for Education in Math and Science project studied player behaviour among (child) visitors to a science museum over a period of two months (Lawry et al., 1994). Like Jessen they take their cue in commonly held negative perceptions of video game play. Somewhat in contrast to these beliefs the authors find that boys are often attracted to mentally challenging games (i.e. not only violent action games), that any link between anti-social behaviour and gaming is not supported by their data, and that many boys who are interested in games also display an interest in other activities. In a related study (Inkpen et al., 1994) focusing on girls as players, the authors find that the girls studied are interested in electronic games but seem to favour games in which communication is either required or made possible by the pace of the game. Both studies used a combination of qualitative and quantitative methods as the players were both observed, interviewed, surveyed and the subjects of timed samplings measuring the number of participants engaged in each activity at certain intervals.

Though not gamer-specific, Sherry Turkle's ethnographic work reported in her *Life on the Screen* (Turkle, 1997) deserves mention. While less than stringent in her methodological considerations, Turkle offers a wealth of observations on how players (particularly those engaged with virtual worlds) use games as tools for experimenting with their identity as they explore the possibilities of assuming different personalities, genders etc. Her interest being psychological and philosophical aspects of modern-day computer use she does not comment on the concrete details of play behaviour except to underline that people play for a variety of reasons suggesting that they also play in a variety of *ways*.

What we know

Although growing with each study, our understanding of player behaviour and its relationship to game design is unimpressive.

It would not be unfair to suggest that most of the studies mentioned share little else than an allegiance to a loosely specified sets of methodological techniques. Some see it as their aim to counter ill-begotten myths regarding the anti-social nature of gaming or the alleged lack of creative work by the players but they do not, for instance, share guiding concerns which make one study build upon another in any direct sense[82]. And yet, certain indicative results stand out.

As we saw, studies on video game player behaviour are conducted from either within the gamespace or from without. The former approach often foregrounds the explanatory value of the game itself while the latter tends to depreciate that value. From the category of in-game studies it is difficult to determine the effect of the game compared to other games or compared to a non-game condition. Few of these studies attempt to make systematic comparisons But from these studies, the following conclusions are relevant here:

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[82] As a rule they do not include references to each other.

- Game cultures are not restrained in complexity by relatively simple interaction features (Mortensen, 2003; Squire & Steinkuehler, In press; Steinkuehler, 2005; Wright et al., 2002). It would be a grave mistake to consider player interaction forms (in the broadest sense) simple. This may be particularly crucial in the context of persistent game worlds.

- In MMORPGs, players exhibit a variety of playing styles (e.g. Steinkuehler, 2005) but a general division can be observed between "achievers" (or "power-gamers") and "socializers" (Ducheneaut & Moore, 2004; Jakobsson & Taylor, 2003; Squire & Steinkuehler, In press). While this shows that players are clearly divided as to how the game should be played it also shows that behaviour patterns are anything but random (even in relatively goal-less games).

Although almost as methodologically varied, out-of-game studies have also converged on certain observations.

- Inter-player communication has been observed to be surprisingly sparse (Holmes & Pellegrini, 2005; Manninen, 2001). This is suggestive of the high cognitive demands of much video game play and this does question the use of verbal behaviour as a measure of behaviour more generally.

- Players have been observed to equalize their chances, indicating that fairness often plays a strong role trumping mere competitiveness (Holmes & Pellegrini, 2005; Lazzaro, 2004). In particular, highly skilled players have been observed to handicap themselves (Lazzaro, 2004) and to attempt to raise unskilled players to their level by offering help (Holmes & Pellegrini, 2005).

- Inexperienced player have been observed to visibly disrespect the objective game goals (Lazzaro, 2004) but also to lose interest in the game if the frustration becomes too high (Klastrup, 2003).

The implications of these findings in relation to my study will be further addressed below.

The Study: Three games, three player relationships

We turn now to the experimental study devised to reveal the strength of the Rational Player Model. After a brief description of the games I will discuss the behaviour which these games should elicit from rational players (the predictions tested by the study). I then go on to describe results and methodological issues.

In the study, groups of players played three console games spanning the spectrum from the entirely cooperative, over the semi-cooperative to the fully competitive. The cooperative game chosen was the soccer game *FIFA Soccer 2004* for Xbox (with players on the same team), the semi-cooperative game was the role-playing game *Champions of Norrath* for PS2 and the competitive game was the racing game *Mashed* for PS2.

FIFA 2004 is an installment in a long-running series of popular FIFA games aiming to closely mimic soccer television aesthetics (see Figure 68). Players control a player each (either on the same or opposing teams) and play either stand-alone or tournament matches. During play, a player may switch between members of her team (no particular team member is the player’s avatar).

Figure 68 – *FIFA 2004* (PC version)

In the study, the players were placed on the same team and played stand-alone matches. A stand-alone soccer match can be thought of as Figure 69:

		Team B	
		Cooperate	*Defect*
Team A	*Cooperate*	Team A: 0,5 point Team B: 0,5 point	Team A: 0 points Team B: 1 points
	Defect	Team A: 1 points Team B: 0 points	Team A: 0,5 points Team B: 0,5 points

Figure 69 – A stand-alone soccer match (team perspective)
This notation follows the logic of the *Spacewar!* matrix seen earlier (Figure 31) and not the tournament rules discussed in the previous chapter.

If we take "cooperate" to mean "strive for victory for own team" and "defect" to mean "strive for victory for opposing team" the situation between players on the same team looks like Figure 70:

		Player B	
		Cooperate	*Defect*
Player A	*Cooperate*	Player A: 0,5 point Player B: 0,5 point	Player A: 0 points Player B: 0 points
	Defect	Player A: 0 points Player B: 0 points	Player A: 0 points Player B: 0 points

Figure 70 – A stand-alone soccer match (same team player perspective)
This notation follows the logic of the *Spacewar!* matrix seen earlier (Figure 31)

There is no temptation to defect, no way of bettering one's outcome by not cooperating with team members.

Champions of Norrath is an *Everquest*-themed role-playing game taking design cues from games like *Gauntlet*, *Diablo* and *Baldur's Gate: Dark Alliance*. In *Champions of Norrath*, a party of adventurers are given a series of partially interrelated quests many of which must be completed while others are optional. Players are placed on the same screen (*Gauntlet*-style) and rules are heavily inspired by classic pen-and-paper role-playing games like *Dungeons & Dragons*.

Figure 71 – *Champions of Norrath*
Character generation (left) and the standard party screen (right). In the party screen each player character is marked by a coloured circle and vital player meters are displayed at the top of the screen.

In *Champions of Norrath* (*CoN*), players are forced to cooperate to make progress; soloing is not a possibility. The interdependence is enhanced by the ability to choose character classes with different abilities. And yet, each character has its own unshared inventory and money and players may be tempted to claim resources for themselves. This is the exact same conflict type as the one found in *Gauntlet* (Figure 16, page 52) and modelling the tension between two players in *PD* terms we get:

		Player 2	
		Cooperate	*Defect*
Player 1	*Cooperate*	Player 1: 2 points Player 2: 2 points	Player 1: 0 points Player 2: 3 points
	Defect	Player 1: 3 points Player 2: 0 points	Player 1: 1 point Player 2: 1 point

Figure 72 – *Champions of Norrath* (as two-player game)

As in *Gauntlet*, this model only tells part of the story. Importantly, *CoN* players are playing what amounts to an iterated game: Each choice is made under the shadow of the future helping to deter rampant selfishness (even among the hypothetical rational agents).

Finally, the racing game *Mashed* (see Figure 73) continues the tradition of top-down-perspective racing games like *Micro Machines*.

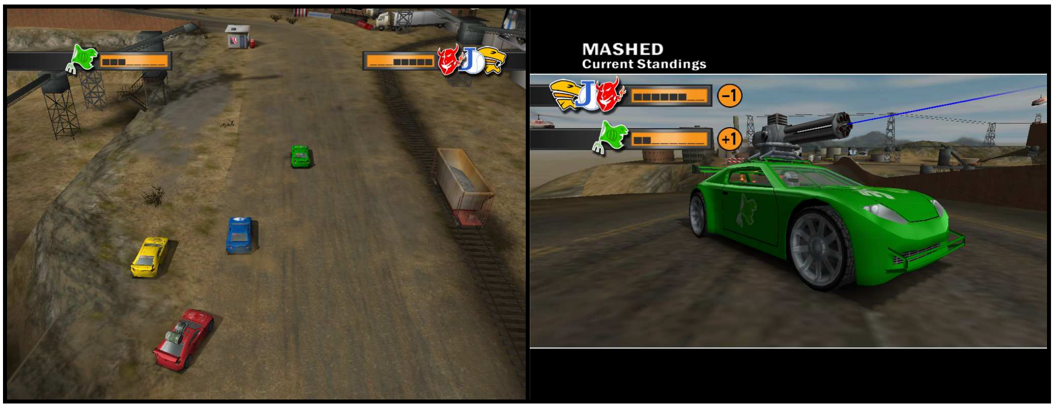

Figure 73 – *Mashed* (PC version)
Standard racing perspective (left) and round victory screen (right). On the left, four cars compete to leave the others behind and win the round; green is ahead and red is furthest behind (but has a weapon on the roof). The victory screen shows green as the winner (getting one point) and the others as losers (getting -1 point each)

Players compete on a single screen and win by making other players fall behind as not keeping up with the perspective means defeat. Alternatively, players lose if their car is destroyed, either by going over the side of the road or by taking damage from weapons which can be picked up by touching power-ups. The game has an equity equilibrium feature as being ahead of the others means being able to see less of what lies ahead. The relationship between two players is shown in Figure 74.

		Player 2	
		Cooperate	*Defect*
Player 1	*Cooperate*	Player 1: 0,5 point Player 2: 0,5 point	Player 1: 0 points Player 2: 1 points
	Defect	Player 1: 1 points Player 2: 0 points	Player 1: 0,5 points Player 2: 0,5 points

Figure 74 – *Mashed*

But importantly, as a constant-sum n-player game, *Mashed* players may be inspired to establish temporary alliances (as discussed on page 113). Should one player pull significantly ahead, others may feel inclined to concentrate on the common threat.

General behavioural predictions

The following briefly summarizes the behavioural predictions on a general level. More specific predictions will be discussed later. From the Rational Player perspective, *FIFA 2004*, *CoN*, and *Mashed* are expected to motivate radically different behaviours from the players. In *FIFA 2004*, a fully cooperative game, players are expected to cooperate, having no formal incentives to compete. Cooperation in this case means that each player should do his best to further the *team* goal of winning the match (by in fact furthering his own goal). In *CoN* we should expect the players to be torn between party and individual interests. Players are expected to exert effort in order to be able to function as a team and cooperation is expected to break down at times. Finally, in *Mashed* players are expected to compete fully. Help, if given at all, should only be given in the context of temporary coalitions.

Experimental design

To examine the validity of the Rational Player Model an experimental study was performed. Players were asked to play the three games in groups and the game sessions were videotaped. Three types of analysis were then performed: 1) The game sessions were studied to identify in-game behaviour incompatible with the model. 2) The dialogue between the players was transcribed and analysed through use of a coding schema and the coding submitted to statistical analysis. 3) Observations were made on qualitative communication data from the sessions.

The following sections discuss choices made on various levels of the study.

Choice of methodology

The methodology chosen aimed to address the research question by observation of behaviour.

As mentioned, the overall aim was to determine how well actual player behaviour conformed with the Rational Player Model in order to understand when players let themselves be guided by the objective game goals and when they do not.

The study was based on observation rather than on examining the players' own subjective understanding of the situation (for instance, through qualitative interviews). The general reason why studies of cooperation generally do not rely on participants' own understanding of the situation is that the issue is not necessarily one which respondents are reflective about. Also, individuals in (say) one-to-one interviews would be asked to individually reflect on quite subtle group dynamics. As described in the section on **Signalling and commitment** in the previous chapter, cooperation also has a large irrational (and presumably often subconscious) component. Second, media users are not *generally* able to verbalize all aspects of their media consumption and basic motivations, a common observation in ethnographic media studies (Lull, 1990). Choices in media use are taste judgments, and these may have strong strategic aspects which the individual needn't be aware of. Also, choice of methodology of course had a pragmatic aspect. While complementary approaches might well have allowed a degree of data triangulation (Deacon, Pickering, Golding, & Murdock, 1999) the amount of data generated through the chosen approach was quite formidable in itself. In other words, data on the perceptions which test subjects had of the games were not collected. The implications of this methodological choice are discussed in **Validity of results** below.

Choice of games

The three games were chosen for being clear representatives of each category (*Mashed*: competitive, *CoN*: semi-cooperative, and *Fifa*: cooperative). Also, to avoid having players with very unequal experience, two relatively unknown games were chosen while *FIFA 2004* was expected to be a fairly well-known game which most players would be familiar with. This particular expectation was proven wrong as most players turned out to be inexperienced *FIFA* players or at least displayed trouble grasping the controls of the game.

Whereas *CoN* is a fairly standard-adhering specimen, *Mashed* differs from mainstream racing games like *Gran Turismo* and *Need for Speed* by having an intense action-oriented gameplay (partly a consequence of the non-splitscreen setup). This was seen as an advantage as it was likely to increase the intensity of the in-game interaction[83]. Also, *Mashed* is simply one of quite few console racing games for more than two simultaneous players.

Since *CoN* was considered more complex than the other games, it was played for approximately 45 minutes each session while the other games were played for approximately 30 minutes each (games were stopped at "natural" points such as the end of rounds). While the first three groups played in the order *Mashed – CoN – FIFA 2004* the last three played *Fifa 2004 – CoN – Mashed.*

Test subjects

The players were recruited among students at the IT University of Copenhagen. Invitations to participate in the study were sent to various email lists and given verbally to students enrolled in game-specific courses. Also, students were encouraged to pass on the invitation to acquaintances. The only requirement stated for participation was some experience with video game console play.

