Playful Networks: Measuring, Analysing and Understanding the Social Effects of Game Design

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Abstract

Games are fundamentally a social activity. The effects of this foundation can be felt at every level - from the social negotiation of rules, through co-operation and collaboration between players during the game, to the effects of relationships and social status on play. Social effects can change the way the game is played, but the mechanics of games can also affect the patterns of social behaviours of the players. The arrangement of game mechanics and interfaces together defines a “social architecture”. This architecture is not limited to directly social mechanics such as trading and messaging - the game design itself has a holistic effect on social activity.

This dissertation frames games around these social aspects, and focuses on analysis of the patterns that emerge from these playful interactions. Firstly, a model is defined to understand games based on the social effects of play, and these effects explored based on the varying impact they have on the play experience. Mischief and deviance is also investigated as forces that challenge these social effects in and around games. Based on interaction data gathered from server logs of experimental social games, social network analysis is used as a tool to uncover the macroscopic social architectures formed by each design. This allows the use of quantitative methods to understand the nature of the relationship between game design and the social patterns that emerge around games in play.

Key findings confirm that social activity follows a heavy-tailed distribution - a small number of “hardcore” players are responsible for a disproportionately large number of interactions in the community of the game. Further than this, the connections between active hardcore and the rest of the player base show that without the hardcore users, the community of games as "small worlds" would collapse, with large numbers of players being separated from the society within a game. The emergence of grouping behaviour is investigated based on the effect of social feedback. Following findings of social psychology in non-game environments, evidence is provided that highlights the effect of socio-contextual feedback on players forming strongly bound tribal groups within games.

The communities formed through the play of games can be described in terms of network graphs - webs of interactions flowing around a network of players. Social network analyses of social games show the emergence of patterns of reciprocity, clustering and tribal behaviours among the players. The evidence also shows that the collections of game mechanics, or social architectures, of games have a predictable effect on the wider social patterns of the players. As such, this suggests games can be specifically engineered for social effects based on changes in the patterns of interactions, and issues around mechanical or interface elements can be identified based on anomalies observed in the network graph of player interactions.

Together, this dissertation provides a link between the theoretical ideas around social play to the measurable effects of social behaviours of players within games. It proves that game designs, as mechanical systems, have a demonstrable effect on the social patterns of play, and that these patterns can be examined and used to engineer better game designs for the benefit of social experience.

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Publications

Several peer-reviewed papers have been published based on the research presented in this dissertation.

- Ben Kirman, Conor Linehan and Shaun Lawson (2012) Exploring Mischief and Mayhem in Social Computing or: How we Learned to Stop Worrying and Love the Trolls, *CHI EA '12 Proceedings of the ACM SIGCHI Conference on Human Factors in Computing Systems (CHI)* (alt.chi), Austin, USA. ACM Press
- Ben Kirman, Francesco Collovà, Fabrizio Davide, Eva Ferrari, Jonathan Freeman, Shaun Lawson, Conor Linehan and Niklas Ravaja (2011) Social Architecture and the Emergence of Power Laws in Online Social Games, *Proceedings of "Think. Design. Play.", the 5th DiGRA conference on games and play*, Utrecht, Netherlands
- Ben Kirman, Conor Linehan and Shaun Lawson (2010) On the Edge of Good Taste: Playful Misconduct and Mischief in Online Games, chapter in *Edges of Gaming. Conference Proceedings of the Vienna Games Conference 2008-2009* Editors: Konstantin Mitgutsch, Christoph Klimmt, Herbert Rosenstingl. Vienna, Austria. Braumüller Verlag
- Ben Kirman (2010) Emergence and Playfulness in Social Games, *Proceedings of Academic MindTrek Conference*, Tampere, Finland. ACM Press
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- Ben Kirman, Eva Ferrari, Shaun Lawson, Jonathan Freeman, Jane Lessiter and Conor Linehan (2009) Familiars: Representing Facebook Users' Social Behaviour through a Reflective Playful Experience, *Proceedings of the ACM SIGCHI Conference on Advances in Computer Entertainment (ACE)* 2009, Athens, Greece. ACM Press
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- Ben Kirman, Shaun Lawson, Duncan Rowland, Fabrizio Davide, Francesco Collovà and Stefano Puglia (2008) Familiars; Manipulating Social Networks with Mobile Gaming, *Proceedings of the Games Design and Technology Workshop and Conference (GDTW) 2008*, Liverpool, UK. ACM Press
- Ben Kirman and Duncan Rowland (2006) Familiars: Social Gaming with PASION, *Proceedings of the 4th International Games Design and Technology Workshop (GDTW) 2006*, Liverpool, UK. ACM Press

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Introduction

Pong (1972)

When this dissertation was in the editing process, a post appeared on the games business blog *GamesBrief* with the title “What is a Social Game?”[173]. The author, Nicholas Lovell, had asked dozens of illustrious game designers to define what social games meant to them. Responses were split from the practical business definitions one would expect from the rising stars of companies making millions from games on *Facebook*, through the facetious (“A social game is the last unicorn in the vacuum of space” - Ian Bogost) and philosophical.

A common thread appeared in many definitions:

> “In my mind, a social game is a game where the primary interactions are with other people” - Jesse Schell
>
> “[They are] an occasion for mutual enthusiasm and interest” - Tom Chatfield
>
> “It’s more about a shared, fun experience” - Ian Livingstone
>
> “Games are, by their very nature, social” - Brenda Brathwaite

These feelings of innate social-ness and the importance of relationships in games were underlined neatly by game designer James Wallis:

> What we are seeing with the rise of multiplayer [and] social games... is the reestablishment of a norm, not the creation of a new paradigm. So 'social games' is meaningless phrase. Games are social by definition.
>
> - James Wallis [173]

These feelings highlight a fundamental issue - the explosion in popularity of digital games with explicit social functionality draws a lot of deserved attention, but except for a small blip in the late 20th century when it was normal to play games on your own, games are naturally social activities. What has changed is the scale - MUDs and later MMOGs put you in connection with strangers of similar tastes all around the world. Lately, social network games have found mass-market appeal by being more accessible and targeted towards playing with existing friends. It has become apparent to game designers that, for a lot of players, the relationship between them and their co-players is perhaps more important than the cleverness of the game design or the number of polygons. Although there will always be a large market for people who like complex and elaborately designed game experiences, it turns out, in general people actually *enjoy* being social (who could have guessed?).

Game studies, as a field of inquiry, has long acknowledged the value of social play both in terms of the kinds of interaction it enables, and how social psychological tools like cooperation, negotiation and conflict make for interesting and engaging game mechanics. However, there is no clear wider picture of the social aspect of games in general. Instead, the social effects are most often treated on par with the design choices of the game features. This dissertation takes a step back, to examine the importance of social factors in *all* games. In other words, that 'Social' is not a feature of games, rather, games are a feature of society.

This dissertation examines games as social systems, from the mechanisms that affect the way we enjoy them, through to the wider social patterns that emerge over prolonged play. The central research question of this work is to find if the mechanical features of games meaningfully describe the social effects of those games during play.

To begin to address these questions, the following two chapters explore the boundaries in which games exist as social activities. The first expands common definitions of games as systems of rules [44, 64, 136, 229] in order to support the implicit rules of play as a social activity. The second explores the system of rules in terms of transgressions, and the effect of bending and breaking both implicit and explicit rules within social play.

Chapter 4 forms the bridge between theoretical ideas and measurable social effects. The approach is to describe games in terms of their *social architecture* - that the system of mechanics, along with the social context of play, are what determine the patterns of social interactions that arise in social play.

Using the social architecture as a base, Chapter 5 looks at the measurable behaviours of individual players within social games. Although playing the same game with the same mechanics, individuals behave in different, but predictable, ways. By analysing the social behaviour of players in real online games, this chapter builds on previous work about play styles in order to better understand the patterns of individual players' social behaviours.

Moving from individual behaviours to group behaviours, Chapter 6 explores the emergence of tribal behaviour in social games. By analysing the social behaviour of groups in social games under experimental conditions, this chapter determines the effects of social feedback on group behaviour, and provides evidence for how games are able to exploit socio-psychological patterns to increase engagement.

Finally, Chapter 7 uses techniques of Social Network Analysis (SNA) to explore social play as a web of interactions between individuals. Analysing a range of social games, the emergent patterns of reciprocity, clustering and scaling are highlighted and discussed. Social games emerge as scale-free small-world networks, where differences in patterns of interactions between players are traceable to the differences in social architecture. This finding suggests that social network analysis can be reliably used to identify problematic areas of the social architecture based on anomalies found when analysing the networks of play.

In terms of academic contributions, this dissertation…

- Demonstrates that the social behaviours of players within games results in measurable and predictable patterns
- Evidences that the same game design in the same social context will result in similar social patterns, even with different players
- Shows that the arrangement of game mechanics has a direct effect on the social patterns of play
  - Including the effect of socio-contextual feedback on player engagement
  - Also, How specific tribal mechanics trigger measurable in-group favouring behaviours in game communities
- Finally, the dissertation highlights the potential for social network analysis as a tool for supporting the game design process (e.g. identifying problems within social mechanics)

This dissertation is written in a purposefully informal way, and intentionally bends some academic conventions for the purpose of clarity. While the content includes results from experimental studies, the findings are relevant for everyone interested in social game design - from academics to practitioners and everyone in between. Over a hundred social games are used as examples throughout the text to better connect the theories and findings with real play (the reference information for the games is collected in the Ludography).

Games, like many other activities, are fundamentally social. The users of social systems interact with one another in similar ways and patterns that, although triggered by the activity, are not unique to it. A player developing allegiances and waging war in a game does so in the same ways that politicians do for real - the differences in the patterns can be distilled to the differences in the tools that are used. Although games are complex social systems, concepts like the social architecture, and tools like social network analysis, create the possibility of understanding these effects using quantitative means. From the complex interrelation between game mechanics and player activity, we are able to tease out the patterns of play and understand games, and game designs, based on their social dimensions.

2

Social Play

Golden Axe (1989)

> Long, long ago, in the depths of prehistory – that is, before *Pong* – games were a social activity... Solitaire games existed, but they were the aberration, not the norm, and everyone viewed them as a poor substitute for the real thing. Then came the PC.
>
> - Greg Costikyan [61]

In his open letter to the mid-1990's games industry, the game designer Greg Costikyan argued that "Online Games Suck". He claimed that the games industry had become enamoured with the single-player metaphor that had defined computer gaming for years, and had forgotten that solitaire gaming was just a blip - games are supposed to be *social*. Although, at the time, many new games were appearing that used the Internet as a platform, they were designed according to the solitaire gaming mindset; that these games all lacked the important social aspect. The game designer Chris Crawford compares single player games with inflatable sex dolls - highlighting the "pathetic and slightly sick nature of [solitary] computer game playing"[65, p169].

While Greg and Chris's complaints have largely been addressed in the explosion of truly social online games, Greg's lesson is still valuable - it is trivial to include a feature for multiple players, but real social play must be explicitly *designed*.

This chapter explores the nature of social play in games from a ludological perspective. A common aspect of many definitions of game play is that games are fundamentally systems of rules [136, 229]. Here, it is proposed that these definitions can be re-framed based on the social aspects of play. Although social factors influence all aspects of games, the types and forms of social interaction are closely associated to different types of game rules. Every game requires its players to take different amounts of responsibility for making the game enjoyable, and the implicit *social architecture* of a design determines how players should behave, and defines the patterns of how the players behave as a community.

In understanding game play, academics have emphasised the need to consider the social aspect - models for game design include the need to explicitly consider social dimensions. One of Nicole Lazzaro's "Four Keys of Fun" is the "People Factor"[168], Marc LeBlanc's "8 Types of Fun" calls it "Fellowship"[128] and one of the Richard Bartle's player types is "Socialiser"[15]. In the analysis of player motivations in massively multiplayer online games (MMOGs), Nick Yee finds [298] the social factor of play (encompassing socialising, relationships and teamwork) to be a central motivating factor for players.

However, a designer considering the social aspect as just one, almost optional, facet of play would be shortsighted. Social effects permeate games *completely*. They are fundamentally important to, and inseparable from, games at all levels - from a shared understanding of the rules themselves to the table-talk and discussion between games and even the larger social effects of being identified as a *gamer*.

Game scholars also highlight the particular importance of social factors in game studies: In a study of several hundred board gamers, Stewart Woods found the social interactions to be the single most important part of the game experience [291, p208].

In his deconstruction of games and their mechanics, Aki Järvinen includes the social aspect of games as the "Behavioural elements, i.e. players and contexts, are entities that make games essentially a human phenomenon."[133, p31]. Also, Bernie De Koven directly makes the social aspect a vital part of the definition: "I think of games as **social fictions**, like works of art, which exist only as long as they are continuously created."[159, p3]. The social psychologist Erving Goffman [111, 133] sees social gaming as the purest example of a social gathering with a purpose, and uses it as a basis from which to understand social behaviour between humans generally.

Given the importance of social interactions within games, the recent emergence of the term "Social Game" to explicitly refer to a specific type of games based on the platform (e.g. [72]) is bizarre. In this dissertation the term is used broadly. It includes both online and offline games, games that take place on a scrap of grassland, around a table, or on computers separated by the Internet, and those played with strangers or just with old friends; The defining features are investigated in terms of social design and social effects, rather than by platform or context.

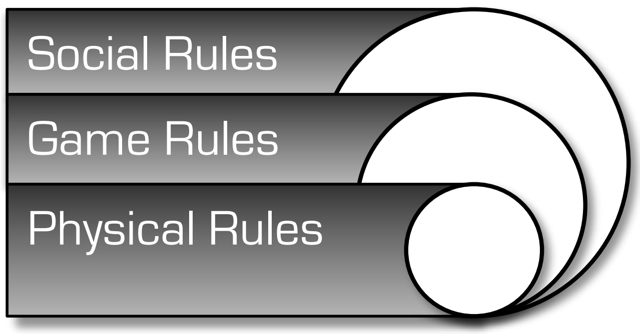


Figure 2.1: Expressing Games as Rules - Three layers of rules

2.1 The Rules of the Game

It is important to understand the player's position within social games as *social fictions*. Different games require the player take on different social responsibilities towards that game. In this section, the nature of social interactions in games are examined with respect to a game as a system of rules. Based on Katie Salen and Eric Zimmerman's proposal in *Rules of Play* [229, p139], the game rules are split into three distinct layers, although here we split them based on mainly social factors. This structure of rules deliberately ignores idiosyncrasies of design, platform and mechanics in order to more clearly explore the role of the players in a social gaming experience.

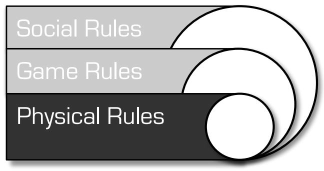
The ***Physical Rules*** of the game are maintained by the environmental context and without player intervention. Dexterity games such as *Jenga* and *Bausack* use a law of gravity – that things fall over when they are imbalanced – as a fundamental rule required for play. Therefore the game of *Jenga* cannot logically exist on board the International Space Station. Similarly, it is almost impossible to play *Unreal Tournament* online if your Internet connection is via 600 baud modem (or you have a British broadband provider). This is an important layer in social terms because of the importance of *context* in social play.

Game Rules are the logical rules that make complex games work - It takes two wheat and three rocks to build a city in *The Settlers of Catan* and you need to research Refrigeration before you can build offshore oil-rigs in *Civilization V*. A difference in context means that in the board game version of *Settlers*, it is the responsibility of the players to make sure the cost is paid, but computerised versions enforce these logical rules automatically. This is the equivalent of Katie and Eric's "Operational rules", and is important because of its ideological sanctity from social effects.

Finally, the ***Social Rules*** are a set of rules arranged between the players that describe their mutual expectations of each others' behaviour in the game. It is negotiated based on the players involved. When you play a chaotic-evil wizard in *Dungeons*

& Dragons, you are responsible for making sure your character does chaotic and evil things. This is an example of a "Social Contract" between the players for mutual benefit - it applies in all social games, including those online - you have an implied social responsibility to heal your team-mates when playing a Medic in *Team Fortress 2*. These "Implicit rules"[229] are explicitly in the hands of the players themselves.

2.1.1 Physical Rules: It's the Law

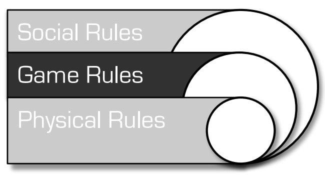


Games always have a place. The place in which the game is played, whether on virtual servers or muddy gardens, invariably affect the game itself. Every Tennis player knows the ball bounces differently when played on grass, clay, asphalt or carpet. The physical attributes of the game context have dramatic effects on the tactics the players use and the way the game plays out. Because of this, the game of Tennis can be considered a broad term for several games based simply on these differences. It defines the game rules, but the physical context can make it into a different game. Although it is counter-intuitive to think of Tennis as several possible games, imagine what would happen if the tournament organisers at Wimbledon decided to play one semi-final on a grass court while the other was played on clay. People would choke on their strawberries and cream just contemplating the idea - it just isn't *fair*, the two different matches aren't comparable because the differences in physical rules created by the context of play makes them different games.

The impact of physical rules on games is clear in sports and board games, but less obvious in digital games. In chapter 3, when issues of emergent games are explored, the implications become more obvious - an emergent game played within the virtual environment created for another game is restricted by the physical rules imposed by the environment of play. While 3d virtual world *Second Life* is not explicitly a game, games are played within it, and these games inherit physical rules based on *Second Life* as the context of play.

So, we can consider the physical rules, that represent the nature of the context, as the most fundamental rules of a game. Once a context is chosen, the physical rules are non-negotiable. Although the nature of the physical attributes may change during the game, such as when Squash balls get warmer and bouncier as the game goes along, the affects of the environment are (ostensibly) the same from game to game. The physical rules aren't intrinsically social, so may seem out of place here, but they are the core foundations of the rules of any game, so must be considered in any model.

2.1.2 Game Rules: The Lusory Attitude



When playing a board game, the wooden pieces, cards and dice that are found within the box don't alone constitute the game. These physical elements merely act as markers and reminders about the *game state*. The game itself only exists because of a social agreement between the players (as a "social fiction"[159]). Practically, the players each understand these constitutive and operational rules that are fundamentally important to the game [229, p132], and according to these, pieces are moved between various positions on the board. This serves to remind each player about the current *state* (e.g. the current scores) as the game progresses. Tools such as dice and cards are provided to support players in generating randomness as required.

> To play a game is in many ways an act of "faith" that invests the game with its special meaning... To decide to play a game is to create-out of thin air-an arbitrary authority that serves to guide and direct the play of the game.
>
> - Katie Salen & Eric Zimmerman [229, p98]

This "act of faith" is what the philosopher Bernard Suits called "the Lusory Attitude" [253]. Where the player is willing to follow the rules of the game for the *sake* of the game. If the player lacks this attitude, and refuses to recognise the rules, the game cannot logically exist for them.

Kenneth Binmore [25] takes the example of *Chess*:

> "It is actually within our power to move a bishop like a knight... But rational folk choose not to cheat."

In this example, the game of *Chess* cannot exist if *both* players will not accept the movement rule for the bishop. They may be able to play some other game with the components, but not *Chess* itself. All the players agreeing to follow a single set of rules is what enables the attitude, and therefore the game itself, to exist.

Responsibility for the Game State

The lusory attitude, and therefore the "Game Rules" layer of player responsibility, clearly does not apply to all games. In a computer gaming context the issues of game state maintenance are almost universally the responsibility of the computer as a platform. It is therefore tempting to assume that the lusory agreement only applies to offline non-electronic games, but this is a false distinction. The platform does not define the game - It is perfectly possible to play games that are designed for cardboard and wood in an online context, mediated by a computer that partially mitigates responsibilities implied by the lusory agreement. For example, by automatically managing the rules and game state (e.g. *Carcassonne* for *XBox Live Arcade*). Similarly it is popular to play games on a virtual tabletop using software such as *VASSAL*[1] or *CyberBoard*[2]; software that doesn't understand the game state and still requires the players to enforce the game rules, and therefore the lusory attitude, themselves.

[1] http://www.vassalengine.org/ (Accessed August 2010)

[2] http://cyberboard.brainiac.com/ (Accessed August 2010)

So, the issue of game rules is more complicated than they may first appear - even though the game designer has written them in stone, the actual operations of those rules during play places a lot of responsibility in the hands of the players. First, the players have a responsibility to operate the game as defined by the designer. The designer must also make presumptions about how the players will enact their rules. For example, when designing a game of conflict or competition, to be able to effectively create a balanced experience, the designer must presume that the players will actively use the tools available to attempt to win the game and beat their opponent.

Striving for Victory

In 2007, Stewart Woods conducted a study of over 700 board gamers [290] to find out the rules of conduct in a context where the game requires players to maintain this lusory agreement. Among his findings, a key rule appeared time and time again:

> "victory is the goal towards which all players must strive in order to retain the stability of the game system"[290]

In a similar study of Swedish board gamers [22], Karl Bergström also found this as a recurrent theme. The first rule of social play in board games is apparently:

> "each player is expected to strive towards the game goals."[22]

This may seem initially unrelated to the "lusory attitude" and the rules of a game. However, games are commonly specifically designed based on the precondition that all players actively seek victory.

This effect is most visible in games based around economic engines. The "18XX" series is a collection of games (*1830*, *1832*, *1856*... you get the idea[1]) about the robber barons during the early days of the railways. Each player represents an individual,

[1] A full list is available online at http://www.boardgamegeek.com/wiki/page/18xx (Accessed July 2010)

Figure 2.2: Economic games can be unbalanced if players fail to "strive towards victory" - Players in games such as *Container* must be able to predict the actions of others, in order for the economic game dynamics to function properly. Image ©Gary James

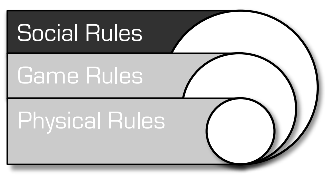
investing in shares for various developing railway companies. Based on the expansion of the railways during the game, dividends are paid to the shareholders. At the end, the player who became richest through wise investments wins. Since the dividends are calculated based on player activity, players make their investments based on what they think their co-players' strategies might be. If a player behaves irrationally (for example - a strong railway looks to be making a solid profit, players speculate on shares in the company, then the controlling player irrationally drives it into the ground and loses everybody money), this unexpected behaviour can cause the economy to collapse - damaging the play of everyone in the game. The abusing player is technically playing within the rules. However, the play is at the expense of the fun of the other players, who may feel cheated because the game didn't play the way they expected. The game wasn't played "correctly".