Initially, the aim was to assemble groups which were comparable in terms of gender and play experience of the participants. This ambition was abandoned, however, as it became clear that recruiting participants represented severe difficulties. Thus, the participants were allowed to simply sign up for the date (or dates) in which they were able to participate. The result was that while most participants were loosely acquainted with one another it was also possible for pairs or groups of friends to sign up together. I'll discuss how this did, or did not, affect their interaction under **Friendships and communication** below.

Due to the difficulties of recruiting, I chose to proceed with one round of sessions while recruiting for another round to take place one month after the first. For each session, arrangements were made with four subjects. However, some cancelled late or failed to show up for the scheduled session and I chose to proceed

[83] In *Gran Turismo*, for instance, unequal player skill can lead to virtually no interaction within the gamespace as described in the previous chapter.

with sessions even if only two players showed up (as further discussed below). In the end, the 19 participants[84] were divided (or divided themselves, as it were) into six groups of the following sizes (by gender):

Group	*1*	*2*	*3*	*4*	*5*	*6*	***Total***
No. of males	3	2	3	3	2	1	**14**
No. of females	0	0	1	0	1	3	**5**
Total	3	2	4	3	3	4	**19**

Table 5 **– Group sizes**

Participants were given a brief questionnaire asking them to report their age, whether they had a gaming console in their home, and how many hours a week they spent playing video games (divided by console and PC). Figure 75 shows age distribution.

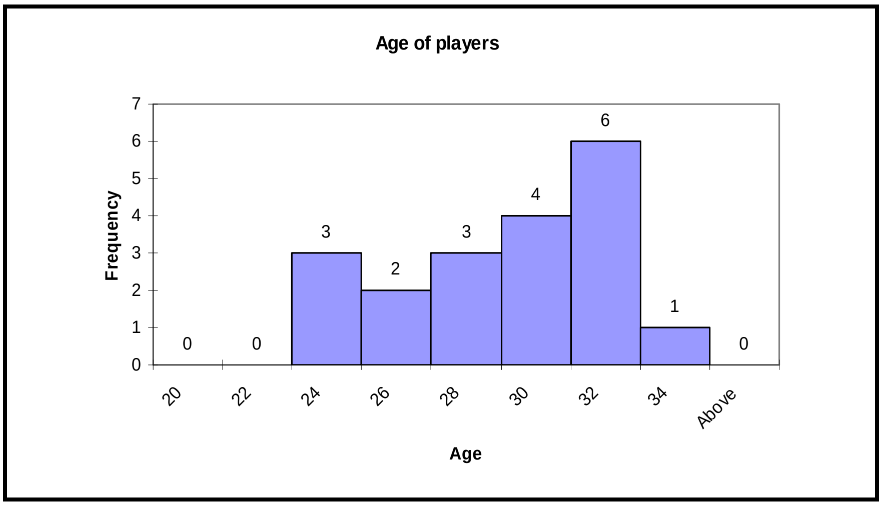

Figure 75 – *Age of players (histogram)*
Mean: 28; St. deviation: 2,99

The subjects were relatively homogenous in terms of age, the youngest being 23 and the oldest 33 years of age. Weekly video game use shows more heterogeneity (Figure 76). One subject reports zero hours of gaming per week and, at the other end of the scale, one reports 60 hours.

[84] Of whom 16 were students at the IT University of Copenhagen, 2 were students at the University of Copenhagen and 1 was not a university student (but was brought along by an IT University student).

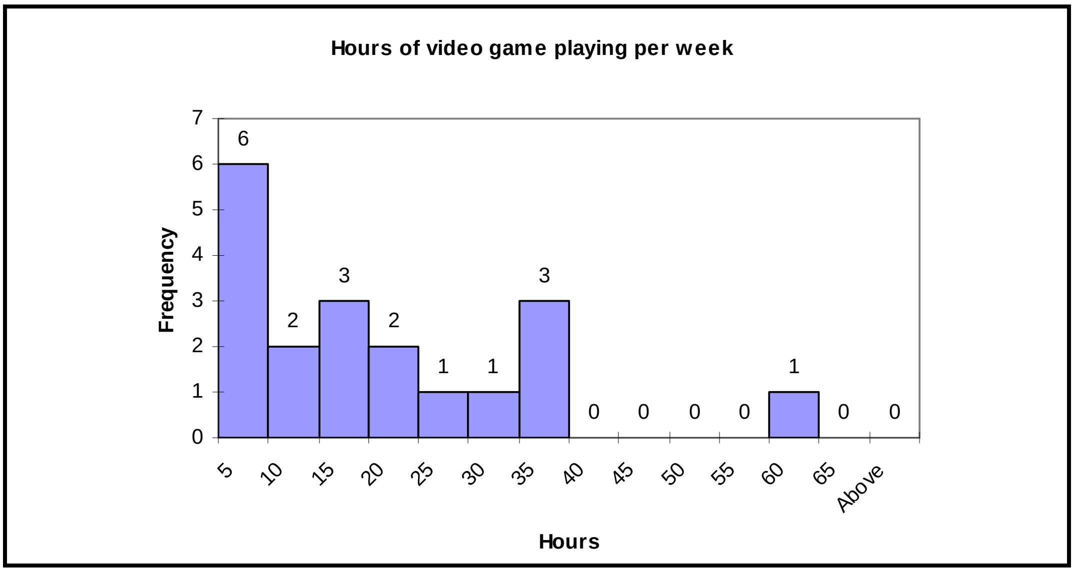

Figure 76 – *Hours of video game playing per week (histogram)*
Mean: 16,68; St. deviation: 15,73

This also means that the average gaming hours per week of the groups varied widely (ranging from 5,5 to 34,5 hours per week). In the data analysis to follow, however, groups are considered separately making it possible to some degree to gauge effects of group makeup.

The implications of the non-random sample will be addressed in the discussion of validity below.

The setting and the role of the researcher

The game sessions took place in a gaming console lab at the IT University of Copenhagen. Players were placed in a sofa facing a wall-mounted display connected to gaming consoles. One camera was placed in front of the players at an angle (Figure 77).

Figure 77 – The perspective of camera 1

The other camera (visible in Figure 77) was placed behind the subjects recording the display (see Figure 78).

Figure 78 – The perspective of camera 2

The original plan was to run the sessions in the evening to avoid disturbances. However, a pilot session run at 8pm indicated that subjects were influenced (became subdued) by being in an empty building in which lights automatically went off outside the room. Thus, the actual sessions were run in the afternoon. My observation was that this created a much less oppressive mood and that the players in general were very quick to become immersed in the games. Also, they very quickly seemed to ignore the cameras (which were only commented upon very rarely and did not attract glances during play)[85]. Before sessions began, subjects were welcomed and given a brief introduction to the study. They were informed that the object of the study was to examine player behaviour and they were told which games they would be playing. Furthermore, they were made aware of the cameras and assured anonymity (names used in the following are pseudonyms).

The game introductions were kept general and the objective game goals were only specified in overall terms (e.g. “A soccer game in which you play on the same team” and “A role-playing game in the style of Diablo” and “A racing game in which you are all on the same screen”). The logic behind this choice was that verbalizing the game goals more concretely would in itself convey expectations about behaviour.

The researcher remained in the room during the sessions assuming a mostly passive role. Only if the players asked directly for advice or if they displayed severe problems navigating game interfaces did the researcher offer help. Interestingly, even though the players were not told that they could not ask questions most preferred to work out game controls on their own (neither the researcher nor the game manuals were consulted).

Data analysis

After sessions the two video feeds were edited together in a picture-in-picture format (Figure 79).

[85] The broader implication, of course, is that the exact play context influences player behaviour. Thus, the results of this study may be tied to a particular setting etc.

Figure 79 – Camera feeds edited together (picture-in-picture)

Subsequently, all verbal communication between the players was transcribed[86]. Arguably, the broad rationale for transcribing talk is to slow it down to enable analysis of what is being said as opposed to making on-the-fly assumptions about what is meant (Langford, 1994: 31). Even so, transcribing talk is an interpretive activity involving numerous choices. For instance, the possible level of detail in a transcription is a practically infinite spectrum in which, at the deepest level, one could note all details about pronunciation, tone of voice, speed etc. Also, talk is clearly contextual as each sentence is uttered in relation to other sentences and this relationship could also be explored at almost infinite levels of detail. In this sense, any actual transcription (and analysis hereof) is necessarily reductive in relation to the information potentially derivable from recorded speech. Usefully, Jane A. Edwards (Edwards, 1993) has distilled two design goals for assuring "desirable"

[86] All sessions were held in Danish. Only quotations used in the body text of the thesis are translated into English.

properties in transcripts: Transcriptions must "preserve the information needed by the researcher in a manner which is true to the nature of the interaction itself" and their conventions must "be practical with respect to the way in which the data are to be managed and analyzed, for example, easy to read, apply to new data sets, and expand if needed for other purposes." (Edwards, 1993: 4). It follows that transcriptions for close linguistic analysis of (say) turn-taking, speech repairs or pitch variations would need many, as well as particular, details whereas such a level of detail is impractical for purposes such as mine (even though leaving out these details does entail losing potentially meaningful data). Thus, the transcription made for this study include almost exclusively the words uttered (along with false starts, stuttering etc.) while bracketed notes were made in the transcription of what statements referred to in the game. An example:

> **August**: Just distribute them all [Albert is distributing points]. Dexterity and intelligence are probably the most important things.

The transcriptions were then coded using a schema based on categories intended to capture aspects of cooperation and conflict and revised bottom-up in an iterative process further described below.

Finally, data on the coding of each statement were analysed as described in the **Results** section below[87].

Analysis of transcriptions

The following is an example extract from a transcription[88]. In this brief sequence the players are experimenting with transferring items between characters in *CoN*:

---

[87] The accompanying CD-ROM contains code frequencies and test results (Appendix A), transcriptions of sessions (Appendix B) and contents of each code (Appendix C).

[88] The quotes vary slightly from the notation of the transcriptions. The latter were written with an eye to practicality, while the quotations follow more standard notation (Deacon et al., 1999). Here,: "()" indicates inaudible word(s) and "…" at the end of a sentence means that the statement was not completed.

[Group 4: *CoN*]

August: Let's see if we then have, how do you get into inventory you said?

Adam: Select. I probably need to use that also [goes into inventory]. Oh well, I'll drop a necklace, there is one there (). That's right [equips large axe] yes yes yes yes.

August: Now we're talking.

Albert: Yes [laughs].

August: What about you Albert, anything you needed to do?

Albert: No, I don't need anything I have….

Adam: Isn't there a necklace there? Maybe it just disappeared. Like in World of Warcraft. There is something there.

Albert: I think I saw it.

The unit of analysis chosen was the individual statement which was then assigned every relevant code in the coding schema. For instance, in the second statement in the excerpt, Adam answers a question regarding the game controls and also tries to pass on an item without being asked to do so. Thus, the statement was assigned the codes GIVES INFORMATION REGARDING INTERFACE OR CONTROLLER NON-SPONTANEOUSLY and OFFERS HELP OR OBJECT SPONTANEOUSLY.

This choice of unit of analysis has particular consequences. On the negative side, a given topic may expand over several statements. For instance, a player may make an offer of help which the addressed player misunderstands and then repeat the offer in another form. This hypothetical situation would give two instances of helpful behaviour even if the player was arguably only being helpful once. On the other hand, the analysis primarily focuses on differences between the three games and thus the imprecision only matters to the extent that it is not equally severe in the three games. Also, using individual statements as the core unit allows for consistency. It is simply much easier to determine whether a given statement should have a certain code applied than to determine exactly where a given instance of a certain behaviour begins and ends. But consistency is bought at the price of some precision.

The total data set contained a little more than 8500 statements.

The coding schema

As mentioned above, the coding process began with a series of codes related to cooperative and competitive behaviour. These remained on a general level as it was believed that they would need revision based on the actual material. This was correct as unanticipated categories were needed to code statements which did relate to cooperation or conflict. The transcriptions were coded iteratively until no further coding occurred. The table below (**Table 6**) shows the final coding scheme.

1. ADVICE, INFORMATION OR HELP GIVEN (SPONTANEOUS)
2. ADVICE, INFORMATION OR HELP GIVEN (NON-SPONTANEOUS)
3. ADVICE, INFORMATION OR HELP GIVEN REGARDING INTERFACE OR CONTROLLER (SPONTANEOUS)
4. ADVICE, INFORMATION OR HELP GIVEN REGARDING INTERFACE OR CONTROLLER (NON-SPONTANEOUS)
5. ANALYSIS OF GAME MECHANICS (SPONTANEOUS)
6. ANALYSIS OF GAME MECHANICS (NON-SPONTANEOUS)
7. ANNOYANCE OR CHAGRIN
8. APOLOGY OR EXCUSE FOR SELF
9. APOLOGY OR EXCUSE FOR OTHER PLAYER
10. APOLOGY OR EXCUSE FOR ALL
11. ASK ADVICE BY STATING IGNORANCE (HEARD)
12. ASK ADVICE BY STATING IGNORANCE (IGNORED)
13. ASK ADVICE REGARDING INTERFACE OR CONTROLLER (HEARD)
14. ASK ADVICE REGARDING INTERFACE OR CONTROLLER (IGNORED)
15. ASK FOR ADVICE, INFORMATION OR HELP (HEARD)
16. ASK FOR ADVICE, INFORMATION OR HELP (IGNORED)
17. BOAST
18. COMMENT ON CUTSCENE
19. COMMENT ON MUTUAL COOPERATION
20. COMMENT ON RESEARCH
21. COMPARISON WITH OTHER GAME
22. CRITIQUE OF OTHER PLAYER
23. ENCOURAGEMENT
24. EXPRESSED FEAR
25. GAME CRITICISM
26. GRATITUDE - ALSO MOCK
27. INFO FROM RESEARCHER
28. JOKE
29. LAUGHTER
30. NON-GAME-RELATED
31. ORDER, REQUEST OR SUGGEST ACTION (HEARD)
32. ORDER, REQUEST OR SUGGEST ACTION (IGNORED)
33. ORDER, REQUEST OR SUGGEST ACTION REGARDING INTERFACE (HEARD)
34. ORDER, REQUEST OR SUGGEST ACTION REGARDING INTERFACE (IGNORED)
35. PRAISE OF EVERYBODY
36. PRAISE OF OTHER PLAYERS
37. REFRAME GAME GOALS
38. REQUEST TO SKIP CUTSCENE
39. SELFDEPRECIATION (ONLY SELF)
40. SELFDEPRECIATION (COLLECTIVE)
41. SUGGEST INJUSTICE
42. SUGGEST MUTUAL COOPERATION
43. TAUNT

Table 6 – The coding schema
In the body text certain codes are grouped for ease of reading (e.g. ADVICE, INFORMATION OR HELP GIVEN refers to both 1 and 2)
"Spontaneous" means unprompted, i.e. the speaker has not been asked to give info etc.
"Heard" means that a code was reacted upon as opposed to "Ignored"
These distinctions are not addressed in the analysis presented below

Given the bottom-up nature of the coding, more codes were identified than actually used in the analysis below (for instance, I don't address COMMENT ON CUTSCENE). It should also be noted that not all codes entirely satisfy the criterion of being *systematically discriminable* (Edwards & Lampert, 1993: 5). For instance, ADVICE, INFORMATION OR HELP GIVEN and ENCOURAGEMENT can be close as in:

Carl: Now there's only one [enemy] left

More generally, many locutionary statements may be intended and/or interpreted by other players as perlecutionary ones; a simple statement of fact may be intended to provoke a certain effect (e.g. in the form of an action). To ensure consistency statements were only assigned ADVICE, INFORMATION OR HELP GIVEN or ASK FOR ADVICE, INFORMATION OR HELP if other codes did not apply. Also, interpretations of perlecutionary aspects were "conservative" to the effect that the coding tends towards literal readings of statements. Such choices do sacrifice some correspondence between codes and communicative intention in favour of consistency but this points to analytical trade-offs that are difficult to avoid altogether.

Results

The study produced three types of data:

1. **Observed model-contradicting in-game behaviour**: While transcribing the game sessions, notes were taken on in-game behaviour which did not get reflected in verbal behaviour but which ran contrary to the behavioural predictions.
2. **Statistical tests of significant influence of game type on verbal behaviour:** For relevant codes, tests were made of whether game type had a statistically significant influence on the occurrence of the code. For instance, it was tested if the game-relative frequency of the ANNOYANCE OR CHAGRIN code in a group was incidental (α=.05). If such an influence was found, it was checked whether the code distribution conformed to the model.
3. **Qualitative observations on the content and apparent function of codes and individual statements:** Interpretations of the function of various statement types and deeper analyses of

> noteworthy occurrences in the play sessions. These observations also serve to describe the broader atmosphere of play and as indications of phenomena to be studied more thoroughly in future research.

Importantly, not all codes derived from the iterative coding of the material are analysed/discussed here. "Relevant" codes, in terms of this analysis, are those which relate to cooperation or conflict (e.g. 1-4, 19, 31-34, 42), those which specifically relate to issues brought up in previous studies (e.g. 38) and those which help explain particular observations or differences between groups (e.g. 23, 35, 36).

Analysis of verbal statements (result type 2) clearly indicates a focus on gamespace-external behaviour. But as mentioned, during analysis notes were made of in-game occurrences of model-contradicting behaviour (result type 1). Thus, just as the study employed two literal perspectives by use of two cameras, so the analysis has two perspectives: Gamespace-internal behaviour (behaviour exhibited within the game itself) and gamespace-external behaviour (behaviour exhibited by the players unmediated by the game software).

Result type 1: Observed model-contradicting in-game behaviour

As to the former, it became clear from the very first session that gamespace-internal behaviour which directly contrasted with the idea that players accepted the objective game goals was rare.

Viewing the recordings, notes were made of in-game behaviour which appeared to intentionally run counter to the player's objective goals. As mentioned, only case was found: In one group, a *Mashed* player deliberately stopped his car to allow the other players to catch up (this episode is described in detail in **Self-inflicted handicap** below).

What type of behaviour *would* run counter to one's objective goals in the three games? For *FIFA* and *Mashed* that is a relatively straightforward question. In *FIFA* it could be manifested by anything from directly working against the team's interest by taking the ball in the wrong direction or passing the ball to the opposition to merely playing around with the ball without attempting to push for the goal of the opposing team. In *Mashed*, it would mean deliberately not attempting to outdistance the others, not using acquired weapons or taking great risks for aesthetics effect.

Since *CoN* is a semi-cooperative game and thus expected to elicit tension between individual goals and party goals, model-contradicting behaviour is more difficult to specify. Here, the material was viewed with an eye to extreme behaviour; players showing remarkable altruism (e.g. by giving away many objects) or selfishness (e.g. refusing to share or refusing to conform to collective decisions).

Of course, for such behaviour to qualify as model-contradicting it would have to be deemed intentional. A *Mashed* car *accidentally* losing traction and plunging to a watery end is clearly unfortunate for its player but not a case of said player actively choosing not to compete. In practice, determining intentionality meant looking for behaviour which was prolonged (e.g. not just one *FIFA* ball kicked in the wrong direction) or not followed by clear signs that a choice had been mis-implemented (e.g. a *FIFA* player apologizing for a mistake). This leaves room for some interpretation. For instance, Figure 80 shows the black car smashing through a crash barrier to jump a ravine. This action may be aesthetically motivated (the player may simply be trying to perform a cool move) but the brief flight also constitutes a (risky) shortcut which enables the player to simply keep going straight instead of making a time-consuming swerve to follow the road. Such an event, although clearly ambiguous, fits into the model and would not be noted as contradictory.

Figure 80 – The black car (slightly left of image centre) jumps a ravine.

The same goes for situations in *FIFA* where a player shoots the ball in the direction of the players' goal by what appears to be a mistake. Players often apologized for such mistakes which typically were not repeated and in such cases the behaviour was identified as non-intentional.

Two points regarding this behavioural "test" must be kept in mind. First, it is a "light" test in the sense that only behaviour which strongly contradicts the model was noted. Figure 81 shows three categories in which player action can be placed; only "Clearly model-contradicting behaviour" was noted, thus in practice ignoring the category of more ambiguous actions.

Clearly model-contradicting behaviour	**Ambiguous behaviour**	**Clearly model-conforming behaviour**

Figure 81 – Three behavioural categories

Nevertheless, it would be so easy for a player not attempting to fulfil the objective goals to radically contradict the model that finding only one instance is noteworthy. This brings us to the second point worth acknowledging: I have not defined exactly what constitutes an instance of "behaviour" and so the significance of "one instance" is not immediately clear. But let us simply consider the number of times our model-contradicting player seems to handicap himself in respect to the total number of *Mashed* rounds (i.e. individual races). He visibly slows down his car seven times and the group plays about 50 rounds. Including the other five groups, we see "non-rational" behaviour in seven out of (roughly) 50x6=300 rounds, or in 2,3% of the rounds. No similar behaviour was seen in the other two games.

Thus, with this exception, players displayed in-game behaviour fully compatible with the model.

Result type 2: Statistical tests of significant influence of game type on verbal behaviour

This near-consistency was not reflected in the verbal interaction. While many types of verbal behaviour are related to the game, only some of these relationships are in line with the model[89]. The six game sessions are treated as separate experiments and for each group two tests are made:

1) Is the difference between the frequencies of the code in the three game conditions statistically significant?

2) Is the difference between the frequencies of the code in *FIFA* and *Mashed* statistically significant?

In both cases, statistical significance is measured by testing to what extent the statistical model that the games in question elicits the same code frequency fits the observed frequency: the "goodness of fit" (using Pearson's chi-square test). If the observed frequency of a code across the games is shown to be less than 5% likely to occur by chance given that the frequency was known to be equal, the relationship between game and code is said to be statistically significant.

For most codes, only some groups (if any) showed a statistically significant relationship. In such cases, there is indication that game type only affects certain

[89] Also, some codes occurred too infrequently to allow for meaningful statistical testing. In the following, certain codes are combined to allow for testing (e.g. "spontaneous" and "non-spontaneous" versions of the same code).

player constellations[90]. To illustrate, we will turn to some of the codes which show a significant relationship. In the following, I begin with some general descriptions of the material and then go into the more concrete results before offering any interpretation.

Figure 82 gives a very general picture of the effect of the games on the intensity of the communication.

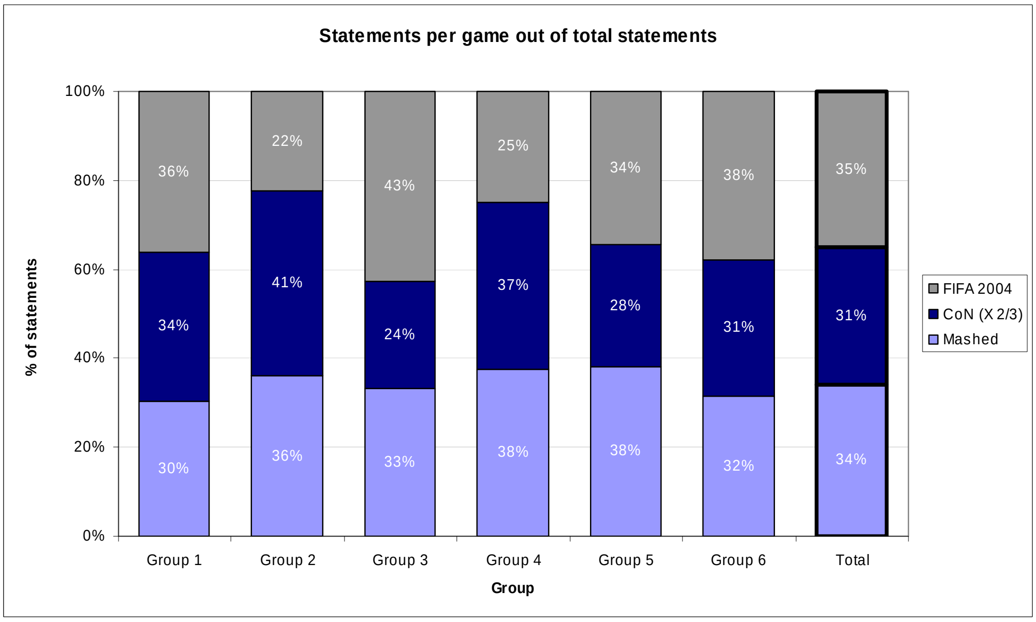

Figure 82 – Graph showing the number of statements accounted for by each game as a percentage of total statements made by the group. Since *CoN* sessions were approximately 1.5 times the length of the other sessions, *CoN* figures have been multiplied by 2/3. For a groupwise comparison of number of statements see Figure 83.

We see here that in some groups, the games inspire quite different levels of communication intensity and that there is some variation between the groups. But we also see that no single game tends to produce far more or fewer statements across groups than the others. Simply adding the numbers of statements together (compensating for the longer *CoN* sessions) we see that the numbers of statements per game are quite similar (last bar on Figure 82).

[90] Notably, the groups must of course display the *same* relationship to be meaningfully grouped in this way.

As mentioned above, the player groups were not of equal size. As we can see from Figure 83 group size did seem to affect the number of statements made in total by the group.

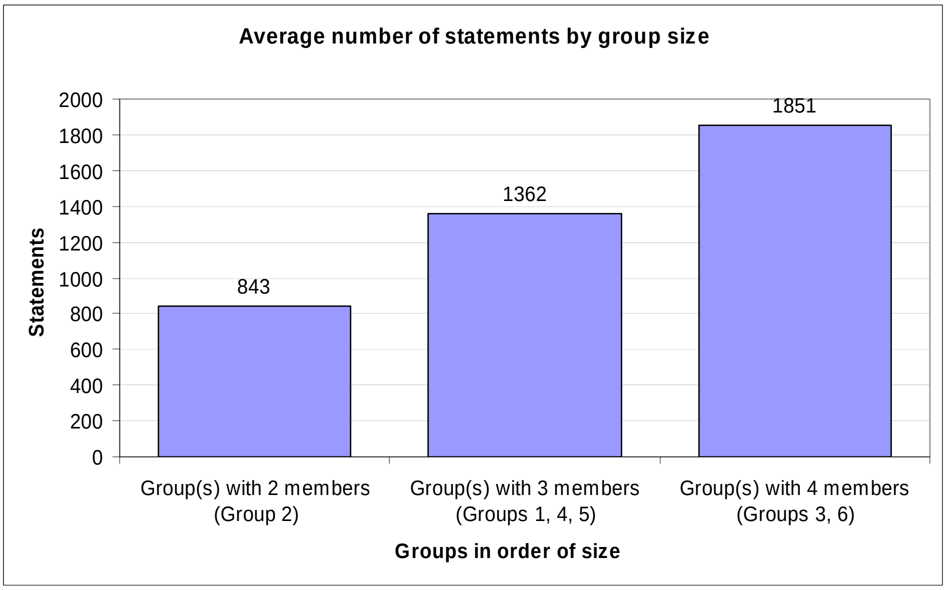

Figure 83 – Group size and number of statements
(Group 1: 1554 statements, Group 2: 843 statements, Group 3: 1613 statements, Group 4: 897 statements, Group 5: 1635 statements, Group 6: 2088 statements)

That more players produce more statements seems relatively intuitive as they face a more challenging coordination effort. It should also be noted, however, that Group 4 produces only marginally more statements (897) than Group 2's 843. While this did not seem to be captured by the players' reported game time in the last month, all members of Group 2 and Group 4 did seem particularly able to quickly understand the game controls and thus showed less confusion even in initial stages of play. No clear behavioural effects of group size on cooperation or conflict were observed here but more specific studies of the communicative effects of player group size would be a worthwhile area of attention for future studies.