It is important to distinguish between the act of *striving* to win, and winning itself. While winning may be seen as a reward for good play, the act of striving to win benefits all the players, not just the winner. “A well played game”[159] is a reward that is superior to a simple victory or defeat. In fact, in Stewart Woods’ study, less than 19% of participants claimed that *winning* was an important part of the game experience for them. The important part of the social game experience is not always the victory or mastery over one’s opponents. Stewart Woods describes this aspect of board games as “schizophrenic”[290], in that players are obligated to play together but still strive to win. The prolific game designer Reiner Knizia phrased this paradox in almost koanic terms:

> The goal of the game is to win, but it is the goal, not the winning, that is important
>
> - Reiner Knizia [240]

2.1.3 Social Rules: The Social Contract

> The social contract is an agreement of man with man; an agreement from which must result what we call society.
>
> - Pierre-Joseph Proudhon [218, 4:1.36]



The “Social Contract” is a concept that is used in sociology to describe how it is in an individual’s best interest to behave correctly in society. Of course, the concept of the social contract is very deep, with centuries of discussion and many tomes exploring the idea at great length [32, 228]. However, the core idea is useful in describing player relationships in social games. Stewart Woods points out that “the magic circle [of play] acts as a constraint upon players in a similar way to the social contract”[290]. In all social games, whether online or off, players enter into an unspoken contract that describes appropriate behaviour within the social environment of that game. Katie Salen & Eric Zimmerman call these the “implicit rules of play”[229]. Carsten Magerkurth and colleagues [179] describe this part of a game as the “Social Domain”, which includes social information that occurs around the game, extending to alliances between players, diplomacy and issues of trust. It includes the importance of maintaining a social fiction around a game, such as mutually agreeing to pretend to be wizards in D&D or suspending their disbelief to allow the existence of a narrative overlaid on the real world in an Alternate Reality Game (ARG)[188].

Although the social contract and the lusory attitude are closely related concepts, there is a key distinction. The lusory attitude is solely concerned with the correct operation of the game following the intention of the rules (as a proxy, perhaps, for the intent of the designer). The social contract is a layer above - the rules are being correctly observed, but player actions above and beyond that (i.e. behaviour within the game) are not the concern of the game design itself. In other words, if the lusory attitude makes sure that players behave according to the *letter of the law*, the social contract ensures they behave according to the *spirit of the law*.

Unwritten Rules

The social contract agreed by players also includes “unwritten rules” for managing behaviour both within the formal structure of the game, and also the immediate social context around the game. Within the game these rules are used to define appropriate behaviours of the players, for the benefit of all involved. Consider *Monopoly* - it is a safe bet that everyone who has played the game has experienced (or perhaps committed) breaches of the social contract by the banker. The banker takes responsibility for handling the paper money and dishing out payments to the players and making change where necessary. In this position of responsibility, it is trivial for that player to 'accidentally' give incorrect change, or 'accidentally' award themselves an unofficial 'government subsidy' up the sleeve of their shirt. None of this is against the official rules of *Monopoly*[1], so will always have the defence of "It doesn't say you *can't* do it". Despite this cast-iron defence, this is almost always a sociopathic act - it is clearly in violation of the standard implicit social rules of the game as a social activity.

The social contract is such an important part of the play experience that many game designs become more interesting because of the social rules in effect around the game. Johan Huizinga [126, p225] takes the case of *Bridge*, a fairly pedestrian trick-taking game by the written rules, but with incredible complexity of social rules affecting the bidding process. Bidding serves as a way for players to communicate with one another, according to an esoteric set of communally understood rules. In illustration of the same concept, Stewart Woods imagines an isolated group of people learning the game of *Poker* from the written rules [291, p258]. In this situation, those players may consider bluffing and deception to be against the spirit, and therefore the social contract, of the game. The complicated social rules of *Poker* have been built up over centuries of play and are inseparable from the status of the game as a cultural artefact. In massively multiplayer online games (MMOGs), Edward Castronova finds [48, p100] the social contract can become extremely complicated. Where the social environment of the game is persistent - and there is no formal 'end' to the game, the social norms, and therefore the social contract and the rules players are expected to abide by, are in a constant state of negotiation and change.

Social Play as a Requirement

Raph Koster points out that some games, for example *Werewolf*, place special emphasis on the social interactions of the players [157]. *Werewolf* is a game for larger groups of

[1] Check for yourself: http://www.hasbro.com/common/instruct/Monopoly_(1999).pdf (Accessed October 2010

Figure 2.3: The rules of *Werewolf* mostly exist within the social layer - These cards (from *Die Werwölfe von Düsterwald*) show the secret identities of players as werewolves or villagers - they are the only material required to play the game

people (8-15), and is operated by an impartial moderator. Randomly at the start of the game, players are secretly assigned the role of villager, or werewolf (or in advanced games, some additional roles). The game then follows a cycle of two-phase turns. In the night phase, the villagers must close their eyes while the werewolves silently indicate a victim to the moderator. In the day phase, the survivors must choose a player to lynch. The villagers win as a team if they manage to lynch all the werewolves, and the werewolves win if they eat all the villagers. It is a very simple game, and by the rules it is essentially random. As long as the werewolves keep their role a secret, there is no mechanism within the game to allow the villagers to deduce their true identities.

The real depth and fun of the game occurs at the *social layer* of play. Players must use their skills of discussion and rhetoric in order to identify the werewolves based on their social behaviour and simultaneously the werewolf players are trying to deflect accusations onto innocent villagers. To a casual observer, the game in play appears to have more in common with a cutthroat political debate than a friendly board game. Of course, *Werewolf* still has an implicit social contract - the play is 'safe' and there are limits to the rhetorical tactics players can use.

Etiquette, Sportsmanship and the Impossibility of Writing Down the Unwritten

Around the allowable tactics in the social contract of games themselves, Karl Bergström [22] finds key social rules such as "No early termination of the game", "No unacceptable whining [about your position] during the game", "No serious after game gloating/sulking". It also may include variable rules of social etiquette such as "No drinks on the table".

Stephen Sniderman [242] highlights the importance of players observing this proper gaming etiquette, the following of conventions and game ethos; all under the banner of proper sportsmanship. He also argues that defining a complete list of any game's rules is actually *impossible*, since this social context creates the problem of "infinite regression"- All the rules and exceptions will need their own set of rules to explain the context for those rules, and those explanatory rules will, in turn, require more and more nested layers of rules to support them. The central lesson of this is that each play of any single game is can always be regarded as a different game in its own right. The social contract is affected by the players involved, who won the last game, their relationships and their taste in novelty ties. It shifts and changes from moment to moment with the moods of the players. As the Greek philosopher Heraclitus once said "You cannot step twice into the same river", here we can instead say, *you cannot play the same game twice.*

2.2 Playing Together

Games can be described in terms of layers of rules, but the specific rules applied change based on the social context of play. Who we play with can change the rules of the game at every level. Stewart Woods argues that "The shape and experience of a specific game encounter are highly dependent upon the particular social structure of the game encounter and the attitudes and expectations of players"[291, p237]. In this section, the social context is explored in terms of the different relationships we may have with our co-players, and the effect on the games.

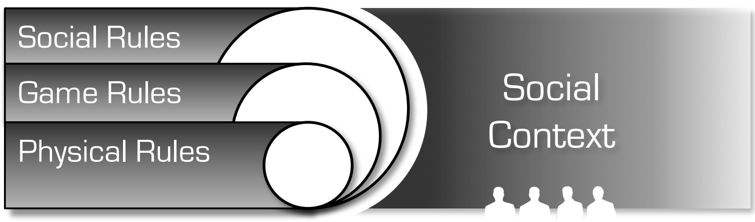


Figure 2.4: Social games are defined by rules combined with context - Social context affects the interpretation of rules at every level of play

Fundamentally, there is a balance between acceptable social rules given the context and type of game, and excluding unacceptable behaviour based on the same. This balance varies greatly depending on the make-up of the group of players. For example, tabletop Role-playing Games (RPGs) have a highly variable and fluid balance based on social context - they have their own complex sets of rules about what is appropriate. Different gaming groups take different approaches and take the role-play aspect more or less seriously (e.g. "Real Men Don't Play *GURPS*"[204]). Again, this is not limited to an offline, face-to-face, context. Online, there are similar, almost ideological differences between players of MUDs (Multi-User Dungeons) and MUSHes (Multi-User Shared Hallucinations) about how the game should be operated in the social domain [119]. Even modern MMORPGs such as *World of Warcraft* offer separate game instances ("Realms" or "Shards") to cater not only for users who would prefer more or less role-playing in the social environment, but also for those users who would prefer more inter-player conflict in the form of Player vs. Player (PvP) combat [27].

2.2.1 Social Context

So far, the social factors discussed are those that affect the play experience internally, bounded by the conceptual "magic circle" of play. The magic circle has proved a useful metaphor for understanding the special space within which games exist outside normal life, as an example of Michel Foucalt's "heterotopia"[99]. The boundaries between real-world and game spaces described by the magic circle are important for games to function - Johan Huizinga directly equates it with "the sacred emotion of the sacramental act[126, p36]. Although a very useful concept to help understand play and games, the metaphor of the magic circle has limits to its usefulness when thinking about games in wider social contexts [302]. Fundamentally, games and play affect, and are affected by, the social context in which they are played. Edward Castronova describes the magic circle as a "porous membrane"[48], through which people can't help but bring their social and emotional baggage. Stephen Sniderman says:

> no game or sport is played in a vacuum. All play activities exist in a "real-world" context, so to play the game is to immerse yourself in that context, whether you want to or not. In fact, it is impossible to determine where the 'game' ends and 'real life' begins. As a result, knowing only the recorded rules of a game is never enough to allow you to play the game [242].

Additionally, even though there is a rule of the social contract that there is "No Between Game Memory"[22], and players have the best intentions, it is arguably impossible to play two games without the result of the first affecting the strategy of the second. This is another paradoxical aspect of play - that games should be treated both as self-contained experiences and opportunities to develop social relationships.

Figure 2.5: Ripping out your opponent's spine is a great way to impress potential girlfriends - ©Acclaim Entertainment Inc.

The game experience will even become changed by those who aren't playing. The presence of spectators and their relationships to the players have an impact on player behaviour within the game. Salen and Zimmerman call these *externally derived* rules of play [229, p463]. Will you try to pull off Sub-Zero's signature finishing move in *Mortal Kombat* to impress your friends at the arcade? What does your mother think about the poor health of your *Tamagotchi*?

2.2.2 Societal Context

I suggest a new strategy, R2: let the Wookiee win.

- C-3PO

The effect of the permeability of the magic circle is not limited to a local scope - the games you play and the way you play them have knock on effects on your long-term social status. Consider the effect of going softly on your boss during your regular Squash matches, or that time your Mum told you off for trouncing your little sister at *Mario Kart 64* (Sorry, Sally).

Play is an important social tool. What you play, and who you play it with, are important factors in determining your position and status within society [58, 249]. Although it is something of a cliché, the game of *Golf* has genuine social benefits for the players. Being able to play golf and socialise with other golfers enables you to connect to a certain social network, that can later provide opportunities for exploitation - For example, when looking for a new job [114]. In other words, it's not just "who you know", instead it's more accurately "who you play with knows".

Figure 2.6: Games have effects on social stratification and exclusion - *Caddyshack 2*: A discussion on the profound effect of sports clubs on the stratification of society [9]. ©Warner Bros.

2.2.3 Playing with Strangers

The nature of the relationships you have with your co-players in social games have a profound effect on your behaviour within the game. When playing with strangers, there are additional confounding factors. Players interact with others who may be from radically different backgrounds and cultures, so must be considerate and cautious with their social behaviour just as they would meeting strangers in normal social situations.

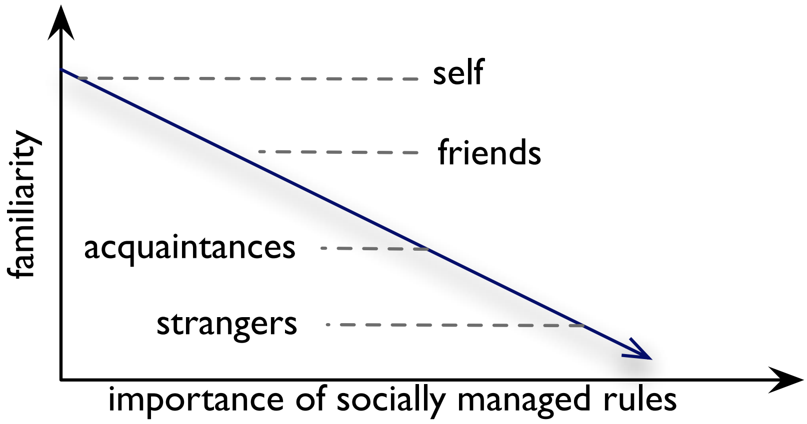


Figure 2.7: The importance of socially managed rules for play appears to be inversely proportional to the familiarity between players - The more familiar the players are with one another, the more scope there is for bending social rules

In 2006, Constance Steinkuehler and Dmitri Williams did extensive research into social behaviour in the *Lineage* and *Asheron's Call* series' of MMOGs [248]. What they found was that strangers online used virtual worlds as "Third Places"[203] - in exactly the same ways, and for exactly the same reasons, as people use Cafés, Pubs and other hang-outs in the real world. These social environments serve as a safe and non-threatening place for interacting and socialising with strangers as peers. Two years later, with the emergence of *Facebook*, Valentina Rao confirmed that this appeared to be true of games and applications on social networks too [221] - opportunities for "interactive silliness" and frivolous interaction seem to be the key factors for creating a socially playful and neutral "third place". Given this playful environment, people quickly generate social connections with strangers. These weak connections with strangers form **bridging** relationships - the people you interact with are outside your circle of close acquaintances, so this new connection acts as a bridge between social groups [220].

Despite the apparent value of games as places to create new relationships with strangers, Jonathon Cummings (*et al.*) find that the *quality* of relationships started online are generally not as strong as those formed in face-to-face contexts [67]. Of course many do, in fact, lead to long lasting friendships and even intimacy and marriages [194, 206, 214] but most interactions appear to be temporary associations based on convenience (for example, *grouping*). As Ian Bogost argues [29], these interactions generally have more in common with one-night stands than first dates.

Nicolas Ducheneaut and colleagues confirm the prevalence of these short-term social relationships in a longitudinal study of *World of Warcraft* [82]. They found that players spent a majority of their time alone, and there was a strong preference for character classes that would most easily facilitate solitaire play. In fact, there appeared to be little in-game benefit for players to form social groups since "characters who are never in a group consistently [progress] faster than characters who group at any frequency" [82]. In WoW, at least, the social interaction takes a passive role and many people prefer to "play surrounded by others instead of playing with them". However, this is a positive attribute of the game, and feelings of *social presence* and the value of being "alone together" in the social environment of massively multiplayer games may have played an important part in their huge success.

2.2.4 Playing with Yourself

Although the history of games has included a period where players played solely against a computer opponent [61], it is possible to consider this solitaire gaming as a form of controlled social play. While this perspective is more obvious in games with "bots" or AI controlled players, most single player games can be considered functionally asymmetrical multiplayer games, where "the role of the computer acts as a substitute for the 'other'" [289]. This perspective echoes the sociological approach of Actor-network Theory, that proposes that, in an abstract manner, both human and non-human actors within systems can be considered to be capable of social relationships (including within games [68, 106]). Consider a computer RPG such as *Neverwinter Nights*. In this

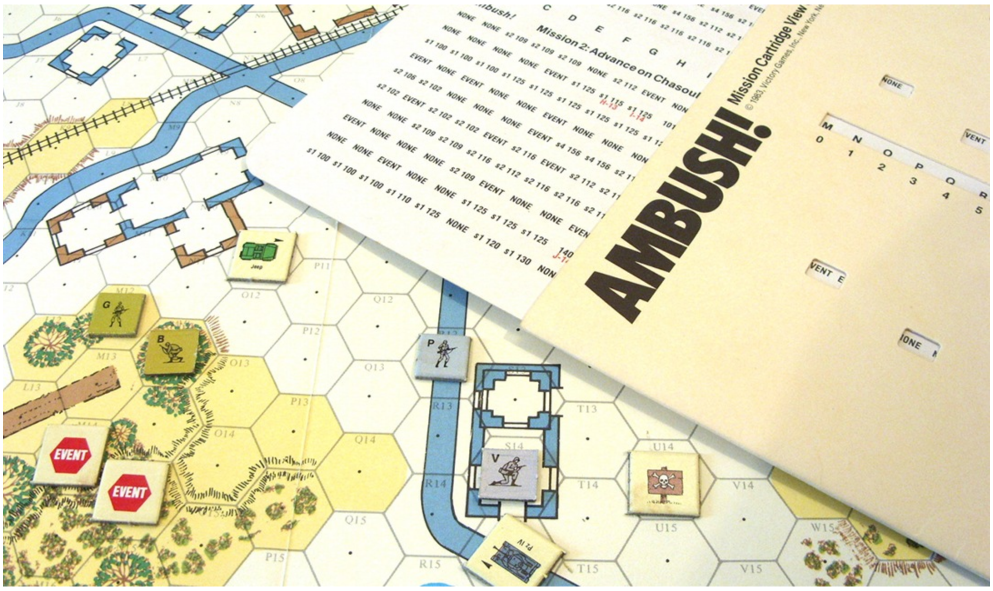


Figure 2.8: WW2 Solitaire game *Ambush!* uses a system of charts to determine enemy responses to your actions - The mission is pre-programmed so reactions will be the same on each play

genre, the computer takes on the role of several other players, controlling the aggressive monsters and the friendly non-player characters (NPCs) and their relationships with the players. This role is exactly the same as that of the Dungeon Master (DM) in a face-to-face role-playing game. In fact, the distinction between machine and human is even more blurred since many computer RPGs explicitly use systems designed for face-to-face play - all the way down to the computer rolling virtual dice and comparing against virtual charts in direct implementations of the paper based models like the *d20 System*.

> Kids like the computer because it plays back. You can play with it, but it is completely under your control, it's a pal, a friend, but it doesn't get mad, it doesn't say "I won't play", and it doesn't break the rules. What kid wouldn't want that?
>
> - Isaac Asimov [266]

Although solitaire gaming is most often seen on digital platforms, many board games have long implemented surprisingly elegant systems for creating meaningful *a*social play. *Ambush!* is a squad based solitaire wargame set in Normandy during the second world war. The player controls a small squad of infantrymen on a variety of missions. As the player moves, they use a coded matrix and sleeve system (shown in Figure 2.8) to determine what the enemy response is to their movement. In a similar way to the *Choose Your Own Adventure* [207] and *Fighting Fantasy* [131] books, the structure of the missions is explicitly pre-programmed by the designer.

An issue with programming responses is the limited option space for the players in choosing only actions that have pre-defined responses, and the limited re-play value as a result of the same choices leading to the same conclusions. The card game *Race for the Galaxy* uses a more elaborate system to avoid this. A flow chart is set up based on a variable set of starting positions (shown in Figure 2.9), which tells the player how the "robot" player responds to various events in-game (including player activity). Since an important strategy of this game is predicting your opponents moves, the robot preserves this and not only responds to the player's actions but is semi-predictable to give the player more strategic options. In this way, no two games are the same and the robot makes surprisingly elaborate moves given the simplicity of the rules it follows.

Of course, you will never hurt the feelings of a solitaire game through your actions, but the solitaire game is much more reliant on the lusory attitude. A player cheating, "only cheats themselves", but the stability of the game as a system is under serious threat of falling apart because of the failure of the player to observe the rules. The solitaire game design almost always relies on the player following the rules and "striving for victory" in order to function correctly. Although it seems counter-intuitive, solitaire games are effectively built around these socially managed rules of play.

Figure 2.9: *Race for the Galaxy* solitaire expansion *The Gathering Storm* introduced a cardboard "robot" that follows simple rules to act as an opponent - The AI uses most of the same mechanics the player does in order to play.

2.2.5 Playing with Friends

In 2007, legendary arcade game developer *Capcom* made the decision to start developing multiplayer arcade games to be played on online services such as *XBox Live Arcade* and *The PlayStation Network*. One of the first games they chose was a reimplementation of the classic 1980's *Games Workshop* adventure board game *Talisman*. However, the project failed and the development was cancelled.

> Complex board games like Talisman live and die on the social interaction of people. Whether it's the taunting of the person sitting to your right or the planning of what the players should do next, it relies on people sitting together and talking. Social games like Talisman rely on that aspect, so if the people in your match aren't going to use their headsets, the social aspect of a board game gets completely drained and becomes a slog as you could be sitting there for five minutes waiting for your next turn
>
> - Adam Boyes, Director of Production, Capcom [186]

The problem is, in terms of mechanics, *Talisman* isn't a very interesting game. Players move using random "roll-and-move" mechanics, get rewarded and punished arbitrarily and sometimes unfairly by the game, the game is very long (over 4 hours), there is little direct player interaction and the outcome of the game is essentially random. However, as Adam hints, what is important about *Talisman* is not the game itself, but the *social occasion.* In an online context, even with the same friends, there is no occasion and the game fails to entertain.

Co-location and existing relationships between players significantly changes the social play experience. In several studies, researchers have found stronger feelings of arousal and social effects between co-located friends than against strangers both local and remote [180, 222]. Siân Lindley *et al.* investigated the impact of physical interfaces (the *Donkey Konga* bongos) in co-located play and found that they also increased the amount of social interactions and *also* the fun and engagement players reported about the game [172]. The context of playing games together with others appears to be a major factor in creating enjoyment of play - perhaps the quality or intent of the design is not that important in the play experience. In a study of console gaming behaviours, Amy Voida and Saul Greenberg found that one of the primary motivations for console gaming was the social factors [272] - even games designed as single player experiences create valuable social play experiences when played collaboratively with friends. In a study of games on the social networking service *Facebook*, Luca Rossi highlights that although the game designs are often simple, there is significant social value added through playing with people who are already friends [227]. This is in contrast to other online games, where friendships are forged based on mutual interest in the game itself. Both forms still have social value, but the context of those relationships is important in different ways.