We turn now, to the concrete codes beginning with ADVICE, INFORMATION OR HELP GIVEN (COMBINED). This code is a measure of how much players help each other. This help can take the form of simple pointers to features of the gamespace to actual help in the form of gameplay tips etc. The relationship between game and this code is shown in Table **7**.

	Percentage of statements *CoN*	*FIFA*	*Mashed*	Same frequency for all three games? (p value)	Same frequency for *FIFA* and *Mashed*? (p value)
Group 1	14,6%	1,5%	4,0%	**.00**	**.02**
Group 2	11,8%	1,3%	4,0%	**.00**	.10
Group 3	24,6%	9,4%	11,0%	**.00**	.28
Group 4	19,8%	8,5%	10,2%	**.00**	.41
Group 5	24,6%	9,5%	10,4%	**.00**	.30
Group 6	24,6%	5,7%	12,1%	**.00**	**.00**

Table 7 **-** ADVICE, INFORMATION OR HELP GIVEN (COMBINED)
Statistical significance is shown by the use of **bold**.
"Same frequency for all three games?" is a test of the probability of the difference between the occurrence of the code in the three games occurring by chance (in this case the probability is .00). "Same frequency for *FIFA* and *Mashed*?" tests only the difference between *FIFA* and *Mashed* (and in this case the probabilities vary from .00 to .41).

The table shows that the game has an effect on code frequency in the sense that the chance of the observed distribution occurring by mere chance must be found in distant decimals. In other words, the three games do not lead to the same code frequency. This is true for all six groups. But it is also clear that much of the difference is caused by *CoN* in which the frequency is considerably higher than in the other two conditions. The fact that the semi-cooperative game causes the most helpfulness does not fit the model. Turning to the two extremes (last column), we see that the difference is significant for two groups. In both cases, *Mashed* leads to more helpfulness than *FIFA*. This is also (clearly) not in concordance with the model[91].

ADVICE, INFORMATION OR HELP GIVEN (COMBINED) indicated help on what to do in the game. The related ADVICE, INFORMATION OR HELP REGARDING INTERFACE OR CONTROLLER (COMBINED) indicates help on *how* to play the game (Table **8**).

[91] We should also note, however, that the code may have been conceived too broadly. The logic of grouping advice, information and help given was that all were instances of helpful behaviour; statements that the receiver could benefit from. But statements that conveyed information also served other purposes, e.g. as merely phatic statements of the obvious or as statements of the player's present estimate of some game aspect, spoken aloud to allow for other players to correct it. Thus, future studies inspired by the code schema presented here may want to avoid this conflation by distinguishing more clearly between types of information given.

	Percentage of statements			Same frequency for all three games? (p value)	Same frequency for *FIFA* and *Mashed*? (p value)
	CoN	*FIFA*	*Mashed*		
Group 1	6,1%	4,4%	2,5%	**.02**	.12
Group 2	3,5%	9,6%	1,6%	**.00**	**.00**
Group 3	6,6%	3,9%	1,2%	**.00**	**.05**
Group 4	5,7%	8,5%	4,2%	.15	**.00**
Group 5	6,6%	5,1%	1,6%	**.00**	**.00**
Group 6	3,2%	1,8%	4,7%	**.01**	**.00**

Table 8 **-** ADVICE, INFORMATION OR HELP GIVEN REGARDING INTERFACE OR CONTROLLER (COMBINED)
Statistical significance is shown by the use of **bold**.

Here, something significant is happening for most of the groups but the picture is not clear. Five groups show a statistically significant difference between the three games but the games do not produce the same difference across the groups. For instance, Group 2 has most code occurrences in *FIFA* while Group 3 has the most in *CoN*. In the *FIFA-Mashed* test, the difference is statistically significant for five groups, four of which have most occurrences in *FIFA*. Again we see how *CoN* tends to have a higher frequency than the other two games[92]. But we also see that for most groups, *FIFA* has more statements than does *Mashed*. This is compatible with the model.

Meanwhile, ASK FOR ADVICE, INFORMATION OR HELP (COMBINED) gives an indication of *expected cooperation*. Its presence shows that the speaker has some belief or hope that others will take it upon themselves to offer aid. For this code, the three-game-result was significant for five groups though only consistent across four of them (see Table 9).

[92] Statements made during *CoN* simply fell into many categories. Thus, the frequency of codes per statement was higher in *CoN* than in the other games.

	Percentage of statements			Same frequency for all three games? (p value)	Same frequency for *FIFA* and *Mashed*? (p value)
	CoN	*FIFA*	*Mashed*		
Group 1	10,3%	2,7%	2,5%	**.00**	.55
Group 2	6,9%	3,2%	4,4%	.14	.54
Group 3	19,0%	3,9%	6,2%	**.00**	.07
Group 4	8,3%	4,8%	3,9%	**.04**	.57
Group 5	10,9%	6,3%	6,4%	**.00**	.76
Group 6	14,9%	2,1%	6,1%	**.00**	**.00**

Table 9 – ASK FOR ADVICE, INFORMATION OR HELP (COMBINED)
Statistical significance is shown by the use of **bold**.

In all groups, the code was most prevalent during *CoN* play. In the one group with a significant relationship in the two-game test, the players asked for info more frequently during *Mashed* (competitive) play than during *FIFA* (cooperative) play. That players expect more cooperation during *Mashed* seems to contradict the model (although the model does not make strong predictions about expectancy or hope of cooperation from others).

Turning to questions regarding interface or controller, only Group 2 shows a statistically significant relationship and only in the *FIFA*/*Mashed* test (Table 10).

	Percentage of statements			Same frequency for all three games? (p value)	Same frequency for *FIFA* and *Mashed*? (p value)
	CoN	*FIFA*	*Mashed*		
Group 1	3,4%	2,9%	2,2%	.53	.52
Group 2	2,1%	3,8%	0,8%	.11	**.03**
Group 3	4,5%	2,6%	2,5%	.12	.88
Group 4	5,4%	3,2%	2,5%	.12	.60
Group 5	4,0%	2,8%	2,6%	.32	.78
Group 6	2,6%	1,2%	2,1%	.13	.19

Table 10 – ASK FOR ADVICE, INFORMATION OR HELP REGARDING INTERFACE OR CONTROLLER (COMBINED)
Statistical significance is shown by the use of **bold**.

Thus, the tendency for the players to ask (significantly) more general questions during *CoN* play did not carry through to questions regarding how to interpret or control the game.

Till now we've seen how the asking for, and giving of, information was related to game type in only certain cases and showed patterns which generally fell outside the Rational Player Model. Interestingly, the code which shows one of the strongest relationships to game type was ORDER, REQUEST OR SUGGEST ACTION (COMBINED) as shown in Table 11.

	Percentage of statements			Same frequency for all three games? (p value)	Same frequency for *FIFA* and *Mashed*? (p value)
	CoN	*FIFA*	*Mashed*		
Group 1	6,9%	14,1%	1,0%	**.00**	**.00**
Group 2	6,0%	1,9%	0,0%	**.00**	Insufficient frequency
Group 3	5,4%	16,9%	0,6%	**.00**	**.00**
Group 4	6,8%	6,4%	1,4%	**.00**	**.00**
Group 5	6,6%	6,1%	3,1%	**.02**	**.02**
Group 6	7,7%	0,6%	2,6%	**.00**	**.00**

Table 11 – ORDER, REQUEST OR SUGGEST ACTION (COMBINED)
Statistical significance is shown by the use of **bold**.

While *FIFA* and *Mashed* frequency distributions are not completely consistent across the groups, no testable group was unaffected by game type as regards this code. ORDER, REQUEST OR SUGGEST ACTION generally signifies an attempt to coordinate player actions. In the Rational Player Model we should expect this to occur in *FIFA* and *CoN* as both have coordination game elements. In *Mashed*, coordination might be expected but only between players facing incentives to form a temporary alliance; in general it is expected to be lower than for the other two games. This seems to hold except in the case of Group 6 where almost no *FIFA* statements are of this variety (and *Mashed* has a higher percentage).

Another code which lends some support to the model is COMMENT ON MUTUAL COOPERATION. Here, the expectation is that *CoN* would produce the highest percentage, as the player relationship is the most ambiguous. Only two groups produced testable frequencies in the three-game test (none in the two-game test) but both of these showed a significant relationship with *CoN* having the highest percentage.

Other codes occurred either too infrequently to allow for testing, were not relevant to the model, or showed very vague (if any) relationship to game type.

How can these results be explained? First of all they clearly do not, in total, conform to the Rational Player Model. They do, however, indicate that the more general idea that the codes in question are strongly affected by game conflict type is correct.

Moving through the codes in the order presented, we first saw how *CoN* play was characterised by most general helpfulness, followed by *Mashed* and then *FIFA*.

How come? A possible interpretation of this finding is that helpfulness simply followed the extent to which player were *able* to help each other. Generally, *CoN* was a complex game with a plethora of unknown factors. The players had to discover the goals, the relationship between in-game forces, the layout of the game world and how variables like friendly fire and resource sharing worked. In *Mashed*, although the game is not a standard racing game the players can apply core assumptions about such games: One needs to go as fast as possible and stay on the road. And in *FIFA 2004*, even if players are unfamiliar with the concrete game, they know how to interpret a soccer match in terms of goals and concrete rules. In other words, *CoN* may simply call for more collective interpretation as players notice different details about how the game works (and *Mashed* may call for more than *FIFA*).

This idea that *general* help is related to understanding of general game mechanics may be extended to explain the findings regarding interface/controller help. In the case of this code we saw how the distributions were not consistent across the groups, but in the two-game test *FIFA* produced more statements than *Mashed* for four out of five groups (that had a statistically significant relationship). While the players understood the *principles* of soccer such an understanding does not necessarily extend to cover the details of the *FIFA* interface which indeed seemed to confuse many players. Meanwhile, while the players might not initially feel comfortable with the exact *Mashed* mechanics they were quickly able to understand the controls.

Turning to requests for help, the general relationship was *CoN* > *Mashed* > *FIFA 2004*. Of course, such requests are not necessarily indicative of an actual expectation of help; even if a rational player did not fully expect a positive result asking for it would not harm him or herself. Either way, the distribution follows that of help given and thus may perhaps be explained by the same simple interpretation.

Finally, the results for ORDER, REQUEST OR SUGGEST ACTION (COMBINED) shows no consistent three-game pattern but five groups of six have *FIFA 2004* >

Mashed. Group 6 is the special case but their particular result may well be a consequence of most Group 6 members having continuous problems with understanding the controls. Being unable to implement their desired input, they may simply be giving up on the more demanding task of coordinating the team effort.

Let us sum up the analysis of the quantitative data. We saw that while game type clearly influenced the frequency of certain statement types, the results did not as a whole support the Rational Player model. In particular, more help was given during *Mashed* (competitive) play than during *FIFA* (cooperative) play contradicting the model. It was proposed that a better interpretive framework was in fact the simpler one that the amount and type of helpfulness is merely a function of the difficulty/novelty of the game in question.

In the light of the earlier observation that in-game behaviour was shaped by the game goals this is confusing; after all the players show clear, yet mutually contradicting, behaviour patterns in the two types of data. Other interpretations of the results may well be possible. I will return to this issue after addressing the qualitative results.

Result type 3: Qualitative observations on the content and apparent function of codes and individual statements

In this section, I look in more detail at what in fact goes on between the players. The aim is to describe the playing climate, to arrive at a sense of what actually goes on during play and to offer some suggestions as to why. Many of the codes described below occurred too infrequently for statistical testing. Thus, relationships mentioned are often only indicative and offered as suggestions for further enquiry. Following the individual themes (containing one or more codes) I give a summary noting the relative importance of the observations. Subsequently, the chapter is concluded by a discussion of the combined results of the study.

Redefining game goals

Although an infrequent occurrence, players sometimes toyed with the idea of redefining the game goals. As mentioned earlier, Lazzaro (2004) observed how

> To have more fun newbies 'act out' when paired with better players. In multiplayer games beginners use gross motor control to run into, shoot at, and push over more experienced players. They often ignore agreed on game goals and do something surprising for a few moments of laughter. (Lazzaro, 2004: 21)

At no time did such strong telic redefinition occur in my study. Indeed, I use the verb "toy" since the redefinition which did occur was mostly playful; partly ironic ways of saving face following defeat either personally (in the case of *Mashed*) or collectively (*FIFA*). Redefinition did not occur during *CoN* play.

In Group 5's *Mashed* session, William has just crashed into a mine and says jokingly that

> **William**: It's not about winning, it's about having fun.