> At its smallest level, social videogaming involves two, three or four friends racing cars against each other or beating each other up through colourful

> digital surrogates on the screen. The videogame console is mediating and providing the visual forms for such contests, but the pleasure is largely a social one.
>
> - Steven Poole [215, p178]

Winning and Losing Together

The fun of co-located social play with friends is not just limited to competitive games, but also includes games built around cooperation. In an analysis of cooperative and collaborative games, such as *Lord of the Rings*, José Zagal *et al.* highlight several recommendations for game mechanics to build balanced and enjoyable games that take advantage of the social context for an enjoyable game experience [301]. Karl Bergström and Staffan Björk identify game design elements of *camaraderie* that create enjoyable situations out of the specific affordances of the shared play experience [23]. For example, the "Spectacular Failure Enjoyment" design pattern:

> Exceptional bad luck, gross ineptness or overwhelming opposition... can have an aesthetic quality of its own. Here, the magnitude of the failure lessens the fact that it was a failure and can probably in many cases be as entertaining as a victory

For example, *Galaxy Trucker* is a game where players individually create starships from a selection of tiles (engines, shields, lasers,...) under pressure created by a timer. Once the ships are complete they are taken on a mission and encounter various random hazards. Ships can encounter hostile pirates, friendly traders and other spacey things. The fun part of the game is not in the victory - a well constructed craft can (boringly) survive most encounters easily, the fun is where things go *horribly wrong*. Under the time pressure during the construction phase, a player can make simple mistakes that may have catastrophic knock-on effects during the encounter phase. An error in construction may leave a weak point in the structure of the ship that could get hit by an asteroid. This damage could cause the complete collapse of the entire ship. Although this harsh penalty for a minor mistake seems unfair - the magnitude of the failure can be hilarious to the social group playing the game, both in terms of *schadenfreude* and in sympathy at the scale of the punishment given by the game.

Figure 2.10: *Galaxy Trucker* lends itself to *spectacular failure* that is enjoyable in a social co-located context - The game is engineered to create opportunities for players to fail catastrophically

Many classic children's board games are built around player failure as an *event*. *Jenga*, *Ker Plunk* and *Buckeroo* all rely on the same mechanic. These games slowly build up in tension until a bad move from a player causes the game to self destruct and dramatically explode, to the great delight of the players.

2.3 Social Play as Experimentation and Learning

> [Games are] the most ancient and time-honored vehicle for education. They are the original educational technology, the natural one, having received the seal of approval of natural selection. We dont see mother lions lecturing

> cubs at the chalkboard; we dont see senior lions writing their memoirs for posterity. In light of this, the question, "Can games have educational value?" becomes absurd. It is not games but schools that are the new-fangled notion, the untested fad, the violator of tradition. Game-playing is a vital educational function for any creature capable of learning.
>
> - Chris Crawford [64, p15]

Games are fundamentally about learning - at the highest level this is about learning how to avoid being eaten by zombies, and learning how to effectively manage a developing civilisation. At the lowest level, Raph Koster believes learning in games is all about identifying recurring mechanical patterns. He argues that the human brain is a matching machine, and games provide unlimited puzzles with which we can exercise our brains [155]. Based on this, the following section briefly explores the potential of games for training social skills, and the transformative nature of games in social development [229, p475]. This may be formally, such as acting out role-playing scenarios in a customer service training course, or informally, when negotiating social hierarchy implicitly during the weekly after-work football kickabout.

Play is a 'safe' environment when the players are permitted to take on new roles and behaviours that they might not be comfortable with outside the game [42]. Brian Sutton-Smith talks about social roles such as *aggressor*, *bully* and *backstabber* [257] that the game enables players to experiment with, with the promise of no external effects based on their actions. He also suggests that "kissing games", such as teenage favourite *Spin the Bottle*, allow adolescents to experiment safely with social relationships [256]. These types of "forbidden play"[229, p478] give the players an opportunity to "thumb their nose" and overcome normal social convention [64] through the use of games as a learning environment.

2.3.1 The Circle is Safe, but Leaky

As such valuable tools for practise and experimentation, social games can become elaborate playgrounds for unusual and unlikely social situations. Games can give players temporary permission to use anti-social tactics, that normally may have no place at a friendly game night, to gain in-game advantages. Although we can consider that this anti-social play takes place within the safe confines of the magic circle as a conceptual space for play, in some cases, poor in-game behaviour can leak out and have real world consequences.

In *Diplomacy*, players take the roles of the leaders of major European nations shortly before the start of the first world war. Troops are moved around the board and engage in combat according to simple rules, and players compete to annex enough territory to win. The key part of the game is in the social domain - players must cooperate with one another in order to coordinate attacks on mutual enemies. However, where alliances can be made, alliances can be broken. Although the players are simply taking the roles of world leaders, and the play takes place "outside the real world"[126], the effects of this social play may "leak" into the real world. When your friend *stabs you in the back* after you both agreed to attack the vile Prussians, although this is just a normal part of the game, it may be hard not to feel this treachery reflects badly on their character as a human being (and I'll never trust you again, Leo). Jinghui Hou and Hua Wang highlight this effect in social network games [122]. In games where stealing is possible, they note that even when playing by the rules of the game, players can cause grave offence to one-another through their actions. The public shame of having stolen from your friend leaks out of the context of the playful environment and can have impacts on your real social identity.

Cut-throat social games such as *Diplomacy* and *Machiavelli* are notorious for causing arguments and even permanently destroying friendships [45]. The potential real-world impact of in-game actions have lead to player communities creating elaborate systems to anonymise the players. Typically this involves a play-by-mail system that is moderated by a single impartial judge. All players communicate solely with the moderator, sending them the game turn orders and even messages intended for other players. The moderator anonymises and forwards messages between players as appropriate, then collates and resolves the consequences of any moves. This way, although a player may bitterly remember that time the Turks broke an alliance and invaded Austria, they will never know the actual identity of the Turkish player. This deal-breaking is not necessarily a negative design pattern to be avoided; indeed many groups find it a lot of fun. The 1994 game *Intrigue* was specifically designed to create these situations - It is essentially impossible to win the game without directly breaking an arrangement with a fellow player.

2.3.2 Playing with Identity

Play has important social functions - In *The Ambiguity of Play*, Brian Sutton-Smith talks about identity as one of seven "rhetorics of play": "Play is a means of confirming, maintaining, or advancing the identity of a community of players"[258]. He uses examples of festivals and other community celebrations that serve to restate a social identity. On an individual level, play has important social functions. In addition to exploring social structures and hierarchies, it is an crucial part of defining *identity*, both for individuals and the larger social groups within which they are members.

The social identity of a person is a complicated matter - it is not fixed. Over time, it is constantly updated and changed to match the owner's current mood. While projected identity in the real world changes with haircuts and snappy suits [110], on the social web it is the profile pictures, group memberships and status updates that together form the image [34]. In social networks, there is an unusual situation as the different groups of people you know in real life mix for what might be the first time - all the different identities you project collide and must be consolidated into a unified *you*. This effect has been observed by researchers at IBM - after new recruits join the corporation after graduation, the college-era pictures of booze and nudity quietly disappear and a new corporate-friendly social media identity is forged, tailored to suit the new position [74].

In fact, the act of creating an identity appears to be a major milestone in the use of a social service. In a study of new users to the social networking service *Facebook*, creating an identity by adding a photograph to a profile, joining groups, etc. is a strong indicator of commitment to continued use of the service [95]. There is a wealth of research into how social identity formation and management are an important part of the success of online social networking [33, 35, 88, 252].

> "Our facebook profiles are both extension of self and a public platform where we actively search and reflect both who we are, and who we want to be perceived as."
>
> - Asi Sharabi [236]

Asi Sharabi analysed the different types of application available on the *Facebook* platform and found that 42% could be defined as "identity presentation tools" that allowed users to somehow define themselves and their identity through use [236]. This includes applications that enable users to share their taste in books or movies, their political stance and even which charitable organisations they support. Particularly interesting were that 24% were for "collective identity formation". These applications, such as *Superlatives*, generally allow friends of the user to contribute to defining their identity through collective action.

Games are also an important part of this identity-formation. The types of games we play, and how we play them, communicate something about ourselves in just the same way as our tastes for novelty ties and braces. Marc LeBlanc talks about this form of self-expression as an important part of the play experience - both in terms of the

Figure 2.11: Collective identity is formed on Facebook through using applications such as *Superlatives* - Players seek feedback from friends about their identity and how they present themselves socially

identity we wish to project to others, and as a form of self-discovery and a need to understand ourselves [128]. Even within the enclosed fiction of games, identities are carefully managed; a player's activity is carefully chosen to match the identity they wish to project [123], whether this is part of a formal character in an RPG or just ordinary casual play.

2.3.3 Gaming with Identity

People are playful with their identities, but explicitly designing a game around this playfulness is a potential minefield. The *Twitter* game *Social Heroes* allowed players to tag one another with various attributes. Based on the combination of different attributes a player collects, the game assigns an identity ($glamor + sophisticate + 2 \times drunk =$ "*Socialite*"). However, since some players aspired to certain titles (according to the identity they wished to project), the game was rife with horse-trading between players trying to achieve their own ideals (e.g. I'll swap you a *punk* for a *hipster*...) [241].

Figure 2.12: Players in *Familiars 2* had an animal companion that represented their personality - The game allows friends of the player to "vote" the familiar changes form

In a similar style of game on *Facebook*, *Familiars 2* (described in detail in Appendix A.4), players were given virtual animal companions that represented their personalities. The species was based partly on "votes" from friends. Votes were weighted to count less the more votes an individual makes (to prevent spamming), but still players persevered and continually submitted votes until the familiar changed into the identity they wanted [142].

The designs of both *Familiars 2* and *Social Heroes* restricted a player's ability to control their own identity by constructing game-mechanical barriers. Players managed to always find ways to work around these barriers, in *spite* of the game design. The ability to control one's own identity is a fundamental requirement in social applications. Although informal social games exist around this on-going process of identity formation, the formalisation in a game design may bring additional social baggage that damages the activity itself.

2.4 Metagames

The concept of metagames, as an intrinsically social aspect of play, is common. However, it is often talked about in different ways. Richard Garfield, the designer of *Magic: The Gathering*, defines a metagame as "how a game interfaces with life" [104] and encompasses the external baggage that players bring to a game and what they take away after its conclusion. Players of role-playing games often use the term to distinguish between "in-character" and "out-of-character" behaviour during play [60]. However, both of these definitions presume the social aspect of play is somehow separate from the game itself, and needs to be isolated away from the real game. They recognise its potential impact on play, but consider it as an external (and perhaps undesirable) force. This dissertation argues that the social aspects are inextricable from all forms of play, so this interpretation of the metagame is directly included in the definition of games as layers of rules. Specifically, in the model presented here, these human aspects fall within the social layer of rules. Different groups of players may have different attitudes towards certain behaviours, but these cultural aspects are intrinsic to the game as social rules. The appropriate social rules are caught up in the "fuzzy boundaries" between games and the real world [242]. In the definition here, a game is not defined by the components alone (e.g., the source book, the game pieces or the plastic disc) but also by the physical and social rules of play.

Despite this confusion, the concept of metagames is useful and interesting in terms of their social implications. Here, the interpretation is of metagames as *games of games*. While an individual game is about scoring more goals than your opponent or winning a battle, the metagame is about the team's final position in the league or the outcome of the extended war. Greg Costikyan finds this the most compelling aspect of games: "[It's] a reason to obsess about the game, to think about strategy, to study it"[61]. As a game itself, the metagame encapsulates *many* games as part of its rules and operations. While the most common forms are structured around one type of game (like leagues, tournaments and other competitions based around specific games), it also extends to games that are made up of several games with different sets of rules. The Olympic Games are a classic example of a metagame (winning medals) made up of a series of other smaller games, which mostly involve different people and completely different rules. The Olympic metagame is also a game in its own right, so can be defined in terms of layers of physical, game and social rules just like any game, except these layers also include embedded layers of rules belonging to the individual component games.

The new dimension is most often along the axis of time (e.g. in a league structure) but this is not a necessity - In tournaments with large numbers of participants (e.g. matches between *Chess* teams) these constituent games are often run simultaneously.

The metagame is frequently a very different game to the constituent games. The *FIFA World Cup*, held every 4 years, is a very popular game in its own right - the nature of the constituent game is almost irrelevant. People who normally might not be interested in the game of *Football* become swept up in a world-wide excitement around the unfolding metagame. The metagame has its own rules and structure, that have been finely designed with peaks and troughs of excitement and tension as the game unfolds through group stages and into a knock-out structure.

Figure 2.13: The FIFA World Cup is a popular game in its own right - Board game *The World Cup Game* simulates the tournament structure of the *FIFA World Cup*, rather than the sport of *Football*

The metagame itself can be considered a constituent part of a wider game, and that a part of another, as one of an infinite number of game layers. Just as players cannot play the same game twice, we can consider that everyone is "never not playing"[291, p253]. As each game ends, we only then realise that was simply one move in some larger amorphous social game.

2.5 Discussion

This chapter has briefly explored social play. The purpose is to establish the fundamental importance of the social factor in play and games. Games are completely inseparable from the social context, both around and within the experiences themselves. Even solitaire gaming cannot be considered independent of its wider social context.

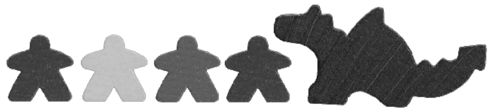
Games provide unique contexts for social interaction between real people. They bring together strangers and friends, and allow for interactions between players that have the possibility to affect players' interpretations and understandings of a game's design. Players collaborate, cooperate and compete with one another as part of artificial and temporary communities-within-communities. Their interactions are informed by diverse cultures, expectations and skills for social negotiation that leads to a complicated social environment around a shared focus of a game.

Understanding the nature of these communities built around games is important for the game designer - They must be able to predict and respond to the idiosyncrasies of a group of players, and understand how the mechanical aspects of the game design still have an effect on the fragile social ecosystem that the design supports. This is especially true in social games where interaction between players has a direct impact on the success of each individual within the game framework. For example, if the players have the ability to trade useful items, the most successful players may then be the ones with the greatest social skills in negotiation and charm instead of the ones with greater technical abilities associated with the formal mechanics. In these games the social interactions are purposeful, genuine and important tools available to players, rather than just a background or higher-level separate from the game itself.

In addition to the importance of *social context*, all games can be described in terms of layers of rules. The three layers of *physical rules*, *game rules* and *social rules* require the players to take responsibility for the operation of the game with different levels of commitment depending on context. A board game requires the players maintain the *lusory attitude* in order for the game to exist, and the *social contract* requires players to behave appropriately for mutual benefit. The social context has a profound effect on how these rules are interpreted, and how the rules are enforced. Differences between individuals and differences between groups around expectations of appropriate behaviour mean that even when playing the same game, the social rules of play must be negotiated. Therefore, games cannot be studied and understood when considered to exist in a vacuum. Social effects permeate play completely.

3

Playful Mischief



Carcassonne: The Princess & the Dragon (2005)

If we describe games in terms of layers of rules that need to be maintained, we need to presume that the players will take that responsibility seriously for the benefit of the game. However, since the majority of game players are human, the perfectly run game is, perhaps, an unobtainable goal. At some point, someone will accidentally misinterpret or intentionally subvert the rules and break the game that the designer has carefully crafted. The truth is that *games are not cathedrals*, and as such, are not truly described by the designer but interpreted by the players. This chapter explores *mischief* in social games, and what happens when some or all of the players decide to purposefully ignore or subvert the established physical, game and social rules of play. It challenges the theoretical ideas presented the previous chapter and explores what really happens when people play together. While the notion of mischief perhaps has negative connotations, it is explored as a positive product of the complexities of social play - mischief can create new experiences, challenges and even new games as a result of players appropriating games for their own purposes.

Raph Koster believes [157] the approach of players to games follows a pattern that closely matches Robert Merton's theory of social deviance [190]:

1. First, players try to conform to the rules as they work to understand them.
2. Then they try to innovate and reach the goals in new ways.
3. Then they keep doing things “the right way” (as ritual) but stop caring about the objective.
4. Then they retreat and stop caring about the goal or the method.
5. Finally, they rebel and start doing their own thing.

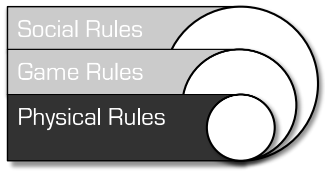
(Adapted from [157])

Most importantly, we must recognise that the player’s approach to games as systems of rules changes based on context and time. This chapter explores *mischief*[1] and how players mangle and disrupt our beautifully crafted games. Each layer of the game as a system of rules has different opportunities and effects from players choosing to twist them. These can be harmful, as in the case of “griefing”, or profoundly positive, where players take advantage of game systems as a canvas for genuinely artistic creations.

Crucially, such rule-breaking and mischief is firmly reliant on the social aspect and context of games. Although previous game studies literature (e.g. [229, p267]) recognises the importance of understanding transgression based on effects on gameplay, here the approach is to understand the same from a social perspective. Whether the co-player is human, AI or even the game system itself (e.g. see [289], and Section 2.2.4), abuse and mischief within games are definitive social acts.

3.1 Breaking the Physical Rules

[1]It should be noted that the use is according to the British English definition of mischief as “behaviour, especially a child’s, which is slightly bad but is not intended to cause serious harm or damage”[46], in contrast to the more serious legal definition

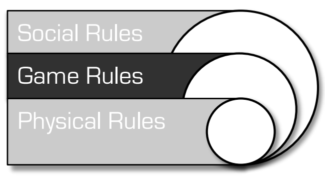


The physical layer of rules is the most resistant to manipulation by the players - rules such as the second law of thermodynamics are strictly non-negotiable. However, we can manipulate the materials and accessories of play to change the game experience.

In a children's playground the height of a basketball hoop may be attached lower the regulation 10 feet from the floor. This is explicitly against the official rules of basketball associations, but is done for the benefit of the game given the context of play. We might also play cricket with a bouncier tennis ball - this changes the game dramatically. Fielders will need to be placed further into the outfield, the bowler will need to use less power and the batsman may go without the protective pads that hamper movement. It may be that it is "just not cricket", but a simple change of material makes a variant more accessible to casual and inexperienced players for whom the hard cork and leather ball is too dangerous and unforgiving.

A nefarious player may modify the playing pieces to take advantage of the nature of the physical rules of a game. For example, in a dice game, players can reasonably expect each possible result on a single die to be equally probable. However a player who substitutes a loaded die has additional knowledge that the game piece will not behave correctly according to the physical rules of the game. This is an advantage for that player against the intuitive aspect of the physical context of the game.

3.2 Breaking the Game Rules



Depending on context, games require their players to engage with the *lusory attitude* in order to allow the game to exist. Players must take responsibility for the correct operation of the game according to the rules in order for the game to function. Where players have control over the maintenance of the game rules themselves, the game as a system of rules is vulnerable to changes, tweaks and abuse.

3.2.1 Spoilsports

The lack of respect for the game rules is a behaviour of what game studies knows as the *spoilsport* [126]. This type of person (because they are not a *player*) is the one who refuses to take the *lusory attitude* and take responsibility for maintaining the game rules - thereby preventing the game from existing. As Johan Huizinga puts it, the spoilsport "shatters the play-world itself"[126] by failing to recognise, and therefore respect, the "unshakeable truth" of the game rules (Paul Valéry via Johan Huizinga [126, p30]).

Bernard Suits defines games as "the voluntary attempt to overcome unnecessary obstacles"[253]. They key point is that the activities and movements that we perform through playing games are done for the value they add to the game itself, and may not have any extrinsic value. In other words, "rules prohibit use of more efficient in favour of less efficient means"[253]. As the definitive inefficient act, the player who refuses to realise the benefit of this purposeful inefficiency (i.e. fun) is making a rational choice, but one that prevents the game from existing.

> The World Snooker Championships in Reading were thrown into chaos this afternoon, when mid-way through the Steve Davis/Jimmy White quarter final, a young child stood up in the audience and shouted "Hold on! All this game is, is two blokes hitting some balls around a table for a couple of hours. Where's the entertainment value in that?" The rest of the audience realised how foolish they had been for so many years and the disillusioned players were unable to continue.
>
> - Alan Partridge, in *On the Hour* [192]

Although the charge of "preventing the game from existing" sounds incredibly melodramatic, players failing to engage with the "lusory attitude" will genuinely damage the game and this is a frequently recognisable situation rather than just academic hand-wringing. The game of *Werewolf* requires players to close their eyes as a part of the game (to allow for the werewolf players to attack in secret). However, the act of closing your eyes is commonly associated with children's games (e.g. *Hide and Seek*), so new players may be unwilling to engage with this part of the game - perhaps for fear of appearing childish, or maybe for fear of being made the butt of a joke. However, the game *requires* all players to adopt the lusory attitude so by refusing to participate, the reluctant player effectively ruins the game for everyone.

Figure 3.1: RPGs are susceptible to players failing to adopt the *lusory attitude* - For example, knowing to avoid the Owlbear's vicious 'hug' attack (©Wizards of the Coast)

Similarly, in Role-playing games, it is commonly expected that players engage with the lusory attitude by performing a strong role. That is, by creating a character with depth and dimension and *playing* as that character during the game. This may involve taking on accents and speaking in a manner and tone appropriate for the character, regardless of the nature of the player themselves. Although it is usually not expected that the player dresses in pantaloons and starts every sentence with "forsooth", it is expected that the player behaves appropriately when "in-character". This dual personality often leads to issues over "player knowledge", where a character may act upon knowledge that the player has deduced. For example, a character with a low intelligence score may not be able to decipher the solution to a word puzzle, even if the player spots the solution easily. A character encountering a ferocious *Owlbear* [283] for the first time should not act as if they understand the strengths and weaknesses of the creature, even if the player has faced them in the past with different characters.

In role-playing games, maintaining the fiction of characters within the narrative is a core part of the game experience - if players refuse to engage with the lusory attitude in this respect, it harms the game for everyone.

Curiously, in his introduction to Johan Huizinga's *Homo Ludens* [126], George Steiner takes Huizinga's comparison of games to warfare a step further, and argues that it was the invention of the concept of "Total War" (i.e. considering a whole nation to be a contributing part of the armed forces, rather than distinct from them) during the American Civil War, that tore up the rules of war. He claims it was "Sherman's decision to be the ultimate spoilsport" that changed warfare forever - from then on it could no longer be regarded as a game played between gentlemen.

3.2.2 Cheaters

The lusory attitude requires players to be responsible for upholding the game rules as a condition of play within the magic circle. As opposed to the spoilsport, who refuses to engage with this responsibility, the *cheat* "pretends to be playing the game and, on the face of it, still acknowledges the magic circle"[126].

Where players are responsible for the maintenance of the game state, the opportunities for cheating are presented everywhere - misreading the dice, under-charging yourself for resources or "forgetting" to pay upkeep costs, the prospective cheater in a board game has a wealth of opportunities. However, as an adult, playing games in good company, cheating is a serious breach of the social contract, that could lead to serious real-life social consequences (e.g. making your 9-year old niece cry).

In online games, too, there is a social contract that forbids cheating, but it can be argued that it is not as strict as that observed in board games. The game state is generally not the responsibility of the players to maintain, but is instead managed by the game server; therefore directly cheating in an online game is (ostensibly) impossible. Despite that, when playing a game online, where some of the game state is under your control, something about the distance of the other player and the capability to cheat makes it somewhat more attractive. When cheating is possible, it appears that people *will* cheat.

> "People who wouldn't dream of cheating their close friends in person are happily willing to cheat strangers... Players have gotten used to the notion that computer games will enforce the rules for them. They assume that anything they can do, they are allowed to do"
>
> - Andrew Rollings & Ernest Adams [226, p515]

Online implementation of board games make it trivial to cheat, because the design was often never conceived to be played over a distance. For example, the online game *Scrabulous* is an asynchronous re-implementation of *Scrabble*. In this new context, players have as much time as they like to study the board, and their tactical options. There is also no-one watching them to make sure they don't get any "help" in finding high-scoring combinations. The journalist Charlie Brooker vividly describes the moment he realised both he and his opponents were using online crossword-solver tools to calculate optimal moves:

> What had started as a fun diversion had become an arduous job in which I received regular instructions (the layout of the board), inputted them into the system (Scrabble Solver) and then fed the results back into the machine, ready for regurgitation.
>
> - Charlie Brooker [40]

The act of cheating is that of directly breaking the game rules with the appearance of following them. Although this has effects in the social layer of play, the true victim of the cheat is the game itself, which is broken by the treachery. The game as defined cannot exist as long as one or more player cheats - while the cheating may afford different types of play, some of the players are not playing the game they think they are playing.

3.2.3 Cheated by the Game

For as long as there have been games, there have been cheats. Curiously, it is not always the humans that are guilty of this. The game designer may implement mechanics and systems that cheat against the players.

In digital racing games, “Rubber-banding” [181] is a common feature of the opponent AI. The game design justification is that in a racing game, it is not much fun to be too far behind and it is not much fun to be too far ahead. Therefore, when a player is found in one of those positions, the opponent cars are discreetly moved to more “fun” positions nearer the player (as if the player and opponent are connected by a rubber band). The reality of the experience is unfortunately different - opponent vehicles appear to defy the laws of physics to make incredible challenges out of nowhere (e.g. [187]).

The *Choose Your Own Adventure* range of books are based on a paragraph and choice system. Based on events in the story players select their desired response and are directed to the next paragraph as part of a large, branching narrative. In this system, cheating by players is rife - a cheating player can keep a finger on a page so that they can “rewind” if their choice results in an unfavourable situation. One title in this range, *Inside UFO 54-40* [208], twisted the stereotypical mechanics of the genre by having the ending unreachable through normal play - in order to win, players had to ignore the rules and skip through the book to find the real ending hidden among the pages [259]. The game breaks its commitment to the lusory agreement by wilfully preventing honest players from winning. This betrayal by the game gives it some kind

Figure 3.2: Racing games such as *Split/Second* are notorious for "Cheating AI" - ©Disney Interactive

of revenge over the players who may have frequently cheated in previous titles.

In these situations, the game designer is directly cheating the player by secretly allowing the game to secretly ignore the stated rules of the game. This is a social act, and it exploits the relationships between designer and game, and game and player. When discovering this duplicity, the player has a right to feel betrayed by the game, whom they have presumed would play with honour and integrity.

3.2.4 Cheating with the Game

The act of cheating during a game is a major taboo around social play. Some game designers have explored this taboo as a valuable source of fun in its own right. Several games exist that play with the idea of cheating as a part of the game. The card game *Illuminati* includes an optional variant where cheating is explicitly allowed [229], and in recognition of the social aggravation that cheating may cause, the rules even state "We recommend you play the cheating game only with very good friends or with people you will never see again".

Figure 3.3: Games can be designed that use cheating as a mechanism of play - The components of *1000 Blank White Cards* can be created and altered by players for their own advantage during the game

More complicated games disallow cheating but implement common cheating mechanics in order to create interesting play. The card game *1000 Blank White Cards* allows players to write their own cards as required during play. The goal is to accumulate as many points as possible, so players are free to draw a card that says "I earn 1,000,000 points", however a riposte from another player might be to make a card with the effect "Everyone with more than 999,999 points must discard *all* points". The blank cards are mixed with cards from previous plays, so quickly the game evolves new and interesting mechanics based on new cheating strategies developed by the players.

The card game *Fluxx* breaks the gaming equivalent of the "fourth wall" that exists between game designer and game player (as opposed to the "fourth wall" between actor and audience in theatre [250]) by changing the objectives and even changing its own rules during play; therefore making the players aware of their role in maintaining the game state. The game *Nomic* uses similar mechanics in a more freeform manner. Play centres around players voting to change the rules of the game while it is in progress - the exact procedures used in deciding new rules, and indeed the victory conditions themselves, are negotiable within the structure of the game.

Mao is a game played with a standard deck of cards that has an unusual twist as the central rule is that "the rules will not be explained". Although a rule-set does exist

Figure 3.4: The card game *Fluxx* changes its own rules during play - *Fluxx* encourages players to reflect on their social responsibility to enforce the rules of card and board games

and is followed correctly during play (although this rule-set can vary between dealers), new players have to use trial-and-error to be able to determine how to play correctly. *Mao* purposefully twists the relationship between the players to the game and turns player responsibility for game state into a game itself.

In the ultimate twisting of rules by games, the players of *Mornington Crescent* are *always* cheating. In this parlour game, players must take turn naming stations on the map of the London Underground, until one player is able to claim “Mornington Crescent” and therefore victory (unless playing the 1972 Barnsley Council adjunct variant). To the un-knowing spectator, the players seem to play a game - they appear to honour the lusory agreement and follow an agreed set of rules. However, the exact nature of the rules is designed explicitly to be inscrutable. *Mornington Crescent* plays on the ideas of what games are, and the way they are played, in order to create an interesting experience for the players at the expense of the spectators.

3.2.5 Negotiation

The lusory attitude is the responsibility of each player in a social game, yet agreement must be negotiated first. As such, players may abuse the game rules intentionally for mutual benefit. These changes in mechanics might be to make the game easier or shorter, or to encourage or discourage particular strategies. All game rules are essentially negotiable [242]. Bernie DeKoven highlights this flexibility as being a method for players to create the optimal "well-played game"[159]. In other words, players have a natural propensity to seek to negotiate the rules of a game for maximum enjoyment. This propensity for changing rules is what leads official sports to need to codify official rule-sets formally. It is the reason why football has *laws* and not *rules* [96].

The context of play also affects the ability of the players to negotiate new rules. Stewart Woods makes the point that "digital rulesets inevitably codify elements of gameplay that, in a non-digital environment, are more malleable due to the emphasis on player maintenance of the game state"[289, 290] and highlights that the game experience is able to be negotiated on-the-fly based on even non-verbal interactions.

Negotiation need not be only before the game begins, but the rules can be renegotiated at will by the players. Karl Bergström notes that in games that have huge time investment, allowing players to "take back" turns if they might cause the game to end early [22]. For example, it is common for wargames to have long play times. An extreme example is *The Campaign for North Africa* with an estimated play-time of 1200 hours - it is understandable that players might forgive a stupid mistake if only 20 hours into that game.

Karl finds that one of the most important social rules around board games is "The Almighty Consensus Exception": "If everyone is in agreement, any rule can be bent or broken, sessions terminated and restarted, exceptions made, and so on. The common consensus between the players is what constitutes the gaming agreement, so it follows logically that if there is another consensus, it takes precedence"[22].

House Rules

The constant negotiation of rules tends to stabilise into variant rule-sets among certain social groups. The anthropologist Linda Hughes studied children playing the American schoolyard game *Foursquare* [125]. Although the game has a formal set of rules, the children of various groups developed variant systems of rules based on how they enjoyed to play (e.g. "no rough-stuff"). Although each individual group had their own standard variant set of rules, when members of two or more groups joined to play the game there would be conflict over the "correct" way to play the game. These formulations of "house rules" will be familiar to any game player. Just ask any British pub-goer if there is a one or two-shot penalty after sinking the cue-ball. You can't play *both* - a compromise must be reached.

The key is that no one is right. Rules are always negotiable regardless of what is printed on the inside of the box-lid. We can trust the designer's skills and assume the rules-as-provided make for an interesting and balanced game, but we can't assume the designer balanced the game for every social context.

The "free parking" rule in *Monopoly* is a famous example of house-rules gone awry. This rule simply states that when a player must pay money to the bank (i.e. from income tax) the money instead goes onto the "Free Parking" space. A player who lands on "Free Parking" may then collect all the money stored there. This common rule is actually a house rule and does not appear in the rules of the game rules as printed. This, and ignorance of the official rule that requires un-purchased properties to be auctioned each turn, converts *Monopoly* from being a somewhat average 2-hour auction game into a 6-hour monstrosity that is the cause of countless family arguments each Christmas. These house-rules have been passed from player to player to player, and often from generation to generation, in a form of "Chinese Whispers" that meant the house game bears only passing resemblance to the designer's intent.

In his study of variants of *Texas Hold'em* (a poker game), Gifford Cheung points out that players are somewhat aware of the effect of this renegotiation of the rules in terms of game mechanics [53]. It is quite common for a negotiated rule to necessitate the addition of several other rules in order to balance out some perceived new unfairness. Players are able to understand and predict second order effects of changing rules on the dynamics of the game.

Conceptually, each of these house rules can be considered to create a different game. The *game* is not usually an intrinsic quality of the components, but the rules as a system enforced socially between the players. Variants are passed around between the players and tweaked as necessary, even whole new games are created and published using the components from previous games [69, 230]. Remixing and renegotiating rule systems is an important part of the play process.

Handicapping

When changing rules, the changes are not always made symmetrically - they can be designed to give advantages or disadvantages to specific players. This is an important part of the negotiation of a "play community"[159, p20] that provides an enjoyable experience for every player. This can be explicit changes, such as removing pieces from a strong player before playing *Chess*, or implicit like playing softer around a child.

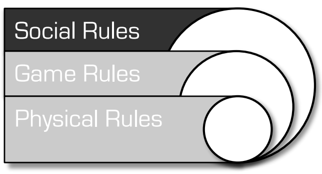
> The fun is what matters, not the victory. To glory in the defeat of another, to need that purchased pride, is to show you are incomplete and inadequate to start with.
>
> - *The Player of Games* (Iain M. Banks) [12]

The purpose of this handicapping is the increase in mutual enjoyment gained from playing a more balanced game. This even includes giving gentle hints to other players in order to improve the game. Stewart Woods asked board gamers in what condition they would purposefully not play to win. he found a common theme was a "conscious desire to improve the gaming encounter for other players"[290] - especially through non-optimal play to restore balance, thereby giving new or young players better chance. In a related study, he also found 60% of board gamers acknowledge secretly self-handicapping in social play, especially when teaching the game to new players or playing with inexperienced opponents [291, p222].

This is contrary to the social responsibility of the players to "Strive for Victory" (2.1.2). There exists an uneasy balance between attempting to win, giving a weaker opponent a fighting chance, and not patronising a weaker opponent with too much overt support.

The malleability of game rules is an important part of social play. It empowers the players to adjust a game to fit their own needs and desires over those defined by the designer. Game rules are not only followed, but are instead *interpreted* by the players, depending on the social context.

3.3 Breaking the Social Rules



The social rules define acceptable behaviour in the game, for the benefit of all the players - players codify their expected behaviour as part of a social contract of play. The social contract is complicated and varies between individuals and groups based on culture and background, however there are inevitably situations when there are perceived abuses and one or more players don't behave appropriately. It is possible for a player to operate within the confines of the game rules, but to the detriment of the enjoyment experienced by co-players by following so-called "degenerate strategies"[229, p271]. This is especially evident in games which expect rational and optimal tactics from the players. Examples could be as simple as a husband and wife engaging in unfair collusion during a four-player game, "Kingmaking", where players collude to hand victory to an undeserving player [291, p253], or other inappropriate behaviour such as a losing player swearing and insulting the host.

Although abuses of general social rules (e.g. bad behaviour, impoliteness, disrespect) are included in the social rules of play, some transgressions may not be considered so clearly against the rules. Consider the use of "Psyching-Out" as a social tactic for gaining advantage in games. The player is technically following the rules, but the aggression and body language that may be employed could be considered against the spirit of the game for some players. The Chess Grandmaster Gary Kasparov famously uses this form of aggression to great effect as a social tactic for *Chess*. However his reliance on these social effects was his downfall in a notorious match against the computer opponent *Deep Blue*. The computer's lack of emotional response to his aggressive play [212], combined with the speed of the computer's decision making processes [51], reportedly unnerved Kasparov. This resulted in him making key tactical mistakes that would lead to the loss of the game.

Inspired by *Deep Blue*'s unintentional skill at "psyching-out" opponents, Doug De Groot and Joost Broekens built a chess computer that *intentionally* intimidates its opponent in the social domain for an advantage [70]. This computer directly breaches an implied social rule of single player chess (that computers don't have emotions) for the sake of game victory.

Massively Multiplayer games (MMOGs) have particularly interesting social rules since the games are generally *persistent*. There is no start or end of the game, so no point where players can renegotiate appropriate social behaviour. Instead, the social rules of these games are organic, changing and developing based on on-going social interactions between thousands of concurrent players.

Since the number of players is so large, the effect of any single player breaking the contract is usually not great. It is precisely this lack of strictness in the social contract between online game players that makes it possible for players to bend the rules and experiment with acceptability by engaging in anti-social acts in online games. If the behaviour of a fellow player is not to someone's liking, it is trivial for him or her to avoid it by leaving the area or using tools to hide it. The "cost" for the offended player is low and the perpetrators are not causing catastrophic damage to the game experiences of the others (as they perhaps would have in a board game with fewer players). Since there is this leeway in the social contract regarding anti-social behaviour there is space for mischievous activity at the edge of social acceptability, as well as more negative play such as "griefing"[52, 98] where some players deliberately abuse the game rules to cause genuine upset to others.

3.3.1 Unacceptable Behaviour

> In every aggregation of people online, there is an irreducible proportion of jerks
>
> - "John Hanke's Law", from Raph Koster's *Laws of Online World Design* [152]

The social rules of games change from person to person, and often there are conflicts between different expectations that require negotiation. However, in some cases, users explicitly break the social rules for their own amusement. Although between two consenting players the social play can be rough and have an agreement where "anything goes", these "violators"[91] intentionally break the social rules in order to upset other players. In the early days of massively multiplayer games, Julian Dibbell famously reported on a virtual rape [73]. This profound breach of the social contract of play, combined with the perpetrator's complete lack of remorse, shook the foundations of the game community - highlighting the vulnerable nature of the social contract of play.

In his large-scale study of MMOG players, Nick Yee finds that the activity of "griefing" is a motivating factor for many players [298]. Griefing is the "Intentional harassment of other players... [it] utilizes aspects of the game structure or physics in unintended ways to cause distress for other players"[275]. This distress may not be simply through harassment, but may involve a range of activities, including scamming, confidence tricks, identity deception and even theft [98].

Richard Bartle describes these sorts of behaviours as part of his "Killer" player type, for whom motivations include the need to *dominate* other players, and that this need is not always satisfied in a "nice" way (i.e. by fighting other killers): "Killers see virtual worlds as sport. This is of the huntin', shootin' and fishin' kind"[16, p137]. These players may not even recognise the genuine emotional distress that grief may cause to others [52, 63] - their defence is "it's just a game"[16, p549].

This difference in expectations from the social contract of games is used to justify griefing, but betrays a lack of empathy on the part of the griefer, who uses the magic circle as an excuse for sociopathic behaviour. Burcu Bakioglu studied griefing in the virtual world of *Second Life*, and highlights that the differing attitudes towards the world affected how people perceived griefing [11]. *Second Life* appears at first glance to be a game, using game technology and many game-like interfaces, however there is no formal game structure or rules. This conflict in attitudes between the "game-playing" griefer and their victim makes the emotional effect of griefing that much more profound.

3.3.2 Playful Misconduct

There exists a fuzzy boundary between the antisocial evil of griefing, and normal honourable play. This is behaviour that teases the boundary of what is considered acceptable social behaviour, not to cause offence and upset but to play with the nature of the social contract itself. This "Playful Misconduct" or mischief can be expressed through challenging accepted social norms, or by misusing the rules or structure of a game for playful means. Most importantly, playful misconduct is not about following the rules, but it is distinct from the activity of griefing because of the *intent* of the perpetrator. Where the intent of the griefer is to cause genuine upset [98], the intent

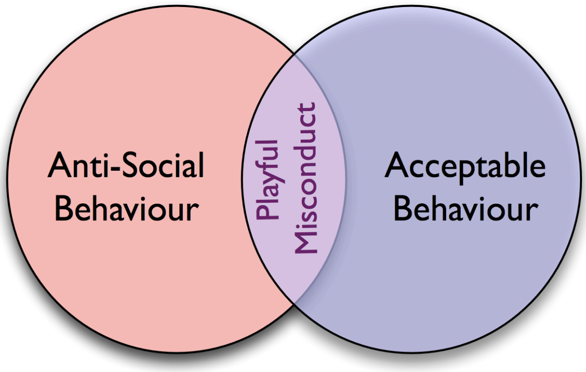


Figure 3.5: Playful Misconduct sits at the boundary between the acceptable and offensive - The boundary is fuzzy and varies based on context and individuals

of the mischievous player is benign, based on subverting the rules of the game to cause surprising and often elaborate and wondrous experiences. By pushing the boundaries of what can be considered "good taste" in social games, the mischievous players add serendipitous flavour to game environments. Although griefing and other sociopathic behaviours are of interest to game studies [11], they are purely the acts of "spoilsports" with simple, negative motivations and effects. In this section it is proposed that mischief, as a disruptive play act, is much more interesting since the intent is positive - the mischievous player is fully engaged with the lusory attitude of the game and is merely using the social capabilities of the games as a canvas for playful expression.

Two of the most common types of mischievous acts are seen through *performance* and *serendipity*. Performance is seen where the mischievous player directly challenges the social norms of games in person. Serendipitous mischief is the graffiti of social games, where mischievous situations are created for other players to stumble into.

Performance

Game worlds are usually built with a strongly established back-story, with complex mythologies, histories and aesthetics. Within this frame the players are introduced, and settle into roles according to the established order. In a high-fantasy game such as *World of Warcraft* the warriors wear armour and the wizards cast spells. To paraphrase Douglas Adams [1], men are *real* men, women are *real* women, and small furry creatures from Alpha Centauri are *real* small furry creatures from Alpha Centauri. These strong identities are often enforced by game rules (e.g. Wizards may not wear armour; Male characters may not wear female clothing), which further guides players to follow the strict stereotypes in order to play more efficiently.

It is precisely these strong stereotypes and established social norms that create opportunities for playful misconduct by players who wish to challenge the status quo. For example, players may subvert these highly established roles in order to stand out as being defined by their *character* rather than by their stereotype. Consider encountering a wizard that refuses to believe in magic, a blind rogue, or a strictly pacifist warrior. The stronger such stereotypes are enforced by the game design, the more rare any divergence becomes, as a mischievous player must work particularly hard to overcome the barriers to expressing individuality. For example, a transvestite character may be prevented by the game from wearing clothes intended for the other gender, but may still be able to assemble an outfit that gives the correct impression by using particular combinations of "valid" clothes.

No matter how strict the game stereotypes, there is room for misconduct through performance. Talmadge Wright and colleagues [296] describe such performances in online FPS (First Person Shooter) games, where there is limited scope for players to challenge stereotypes. In this strict environment players simply used the simplest tools available - changing their names and "spray tags" to provoke reactions in other players.

In these cases, the misconduct is about challenging the social norms in the game, taking the social roles of an "exhibitionist"[91] and creating an performance for the benefit of others. It is an interactive experience intended to elicit reactions such as surprise, confusion and amusement created by an abuse of the game rules.

Serendipity

Many games allow players to alter the game world in some way. Games like *Star Wars Galaxies*, *Habbo Hotel* and others allow players to own spaces within their virtual worlds that can be decorated at will, and usually remain persistent, so strangers can see the creations even while the creator is offline. With the opportunity to leave effects on the game world that remain for some time, there is also an opportunity for serendipitous playful misconduct. Mischievous players can create surprising and unique experiences for other players to stumble upon in normal play. The creator may never even experience the reaction of the "victims".

A vivid example of serendipitous mischief appeared shortly after the 2008 release of Maxis' *Spore*. In this game, players can use powerful tools to design creatures out of huge selections of body parts (arms, legs, horns, eyes, mouths, etc). Although not directly multiplayer, *Spore* connected players together by sharing their creature creations. As players explore their own worlds, the other inhabitants are computer-controlled versions of the alien creations of other randomly selected *Spore* players.

This automatic sharing created the perfect opportunity for mischief in the generation of "Sporn". Using the powerful creature creation tools, players created humorous creatures that were caricatures of a certain part of the male anatomy [293]. Since the worlds of other players may pick up these creatures from the Internet automatically, players may have ended up unwittingly exploring brave new worlds filled with dancing, singing penises.

Similarly, in *LittleBIGPlanet*, a game where players can create their own levels, players spend considerable amounts of time learning to use the powerful tools and physics to create animated levels based on crude sexual imagery [161].

The use of crudely drawn penises in humour is as old as culture itself [118] and, yet, even in these "enlightened" times it is seen as something "naughty". Along with scatological themes it is still a hugely popular topic for jokes and pranks [217, 279]. It

Figure 3.6: Serendipitous Mischief leaves surprising gifts for others to discover - "Sporn" uses the multiplayer facilities of *Spore* to create serendipitous discoveries for other players. (©Electronic Arts)

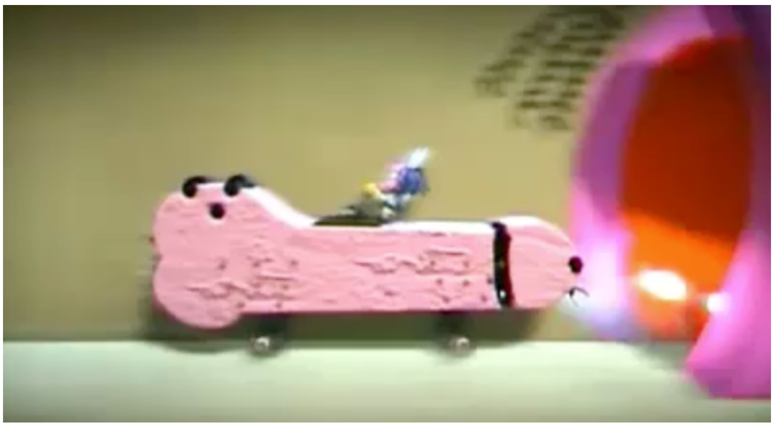


Figure 3.7: Some serendipitous mischief can require significant effort - Constructions in *LittleBIGPlanet* are frequently banned but not uncommon. (©Sony)

is no wonder, then, that this familiar form makes its way into the gaming world as a common theme of mischief. The Western cultural associations with the male genitals are typically as a merely mildly offensive and "naughty" subject reserved for childish pranks and schoolboy graffiti, it is therefore the perfect example of "pushing the edges of acceptability". Its appearance in a game such as *Spore* is unexpected, immediately recognisable and ultimately harmless.