As Maria is leaving the other two players behind and rubs their noses in it, Daniel takes up the theme, echoed by William. Maria ironically concedes the point and William makes fun of Daniel's and his own attempt to save face, jokingly comparing their behaviour to fans of a (to Daniel) unpopular soccer club:

> **William**: It's not about winning or losing, it's just about having fun
>
> **Daniel**: Yes. It's not about winning, it's about participating
>
> **Maria**: No, that's right
>
> **Daniel**: It's not about winning, it's about participating. That's the kind of thing, that's the kind of thing Brøndby [Danish soccer club] fans would say.

In Group 1's session, Lars encourages Mikkel noting how, even if he didn't win, he is the only one to have scored a "kill". Mikkel replies

> **Mikkel**: Oh. Oh well, that's was what I went for [smiles]

Later in the game, Lars ironically uses the same technique on his own behalf:

> **Lars**: I had the most unforced errors. That was me.

Neither player seems certain what constitutes an "unforced error" but they are well aware that errors should be minimized not maximized. Lars' comment is a joke playing on the convention that counted achievements in games are positive.

A variation on the theme is evident in Group 6's session in which two comments hint at aesthetic dimensions. Carl indicates that style is a factor:

> **Carl**: Oops! [points] I won in a cool way [laughs]

Later, Anne hints that while Carl may have shown himself to be the best player, he has a fault:

> **Anne**: But you have no style, you are wearing a white helmet in a black car like that.

In *FIFA* redefinition generally occurs once frustration sets in at the difficulty of the exercise. It seems a consequence of the players being virtually forced to abandon the idea of actually winning matches. In Group 4's session, Adam soon comments on the players' lack of success by saying:

> **Adam**: (). That's right [the players pass to each other]. (). We got past the mid field, that's pretty good.

And he later displays satisfaction at actually coming close to scoring:

> **Adam**: Yes, that was a shot at their goal.

Similarly, Group 5 members joke about lowering the bar:

> **William**: The first shot at their goal
>
> **Daniel**: A victory in itself [just after William's statement]
>
> **Daniel**: Our goal must be to only lose by two goals this time
>
> **Daniel**: Now he can chew on that. Now the goal must be to injure as many as possible in the time left.

It seems to be the case that players who are doing poorly occasionally talk about redefining game goals. This is consistent with the idea that some players attempt to avoid losing (or minimize the importance of formal defeat) by declaring their non-adherence to the objective goals[93]. But it is crucial to acknowledge that this behaviour only occurred in a playful or ironic context in the study. The difference between the "strong" redefinition reported by Lazzaro and the tongue-in-cheek version reported here may be explained by the more formal nature of the study setting, perhaps encouraging players to adhere more closely to the game contract. The hypothesis derived from this contrast is that strong goal redefinition occurs mostly in casual settings. This cannot be settled here, but deserve future attention.

Conflict and competitiveness

Boasts were often expressions of elation over victories or pointers to events that the other players might not have seen. In the former category (most often occurring during *Mashed* play) we have:

> **August (Group 4)**: Now that's a real victory.
>
> **Maria (Group 5)**: I woooon
>
> **William (Group 5)**: Hey, I won [raises arm]

Meanwhile, during *FIFA* play, boasts were often of the latter type:

> **Lars (Group 1)**: Did you see that tackle?
>
> **Carl (Group 6)**: Oh, I got him! Did you see that?

Taunts were exclusively made during *Mashed* play and were mostly light-hearted of the type

> **Daniel (Group 5)**: Where are you going? [The other players fall behind] [Laughs]

By far the most directly aggressive was

> **Daniel (Group 5):** Damn how you suck right now.

[93] Redefining (or objecting to) goals can of course be construed as "subversive" play in the sense sometimes associated with the Active Player Model. It can also be seen as "rational" in terms of the player trying to avoid subjective defeat, but not in terms of the Rational Player Model as applied here.

But this statement was made amid general laughter from the group and did not inspire any hostility. In total, the taunts made can be characterized as humorous if not downright polite statements.

Turning to criticism of other players, the function of this statement type differs even more between games. First of all, it's virtually non-existent during *CoN* play (six occurrences) and signals mild annoyance as in

> **William (Group 5)**: Yes, that you can hurry up a bit [smiles]
>
> **Simon (Group 3)**: No, you click through before you [read the dialogue]. I have no idea what we need to do, I'm just following.

In *Mashed*, criticism is mostly mock (or at least tongue-in-cheek) and occurs in response to being attacked or destroyed.

> **Adam (Group 4)**: Noo, a bastard man
>
> **William (Group 5)**: Would you mind?
>
> **Daniel (Group 5)**: What the hell kind of pushing is that, man?
>
> **Anne (Group 6)**: Yes. And now you are dropping oil in front of us, you cowardly…

Importantly, such criticism never leads to downright anger or non-humorous disagreement. In fact, only one instance of direct anger occurs in the entire material. This instance occurs during *FIFA* play, which seems initially counter-intuitive since one might assume a cooperative game to inspire less conflict than a competitive one. While technically anecdotal, it does *illustrate* how "at-a-glance assumptions" may be misleading. But let us first consider the episode in detail. John (Group 3) has grown increasingly frustrated with the team's achievements. When the computer gets a penalty kick and scores, Simon asks who committed the fault, and John says

> **John (Group 3)**: I did. But nobody's, but nobody's doing anything [extends his arms] and red [i.e. the red player] is just watching while they score.

Slightly later, the computer gets close to scoring (see Figure 84).

Figure 84 – *FIFA* sequence causing hostility within the group (ball marked by white circle). The players (white) are in possession of the ball close to own goal (top left) but loses it to the computer (top right) who shoots at the goal (bottom left) but misses by a small margin (bottom right).

And this sequence leads to the following discussion in which John expresses his annoyance again leading to a small argument with Jacob.

John: No-one is doing anything [annoyed]. The defence is completely gone. Yellow [Notes that the yellow player must act].

Jacob: We're two people who have never tried FIFA 2004 before.

John: But I haven't tried it either.

Jacob: Or FIFA in general.

John: Yellow has to push a button

Kathrine: I thought it was [laughs]

Simon: Just push one of them

Kathrine: Which one?

John: Just one of them. None of us knows ()

Simon: Again shoot

John: Now I'm all the way up here. It's all free on the right side.

Simon: Again, fast.

Jacob: Noo [chagrined]

Simon: No keep going, because they are going to take it from you if you hold on to it. Just send it on.

Jacob: I wasn't keeping it at all, I am ()

Simon: That was fucking poorly utilized there.

John: You can say that again.

Although fairly non-dramatic, this episode is interesting. First of all, all the groups experience some tension during *FIFA* play because of the difficulty of the game. Such tension does not arise in *CoN*, which never proves challenging to a humiliating degree. But *FIFA* is also the one game in which players are actually able to let each other down in a significant way. There is no expectation of cooperation in *Mashed* and no real setback occurs in *CoN* if a player performs poorly but in *FIFA* unskilled or unfortunate players directly impact the others while they are *expected* to help. Though anecdotal, this observation does lend important qualification to naïve notions that cooperative games lead to friendly/harmonious players; as we have seen, it may be the other way round.

Friendships and communication

It is not immediately obvious how communication between players should differ based on the strength of the relationship between players. One could imagine friends being particularly nice to each other but one could also imagine friends being less restrained in their behaviour due to their relationship being strong enough to sustain any minor conflict and to let them communicate freely without risk of mock hostility being interpreted as real. Of the six groups, Groups 3 and 6 included players who (based on the observations) seemed to know each other particularly well: Jacob and Simon of Group 3 and Anne, Linda, and Pia of Group 6[94].

[94] Though it would appear that friends stand out quite clearly in the recordings, it would have been preferable to have asked participants to note down such relationships directly.

In both cases, they used each others' names more often than did other players (probably in part because they were sure what they were). For Jacob and Simon, their friendship did not seem to inhibit their behaviour towards each other. It is mostly Simon who speaks to Jacob, and during *Mashed* play he comments on losing:

> **Simon (Group 3)**: Gee thanks. Is this a personal vendetta Jacob?

He also makes a more general comment:

> **Simon (Group 3)**: Wow, Jacob you are really, you are a really ruthless race driver I think.

And continues in the same vein with

> **Simon (Group 3)**: Have you been drinking Jacob? You drive completely irresponsibly.

During *FIFA* play, Simon criticises Jacob in a way which may seem quite gentle, but which based on other instances of criticism in the material is actually quite direct:

> **Simon (Group 3)**: You need more precision Jacob, otherwise we can't…

In these examples, we see Simon being more direct towards Jacob than is the norm among the players in the study (even if the *Mashed* comments are certainly made partly as jokes).

In their *FIFA* session, Anne and Pia make somewhat different types of comments:

> **Anne (Group 6)**: Pure (). Linda, you're just completely on top of this [looks towards Linda].
>
> **Pia (Group 6)**: Linda is our salvation I think [laughs]

Thus, they are being quite supportive during *FIFA*. During *Mashed* Anne says:

> **Anne (Group 6)**: Don't come around and push me, Linda

And Linda expresses mock anger (having been pushed hard by Anne) by saying:

> **Linda (Group 6)**: Anne!

These two statements are clearly criticisms, but where Simon's two first comments to Jacob implied a certain measure of grudging respect, Anne and Linda's comments may be said to imply mock shock that their friend would attack them. However, this possible difference is mitigated by Pia in a comment which resembles Simon's above:

> **Pia (Group 6)**: Linda, have you been drinking or what? [laughs]

Based on the sessions more broadly, it seems that the players who are friends do interact without initial inhibitions but it is not obvious that they are either more friendly or hostile towards each other than are other players.

Self-inflicted handicap

Players frequently handicapped themselves relatively by passing on information and advice to others. But very rarely did this assistance manifest itself inside the gamespace itself. In fact, this only happened for one group.

Group 6 had a non-average makeup in that it consisted of three players (Anne, Linda, and Pia), who turned out to know each other, and one "outsider" (Carl). Carl displayed higher proficiency with the game types in question which created a form of counter-point to Group 3 in which three (male) players were generally better at the games than the last (female) player.

In Group 6, the group makeup created a somewhat defeatist atmosphere. Pia, in particular, came close to giving up several times and during *Mashed* play, frustrations became particularly salient. This seemed to inspire two related types of behaviour from Carl as he attempted to verbally encourage the others to keep playing (as discussed in **The gaming climate** below) and as he visibly slowed down his car to allow others to catch up. Having won the first round, Carl starts round two by visibly slowing down his car as shown in Figure 85.

Figure 85 – Carl (black car) slows down from the beginning of a new round

He then proclaims to have found the car break and informs the others of the relevant button. Thus, in this situation Carl is not obviously slowing down to give the others a chance. But given the miniscule relevance of the break in *Mashed*, the act of taking time to discover its position must be counted as unmistakably altruistic.

At later points, Carl is more conspicuous. When he sees that the others will be left behind, he simply stops and allows them to catch up. In one situation (Figure 86) the remaining player misunderstands what's happening and starts going slowly into reverse. Carl then actually backs up to avoid instant victory.

Figure 86 – Carl (black car) pulls ahead of the others following a turn (left) and then stops at the edge of the screen (middle) and drives backwards (right) as the remaining other player mistakenly goes into reverse. Carl's car is marked by a red circle.

Although conspicuous, Carl's behaviour is generally not commented upon. The exception is the following exchange:

Carl: It's hard driving now

Anne: [Laughs] but you win anyway [laughs]

Pia: [Laughs]

[Carl breaks and waits for Anne]

Linda: Oh, he's up there waiting

Anne: [Laughs]

But while Linda points out that Carl has stopped, this is not elaborated on by anyone nor mentioned again.

Why does Carl display this notable behaviour? As we will also see in the following section, he is taking responsibility for the playing climate. But why then does that not happen in Group 3 where Kathrine is generally visibly unable to participate on level with the others? The following aspects may contribute to the difference. First, Carl is alone and needn't coordinate with others. In Group 3, to "help" Kathrine out, John, Jacob and Simon would have to agree on holding back. Should one of them attempt this alone he would simply lose. They would be faced with a social dilemma type problem in which each might be tempted not to hold back as much as the others and the agreement might be fragile. Secondly, and perhaps more importantly, should the three female players of Group 6 decide to effectively stop taking the game seriously, Carl would arguably not be playing (and would not be winning). Of course, the opposite is true for Group 3: Should Kathrine pull out, the three others would still be able to play a meaningful game.

The gaming climate

A number of utterances can be interpreted as efforts to maintain or re-establish a constructive atmosphere. Often this takes the form of a player giving encouraging statements or actual praise.

Encouragement only appears five times during *CoN* play:

> **Adam (Group 4)**: This works pretty well
>
> **William (Group 2)**: It's going well
>
> **William (Group 2**): We are too tough. Or this could be a game made for children.
>
> **William (Group 2)**: Come on, I think it's going alright.
>
> **Carl (Group 6)**: That's right, now were rolling. Can we find that, those two last goblin mothers?

This type of encouragement is relatively straightforward; a player stresses that things are going well. We find similar encouragement types during *FIFA* play although the players here are often more modest given the perceived difficulty, e.g.