In perennial academic favourite *Second Life*, although perhaps not strictly a game, one user pushed the boundaries of taste spectacularly with the creation of a new fashion item:

> Tiny, adorable baby unicorns that you can hold and cuddle... but they come with a price - You can only get them by having sex with an adult unicorn
>
> - "Tenshi"[265]

In order to collect a free pet baby unicorn, players (of either gender, since "unicorn seed is magical") would first have to submit to engaging in graphic intercourse (including appropriate animations and sound effects) with an adult unicorn that had been painstakingly designed and programmed by the author for this specific purpose.

In 2006, *World of Warcraft* saw an explosion in serendipitous mischief through the macabre act of "corpse graffiti"[231]. In this game, a deceased avatar's corpse remains in the location it died until it is resurrected. If the player chooses not to resurrect his or her avatar, the corpse remains visible in the game world for everyone to see. This led to players to devise elaborate deaths for their avatars that would leave the corpses in humorous positions, or using collections of corpses to spell out words for other players to encounter.

The key aspect of serendipitous mischief is that the creator may never get to witness the reaction that their play creates. Unlike performance mischief, where there is direct reward for the player in terms of being witness to the responses to their actions,

Figure 3.8: Serendipitous Mischief can use unusual materials - "Corpse Graffiti" involves abusing the physics system in *World of Warcraft* to create interesting sculptures

serendipitous mischief is almost a magnanimous act that is performed for the benefit of the entire game community.

In normal social play, individuals are bound by the social contract that dictates appropriate behaviour within games. Through playful misconduct, the contract is bent to create unusual and unexpected experiences that can enrich the social environment for everyone involved with the game [148]. The uneasy balance between normality and mischief adds value, and is part of what makes social play such an electrifying experience.

3.4 Emergence

In the natural world, complexity is borne from simple rules in a process of *emergence*. From the behaviour of ant colonies, perceived intelligence in slime and even the connections between neurons, basic systems produce complicated effects [135]. Of course, this happens in games too - from the simplest forms of patterns in *Conway's Game of Life* [136], to the nature of the virtual community built from simple blocks in *SimCity* [135, p87].

Salen and Zimmerman [229] propose that players use the system of rules that operate the game as a platform, on which to develop new meta-level games with their own, emergent, socially enforced rules. Playful misconduct displays these emergent properties, where players twist game rules to introduce new social practices that may not fit the overarching fiction implemented by the developers. The affordances of play provided by a game are not simply defined by the constraints of the rules but the surrounding factors. Games like *Warhammer 40,000* may have a strict set of core rules and rich background narrative provided by the game developers, however this rich background means they lend themselves to appropriation by the players, who build on top of the game as a *platform*, including fan fiction, customisation, new rules variants and a world of play around the game as an artefact - which is in spite of the explicit wishes of the publishers as a business [77].

3.4.1 Appropriation

Scholars have long recognised how the process of user appropriation has significant power in adding value to tools and services [76, 80, 87]. Appropriation describes a process through which users subvert technologies and use them for purposes not intended by the designers. Just as cloakroom tickets find new purpose in the organization of raffles [87], technologies can be appropriated for new uses in sometimes surprisingly different contexts. Ron Eglash characterizes this repurposing as a move from the mode of consumption to a form of creativity [87]. In this way, users seize power over tools from the hands of their creators.

Appropriation is not limited to the use of old tools as new ones for purposes of increased personal efficiency or effectiveness, but may also be used to enhance inter-personal communication. The MMOG *City of Heroes/Villains* has an established narrative that promotes conflicts between the hero and villain players, and spaces to do so in PvP (player vs. player) areas within the game world. However, the established social norms of the players are that PvP zones became more social spaces where players from the different factions could interact peacefully. Players following the game narrative and attacking the enemies were deemed impolite and disrespectful [193], which directly undermines the wider fiction crafted by the designers.

3.4.2 New Play

By breaking the game rules openly, the spoilsport denies that the game is allowed to exist, but frequently appropriate the substrate of mechanics to make new, and sometimes more interesting, modes of play. This form of appropriation is transformative, seizing control of tools to make new games.

> "the outlaw, the revolutionary ... heretics of all kinds are of a highly associative if not sociable disposition, and a certain element of play is prominent in all their doings."
>
> - Johan Huizinga [126, p30]

A prime example of transformative appropriative play can be seen in *Ultima Online*. This title was a major instalment in the long running *Ultima* franchise, a fantasy world of swords and magic, with a strongly established fiction. As an MMORPG it had a stronger focus on character development and role-playing than its contemporaries (e.g. *Everquest* and *World of Warcraft*). In particular, *Ultima Online* had no class system - players were free to develop their character's skills in any way they saw fit. Until 2005[1], however, players were only allowed to create human characters. As traditional tabletop role-playing games such as *Dungeons & Dragons* have had a long history of allowing

[1]The seventh expansion, *Mondains Legacy*, added Elves as a playable race

players to create non-human characters; the role-playing *Ultima Online* players sought ways to exploit the game rules to be able to add this functionality. This was seen most impressively with players who wished to play the role of Orc characters. In order to do so, players created characters with Orcish sounding names and wore drably coloured leather armour and masks or cowls in an attempt to give their characters a similar appearance to actual non-player orcs in the game. The players formed guilds[1] and existed within the game as outwardly Orc characters, in spite of the game itself that treated them as humans.

Figure 3.9: Players of *Ultima Online* appropriated game mechanics to create new forms of play - This new play was in spite of the established mechanics of the game

To further compound the difficulty of playing an Orc, in the world of *Ultima Online* there are several fixed forts that are occupied by non-player orcs. Naturally, the players (as Orcs) wished to use these forts for their own purposes. However, because the game recognised the player Orcs as human characters, the native Orcs attacked them on sight. Orc players generated a fictional back-story as drunk or squabbling Orcs in order to

[1]e.g. The Blood Lust Clan, http://www.guildportal.com/Guild.aspx?GuildID=111426

explain this NPC behaviour, and trapped them out of harm's way. These players go to extreme lengths to maintain their fiction as Orc characters, despite the game acting as a system working against them in so many ways.

3.4.3 New Games

In addition to subverting the formal modes of play, the environment of game rules itself can be used as an effective *physical layer* for the emergence of new divergent games.

Jeep Tag, as described by Felan Parker [213], is an emergent (or 'expansive' in Felan's terminology) chase game played on the multiplayer mode of *Halo*, where one player (monitored by socially accepted rules) drives a tank around the level trying to run over other players for points. *Jeep Tag* is misconduct because it explicitly goes against the social rules of the game. Strangers encountering the game randomly could be flummoxed by the apparent disregard for adherence to both the narrative of *Halo* and the established social rules of conduct in the multiplayer mode.

A similar form of emergent game evolved on the European *Ultima Online* servers - a game called *Bagball* [54]. *Bagball* is an organised team game that is based on Football (Soccer), played in the game world, where two teams compete to score goals by passing a ball amongst each other. There is a fixed pitch, with a certain length, but most interesting is the "ball". The ball is actually a bag filled with heavy virtual lumber. The mechanics of the Bagball game are made possible due to physical rules implemented in UO, where a character can only carry so much weight before becoming over-encumbered. Practically, a character can only move a few steps while holding the bag before they have to drop it. Once it is dropped, it is free for another player to pick up. Like Football, players travel up and down the pitch trying to pass the ball between friendly players and avoiding interception by opponents.

The game of *Bagball* evolved into an organised sport, with rules, referees, supporters and even leagues and tournaments. All this within a game structure (and a game fiction) that does not support this sort of activity. *Bagball* became such a popular pastime for UO players, that the developers added official arenas to the virtual world to better support the game-within-a-game [270].

Figure 3.10: *Bagball* is an example of an emergent game within the game of *Ultima Online* - The game achieved official recognition and support from the game developers

The emergence of games-within-games can be seen widely in different titles, but is not always a form of playful misconduct. So, a group of guilds in World of Warcraft having self-organised competitions and battles can be considered emergent play, but since this activity fits within the social norms and fiction of the game world it may not necessarily be considered misconduct or mischief.

3.4.4 New Challenges

For some players, the demand provided by the game as a test of skill may not present enough of a challenge. In this case, players can appropriate the mechanics of a game in surprising ways simply for the effect of increased difficulty. James Newman calls this sort of behaviour *Superplay* [198]. It can either be in the form of additional challenges in line with the game, or emergence of a player's own goals that may be contrary to the formal goals.

A classic example of this is in *Speed-Runs*. The objective of a speed-run is to complete a game, or section of a game, in the fastest time possible. Communities of play have sprung up[1] around this activity, where players compete for best times and share tips and strategies for particular games. Rulesets emerge for proper conduct, and even sub-genres appear, such as *tool-assisted speedruns*, where players can use emulators to slow down time in order to achieve theoretical "perfect" runs [269].

The infamously difficult dungeon crawling game *Nethack* has additional challenges to make the game almost comically hard [201]. For example, since the player must regularly eat in order to avoid starvation, an additional challenge is to be vegetarian (dead animals are the most abundant source of food). There is even a pacifism challenge for players to beat the hack-and-slash game without ever hacking or slashing.

Case Study: PASION Fruit

A community reinterpreting a game design for additional challenge is not limited to commercial or even particularly successful games. The research game PASION Fruit (described in A.5 - p258) was designed specifically to answer research questions about group cooperation in online games. However, it quickly became clear that the players were not simply playing the game as designed, but breaking out of the carefully designed experience to create their own fun.

[1] e.g. http://speeddemosarchive.com/

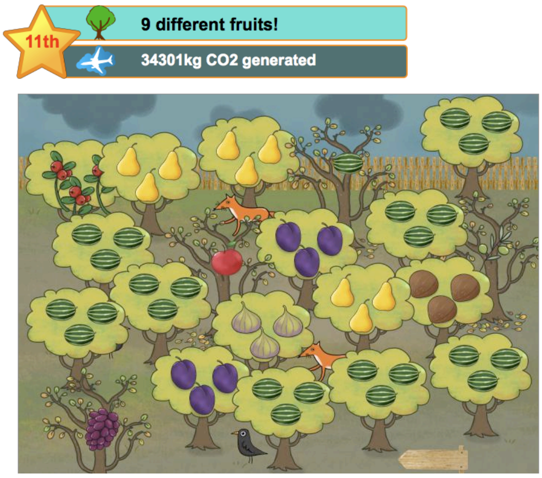


Figure 3.11: Gardens are adversely affected by CO2 - Wise trading is required

According to the responses to a questionnaire, there appeared to be an alternative goal for a subset of PASION Fruit players, not related to score. The game was based around the collecting a variety of fruit. Since the game had 20 different types of fruit, and by chance the players had space for 20 trees in their gardens, some players created an informal challenge to have all 20 types of fruit in their garden. This was no small feat, since every day each fruit tree has a chance of dying, and a small chance of breeding a new tree. Therefore, with no space for new trees, and existing and perhaps rare fruit trees dying, maintaining a garden full of individual trees is very difficult. Maintaining a garden with all 20 fruit trees at once is even harder, and only sustainable for a few hours (before a tree dies).

CO2 expenditure has a negative impact on score in PASION Fruit, so for a player trying to be competitive, it is not in their advantage to collect a great variety of fruits. The optimal rational strategy was one of sustainability, choosing to maintain local sources of rare fruits with players in the local regions. As described by a respondent:

> I tried to keep a mix of fruits locally. I worked with people locally to keep the rare fruits alive. After a while i would get rid of any fruits that were prolific in the area by deleting them rather than sending them on to people who probably didn't want them. At first i sent these locally prolific fruits to other countries in hope to get some different fruits in return. Once all the fruits were in the country i stopped sending abroad in hope to keep my carbon count down. (P5)

The players choosing to challenge themselves to get all 20 fruit were doing so in the knowledge that it would irrecoverably damage their score due to the amount of CO2 emissions generated. This was directly against the designed goals of the game.

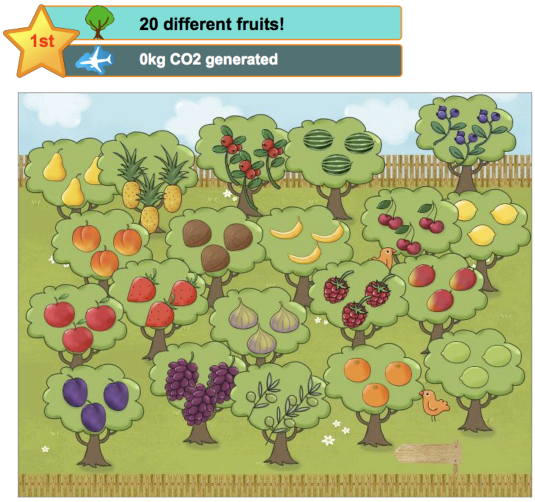


Figure 3.12: One player created the additional challenge of achieving maximum points - This was a particularly difficult task

One player reported they had set a goal that took this idea to the extreme:

> Be #1 with the highest possible score. I.e. No CO2. (P6)

This player had realised that getting 20 distinct trees would be difficult without generating huge amounts of CO2, and had set a new personal objective: achieve the maximum possible score.

Since the game mechanics of PASION Fruit only define that the sender of a gift has to pay costs in terms of CO2, it is technically possible to have a garden without any CO2, by never sending a gift. This player went on a mission to ask other players within the game to sacrifice their own score in order to help him achieve this impossible task. Surprisingly, enough of the other players wanted to see him succeed, that quickly he managed to achieve, not only 20 different fruits, but simultaneously with a CO2 expenditure of 0. This gave him the maximum possible score of 200,000 points for a few short hours before the trees started to die and the score decreased.

This temporary challenge serves as a great example for why social abuse of the rules adds value to the play experience. The challenge was basically meaningless, and was only made possible by enough of the player-base coming together to subvert the implied social rules of the game. Together the players exerted their will on the game as a system and made it their own.

3.4.5 Creativity

Farm Town is one of a range of popular farming themed games found on the social network site *Facebook*. In these games, players own a farm, and must maintain both the business and the finer details of arable and pastoral farming. This includes buying land and animal feed, planting crops and harvesting them for profit when the time is right. *Farm Town* has nearly 9 million unique players each month[1]. One of the key mechanics of *Farm Town* is that each user has a particular amount of virtual land on which they can build their farm, and the player has complete control over where fields, buildings and pastures are placed within this virtual space. The location of crops has no direct impact on the player's ability to be a successful farmer (e.g. crops are no less likely to produce a harvest if very far away from the farm buildings) so this control has no direct in-game impact.

The logical and mathematically rational strategy would be to place the elements of the farm in an arbitrary fashion based on the order of construction, and the developers would have been forgiven if this had been an automatic feature, however, some players have taken this "gap" as an opportunity to show their creativity while playing the game.

Figure 3.13 shows examples of how players have contrived to arrange their farms specifically for aesthetic or artistic purposes. The examples show the likeness of Elvis, a reconstruction of tile patterns taken from the mosaics at the Alhambra in Granada and also a maze based on the 18th century garden mazes found at palaces and stately homes such as Tatton Park and Hampton Court in England. Players have formed groups within Facebook[2] in order to share hundreds of their creations with one another,

[1] April 2010: http://www.developeranalytics.com/app.php?id=56748925791

[2] e.g. http://www.facebook.com/#!/group.php?gid=91934065717 (Accessed May 2010)

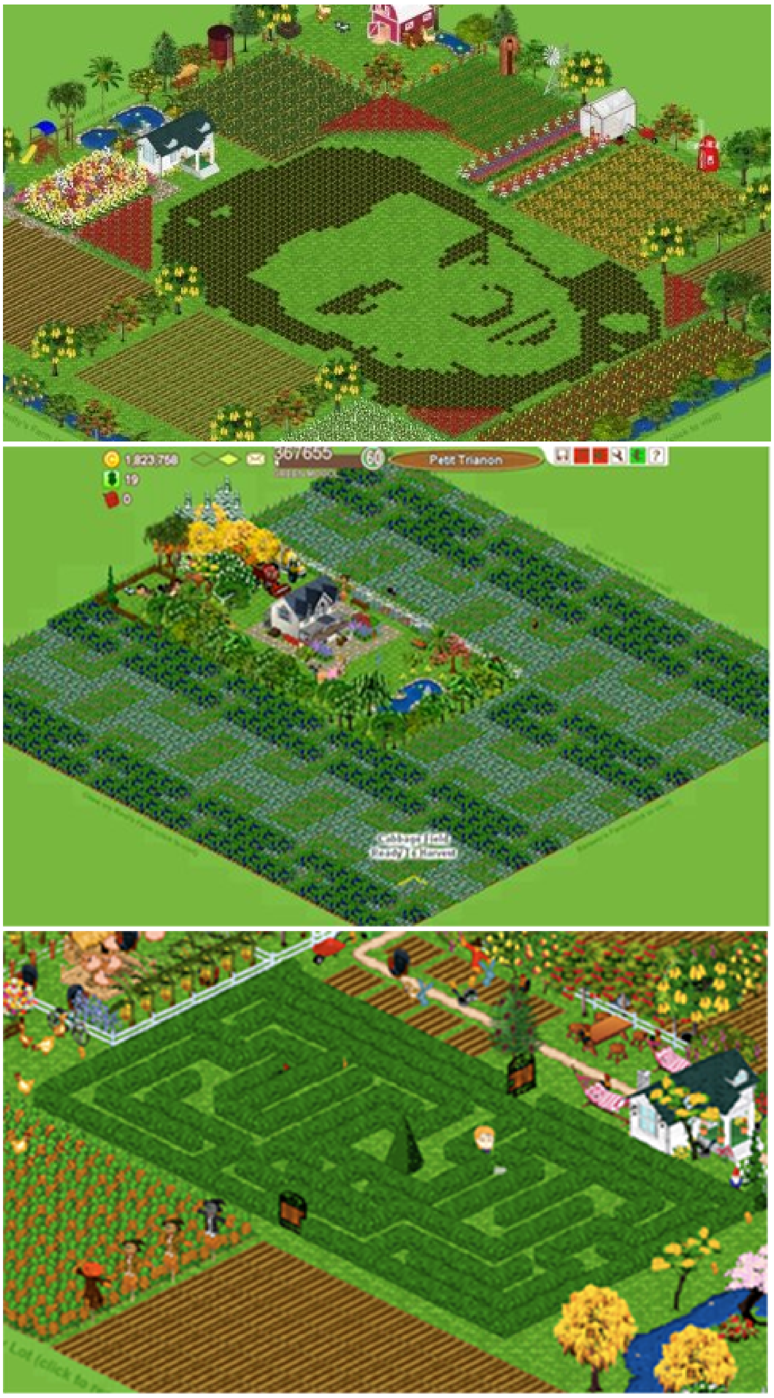


Figure 3.13: Players of *Farm Town* used the game as a canvas for creativity - This community of artists appropriated the systems of the game to create their own playful experiences

sharing tips and techniques for how to use the tools of the game to create various effects. The maze is of particular interest - as the creator reported in informal correspondence:

> [the maze] actually works - the avatar makes its way to the centre of the maze if you click by the cone hedge

The maze creator has taken advantage of the fact that the software implements a pathfinding algorithm for avatars within the game, to allow them to automatically walk between any two locations on a farm based on mouse clicks by the user. Although they may not be aware of the technical details of the pathfinding algorithm, they have devised mazes as a way of "testing" its efficiency at finding the shortest paths. Therefore the original design choice made by the developers to use a pathfinding algorithm to determine avatar movement (instead of, say, just direct control using the cursor keys) has led to another serendipitous form of fun that has emerged through playful experimentation by some of the users. *Farm Town* is just one example of games that allow the possibility to create such "pixel art" from the building blocks provided in the game. The key point for these games that allow this particular form of play is the provision of virtual space that allows players control over individual graphical elements. Farms, villages and night clubs (as seen in other games) could have easily been represented by a simple list of buildings and items, but the simple virtual grid allows for exciting creativity and play generated by the players themselves.

The players appear to exploit "gaps" in the game design, which freedom to express their own playful nature despite there being no direct benefit to them in the formal game structure, such as gaining points or rewards. In one of its more extreme forms, Henry Lowood highlights the increasing popularity of "Machinima"[174], where players use the 3d environments of modern games as virtual film sets for the creation of elaborate films. Some games, such as *LittleBIGPlanet*, have taken advantage of this form of creative play by providing tools to support artistic endeavours - however, creativity can be found in *any* game where there are "gaps" to allow this form of play.

3.5 Design Challenges

Mischief creates a problem for game designers. Commercial games go through serious processes of testing to make sure the game gives maximum enjoyment to the players. Do the players understand what to do? Do they die too often in certain places? Are the rules easily understandable from the illustrations in the rulebook? (e.g. [271]) Based on focus groups, blind testing and other evaluations, game mechanics are tweaked and adjusted to be able to create the optimal experience. However, a player who chooses to deliberately behave in ways contrary to the game 'vision' is a designer's nightmare. This section explores the issues surrounding mischief from a game designer's perspective - as these behaviours are frequently enabled by the game mechanics themselves, designers have the tools to shape and control misconduct itself.

3.5.1 Misconduct and Identity

> Normal Person + Anonymity + Audience = Total Fuckwad
>
> - "John Gabriel's Greater Internet Fuckwad Theory"[160]

Misconduct, especially where abusive, is linked to issues around identity. Anonymity often means lack of *accountability* since the cost of replacing a temporary identity is usually low. People have used and abused this trait of social systems for years, from activities of international espionage and even for avoiding the draft for the war in Vietnam [21, p30]. Anonymity in social systems can also lead to de-individuation effects and changes in attitude - studies of Internet discussion boards show that aggressive "flaming" language is much more pronounced where the users are anonymous [79].

The economists Eric Friedman and Paul Resnick showed experimentally, that in a system where participants were anonymous and capable of quickly replacing identities, the rational action is to distrust all newcomers until they had a proven reputation [102]. This is contrary to the development of a successful functioning society. In other words, positive reputation has genuine value, but having no reputation at all is equivalent to having a negative reputation. This may be familiar for users of auction website *eBay*, where having anything less than a perfect 100% reputation affects your perceived trustworthiness by customers, and therefore your ability to sell items [224]. It works the other way around too - names and identities have value in their reputations [260], so there is an active trade community where players can sell identities (and therefore privileges, respect and prestige) to each other.

Richard Bartle talks about anonymity in games as a "buffer between all your separate identities, not just the real and virtual" [16, p175] and that it is common to have multiple virtual identities - and the identity of each is kept a secret from associates of the other. For example, you may not want your guild buddies to know that it is you that controls the evil wizard that has been causing them so much trouble! The important thing is not necessarily anonymity, but the ability to have several possible identities which are equally likely to be "real".

The power of anonymity to griefers is dependent on context - perhaps unsurprisingly, it appears to be considerably more rare in face-to-face scenarios. Stewart Woods found that 97.5% of players expressed "deep displeasure" at the thought of abusing game rules - they considered the abuse of the social contract within a face-to-face game "constitute[s] a 'pathological act' suggesting 'a severe social disorder'" [290]. Similarly in Karl Bergström's ethnographic studies of board gamers, the concept of 'cheating' in this way was not once mentioned by any participants [22], echoing Stewart's findings of player disbelief that such a thing could occur.

3.5.2 Policing

It is a safe assumption that some form of mischief has occurred within every social game at one point or another. However, the official reaction of developers to this kind of mischief varies from game to game.

Developers and publishers have a real responsibility to ensure the enjoyment of their game by their players. So, when there is a threat to that enjoyment, it must be tackled in some form. If this is a mechanical threat, such as unbalance between character classes, there may be adjustments to calculations made behind the scenes of the game. If there is a problem with hacking, or other direct cheating by players, developers can use one of several solutions created by middleware developers to combat cheats [59, p129]. If there are internal threats to the fun experienced by a sub-group of players (e.g. racism, sexism, homophobia), they need to be dealt with appropriately. For some games this includes a system of warnings leading to possible permanent ban, and for others it may mean mechanical changes to make particular behaviours less damaging.

Since the idea of playful misconduct is at the fuzzy border at the edge of what is socially acceptable, it can happen that misconduct is incorrectly treated as harmful behaviour (when by definition it is not) and policed somehow by the developers. This approach is arguably dangerous because playful misconduct can be considered just as valid as normal play, and, as shown in the examples above, create a richer more entertaining atmosphere for the game generally.

Some developers are strict about monitoring and managing player behaviour. For example, the children's online game portal *Club Penguin* allows users to communicate; however the developers are extremely serious about their child protection policies. Parents may select their children's communication be limited to an "Ultimate Safe Chat" mode (which is also mandatory on some servers), where players are unable to type messages to one another and instead must select from a limited selection of pre-defined expressions. Although protecting children on the service is an important goal, such harsh measures may also prevent milder misconduct on the service.

At the other end of the spectrum, CCP Games, the developers of the MMORPG space game *Eve Online*, take a uniquely laissez faire attitude to policing their players. In one famous example, a single player created an elaborate scam, whereby he gained

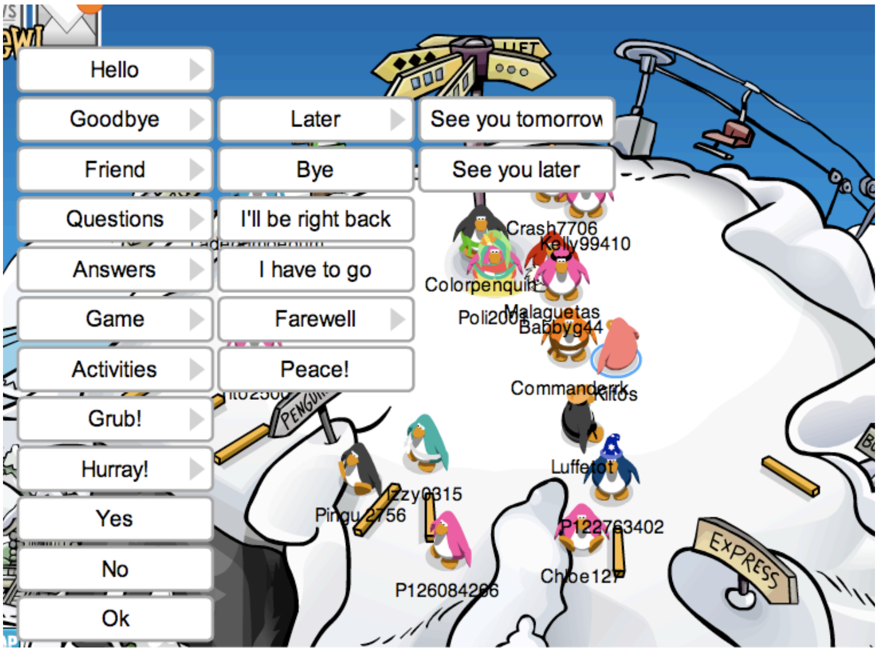


Figure 3.14: Some games restrict communication capabilities of the players to combat abuse - Players of *Club Penguin* can only select from a pre-defined list of phrases.

the confidence of several rich "corporations" (formal in-game player groups), under the pretence of clubbing together to buy a particularly high valued in-game item: the blueprints of a massive capital ship that would then be shared among the investors. At the last moment, the scammer known as "Cally" collected all the investment capital and disappeared. This act caused the virtual bankruptcy of an in-game bank and several of the investors, and caused genuine damage to the in-game economy by the removal of currency that is worth upwards of $100,000 at the then market rate [247]. The game has since become famous for its particularly cutthroat social environment, and has seen countless assassinations and vast convoluted confidence scams (e.g. [100]). In such an environment, where "anything goes", playful misconduct is present and allowed to continue without restriction, but is somewhat overshadowed by the explicit acceptance of genuine sociopathic behaviour of the players by the game developers.

The topic of governance and policing player behaviour in online games is complicated, and policies must be dependent on the style of game and the type of audience (e.g., *Eve Online* is obviously adult). It is a delicate balancing act between maintaining an atmosphere of freedom and preventing genuine harm [127]. However, it is important to consider that social behaviour in games is not a "black and white" issue. Playful misconduct and mischief, as behaviours that sits on the fuzzy edge of social acceptability, should not be sacrificed as a cost of stopping genuinely harmful behaviours.

3.5.3 Paidic Design

In the seminal work "Man, Play and Games"[44], the sociologist Roger Caillois described all play, including games, as being positioned on an axis between two extreme points: *Paidia* and *Ludus*. He described the concept of Paidia as "a primary power of improvisation and joy" compared to its polar opposite, Ludus, for play heavily defined by strict rules, which is defined by "a taste for gratuitous difficulty". Every game conceptually sits at some point on the scale, depending on how much of the experience is driven by a formal system of rules.

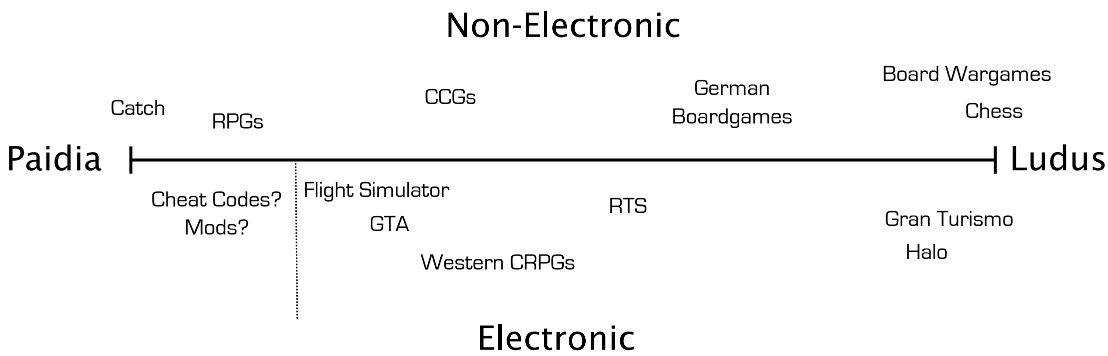


Figure 3.15: Roger Caillois defined play on an axis between *ludus* and *paidia* - All games can be placed on this axis

Man, Play and Games was written long before digital games became popular, but still applies just as well in both the analogue and digital worlds. When thinking about playfulness and emergence in all kinds of games, it is helpful in thinking about the types of play encouraged and enforced by the game design. Roger's classifications of play simply serve as a lens through which we can analyse play.

Using examples from "traditional" console games to illustrate these concepts, the *Guitar Hero* and *Rock Band* games are examples of play that is further towards the ludic end of Caillois conceptual scale. In these games, you either succeed in following the instructions of the game as best you can, or you fail. There is no room for individual interpretation or play within the rules as imposed by the games. The rules can't be bent and there are little to no meaningful choices offered to the players. In the words of Gonzalo Frasca, "Clearly defined goals do not generally leave much room neither for doubts nor for contesting that particular objective"[101]. This does not mean the games aren't *fun*, which they evidently are, but that the source of that fun is not the same as it is in other games that rely less on Ludus.

In non-electronic games, such as those found on every decent schoolyard, play that is at the Paidic end of the scale are supported natively because the rules are highly flexible and defined largely socially. However, when games are mediated by computer systems, the inflexible way the systems are built means there are few such "holes" that allow rules to be bent and adjusted on-the-fly.

At this end of the scale, *Grand Theft Auto*, *The Sims* and other "sandbox" games can be found since they are designed to be more freeform play experiences, where players are allowed, or even encouraged, to explore the environment and find their own source of amusement.

> [Paidia] covers spontaneous manifestations of the play instinct: a cat in a ball of wool, a dog sniffing, and an infant laughing at rattle represent the first identifiably examples of this type of activity
>
> - Roger Caillois [44]

The game designer Chris Bateman interprets Paidia as the "anarchic nebula from which all play originates"[17] and argues that the first moments of playing any new game are highly playful, until the user learns the ludic rules of the game and falls into the structured patterns of play [18]. However, it is important to note that Paidia is not just found in games that are designed specifically to allow for this form of play. Just about every game supports paidic play in some form (even if it is just using the game disc as a Frisbee!), but through design choices, some games support this style of play more explicitly.

The Freedom to Fail

A lot of games give the illusion of freedom, but the formal structure of "how the game should be played" only allows freedom within these carefully constrained limits. True freedom in design gives the players the opportunity to wilfully fail at the task they have been given. By giving the player freedom to do this, they can generate their own goals that are not dependent on playing within the constraints of "normal" play.

As a contrary example, in *Rock Band*, a group of players may decide they wish to play their own version of a song, only including the lead guitar at some sections, and giving more room for extended drum solos where they do not exist in the original song. If they tried this, when the game detects the lead guitarist is not playing notes where they should, it would interpret the playfulness as "failure" and cut the game short. This would then deprive the players the chance to enjoy their self-directed paidic experience.

Grand Theft Auto (GTA) is an example of a large commercial game that gives players the freedom to fail and therefore far more freedom over their experience of the game. In the original game released in 1997, the players only had a limited number of lives, and when the player died too often, the game would end in failure. In the sequels, the game's designers have recognised that the player has the "right" to die, and to die as often as they please (e.g. by repeatedly throwing themselves off the top of the tallest buildings in the game-world just because it sounds funny when the avatar hits the pavement). This gives players the freedom to create their own fun experiences within the game, without fear of intervention by the game design. The *Grand Theft Auto* series is not without criticism on this point, however. For example, in all of the iterations of the game, players are punished for not following story points by being denied access to the complete game world. Large swathes of game world ripe for exploratory, paidic and emergent play are hidden until the player operates the game "correctly" by playing through a series of linear and controlled missions as part of the story arc.

These examples of paidia and ludus are taken from popular console games; however, it is very important to stress that paidia and playfulness are present in all kinds of games, regardless of platform.

Design "Gaps"

> One of the sweetest pleasures as a game designer is seeing your game played in ways that you did not anticipate
>
> - Katie Salen and Eric Zimmerman [229, p540]

From the designer's perspective, players behave erratically when they are creative. In games like *PASION Fruit* in particular, the emergent ideas of players to ignore their scores and focus on self-directed goals is clearly a result of playful experimentation within the game rules. These players want to explore the boundaries of what is permitted within the game and what can reasonably be fun to achieve. In doing so, emergent challenges are created that a significant portion of players may feel are, perhaps, more fun than following the formally defined game objectives.

In this respect, for the designer it is pleasing the players have found new and novel ways to enjoy the game that were previously unexpected, but it challenges them to think, "what could we have done to allow more of this behaviour?" Even without the resources of a large game developer to make sweeping changes to the design, subtle changes could still encourage further playful and emergent activity within the confines of game functionality. Design gaps that allow social intervention and appropriation of the game mechanics can alter the meaning and purpose of the game, creating new social experiences [198].

The emergence of playful behaviours in social games appears to be based on what can be termed "design gaps" that is, some possibilities for players to have an effect on the game world that may not have direct benefits or cost (and may have been unintentional on the part of the designer). For example, being able to manually place items in a virtual world, or being able to customize avatars, or even providing scope for player-defined challenges are all kinds of "gap" in the experience as defined by the formal, ludic, game structure.

In the case of *PASION Fruit*, every action in the game has a direct consequence, and emergent play only occurred in spite of these design decisions. Had there been lower barriers on the "design gaps" where lack of ludic barriers mean the game does not directly punish the player for failing to conform to the rules, experience suggests there might have been a much more active and paidic in-game society.

Figure 3.16: *J.S. Joust* is a simple game that is mostly made of "gaps" - Players try to knock each other's controllers through experimenting with space and movement. Image (CC) *A Bit of Alright*

Restrictive Design

Although many players can identify “design gaps” to be exploited for playful enjoyment, in many games the design can be highly restrictive. In other words, the barriers that guide players along their game experience can be almost impossible to overcome. Players are forced to play along with the strict narrative path of the game and are unable to create their own playful experiences for themselves. Social network games like *Mafia Wars*, *West Wars* and many others are often driven by one major form of interaction - semi-random “missions” that must be completed by repeatedly clicking the same button again and again. The descriptions and rich game narrative of the missions change over time but the actual player activity remains the same - clicking a button. There is no capability for players to escape out of this design loop, and therefore few “design gaps” that allow for playfulness to appear.

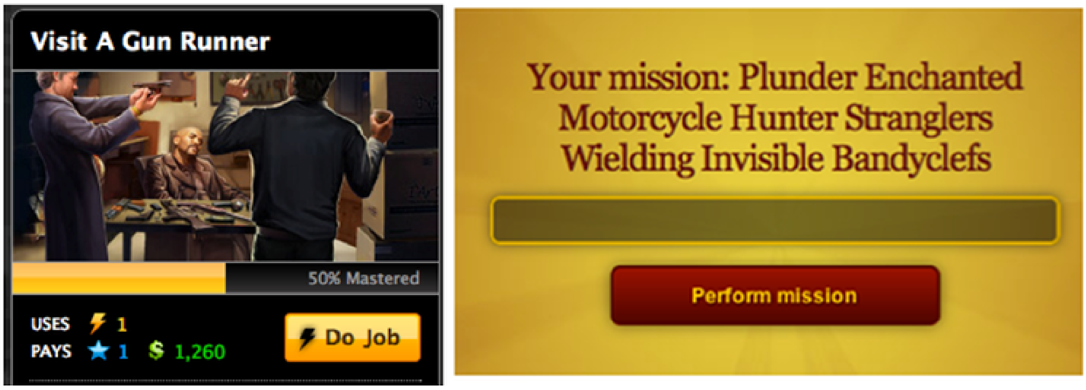


Figure 3.17: In some games the interaction methods can be very simple, regardless of narrative depth - *Progress Wars* (right) pokes fun at games like *Mafia Wars* (left), that are based on very simple interactions

It is also possible for some designs to be so tight that there is little or no scope for playfulness within the formal game structure. The examples of highly ludic “restrictive” social games such as *Mafia Wars* appear to lack any of these “gaps” for players to exploit. Even in games that contain such “gaps”, the possibilities become closed as barriers to use them increase. If a player is punished for exploring a game space, or going "off the beaten path", the motivation to do so may be reduced; the player is effectively discouraged from creating more playful experiences.

Although these games have been criticized and parodied (e.g. with *Progress Wars*) for their simple and repetitive nature, it is very important to note that these games are still fun for millions of users. The narrative is strong enough that it does not matter to the players that there is low depth of interactivity. This form of structured play and enjoyment is perfectly valid (and should not be treated dismissively), but is based more on passive (almost as a spectator) than direct play.

Games as Platforms - The Sandbox

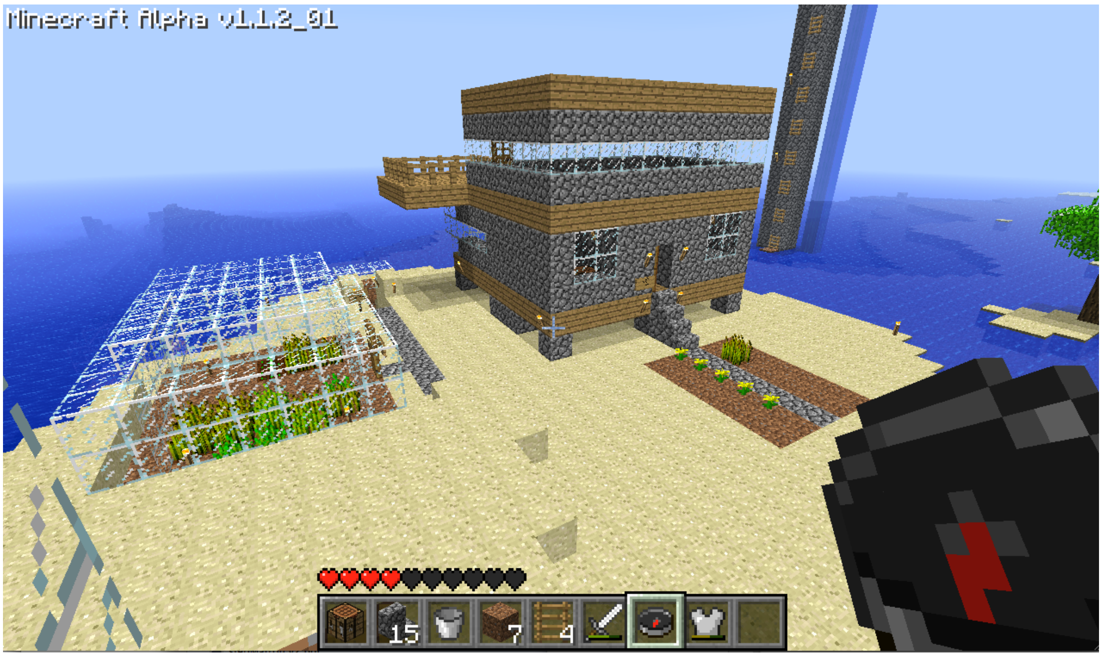


Figure 3.18: Recent Sandbox games such as *Minecraft* avoid formal objectives altogether - The "game" is just an interesting environment for self-directed play

If restrictive games are defined as being at the *ludic* end of Caillois' axis, as the number of design "gaps" increase, the game conceptually moves towards the *paidic* end as affordances for appropriation by players increase. Since before *SimCity*, games have been developed purposefully with this *sandbox* approach to allow for more paidic play.

The recent success [268] of geological games *Minecraft* and *Dwarf Fortress* has demonstrated that a huge number of players strongly enjoy this freeform, *paidic* play. Both of these games eschew the contemporary approach to game interfaces, focussing instead on creating an enjoyable model that can provide interesting play. Neither game has stated goals, and the graphics in both are somewhat rudimentary, although they have a charm of their own. *Dwarf Fortress* in particular, takes this to extremes - the game itself is rendered in ANSI text (although the community has built graphical tilesets) and the real complexity happens under the surface. The game *needs* to be simple in graphical terms because the simulation layer is so complex that it taxes modern hardware to its limits - it simulates not only geological formations, but historical events, cultural development, fluid dynamics, biomes and weather effects to name a few.

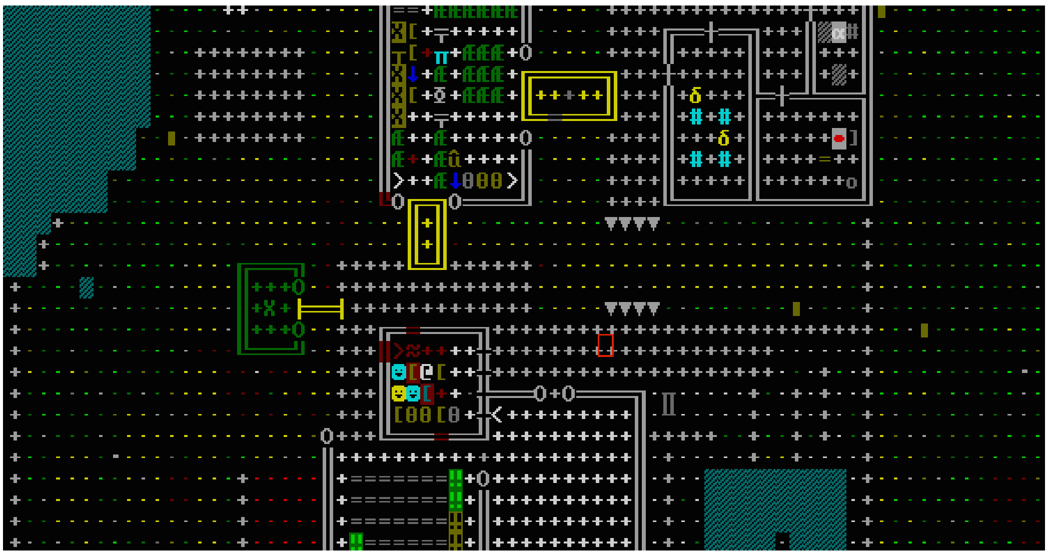


Figure 3.19: *Dwarf Fortress* is a hugely complicated fantasy world simulator - Players are free to make their own games using the physical and natural laws of the simulation model.