> **Maria (Group 5)**: Noo [chagrined]. No it could have been much worse.
>
> **Carl (Group 6)**: We have also kept uhm our goal surprisingly free

Turning to *Mashed*, we see another manifestation of the dynamics discussed in the section above. Out of ten occurrences, nine are from Group 6. The exception is

> **Maria (Group 5)**: I think it's going OK

From Group 6 (in chronological order):

> **Carl**: We're going to learn this, I'm sure.
>
> **Carl**: Yes yes, that should be fun, that probably means that you can get struck by lightning.
>
> **Carl**: Hmm [indicating "yes"]. It's probably funny when everybody's equally good, and just gives it full throttle and you race along four people.
>
> **Carl**: We all went down! [Laughs] How cool.
>
> **Anne**: Ahh, we had learnt something from taking the hard course huh?
>
> **Anne**: It's become a bit more fun now, hasn't it?
>
> **Anne**.: Ooj, it's going well.
>
> **Carl**: I wasn't the winner

Here we see Carl working hard to keep up everyone's spirit. He also attempts to defend the entire situation by stating that the game could actually be fun given other circumstances. Interestingly, Anne comes to his aid about halfway through the game although she seems less concerned with the opinions of Linda and Pia (she smiles, whereas Carl sounds slightly desperate). Her first comment, does elicit some support:

> **Pia**: I actually think so too, yes

But her second comment ("It's become a bit more fun now, hasn't it?") is instantly contested:

> **Linda**: Not at all

But the negative attitude does not stop Pia from expressing a fascination with the game towards the end of the section:

> **Pia**: No, I've always hated car games, now I'm considering getting one of those

To which Linda instantly replies:

> **Linda**: Surely not this one huh?

The fact that encouragement during *Mashed* only occurs in Group 6 suggests that, in the competitive game situation, it is tied to skilled players attempting to uphold the game contract.

Turning to actual praise, *FIFA* elicits the majority of such statements. Most relate to particular events like

> **Adam (Group 4)**: Yes that's a good tackle.

Others express pleasure at developments, effectively encouraging others to keep doing what they are doing or are combined with a request for certain actions, e.g.

> **William (Group 5)**: Yes no we have to get back down there yes, now we need to get down to err. Yes good good good good good pass it forward, pass it forward, pass it forward.
>
> **Jacob (Group 3)**: Oh, that's a good save. Yeah, good outer boot edge there. Try to make some of those yes, exactly. We also need some of those high balls into the box, such a bunch of Herfølge [Danish soccer club] balls, it's more meaningful than us trying to combine our way up because that's clearly a talent which we do not possess.

Praise is almost non-existent during *CoN* play (and when it appears, it is difficult to distinguish from encouragement). During *Mashed* play, praise typically appears as reactions to harrowing situations. But it also plays a special role in the case of Group 3. Up to a point, Kathrine has had no success playing the game, but in the first turn of new round (on a new course) she surprises everybody by winning (Figure 87).

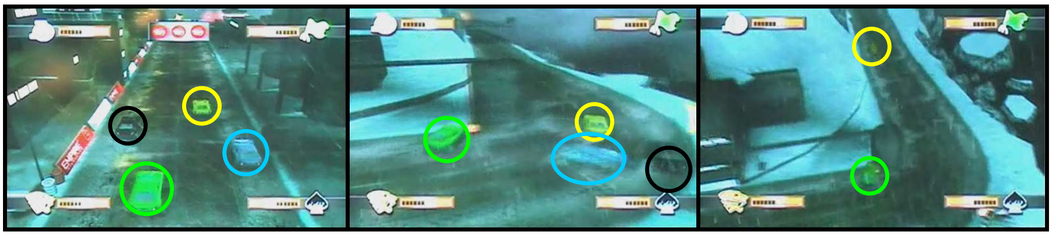

Figure 87 – Kathrine (yellow) starts in the front position (left) and is the only one to make the first turn (middle) as blue and black slide off the road while green gets stuck at the wall (right). Cars are marked by coloured circles.

Till this point no-one has addressed the latently embarrassing situation that Kathrine has seemed unable to compete at all. But her win appears to offer some relief that the embarrassment has now been diminished. As she wins, she very quietly says "Yay!" as a modest boast. She follows this up with brief laughter and the other three echo her laughter. Apparently she senses that they are partly laughing at her subdued "Yay!" and so she repeats it and laughs again. A few turns later she wins again and Jacob says

> **Jacob**: Way to go yellow

Kathrine receives similar praise later in the round but beyond a few laughs she does not participate verbally.

Turning to apologies and excuses, players sometimes offer explanations for collective difficulties. These typically take the form of emphasising how difficult the current game (mostly *CoN* and *Mashed*) is. Actual excuses for concrete actions made by others are very rare. In any case, players more often apologize for, or excuse, their own actions. Playing *Mashed*, Maria excuses her seemingly clumsy performance by

> **Maria (Group 5)**: [Laughs]. No God! I had forgotten that I was pink [holds her hand to her mouth; fell from road side]. I was looking somewhere else completely.

This is somewhat similar to Jacob's excuse for crashing early on a new *Mashed* turn (although Jacob implies that the game design is to blame):

> **Jacob (Group 3)**: Arh that was so bitter man, I was driving. Here at my starting position I automatically drove out and got knocked over.

Mashed players do not offer actual apologies at all. When playing *FIFA*, they are not so reserved. Albert fails to take advantage of a pass:

> **Albert (Group 4)**: [Laughs] Sorry.

Maria hesitates before taking a goal kick and says:

> **Maria (Group 5)**: Oh it's me sorry [goal kick]. What is the one where you shoot far?

Simon is even more explicitly apologetic, saying

> **Simon (Group 3)**: Oh, sorry. That was my mistake.

Such apologies occur in *CoN* as well, but less frequently. This distribution is perhaps not surprising. In *FIFA* any player may become responsible for problems visited upon the team; the player is truly capable of diminishing the success of the others in a way only marginally possible in *CoN*. Of course, the player is even more capable of afflicting the other *Mashed* participants, but here no *expectation* of cooperation makes non-cooperation socially problematic.

These observations seem to indicate that encouragement and praise are ways to deal with problems of significant differences in skill levels. Carl is far more capable than the others and displays an interest in keeping them interested and focused. Meanwhile, John, Jacob, and Simon are better than Katherine and show some interest in alleviating embarrassment inherent in the situation which translates into actual praise. Excuses seem to often serve the function of alleviating collective embarrassment but of course also serve as explanations for personal failings even if they include the entire group. Finally, apologies almost solely serve the purpose of indicating that one is acknowledging one's responsibility in achieving the *FIFA* team goal.

Coordination efforts

At times, one player expressed the desire to have others act in a certain way. Such expressions were coded as either SUGGEST MUTUAL COOPERATION, ORDER, REQUEST OR SUGGEST ACTION or ORDER, REQUEST OR SUGGEST ACTION

REGARDING INTERFACE. Since COMMENT ON MUTUAL COOPERATION is so closely related to SUGGEST MUTUAL COOPERATION it will also be discussed here.

The line between suggesting mutual cooperation and requesting an action is not always clear. The logic of separating the two categories, however, was that certain types of requests for action reflected a desire to cooperate beyond simply suggesting that the players move in the same direction (for instance). Examples of SUGGEST MUTUAL COOPERATION (all from *CoN*):

> **Carl (Group 6)**: Can we give each other money, so someone can buy something hardcore?
>
> **John (Group 3)**: Now's the time to share some of all that equipment, or is that too ambitious?
>
> **Jacob (Group 3)**: Couldn't we just try to see if someone has found something that others can use or that they can use themselves then?

More common were comments which alluded to the idea of cooperation without actually proposing such behaviour. August, for instance, was concerned about whether *CoN* featured friendly fire or not:

> **August (Group 4; *CoN*)**: [Laughs] This is just a brutal slaughter. What the hell? You can't hit each other can you?

During *Mashed* play, Adam makes a joke playing on an analysis of the objective player relationship. He is referring back to a statement made before the actual game began, in which he joked that given the competitive nature of *Mashed* he would no longer be helping anybody:

> **Adam (Group 4)**: Where is that boost? Now, I was just kidding when I said that we should not say which buttons to use right?

The other players laugh at this. Later in the game, August makes a related allusion to the objective player relationship giving him no incentives to help:

> **August (Group 4)**: Yes yes, that's when you're out yourself, but then you haven't seen those crosshairs [points to screen]. I actually didn't want to say anything [laughs] I just knew I would get hit. But [laughs] it appears about [points to screen]. Well, onwards.

Such a comment also appears in Group 5's *Mashed* session

> **Maria**: Why am I teaching you this, that didn't give me shit

The idea that cooperative behaviour should not be taken for granted appeared once during *CoN* play. In this case, however, it was expressed as a form of protest against being forced into choosing an undesired character class and the speaker (William) was clearly making a joke (Group 5):

> **William**: Wait a minute, then I will have to be a cleric when you choose those melee classes.
>
> **Daniel**: [Laughs]
>
> **William**: Then I will become the field hospital
>
> **Daniel**: Yes, that's the way it must be.
>
> **William**: No, you can't do that to me [smiles]
>
> **Daniel**: Oops
>
> **William**: I'll only heal you if you pay me for it [laughs]
>
> **Daniel**: [Laughs]
>
> **William**: You can get a beating, is what you can

William's last remark is meant as a mock response from the other players' melee class characters. The majority of *CoN* statements in this category, however, were related to either friendly fire or the party's funds. For instance:

> **Maria (Group 5)**: Do we have the same? [money pool]
>
> **Mikkel (Group 1)**: Ah, OK great. You've spent all the gold [laughter]
>
> **Linus (Group 2)**: If you had chosen a woman we could have had pooled our funds.
>
> **Mikkel (Group 1)**: Err, do we give each other damage?
>
> **Linus (Group 2)**: Mr Shoe [attacks the other character]. Okay, I was just checking if friendly fire was on [laughs]
>
> **Pia (Group 6)**: Don't we risk hurting each other as well?

Some actual tension is also evident concerning the allocation of found objects. But interestingly, some comments on this topic consist of a player drawing attention to him- or herself getting the lion's share.

> **Mikkel (Group 1)**: Did you see that? I'm just running around snatching all the objects [laughs mockingly]
>
> **Anne (Group 6)**: Do you also pick stuff up, or am I getting all of it?

> **Anne (Group 6)**: I took that, ”ha”

Such statements indicate that the speakers are conscious of the potential tension within the group or that they simply care about a fair distribution of objects. Notably, the first and last statements are accompanied by mock greed which may well reflect a compromise between acting responsibly and the desire to not appear too tender-hearted in a somewhat competitive situation.

Other statements are subtle criticisms or otherwise related to others achieving some bonus. Anne’s comment above (“I took that, ‘ha’”) was preceded by Carl and Linda saying

> **Carl**: No, now it disappeared. Somebody snatched it.
>
> **Linda**: Stealing stealing [smiles]

Hinting at a more basic principle, Jacob jokes that it would be unfair for one player to level ahead of the others:

> **Jacob (Group 3)**: You can’t. No one’s levelling until everyone can level [smiles]

And a little later, he returns to the general theme drawing attention to the fact that he has not received/collected as many items as the other players:

> **Jacob (Group 3)**: I haven’t picked up as much as the rest of you [laughs]. Seven to eleven [reading from item description].

But such complaints about the greed of others are very rare (even Jacob’s is ambiguous, as he may partly just be excusing his lack of items or fishing for someone to give him useful ones).

On the whole, the category of “simple” suggestions for action is far larger. Here, players are voicing more straightforward proposals like the pragmatic

> **August (Group 4; *CoN*)**: Shouldn’t we just go out and beat up somebody then?

During *FIFA* play, players are trying to coordinate the team’s efforts. Suggestions typically indicate that others should try for the goal, pass the ball, or should just get the ball as far away as possible.

Meanwhile, while playing *Mashed*, the suggestions for action which players make tend to be entirely ironic; they are not meant to be acted upon but merely indicate the speaker's preference. Examples:

> **August (Group 4)**: Aaahh. Stay still, stay still.
>
> **Daniel (Group 5)**: Get those crosshairs off me [laughs]
>
> **William (Group 5)**: I just need a lock on you. Drive steadily, God damn it.

Suggestions serve another (rarer) function for *Mashed* players: As encouragement to deal with a "common enemy". This wish is evident in the following statements:

> **Daniel (Group 5)**: Shit, what about just placing yourself up ahead? Fuck man. Smash him, God damn it.
>
> **Maria (Group 5)**: Yes, we can't let him get that victory.
>
> **Mikkel (Group 1)**: You have to bomb him, for God's sake
>
> **Mikkel (Group 1)**: Kill him, kill him, kill him. Yes yes, look it's locking on. That's right.
>
> **Mikkel (Group 1)**: But he's still ahead. That's why you have to let me win now.
>
> **Anne: (Group 6)**: I would shoot the black one right now.
>
> **Simon (Group 3)**: He mustn't be allowed to take it so easily there.

Arguably, what we are seeing are attempts to create coalitions within the player group. These attempts occur as a consequence of the constant sum-game temporarily creating incentives for players to gang up on the opponent likely to win[95].

Summary of observations

In summary, the observations on the use of various statements types were:

[95] Some of the statements also have en element of vengefulness, as players who have been eliminated suggest that their "killer" be eliminated.

- Players toyed with the idea of redefining the game goals though only abstractly or jokingly. In *FIFA 2004*, the game which proved most difficult, this type of behaviour was used to alleviate the collective tension of losing.
- Players boasted, mainly as an exclamation following success (during *Mashed*) or as pointers to event which the other players might have missed (during *FIFA* play).
- Taunts were quite polite and only made during *Mashed* play.
- Criticism of other players were rarely heard during *CoN* play but at times used to signal mild annoyance. During *Mashed* play it was mostly mock and generally used as a response to being attacked. The only exchange which came near heated discussion occurred during *FIFA* play, suggesting that cooperative games may be the most apt to inspire this type of conflict.
- Players who were friends did not display notably different behaviour in terms of cooperation/conflict but tended to use each others' names more often and displayed a tendency to be more direct with each other than others were.
- Every case of passing information to others could be construed as self-handicap, but in terms of in-game behaviour which had the function of intentionally giving other players a chance, this happened only once. This one instance involved one being far more skilled than his opponents.
- Players sometimes encourage each other. Encouragement appears mostly when things are going badly for everyone. One group is practically responsible for all encouragement during *Mashed* play. This happens as one player becomes worried that the other three will stop taking the game seriously or become truly disgruntled.
- Most actual praise is given during *FIFA* play and simply follows successful manoeuvres by other players. During *Mashed,* praise has a special function in one group, which is to alleviate embarrassment when a player who has been

doing poorly suddenly wins rounds. Both encouragement and praise seem to function as methods for mitigating problems of highly different skill levels.