> [DF has] a type of gameplay that one can imagine as utterly dominant in some alternate universe, where clever use of processing power, and not processor-intensive graphic gimmickry, is the dominant aesthetic among those who prize games
>
> - Greg Costikyan [62]

This complicated simulation gives the players implicit tools to create interesting play - whether this is found in battling hordes of goblins, developing complicated machines or just making an awesome castle; the play is non-prescriptive and paidic.

3.6 Discussion

> Never put anything on the client. The client is in the hands of the enemy. Never ever ever forget this.
>
> - Raph Koster's Laws of Online World Design [152]

The previous chapter focussed on exploring the social approach to games as layers of rules tempered by social context, and this chapter has discussed what happens when the players intentionally abuse the established social rules in order to create new forms of play. This abuse of social rules and game mechanics can not always be anticipated by the designer. Fundamentally, the many facets of mischief and misconduct within games highlights a universal truth - *games are not cathedrals*. Just as an author may realise that their clever literary allusions (and *Ghostbusters* references [149]) will be lost on most readers, and a contemporary artist may learn that their masterpiece was hung upside-down, so must game designers come to the realisation that their games belong to the players. If a player *can* abuse, twist and destroy a game, someone *will* do so. Julian Kücklich calls this *deludology* [163] - how the player wrests control of a game from the designer's intent, and although "cheating", they may be engaging in a richer more thorough relationship with the game than they would be able to "by the rules".

As such, games can't be considered artefacts - they exist surrounded and infused by a *paratext* [59, p83] of cheat-guides, walkthroughs, websites, chatrooms, communities and cultures.

Players have also come to realise that they have different interpretations and expectations from games. In face-to-face situations, players negotiate appropriate rules and handicaps for the benefit of a better game for all. Where social play is remote with strangers, new issues of griefing and abuse arise as different players bring their clashing expectations to the shared game.

Although some behaviours are obviously against the social contract of the game, there exists an unfixed boundary between what is acceptable and what is not. The concept of "playful misconduct" has been introduced as a positive behaviour that can be found in social games. Playful misconduct is the intentional challenging of social norms through actions or nature that runs contrary to the general expectations of the rest of the game community. This mischievous activity is explicitly separate from genuinely sociopathic behaviour such as griefing. Where the griefer's intent is to cause upset in fellow players, the mischievous user's intentions are positive, characterised by performative and playful actions within game spaces.

This misconduct can be in the form of performance, with the direct actions of a player behaving in a mischievous way - such as the example of the medieval warrior knight who refuses to wear clothes. It can also be serendipitous, involving leaving "traps" for other players to encounter, and setting up odd and strange experiences, the reactions to which the creator may never experience. Emergent gameplay arises out of social misconduct through the formalisation of unusual play by a group of players within the game that runs counter to the established fiction of the game and the social expectations of the general player base.

The reason for highlighting playful misconduct is that it appears to be universal among social games. While approaches to governance can be harsh or lenient, it appears that playful misconduct will always emerge as a constant and indomitable aspect of any game society. Dmitri Williams and colleagues propose [282] that the social and cultural values of game communities are shaped and formed by a "social architecture" inferred from the game rules. Just as game design informs social behaviours, it also informs social edges. While the carefully designed rules of a virtual world may imply one set of behaviours, they also create opportunities for the rules to be bent and misused for fun in surprising and unpredictable ways.

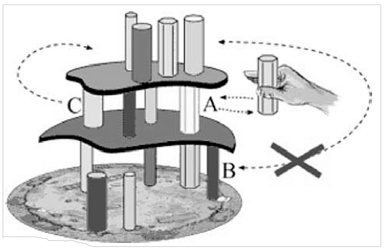
Governance is an extremely important issue in games with online components; a game world, and therefore the online social environment facilitated by the game, is in a sense "owned", and is under authoritarian rule by the business who maintains it. This policing of genuinely harmful behaviours by that business must be carried out with careful consideration towards these valid mischievous and playful activities, which can easily become victims of changes in game rules intended to stop inappropriate behaviour.

The field of Games Studies recognises that "social play" is one of several valid and normal way for players to be able to enjoy multiplayer games. This chapter has shown that, as the range of different online gaming applications grows, it has become clear that the category of social play itself contains a wide range of different ways in which players play and have fun. It includes the spectrum of griefing, playful misconduct and peaceful cooperation and every shade of gray against the backdrop of an evolving social environment. It is imperative to study the nature of playful social environments within this broad social context, not just for curiosity, but to better understand the potential effects of design choices on social behaviours, knowledge of which can help to inform the design and maintenance of game societies in the future.

The mix of social behaviours of players, both positive and negative, appears to be a function of the *social architecture*. That is, the mechanics and interfaces that make up a game determine the forms of social interaction that occur within the game. There is purposefully no distinction between appropriate and inappropriate activity because both are implied by the arrangement of the social architecture. For example, the mechanic of passively sharing user generated content in *Spore* implicitly invites mischief. By creating the semi-anonymous random sharing system, the emergence of *Sporn* was inevitable. If *Sporn* is undesirable to the designer, then they were negligent for designing a system that invites it. To better design social games, we need to understand game mechanics as part of these social architectures that together determine the social behaviour of the players. Given the complexity of the social factors surrounding play, as introduced in these past two chapters, game designers need tools to be able to examine social effects in more concrete terms.

4

The Social Architecture



Villa Paletti (2001)

The term "Social Architecture" is taken from the political and economic sciences to describe the collection of formal structures and systems that evolve within a society to support the culture and communities within [294, 295]. It has its roots in a Marxist understanding of the relationship between the "base" processes of societal mechanics and the "superstructure" of the emergent culture [184]. Through the decisions of system designers, Lawrence Lessig argues that, in the same way, the structures of code have similar direct and indirect effects on the behaviours of the users of that system [170]. Dmitri Williams and colleagues [282] use Lawrence's ideas to help understand social behaviour within *World of Warcraft* - they propose that the choices of game mechanics have had profound effects on the behaviours within the society of players.

Importantly, in the development of such systems (whether for governance, computer systems, or game designs), the social architecture is made up of a complex collection of inter-related mechanisms. It is therefore something that must be carefully designed. Indeed, the social and community aspects of modern social computing applications can not simply be considered as optional features that can easily be applied to existing single-user systems. For these to be effective and engaging, the fundamental social structures, and interactions they allow or encourage must be considered and designed with care and attention. Creators of games that attempt to harness these social aspects can not just be game designers but must be "*social architects*"[226, p500].

This chapter explores the concept of social architecture and how it applies to game design. It is based on the assumption that, given the same starting conditions, the interplay of game mechanics in a given context has a reliable and predictable effect on the social behaviour of the game players (the validity of this assumption is supported with experimental evidence in chapter 7). These changes are both direct, in the type of communication players engage in, and indirect in the broader long term affect game mechanics may have on the culture of a game community. The key argument is that all game mechanics affect social behaviour in some way, regardless of the context of the mechanic in the game. Similarly, different combinations of similar mechanics may also profoundly affect the resulting social patterns observed in play. Therefore, the social architectures of games (and, indeed, social systems in general [138]) must be considered *holistically* as organic systems.

For example, the card game *Hearts* is a simple trick-taking game where players attempt to claim tricks without collecting negative-scoring hearts. One key mechanic is the option for players to "shoot the moon", where a player who collects every single negative-scoring card in the game is able to reverse the rules and claim victory. The addition of this mechanic changes both the strategies of the game, since a player may opt to go for the alternative victory, but also has knock-on effects on the social architecture. Now, when one player appears to be close to claiming this special victory, the other players are forced into a period of negotiation. In order to prevent the coup, one of these players must claim at least one negative point. However, this action will be at personal cost (in points) that will give the other players a slight relative gain. This social tension is a second-order effect of the change in mechanic that may just have been invented to give unlucky players a chance to be competitive.

4.1 Mechanics for Stimulating Interaction

Formal social mechanics are ubiquitous on the social web. While we have long been able to discuss the relative merits of *Star Wars* and *Star Trek* on bulletin boards, chat rooms and forums, now more complex social mechanics give us further options for a social interaction on the Internet. From basic features such as the ability to create profiles, to functions such as "friending" or "following", the implicit aspects of inter-personal relationships are becoming more *explicit*.

In games, social mechanics often take a more central role - interaction is not simply through direct communication and often involves more complex patterns. Players may be able to engage in trading, aggression, cooperation, thievery and politics. José Zagal and colleagues propose [300] that social interaction in games can be either be *stimulated* (such as through the trading mechanic used in *The Settlers of Catan*) or *spontaneous* (such as chatting during a *Quake* deathmatch) in nature. While these terms effectively describe *direct* social interactions that are stimulated by a game design, here it is proposed that some (even non-social) mechanics may also have *indirect*, second-order effects on the social interaction in a game. In figure 4.1, this model is extended with an additional dimension to represent this possibility.

Directly Stimulating Interaction

Games employ a wide range of mechanics that directly stimulate interaction. José Zagal uses as examples, games where "the main goal can be achieved only if there is social interaction among the participants"[300]. Anyone who has ever been forced to play *Two Truths and a Lie* as part of a soul-destroying corporate "ice-breaking" session will be very familiar with this type of mechanic.

Trading mechanics also directly stimulate social interaction, usually giving players the opportunity to mutually advance their position within the game. For example, in bean-trading game *Bohnanza*, the game mechanics may force you to use undesirable

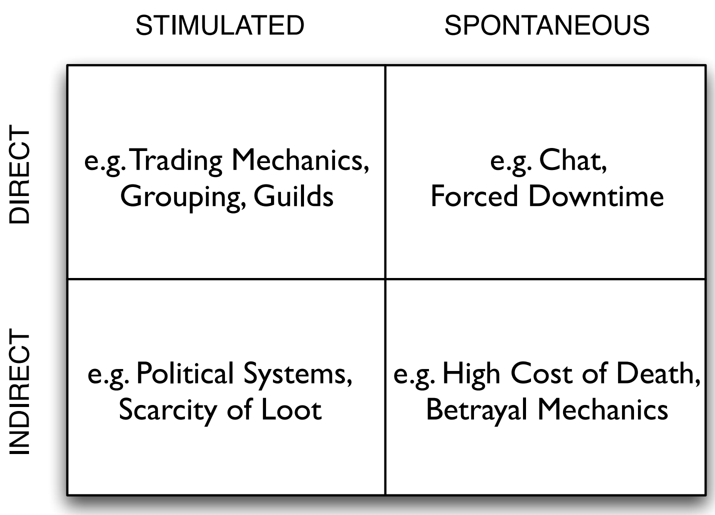


Figure 4.1: Game Mechanics stimulate social interactions in different ways - Stimulation can be direct or indirect, and the types of interaction described as spontaneous or stimulated (proposed by [300])

goods. As such, there is a direct incentive to trade with other players since retaining these useless goods will directly harm your position. Regardless of your personal predisposition to interacting socially and making trades, the game forces you to engage in these activities in order to be competitive. The relative value of social interactions that are directly forced is, of course, arguable.

José also identifies this as a vital part of *collaborative* games such as *The Lord of the Rings: the Board Game* and *Pandemic* [301]. In these games, the players strive for *mutual*, rather than individual victory. Either everyone wins together, or everyone loses together. Invariably, the players are forced to interact socially in order to cooperate towards achieving that end with their limited resources. In a related genre, *traitor* games such as *Shadows over Camelot* and *Battlestar Galactica* have a mechanic where some player may be secretly working towards sabotaging the efforts of the team in order to achieve an individual victory. Here there is a pressing need for the good-guys to cooperate to quickly identify and deal with this internal threat.

Figure 4.2: Trading games *require* players to socially interact to be competitive - You are unlikely to win *Masters of Commerce* without engaging in trades with other players. Image ©Gary James

Indirectly Stimulating Interaction

Indirectly stimulated interaction is observed where there is any need for negotiation. This is most clearly seen in game systems where there is a scarcity of resources - players are forced to negotiate between them in order to ensure fairness.

In Massively Multiplayer Online Games (MMOGs) the complicated social issue of "loot distribution" arises indirectly from mechanics of scarcity. In MMOGs, it is common to require players to cooperate in order to defeat larger enemies. Player classes are defined based on this mechanic - the different classes have synergies that mean it is more efficient for players to work together in groups. However, a problem arises when it comes to rewards. Since large enemies may "drop" one or two very valuable items, how does the group decide which of its members deserves the reward? This problem becomes more pronounced at the higher-end of game play where up to forty individuals may each have equal claim on the single hugely valuable item that is dropped. How can a group of strangers, who may all have invested significant amounts of time in the pursuit of this treasure, agree on who deserves it the most?

In *Everquest*, the issue of high-level loot distribution was commonly determined through a complicated socially enforced system known as “Dragon Kill Points”[93]. In this system, players accumulate points based on the amount of time and effort spent supporting large raids *without* reward. Once an enemy is defeated, there is then a bartering process where players may choose to exchange some of their saved points in order to stake a claim on the treasure. The key to this system is that it is entirely socially managed - there was no hard-coded support for this system in *Everquest*, and it had to be reliably centrally managed by a highly organised group of players. Tom Chatfield calls the DKP system a “sophisticated miracle”[50, p179], in that the game has such great value and meaning for the players that they will go to great effort to build such a complicated supporting social infrastructure.

Later MMOGs, including *World of Warcraft*, deal with this problem through the addition of extra formal mechanics that are implemented into the game code by the game developers. These are then used to resolve the issues around loot distribution whenever a group requires arbitration.

> ...When an item equal to or above the threshold is on a monster that is killed, everyone gets a pop-up box on their screen with the item and pass or roll options and a timer... The highest roller of all those who choose to roll automatically gets the item. Anyone who waits until the timer expires automatically passes. Items below the threshold are taken care of by normal round robin rules. If more than one player ties a loot roll, a random player will receive the loot...
>
> - Just a small snippet from the complex *World of Warcraft guide to Parties*[1]

This complicated system of barter and profit sharing is an important part of the social architecture of many MMOGs. It serves to illustrate that simple social mechanics such as *grouping* can directly stimulate complicated social interactions between players in order to deal with the associated second-order effects.

[1]http://www.worldofwarcraft.com/info/basics/parties.html (Accessed October 2010)

4.1.1 Mechanics for Spontaneous Interaction

Spontaneous interactions are not explicitly part of the game design itself (i.e. the interaction is not required as part of a winning strategy), but part of the supporting architecture that enables additional channels of social interaction. The emergence of this kind of interaction is highly reliant on the nature of the players involved.

Directly Supporting Spontaneous Interaction

At their core, the mechanics for supporting spontaneous social interaction are those that provide a *time* or a *place* for it. In terms of places, this can be as simple as a facility to allow players to chat with one another in an online game, or a common location where players will be in the presence of others. In *Ultima Online*, characters could use the bank to store items, so the banks in the world quickly became established as being the most important social hubs in the virtual world, used for everything from trading to simply hanging out with friends.

In other games, mechanics create opportunities for spontaneous interaction as a part of *downtime* in the tempo of the game [297]. In *Star Wars Galaxies*, the main method of travel was via shuttle port. However, the shuttles only departed once every ten minutes. This mechanic was explicitly designed to force players to hang around in the vicinity of the shuttle ports, and hopefully provoke this kind of spontaneous interaction. Similarly, the combat system was based on resources that could only be replenished by spending time in social "cantina" spaces, again providing opportunity to engage in social interactions [156]. Understanding the close relationship between downtime and social interaction is a crucial tool of the social architect. Raph Koster makes it one of his *Laws of Online World Design*: "**Socialization Requires Downtime**"[153] (emphasis his!)

Many team-based shooters such as *Counter-Strike* also exploit downtime to support social interaction. In the midst of the game the frantic pace of the action makes social interaction difficult. However, the mechanic of death in the game requires players to wait a few minutes before being allowed to re-join the action. In this space, players are not only able to relax from the stresses of combat, but have time to engage in spontaneous interactions with the other dead players - most often by expressing disbelief at the unfair circumstance of their demise.

Using downtime as a mechanic to give space for social interactions is also present in some board games. In most games, the requirement that all players *strive to win* (see Section 2.1.2) implicitly excludes room for idle social interaction - the optimal player will spend all time available either concentrating on their current move or preparing for the next. Some games experience downtime (accidentally or intentionally) as an emergent mechanic. In *Thurn & Taxis*, for example, players claim points on the board based on the cards in their hand, however the actions of each player may dramatically alter the situation on the board. This means that effective forward planning is almost impossible. By the time you come up with a master plan, the player whose turn is before yours may perform an action that renders your plan worthless. In this way, the game mechanics implicitly open up the downtime to non-game activities like social interaction because there is no game-relevant activity the players can perform.

Indirectly Engendering Spontaneous Interaction

Subtle changes in the mechanisms and interface can have profound knock-on effects in the wider social environment of the application. These second-order effects may be purposefully designed or only appear emergently in the presence of a community.

In his research into the social architectures of MMOGs *Everquest* and *World of Warcraft*, Nick Yee highlights the culture of *altruism* [299]. He theorises that the emergence of altruistic behaviour in the social community of *Everquest* (EQ) is a result of differences in the mechanics of death employed in each game. Character death in EQ forces players to go back to the location of their death to retrieve their corpse in order to regain lost items, while the mechanics of WoW allow players to reclaim their lost items automatically. In EQ, it became commonplace for players (including strangers) going out of their way to help the recently deceased, despite there being no in-game reward for doing so:

> It is not simply that EQ provides players with tools with which to offer assistance, but these tools are readily available at a low cost... a five second spell at minimal cost to the provider can save another player an hour of painful and dangerous corpse retrieval.
>
> - Nick Yee [299]

In the design of *Everquest*, it is unlikely that the death mechanic was specifically designed to encourage altruistic behaviour. Similarly, the designers of *World of Warcraft* were probably more concerned with the immediate benefits of having an automatic system for corpse retrieval, than the secondary effect on the social architecture of the game. However, it is important to consider that even in the design of key mechanics that aren't intrinsically social, there may be profound knock-on effects on the emerging culture of the game.

4.2 Social Substrates

The social mechanics of a game do not alone determine the social patterns observed in play, since it is also dependent on *context*. The same set of mechanics can lead to a very different play experience depending on differences in social and physical context. Playing *Mario Kart Wii* together with friends on the couch is a different experience to playing the same game against strangers on the Internet. The social architecture of a game, just as the real architecture of buildings, is not only determined by the structural elements but the context in which the structure is situated.

The social context, as introduced in section 2.2.1, is fundamentally about the relationships between the players. The patterns of social interaction change when the same game is played with different people - the relationships form a webbed substrate on which the rules of the game are interpreted. An interesting example is the physical game of *Twister*, which appeals to two core demographics - pre-teen children and university students. The difference in social context dramatically changes the social meaning and therefore the patterns of interaction that emerge through play. Where a child may play earnestly to win, a young adult may use the same game as social experimentation in "forbidden play"[229, 256] (also see section 2.3) and as such may have their own goals outside of those described by the game.

4.2.1 The Social Web

In online social gaming situations, where co-players were once more likely to be strangers, the emergence of the social web has seen the importance of *implicit* relationships between users be exploited to add value to online applications, including games.

The Internet and the World Wide Web are explicitly structured around using networks to deliver content. The manifestation of the Internet in the physical world is still a semi-organised but contiguous lattice of cables and wireless links that transmit data between various machines. The web is a similar structure, although the cables in this network are hyperlinks that make connections between different content based on mostly logical, rather than physical reasoning. So, at a university the computer networks belonging to the humanities and computer science departments may share the same wires and be adjacent in the physically bound network of the Internet; however on the logically organised World Wide Web the two departments are more distant, and each one is more closely linked with corresponding departments in other universities elsewhere in the world.

Recently an additional layer of abstraction has become important in the way information is exchanged online- *The Social Web*. Rather than being based on connections between nodes in the physical world, or even the abstract logical world, the Social Web is based on connections between the human users themselves. The links between people in both the real and virtual worlds adds an important dimension to understanding the value of any particular content based on the tastes and needs of the individuals themselves, bringing a subjective angle to content that has previously been treated only objectively.

This online social revolution has changed the way people play together. Rather than just using the wires of the Internet to connect and play with people they already know, now games can involve millions of strangers who share the same virtual spaces. Using this infrastructure, players build communities and share their gaming experiences both inside and outside the fiction of the game, creating new friends, enemies, alliances and vendettas of a previously unimaginable scale and reach.

Web 2.0

For the first decade of the web, the pattern of an individual's interactions was almost always as a consumer, limited to reading and absorbing existing content. The barriers to contributing were high, needing access to servers, bandwidth and the technical knowledge to be able to put these pieces together.

The power of the Social Web first became apparent with a wave of websites that were based around lowering these barriers to contribution and providing services to consumers to be able to quickly and easily add content of their own to the web. Collectively these applications were the blueprint for what has become known as "Web 2.0", a term that describes a conceptual move towards using the web as a platform for applications and services rather than simply as a repository for static information [205]. The web itself has become more accessible to be used as the foundations of social architectures of applications and games.

4.2.2 The Users Add Value

Participation is a major theme of Web 2.0 applications, including games, and works to add value to content shared online through a variety of social mechanisms. Take the example of *LittleBIGPlanet*, a game where players are encouraged to create and submit their own levels for others to play. Although level creation tools have been around for many games for decades, the cleverness of the design of this game is that the barriers to participation are lowered - the tools are simple and straightforward to use, and the sharing mechanisms are built right into the game itself. The more levels players publish to the global social ecosystem, the greater the value of the game as a whole, and without additional effort on the part of the developers.

Social participation around content can add value in an endless number of ways, not just for the owner of the content themselves but for the wider user-base of the entire service. The database of content becomes enriched with the social feedback. As Dan Bricklin discusses [38], by giving a single user a reason and motivation to submit useful information about a song, photograph or other content to your service, you can improve the value of the service for all users at once. Tim O'Reilly echoes these thoughts:

> One of the key lessons of the Web 2.0 era is this: Users add value. But only a small percentage of users will go to the trouble of adding value to your application via explicit means. Therefore, Web 2.0 companies set inclusive defaults for aggregating user data and building value as a side-effect of ordinary use of the application... They build systems that get better the more people use them [205].

Through careful encouragement of the participation of users in adding value, game and application designers are able to create a positive feedback loop within the mechanical architecture of the system. This feedback loop constantly improves the quality of their service. These improvements come with only marginal additional cost or effort on their part as the service scales over time - It is only the feedback *mechanism* that needs maintenance rather than the feedback itself.

Wisdom of the Crowds

Any large group of people contains a breadth and depth of knowledge that has a potential to be tapped, through careful mechanical design, for a wide range of purposes.