- Players sometimes make collective excuses but more often excuse their own actions. Apologies occur mostly during *FIFA* play and never during *Mashed* play. This seems to reflect that making mistakes in *FIFA* actually harms the entire team.

- Players tended to allude to cooperation issues rather than actually make concrete suggestions for mutual cooperation (beyond suggesting simple actions). This may suggest that they were gauging the general attitude towards cooperation to ensure that others did not disapprove of the current situation. Players also expressed some concern about fairness in the distribution of *CoN* objects.

- Suggestions for actions were common, particularly during *FIFA* play. When such suggestions were given during *Mashed*, they were often ironic (the other players wasn't expected to comply) and sometimes encouragements to deal with a common enemy.

I will return to some of these observations in the final discussion on the study results at the end of the chapter. Before that I will discuss what is perhaps the most puzzling aspect of the results and then move to discussing the validity of the three result types.

Discussion of the in-game/out-of-game split

Though several results of the study were unexpected, by far the most puzzling outcome is the split between the players' behaviour inside the gamespace and outside of it. If anything, this phenomenon calls for an explanation. I believe, a small series of explanation types are possible and I shall outline them in the following.

The act of playing games has traditionally (Caillois, 1958/2001; Huizinga, 1938/2000) as well as more recently (Salen & Zimmerman, 2004) been conceived of as entailing the construction of a mental boundary between game and outside world. Within this 'magic circle', interaction follows rules that are (virtually) unconnected to those of the outside world (see discussion in Egenfeldt-Nielsen et al., In press). But illustrated by the dotted circle in Figure 88, we see that the study indicates that there is a further separation between behaviour in the gamespace (here drawn as "The game circle") and behaviour outside of this space (here drawn as "The gaming circle"). Although the same people are "behaving" in both arenas at the same time, the observed behaviour differs remarkably. Why?

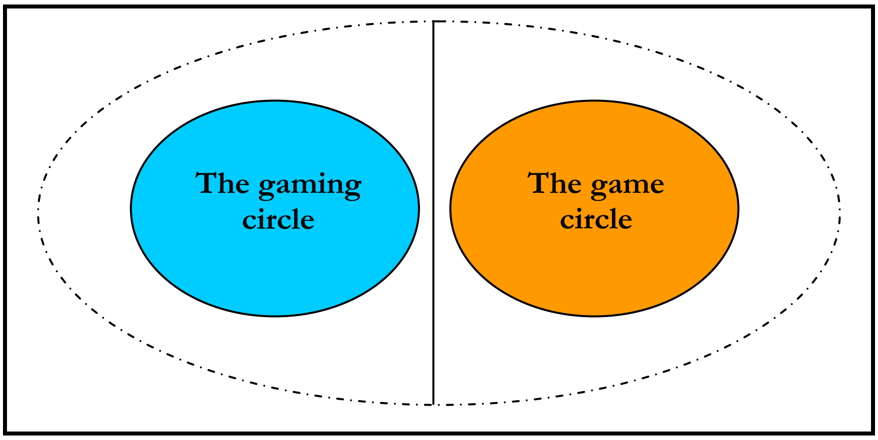

Figure 88

In the following I discuss possible explanation types. Neither is obviously correct, but each may offer potential for further study and I will argue that some seem more probable than others. In short form they are: Expectations differ, Fairness overrides competitiveness, Coordination is difficult in game, Cooperation is competitive.

The first explanation type, *Expectations differ*, highlights that gamespace behaviour is expected to be aligned with the objective goals, while verbal interaction is in fact expected to follow quite different norms. While game playing may be one of the few spheres of life where people are in fact expected and entitled to care only for their own objective interests (when playing opponents of reasonably equal skill) close-proximity verbal interaction in a couch is not. Such an explanation would be compatible with the notion, mentioned earlier; that in the gaming circle, players simply give whatever help is needed depending on the game.

An alternative is that although generally players default to look out for their own objective interests, the presence of fairness is a prerequisite; *Fairness overrides competitiveness*. In other words, players will seek to win but only after having secured that this happens fairly. Certainly, fairness has been shown to play an important in much interaction. Within economics, Robert Frank notes how simply assuming that people are generally self-interested but do care about fairness helps explains many observations that seem inexplicable through the core self-interest model (Frank, 1988: 177). This observation is supported, and explained, in recent experimental work in the area between experimental economics and neuroscience (de Quervain et al., 2004; Gurerk, Irlenbusch, & Rockenbach, 2006; Henrich et al., 2006). While the importance of fairness in many contexts is well-documented it does not evidently explain the results of the study. The two groups that have inequality issues (3 and 6) do not show a higher tendency to give help that the other groups[96].

The third possible explanation is that players *would* also be helpful in the game circle, if only that was not made difficult by the game structure; *Coordination is difficult in game*. The idea here would be that if a player (in a group of four) were to help a weak player the helper would simply lose instantly and her sacrifice be of no help at all. Meanwhile, in the gaming circle help can be given without engaging in (perhaps risky and perhaps humiliating) coalitions with other superior players.

Finally, a more radical explanation would be that the gaming circle behaviour thought of above as cooperative might in fact be a sort of competition. There is some evidence that competition sometimes masquerades as cooperation. In the context of birds, Amotz Zahavi argues that the apparent altruism observed among

[96] Alternatively, the social rule of fairness might prompt all players to inform their group of everything they know but which others do not. This is not belied by the data, but nor does it explain the split between the two circles.

Israeli babbler birds, and which various models have thought to explain[97], is in fact a way of establishing dominance. The bird which is strong enough to be able to share its food etc. is considered the leader. The same phenomenon exists among humans. In its most extreme form it is known from variations of the potlatch phenomenon in which gifts were given in a competitive context (to forcefully establish debts or claim social status). More mundanely, reciprocity is a powerful social rule; giving (or being seen to give) in fact often indebts the taker (and, in this light, is not altruistic at all)[98]. A number of studies within social psychology have shown how giving in this sense effectively established a strong obligation to return the favour (e.g. Kunz & Woolcott, 1976; Regan, 1971). The implication is that cooperative verbal behaviour in the study may be a way of establishing debts. Of course, it may also be a way of further establishing one's superior skills; if one is able to help others and still win, then that victory may be all the more impressive. This interpretation might well explain the split between the two circles as in-game cooperativeness (in a competitive game) is far more difficult/risky/overlookable than its gaming circle counterpart. But it does not explain the difference between general help given and help given in relation to interface or controller.

In the end, it may well be that several of these interpretations are relevant to understanding the observations. But I suggest, as a more general explanation, that the ambiguities in the results indicate that players find "rational" in-game behaviour to be crucial to the act of playing as well as legitimate in all but the most extreme circumstances. Meanwhile, they "manage" the effects of this partial rationality in their verbal interaction, fulfilling a social requirement (among others) that victory must be a function of skill, not of superior knowledge of how the controls work.

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97 Since in evolutionary biology, cooperative behaviour is generally considered needy of explanation constituting a break with the general trend of competitiveness among individuals.

98 For a discussion of the reciprocity rule in a marketing context see Robert B. Cialdini's *Influence: The Psychology of Persuasion* (Cialdini, 1993).

Validity of results

The validity of results is the degree to which they actually measure what a study claims to be measuring and the validity of the present study can be discussed with regard to five, somewhat overlapping issues.

- The artificiality of the setting.
- The non-random nature of the sample
- The issue of interpretation
- The problem of extending from the learning phase
- The comparability of the three games

Many of these issues are common to a broad set of similar studies and the purpose of the following is neither to argue that they are “catastrophic” to affected studies nor to refute their possible problematic implications. Rather the purpose is to openly consider how they should influence the reading of the results (and whether they can be avoided in future studies).

The artificiality of the setting

Perhaps the most general issue of all concerns the very core assumptions of the experimental method applied in the social sciences. Experimental settings are generally used in order to control single variables. But the experimental setting *itself* may be an influential “variable” and may hypothetically produce behaviour different from that of normal media use etc. The objection has been raised against effect studies into player behaviour that by taking players into laboratory settings they are being separated from the inherently social and voluntary nature of the media use which one in fact set out to measure (Egenfeldt-Nielsen & Smith, 2004: 30). In other words, the effect which one measures may be attributable to the setting rather than the variable which one manipulates.

This is a relevant concern, particularly in the light of the observation that the mood of players was markedly affected by moving the sessions from night- to daytime. But an aspect of the study mitigates this potential problem somewhat. First, a *general* behavioural effect of the setting would not destroy the validity of the results since these are relative. The study examines differences between behaviour in three situations (the three games) and if the setting itself made players more (or less) hostile this would not greatly influence the conclusions. However, it is conceivable that the non-natural setting might heighten the effect of *one* game type on cooperation or amplify the differences and this would directly influence the results.

The non-random nature of the sample

As mentioned earlier, the test subjects were recruited among students at the IT University. A call for participants was sent to various email lists and the actual subjects effectively recruited themselves (and they were given no concrete incentives to participate).

The problem of a non-random sample, of course, is the possible existence of bias; that the sample is not representative of the entire population. In principle, such bias is unknowable as there is no way to determine its presence. Hypothetically, members of a given non-random sample might differ from the population average on any variable. But what we *can* do is consider the likelihood of *obvious* bias in the sample. Taking the population to be everyone in the world who plays video games on a somewhat regular basis (whatever that may be) the subjects stand out for instance by having a long education, by being likely bearers of Northern European community values and by having (some of them) a highly analytical approach to (and knowledge of) video games. They are likely to have broad experience with many genres of games and given the university's focus on game design principles (rather than, say, 3D graphics) may be inclined to value gameplay mechanics higher than audiovisuals.

The real question here is whether they can be assumed to differ from the population in terms of the way different games propel (or not, if that is the case) them towards cooperative/competitive behaviour. There is no particular reason to expect bias on these specific variables but the question remains open.

The issue of interpretation

Do the players correctly interpret the three games' objective player relationship and is this important to the study? In behavioural game theory, much care is usually taken to ensure that the players have a full and shared understanding of the game dynamics:

> The overwhelming convention in modern (post-1975) game theory experiments is to explain how each sequence of moves by each player leads to payoffs […] when subjects are not told something about the environment they are placed in, their default assumption may be wrong. (Camerer, 2003: 36-37).

Essentially, the players in the study may not categorize the three games as (objectively) cooperative, semi-cooperative, and competitive. Thus, for instance, failure to act competitively while playing *Mashed* may be caused by the players *being "rational" but misunderstanding the objective relationships* or *not being "rational" (i.e. being altruistic) and understanding the objective relationships*

Not informing the players explicitly about the objective relationships was a conscious choice. The aim was to create a play atmosphere as close to home use console settings as possible. This is a trade-off between the potential strength of data interpretations and the possibility of generalizing the results to "real-life" play. By not explicitly pointing out the game goals, the results become harder to interpret but the likelihood that the observed play is comparable to play in non-experimental settings is increased. In this respect, validity might well have been improved by querying the subjects about their understanding of the player relationship. Future studies without synchronised player interpretations may benefit from doing so.

The problem of extending from the learning phase

In the study, the players were largely unfamiliar with the three games. Thus, what was studied was the initial phase of game mechanics analysis; a phase which may differ from subsequent phases. In particular, initial play may be more explorative as the players attempt to work out affordances and constraints and, more importantly, the players may need to expend all energy on simply working out the game controls. Little cognitive capacity may be left for analysing the finer points of the game's incentive structure. An instructive example of players possibly not fully grasping the objective player relationship is reported by Zagal, Rick & Hsi (2006) in their analysis of the *Lord of the Rings* board game. The authors find that players of a cooperative game initially mistake it 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 […]. When players discover this, they learn that a collaborative situation requires a fundamentally different approach than a competitive one. (2006: 30)

In other words, behaviour in the initial playing phase may not be representative of behaviour of players at latter stages.

How might this affect the results? Two scenarios are plausible: Players in the learning phase may gravitate towards a "default" behaviour type as they have yet to fully appropriate the incentive structures of the games, remaining uncommitted to a (mostly) cooperative or a (mostly) competitive one. This would even out behavioural differences between the three games. Alternatively, players may (as Zagal, Rick & His suggest) be initially biased towards a competitive stance. This would *also* even out behavioural differences between the three games. Either way, differences in the results are likely to be present *despite* potential effects of studying players in the learning phase.

The comparability of the three games

The study builds on the assumption that behavioural differences are due to the difference in objective player relationships between the games. Essentially, *that* is the variable which is allegeably controlled. This assumption may be too inspired by the game theoretical focus on conflict and payoffs as other differences between the games might translate into behavioural differences. As a hypothetical example, one game might be particularly difficult leading to frustration and in turn to less cooperation (than it would have otherwise). This is a genuine concern and future studies might include checks by using the same game with different player relationships (e.g. cooperative mode and competitive mode of the same game)[99].

A series of issues, from the general to the more concrete, affect the validity of the results. And while most of the issues could be raised against similar types of studies, that is hardly comforting in the present situation.

Overall, that which diminishes some of these concerns is the choice to examine differences. Other factors may have influenced the general interaction climate etc. but validity is only radically challenged if there are other plausible explanations for the observed differences; if something other than objective player relationships may have caused the observed differences in behaviour.

When I have addressed these concerns at some length it is partly due to the untested nature of the methodology as concerns game studies. The approach chosen may be improved upon in later studies and the issues above may be worth bearing in mind. In particular, the implications of "the issue of interpretation" are considerable as is the importance of attempting to deal with the question of game comparability.

Summary and discussion

It's now time to sum up this chapter. Initially I reviewed existing literature on video game player behaviour distinguishing between studies conducted inside the game and outside the game. It was shown that the number of studies which have looked for general patterns in player behaviour is modest, although certain observations stand out as relevant for this work:

- Highly skilled players have been observed to handicap themselves (Lazzaro, 2004)

[99] This must be handled with some delicacy, since most games have a "standard" mode of play. For instance, *Mashed* has a cooperative mode but is likely to be initially perceived as a game with competitive connotations (due to its genre etc.).

- Inexperienced player have been observed to visibly disrespect the objective game goals (Lazzaro, 2004) but also to merely lose interest in the game (Klastrup, 2003)
- It has been suggested that skilled players attempt to raise unskilled players to their level by offering help (Holmes & Pellegrini, 2005)
- Several authors are surprised at the limited amount of communication taking place among game players (Holmes & Pellegrini, 2005; Manninen, 2001)

I then proceeded to describe an experimental study on the relationship between game conflict type and player behaviour; seeking specifically to test the explanatory value of the Rational Player model. The study yielded three types of results:

Observing action within the gamespace, only one case of model-contradicting behaviour was found. With this exception, all observed in-game behaviour was compatible with the model.

Testing for the relationship between game type and frequency of types of verbal statements, an unclear picture emerged. While game type did influence verbal behaviour, this influence was somewhat inconsistent across groups and across statement types. For instance, the distribution of general advice was not echoed by the distribution of advice regarding interface and controller.

Perhaps unsurprisingly, a deeper qualitative analysis of interaction dynamics illustrated the complex function of many statements. More importantly, it was found that while several phenomena observed in previous studies were present, they were often couched in irony or kept tightly controlled. On the whole, players in the study were civilized, almost polite. One exception to this occurred during *FIFA* play. Although anecdotal, it was seen as suggestive that the cooperative game should be the only one to elicit aggressive interaction between players.

In brief, the more salient observations/results were (divided by result type, see page 195):

1) Players in the study adapted their in-game behaviour to meet the objective game goals.

2A) CoN, the semi-cooperative game, elicited more general helpful verbal behaviour than did the others. *Mashed* (competitive) elicited more than *FIFA 2004* (cooperative), but this was a less marked trend.

2B) As to interface/control help, one game did not produce highest levels across all groups. But comparing *FIFA 2004* (cooperative) and *Mashed* (competitive), the former tended to produce more of this type of helpfulness.

2C) In almost all groups (5/6), the two coordination type games (*CoN* and *FIFA 2004*) produced more coordination type statements than did *Mashed*.

3A) Players only redefined game goals jokingly, and often in order to alleviate embarrassment over collective defeat.

3B) When players boasted it was often out of surprise at winning or to direct attention to something that others might have missed.

3C) Taunts were rare, quite polite and only occurred during *Mashed* (competitive) play.

3D) Serious criticism of other players was practically non-existent, with the exception of one instance during *FIFA 2004* (cooperative) play.

3E) Encouragement occurred when things were going poorly for everyone. The exception is one skilled player trying to keep up the spirits of three less skilled ones.

3F) Praise is used to remark on achievements by team-members and is used to alleviate embarrassment when an under-performing player suddenly starts winning.

3G) Apologies are used as a way of acknowledging that one's actions hurt the team (not to apologize for brutal behaviour in the competitive game)

3H) Players showed some concern over fair distribution of objects in the semi-cooperative game.

3I) The use of suggestions for actions varied depending on the game. During *FIFA 2004* (cooperative) play such suggestions were serious while during *Mashed* (competitive) play they were meant as jokes.

How does this relate to what was already known from, or indicated by, previous work?

As to the observed relatively sparse communication of video game players it is difficult to judge whether the behaviour in this study questions or supports that finding since sparseness has not been precisely defined in these earlier studies. But based on this study, it seems that video game players talk throughout most of the play time, but that conversation pauses are more frequent than in social settings not centred on an activity other than the conversation itself.

The observation that highly skilled players handicap themselves to allow others to catch up was supported here, but only by one case. That skilled players attempt to raise others to their skill level by giving advice and help was also observed here, but it seemed the case that *everybody* was willing to share their knowledge and discoveries about how the game worked.

As to the question of how unskilled players react (by redefining goals or by losing interest) this study primarily seconds the latter observation. No under-skilled players in this study chose to display disrespect of the objective goals and some did seem about to lose interest (and expressed strong annoyance).

What, more generally, have we learned from this study? Its aim was to determine the ways in which actual game play diverged from the Rational Player Model, so entrenched in the game design literature and to provide knowledge on player interaction more generally. The results show that the player behaviour, at least some aspects of it, diverges from the model. This result, of course, was not entirely unexpected. More unexpected was the finding that the model neatly predicts in-game behaviour while performing quite poorly in terms of verbal interaction. In the end, this finding itself may be the most important as it has clear implications for player research methodology. In **Chapter 2: Visions of the player** the methodological conflict between a formalist and a situationist camp was introduced. The former assumes that player behaviour can be predicted from an understanding of the game while the latter disagrees. The study indicates that they are both right and both wrong; *aspects* of player behaviour is predicted by the game rules. But it also clear that their assumptions are quite understandable since they are led by their focus to a methodology which confirms their preconceptions.

In turn, this highlights a feature of multiplayer games: Being physically co-present provides an aspect of gaming which is not reproduced inside the gamespace and thus not present in low-bandwidth online gaming. Such gaming, then, seems much more likely to be compatible with the Rational Player model although we would expect this to be less so the more communication features the players are given.

Of course, the observations here cannot be readily generalized to different types of play situations. Console players are typically limited in their in-game behaviour in a way that, say, MMORPG players are not. Also, console players obviously have direct access to high-bandwidth communication channels (that is to say they are sitting next to each other). Being more communicatively restrained, with the extreme being limited text-chat access, need not mean that the types of behaviour manifested in verbal interaction in this study become non-existent. In such cases, “non-rational” behaviour may well partly move into the gamespace itself.

The next chapter will conclude on the entire dissertation and discuss promising avenues for further investigation.

CHAPTER 5: CONCLUSIONS AND NEW PERSPECTIVES

The previous chapters have described player behaviour models identifiable in the games literature, described the analytical implications of the dominant model, and used the model as a tool for understanding actual behaviour. While each chapter has been summed up previously, it is now time to present the different types of results in an integrated fashion and to discuss, on a broader level, what we have learned. I will discuss, in closing, exactly *how* we should understand the Rational Player Model of player behaviour.

But first, a concluding summary.

Game scholars do not agree on what is meant by the term ‘player’. Although this disagreement often goes unmentioned, four distinct player models were identified. It was shown how one of these four, dubbed the Rational Player model, plays a dominant role in game design; it is a kind of default model. And yet, it is often applied in a crude form which obscures differences between games and thus the actual behavioural predictions to be derived from it. By applying the model analytically to video games, a number of phenomena, often unacknowledged in game thinking, became apparent. First, it was shown how the model is a strong version of the hypothetical agent at the heart of neoclassical economics. The Rational Player model of player behaviour not only assumes that players have stable and ordered preferences (as would the economic equivalent) but assumes that these preferences are directly determined by the game goals. Then, ways of modelling video games were introduced and it was shown how variations in player relationships mapped onto modest changes in payoff structures in the models. From the model, three core game categories became evident: Competitive games (where player goals are incompatible), semi-cooperative games (where cooperation is rewarded but individuals tempted to act selfishly) and cooperative games (where players are rewarded for coordinating their efforts).

Having mapped differences in terms of conflict types, we saw how an understanding of gaming as a strategic conflict could also encompass single-player games to some extent. And we saw that strategic dynamics change in situations with more than two players, even in constant sum games, as temporary coalitions may appear. Next, it was shown how (regardless of sum type) video game players make their choices under varying degrees of uncertainty. The most common types of uncertainty (as related to genre etc.) were identified and it was argued that in the case of video games a useful distinction ran between games with "completeable" and "uncompletable" information (the former being those in which the player can technically know everything about the initial game state, even if he or she does not have this knowledge when first experiencing the game). The discussion of information led to an analysis of inter-player communication and its role in establishing (or destabilising) cooperation and trust. It was shown how players have displayed a need for commitment-enabling mechanisms, which have subsequently been incorporated into the games themselves. Next, looking more closely at the concept of strategy it was found to be used in many different meanings and that pure strategy equilibria cannot be considered universally problematic. Finally, the concept of "strategicness" was introduced as an analytical measure of the scope and importance of the choices offered to a player by a game.

Till this point, the analysis had described the analytical implications of the Rational Player model, thus offering a perspective on video games. The behavioural predictions of this perspective were now compared to actual behaviour in an experimental study. The study showed that the players divided their behaviour into two distinct modes; behaviour in the gamespace and outside. Their actions inside the confines of the game universe were compatible with objective goal seeking, while their verbal behaviour was not. Furthermore, the study showed that the players exhibited certain behavioural trends reported in previous studies although these were often of a tongue-in-cheek nature.

With this we can return to the overarching question: Do players seek to win?

Within the limits of the study it seems that players do seek to win but that this attempt is subjugated by social norms defining appropriate play. Outside the gamespace itself, the players mitigate and modify their "rational" behaviour to satisfy other priorities. Interestingly, players do not *apologize* for the potentially harmful effects (e.g. to the happiness or self-esteem of other players) of the rampant goal-seeking in the competitive game. The only thing that they seem to find deserving of apology is poor performance in the *cooperative* game where their inadequate performance directly affects the others in a way not sanctioned by the game rules. In the competitive game, what happens instead is that the players display a willingness to help others by giving advice and sharing information. This indicates that the players find strongly competitive behaviour legitimate as long as it is accompanied by a desire to share relevant information with other players. Put differently, concerns about fairness do not extend to gamespace behaviour but clearly mean that performance in the game should not be a consequence of superior or inferior *knowledge* about how the game works. This also shows, if indeed there were any doubt, that competitive gaming (at least in non-tournament settings) is in fact a *cooperative* phenomenon; it is an instance of agreeing to disagree.

Future perspectives

The study of how video game players behave, and the relationship of this behaviour to the design of games is still in late stages of infancy, moving reluctantly towards toddlerhood.

Indeed many pertinent questions concerning players are unanswered. How, for instance, do players interpret the game goals? How do players explore the means available to reach these goals (and how do learning strategies vary)? And why do some people prefer explicit objective goals while others choose games allowing for more variation in playing style?

A reasonable way to approach these issues is through the study of actual game play. If done with attention to how player behaviour relates to game design such studies can help bridge the gap between those who (legitimately) study games and those who (legitimately) focus on gam*ing*.

On a larger view, it also helps establish ties to fields which for considerable spans of time have studied decision making and the relationship between structure and agency.

However, it is also time for those interested in players to begin engaging critically with previous work. It is worth considering how one's results match those of previous efforts; to specify what is new and what is at odds with earlier findings. Sometimes these contrasts may turn out to reflect actual differences between the players or play contexts studied - in itself an interesting finding. At other times, previous (or indeed one's own) results may be wrong. The latter, of course, is an equally important realization.

In more concrete terms, a study such as that presented in this dissertation lends itself to both methodological improvement and to deeper and/or different data analysis than the one performed here. For instance, a different coding of the transcriptions might be applied to study patterns of communication within groups (who says what to who?), variations in speaking intensity (who says how much?) or variations over time (does communication change during single sessions?) and context (how does communication within a single game change according to what goes on in the game?).

Also building on observations made here, it would be worthwhile to compare extremes in future studies as opposed to seeking heterogeneity in group makeup. In particular, it would be interesting to examine how concerns over fairness relate to varying degrees of competitiveness in the game setup. With the extreme being tournament play with prizes to winners, how competitive must the gaming situation be to crowd out the urge to compete on the same level? Similarly, it seems that many social norms of gaming stand out in cases of unequal skill levels. Thus, to further study how players ensure fairness and mutual engagement in the game, it would be interesting to more directly examine the play behaviour of groups whose members are conspicuously unequal.

As for the Rational Player model, it has a particular, very useful, quality. It specifies clear predictions. Games present the player with goals. As a baseline, we can hypothesise that the player attempts to achieve these goals. Thus, we can concentrate on explaining the deviations from that baseline. This provides a systematic way of approaching the larger question of the relationship between game design and player behaviour.

If the Rational Player model is used as a baseline, what then of the other three models identified in **Chapter 2: Visions of the player**?. First, models can of course describe the same phenomenon on different levels. But for such a relationship to work as a genuinely fruitful collaboration they must be compatible, i.e. they must be non-contradictory. As discussed earlier, the Selective Player and the Susceptible Player models are only indirectly models of player behaviour; they deal with choice of game and effect of game respectively. They differ from each other in their notion of human decision making, but that need not concern us here. The Active Player Model and the Rational Player Model are incompatible as *general models*. They cannot explain the same behaviour without contradicting each other. But they may, of course, be applied to shed light on particular instances.

But most importantly, whichever model one applies, tests or draws inspiration from, by moving forward systematically, several parties might benefit. Scholars would be working towards a common end, and game designers, while perhaps unable to derive short-term application suggestions from individual studies, might achieve a deeper knowledge of their audience.

Thus, the player relationship inside game studies and between its practitioners and other groups, might gradually become - if not fully cooperative - then at least a semi-cooperative one with strong incentives for mutual helpfulness.

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