In *The Wisdom of Crowds* [255], James Surowiecki argues that under certain circumstances, the average of the decisions made independently by a group of random individuals can often be better than the decision of even the "smartest" member of that group. In this way, having large numbers of people working on solving the same problem collaboratively can lead to a better solution overall as an example of "emergence"[135] at work. Recent evidence shows that this wisdom is not necessarily a function of individual intelligence but instead related to social sensitivity [292].

Wikipedia is often cited as being one of the major successes of Web 2.0, and it harnesses this idea of "Crowd Intelligence" in order to create and edit the world's most comprehensive encyclopaedia. While the site is rife with inaccuracies and poorly referenced articles [71], the general accuracy and reliability is (perhaps surprisingly) good [107] and the benefits of careful use are self-evident. Robert McHenry describes this dichotomy vividly [189]:

> The user who visits Wikipedia to learn about some subject, to confirm some matter of fact, is rather in the position of a visitor to a public restroom. It may be obviously dirty, so that he knows to exercise great care, or it may seem fairly clean, so that he may be lulled into a false sense of security. What he certainly does not know is who has used the facilities before him.

The mechanisms at work in browsing and editing Wikipedia are simple, and very different from the process of group decision making. A single individual may contribute the bulk of any given article, which may contain several errors, but over time as people read the article and make minor corrections the quality gradually improves. The overall quality of articles on Wikipedia tends towards excellence.

For games, this wisdom manifests itself most clearly in communities built around games. The site *BoardGameGeek* (BGG - http://www.boardgamegeek.com) is a prime example. First and foremost BGG is a database of board games, with pictures and reviews of tens of thousands of titles. However, by bringing together a distributed community of players interested in a niche hobby, BGG serves to add value to the games themselves. Players work together to create new variants for old games, redesign unclear maps and rewrite instructions to benefit new players. They become involved in the creation rather than simply the curation of the game that may have been long abandoned by their designers.

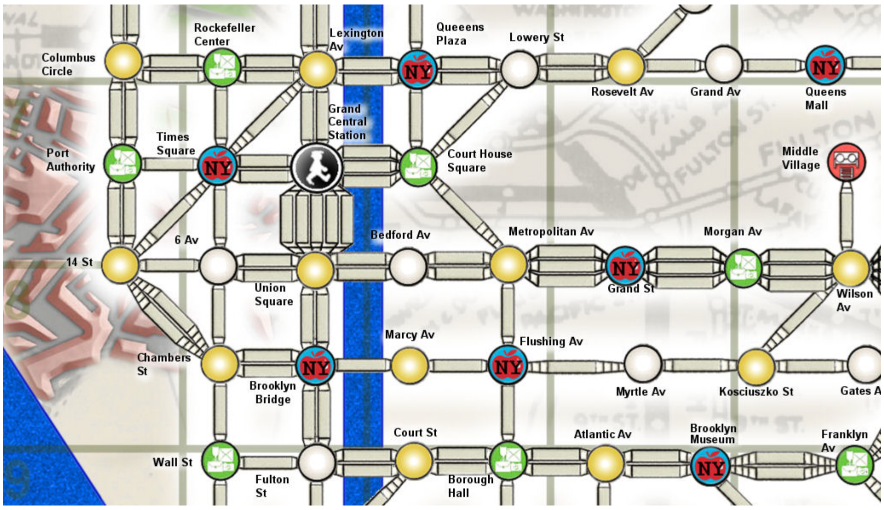


Figure 4.3: A fan-made expansion for *On the Underground* - Although the publisher is defunct, the game continues to be developed by the community of fans. Image ©BGG user “Meat”, Used with permission

Figure 4.3 shows one example of this. *On the Underground* is a board game where players construct their own version of the London Underground by extending different coloured lines to reach different destinations. The publishers of the game, *JKLM Ltd*, needed to seek permission from *Transport for London* in order to replicate the copyrighted map and stations of the real underground system. Until the game publishing company went into liquidation in early 2010, there had been plans for new editions based on the underground systems of major cities around the world. Although the publisher is now defunct, the game is able to survive and continue evolve thanks to the community of players that have build around it online. Fans are able to answer one another's rule questions and develop unofficial expansions and variants for free, such as the New York subway expansion shown in Figure 4.3.

4.2.3 Community Bias

A problem with harnessing communities for generating value and content is that not every group is the same. Particularly in the early days of the Social Web, the early adopters of the new technologies were generally highly computer literate and inquisitive individuals with a passion for technology. These characteristics are not shared by the populace as a whole, so early contributions were centred around activities and interests that are already popular among this social group. For example a disproportionate number of people who are likely to edit Wikipedia are highly knowledgeable about the Internet and computing topics, since the social group who first became exposed to the site is socially predisposed to be interested in these fields [232, 237]. Therefore the articles on computing, and hobbies of interest to the associated social group, are much more in depth than other unrelated topics.

> After using Wikipedia for a while [I realised] it was incredibly biased... there was more information on Middle Earth than Central Africa.
>
> - *Wikipedia Project on Countering Systemic Bias* founder Xed in [237]

Over time these biases reduce as the population of contributors increases as the activity becomes more mainstream, and the technical barriers to contribution are removed. In social applications, it is the sheer scale of the number of users that give such great power. However, it is an important (and perhaps obvious) fact that not all of these users are equal, and that the capabilities of the whole group cannot be scaled down to find an “average user”. For example, there is no single person who knows something about every topic in the millions that are found on Wikipedia. The actual value of a group is not evenly distributed around its members.

This bias is exactly the same in the development of communities around games. The early adopters are stereotypically highly skilled players with a play-style based more around beating challenges than developing social play [16]. Therefore, the early community will reflect this. The longer a game is supported by a community, the more diverse that community will become (often to the abhorrence of the hardcore players). *Ultima Online* was one of the first highly popular MMOGs when it was released in 1997. At this time, most home Internet connections were provided by dial-up and often paid for by the minute. The earlier adopters of UO were those hardcore players who had the time to invest in the game, but also able to afford the cost of setting up and maintaining the technical infrastructure required to play. The design of UO suited these players well, as the environment was a lawless and challenging social frontier - outside of the major cities, players were free to kill and steal from one another at will.

Later, as the technical barriers to play were lowered by the maturation of home Internet access, new players joined the UO community and had an extremely hard time fitting in - they were constantly robbed and killed by more skilled characters with no way to retaliate and often no will to continue playing in such a harsh environment. In 2000, an expansion to UO called *Renaissance* was released that attempted to solve this problem with a dramatic intervention - the entire world was duplicated in a new, safer environment called “Trammel”. In this world, players could not engage in non-consensual combat and thievery from other players was mechanically impossible. The old, lawless, world remained as “Felucca” and players could travel between worlds at will. Although many of the original players were completely horrified by this “castration” of their preferred cut-throat style of play [233], the change was a commercial success and UO gained over 80,000 new subscribers in the year following the release of the expansion [288].

4.3 The Social Graph

The relationships between players in games is so important, that in defining the social architecture of games, we must consider those relationships as a key part of the substrate of play. These relationships can be mapped with the concept of the social graph.

Imagine a graph of nodes and lines, in which each node represents a real person, and each line represents relationships a person has with others around them in all spheres of life - connecting friends, family, colleagues, neighbours and anyone else with whom a person has a relationship in life. Of course, within this graph, the other nodes have relationships with each other, and also other people that the first has not met. Continuing this visualisation, you will eventually end up with a single connected graph that contains every other person in the world, living or dead, and every relationship there has ever been between two people.

In 2003, Albert-László Barabási wrote:

> If we were to construct a [social graph] for society, it would have to include each person's professional and personal interests and chart everyone she or he knew. It would [allow] us to find, in seconds, the shortest path to any person in the world. Of course, such a social search engine is impossible to build... ([13] p32)

Although, as Albert says, this graph seems impossibly complicated, the Social Networking Site *Facebook* has been able to describe part of this graph for 400 million people and 52 billion of their relationships.[1]

[1] as of March 2010; http://www.facebook.com/press/info.php?statistics

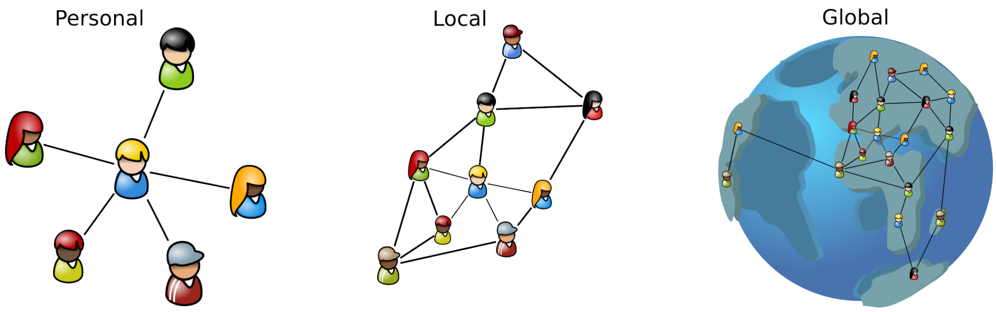


Figure 4.4: An illustration of the "Social Graph" - This figure shows an illustrative example of the social graph viewed from a personal, local and global perspective

4.3.1 Social Networking Sites

It is hard to overstate the explosive growth in popularity that Social Network Sites (SNSs) have experienced. In the UK, visits to SNSs account for nearly 10% of all web requests and in both the UK and the USA, social networking sites are the most popular class of website except for search, and are even more popular than pornography [109].

SNSs shifted the focus of the web away from content, and onto existing human relationships. Typically, the central structure of an SNS is simply to allow you to connect to people by recording your relationships online. Other functionality such as messaging, games and content sharing are ancillary services built around this central objective of relationship management.

Some services deal with specific relationship domains -*LinkedIn* specialises in professional relationships and allows people to use this network to support business and academia, *Bebo* specialises in relationships between teenagers with a focus on accessibility, and *MySpace* supports connections between bands and musicians.

Other services, such as *Orkut* and in particular *Facebook*, disregard the context and treat all relationships as the same. They may be further clarified or otherwise categorised but the basic unit is the connection itself (e.g. the connection between my friend Juliet and myself is decorated with the descriptor "Married to"). This neatly sidesteps the issue of context or domain that is a thorn in the side of the content-centred services. On *Facebook*, a user may have hundreds of “friends” (Facebook’s name for social connections) that includes colleagues, old schoolmates, people met at conferences and people with whom they share hobbies and interests. For the user, each person within that wide social network has a different value based on how close they are and how trusted their opinions are. Despite this, the underlying system of connecting people is strictly content agnostic.

4.3.2 Utility of Social Relationships

Social Networking Sites recognise the intrinsic value of the existing relationships between individuals in their system. This perspective forms the basis of the services, and adds additional social value to ordinary content.

Photograph sharing serves as the perfect example. The SNS *Facebook* allows users to upload photographs to the site, and “tag” the people who appear in them. Those photographs then become associated with each individual and their particular profiles on the site. It is then easy to browse a set of photographs of any one person based on the associated tag data. The actual author of the photograph itself is not as important as the individuals who appear in the picture. By virtue of this social organisation, you can easily find yourself viewing pictures of friends that were taken by people you have never even met. Or vice versa, have complete strangers comment on photographs of you, because you attended a party with one of their friends.

This is in contrast to the Web 2.0 service *Flickr*, where photographs are not organised based on an existing social structure. It is much more likely that aesthetic or semantic features will link two different photographs. Flickr operates a grouping structure[1] to formalise these relationships. Anyone can create and join any public group based on a wide range of topics, such as a group for photos that are predominantly green in colour, or contain toy robots, or based on using a particular model of camera

[1] http://www.flickr.com/groups/

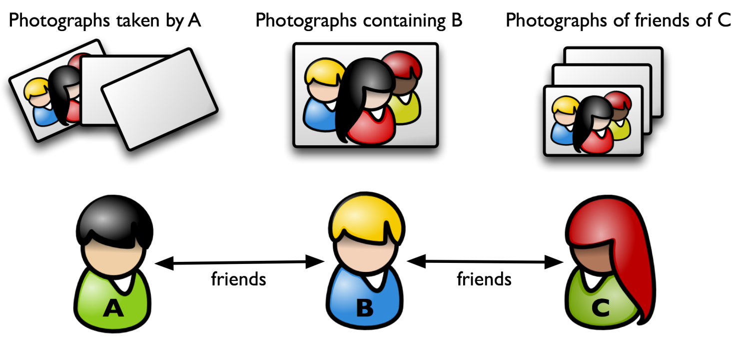


Figure 4.5: Implicit Permissions on Socially Tagged Photographs - If a photograph taken by A is tagged as containing B, then as a friend of B, C would have implicit permission to view the photograph even if C and A had never met.

or specific photographic technique.

The approaches taken by Flickr and Facebook to approach the same topic are very unique, and offer different value to the same people based on different perspectives. A fundamental social difference is that relationships on Flickr are based on shared tastes and opinions around the content itself, whereas Facebook builds value around the content based on the impact of existing social relationships in the real world. Since launching this feature, Facebook has become the most popular photo sharing service on the web, hosting over 10 billion photographs in January 2009 [19] compared to the more mature service Flickr, which only topped 4 billion in October that year [49]. It is, however, unfair to make this direct comparison for anything other than simple scale; since the sites diverge in aspirations and it is probably a safe generalisation to say artistic quality and skill is not a priority over sheer quantity for users who submit photographs to Facebook.

The real strength of the Facebook approach to content-sharing is that the same social structures can be applied to any content, not just photographs. Until the advent of SNSs, the complex web of social relationships between individuals in the real world has been hidden and implicit. SNS take these connections and expose them in a simple and intuitive way, enabling people to view web content through the lens of their existing relationships.

The success of social networks as a service is based on the assumption that existing relationships are intrinsically valuable. As, in the past, they have always been implicit it is difficult to understand where this value is coming from and how this "Social Graph" of people and relationships has become so important. The value has always been there, but the social web has only begun to highlight its advantages.

4.3.3 Social Network Games

The added-value of social relationships that are created by social network services have not been ignored by game designers, who have used these features to create interesting games that take advantage of these social connections as part of the social architecture of play. MySpace and Facebook are the two most popular western SNSs [121]. Both reach out to 3rd party developers by exposing interfaces (via *OpenSocial* and the *Facebook API* respectively) that can be used to develop applications integrated with the social graph maintained by each service. This has allowed thousands of developers to create applications that have social architectures built on a "ready-made" social graph. The platforms handle necessary services such as user management and verification, and in return the developers can provide highly integrated and socially useful applications that seamlessly integrate with the user experience on the site.

Game designers have been quick to realise the potential of the SNS as a platform for games, and have built thousands of titles on these platforms [2, 72]. While many of these games have been re-implementations of board games like *Scrabble* and socialised versions of arcade games like *Pac-Man*, some designers use the nature of social relationships to add value to their game designs.

Parking Wars is recognised as a particularly good example of a game that is designed to use the affordances of social networks as an important part of the game design

[37, 133]. In the game, players have a selection of cars and their own street with car parking spaces. By parking your cars illegally on your friends' streets, you earn points for how long the car was parked. If you find another player has parked a car on *your* street illegally, you can issue a fine and claim the points for yourself. As Aki Järvinen points out [133], the game itself is very simple, but the mechanics are cleverly integrated with the existing social relationships you have with your Facebook friends, and also the interaction patterns the players have with Facebook itself. If you already visit Facebook a few times each day, then you can quickly check up on your street and move your cars while you are there.

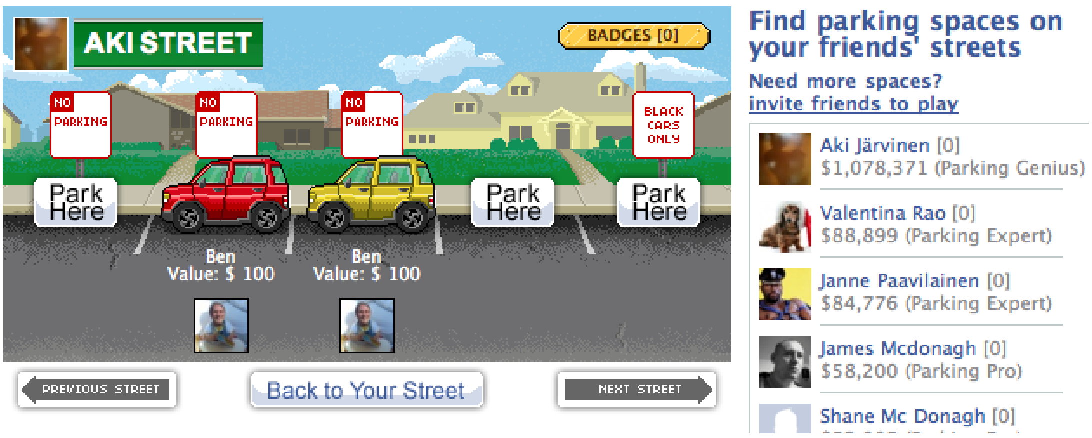


Figure 4.6: *Parking Wars* players gain advantage from knowing friends' real social patterns - Knowledge that a player will not visit *Facebook* for a while due to a non-game event can give in-game benefit

The clever part of the social design is that insider knowledge about the real-life activities of your friends can give opportunities for in-game benefits. Knowing a friend will be away from Facebook for a few days while on holiday gives you the opportunity to park your cars and earn lots of points by parking on their street without fear of being caught out. The game has become a passive social competition between you and your friends, entwined with your relationship in the real world. The use of the social graph as a core element of the social architecture has created an interesting play experience.

Games as Services

The strongest examples of Web2.0 applications treat websites as *services* [205]. The design of games to be played on social networks has evolved to follow this example. The most popular games never end - there is no point where you and your friends decide who has won and pack up the game, they simply continue indefinitely.

This suits the interaction patterns of the users, whose play experience may be split into intermittent bursts of game activity over longer periods of play. As such, games are frequently designed as playful services which the player engages [132, 244]. The business model follows this, too. Rather than the traditional one-off purchase of a complete boxed game, or even the subscription-based approach popular in MMOGs, social network game publishers champion ideas like 'microtransactions' and the establishment of ongoing relationships with the players [244].

Asynchronous Play

One issue with integrating your real social graph into a game is that of availability. Although you may have hundreds of friends formally defined on an SNS, only a handful may be interested in playing any particular game. Out of that handful, there is little chance that some friends will be available to play a synchronous game at a moment's notice without prior arrangement. Since key features of social network games appear to be their accessibility and short play-sessions [72], the need to arrange specific play time is anathema. This is in contrast to "traditional" online games, where you are likely to be able to arrange a synchronous game with strangers at any time by using developer-controlled match-making functionality.

Social network games have used specific mechanics that ameliorate the issue of co-playing between friends, and the most significant is through *asynchronism*. Asynchronous play has been highlighted as one of the most important mechanics to match the casual multiplayer play-style [28]. The games are designed so that each player can visit the game whenever they like, and for as long as they like, without concern about their co-players.

Crucially, these designs, although they may be criticised as “multiplayer solitaire”[291, p119], are about letting you play with your friends, no matter how much time each person has relatively invested in the game. This is in direct difference to “hardcore” social games like *World of Warcraft* that restrict who you can play with based on how frequently you each play [82]. For example, many MMOGs restrict access to groups based on the level of the players, which can leave more casual players behind as time progresses. Although in WoW you can always find another group of strangers with whom to play, in social games built on non-game relationships, players should never be prevented from playing with real-world friends.

In a study into motivations of players of *FarmVille*, Mark Doughty and colleagues identify “friends and family” as a key reason for engagement with the game [78]. In this case, the nature of the existing relationships around the game makes the experience more valuable. The value that these passive social connections add to the game appears to be greater than the need for social interactions to be synchronous.

Friends as Resources

Some games solve the problem of availability and even willingness of friends to play games in perhaps surprising ways.

Restaurant City is one of a class of game that allows players to “hire” their friends to work in their virtual restaurant (or Café, or Zoo...). The friend’s avatar will be controlled by the game AI and move around in the game world doing some suitable activity. The actual real-world person is never consulted about their appearance in the game - they are not invited to actually play, or informed that they are being played *with*. Although this sounds somewhat sinister, in the context of the game it gives the game world a more social narrative - that they and their friends are working together in this virtual business. All without the complexity of organising real synchronous play, and happening on the terms of the player themselves. Even if the "employed" player is not interested in games at all, their relationship brings additional value to the game.

Figure 4.7: *Restaurant City*, and similar games, allow players to play with friends as NPCs in their game - The friends don't need to actually play or even acknowledge the game

Some criticise these mechanics as "commodification"[72] of relationships, and that sometimes the use of relationships in mechanics can be cynically abused by game designers to support the viral spread of the game [10]. Ian Bogost's satirical "game about Facebook games"[30] *Cow Clicker* plays on tropes in social network game design with meaningless interaction (clicking cows) enhanced with arbitrary social features common to many popular titles. Perhaps the criticisms of the social network game industry tactics are valid, but the value of even simple games that are imbued with the power of relationships cannot be ignored. Games should be considered functions of society rather than something separate.

Although these *passively* social features have become a common mechanic in modern social network games, similar mechanics have been used as novelty factors in previous games. The 2001 game *Black & White* could integrate with your email client and name villagers in the game after contacts in your address book. When you received email from those people while playing the game, that particular villager would find you to relay the message. Although this implementation can lead to odd situations in the game narrative (such as receiving a memo about TPS report cover-sheets from a primitive tribesman), the game is still enriched with the value placed in the player's relationships. Just as the skill-free and random game of *Snakes & Ladders* has value when played against a young relative, sacrificing a villager to an angry volcano may be more satisfying if that villager is named after your boss.

Games as Social Functions

Asi Sharabi [236] proposes that applications, including games, built on social network platforms such as Facebook can be classified based on their social purpose.

Phatic Communication Tools are about maintaining social contact through small one-way interactions, such as sending gifts, hugs and pokes. This is a form of social touch that reinforces the importance of a relationship in a small but meaningful way. It isnt a grand intervention like a phone call, but rather a small reminder that the relationship has value.

Self Presentation Tools allow people to define their identities from their perspective. This includes applications that allow people to post their current mood, and also applications such as iLike that allow users to post lists of movies or bands that they like. The act of choosing these artefacts and displaying them publicly on their profile is used as a way to present aspects of their personality to friends.

Collective Identity Formation applications are those that ask other people to define a person's identity For example, "Hot or Not" style games or applications that ask users to pick adjectives to describe their friends. These are used to find out what other people think about them as a person in a playful way.

The social functions of applications built on social networks is made important through the integration with the social graph. Fundamentally, the co-players in games on social networks are not just relationships made for convenience but longer term affairs with impact outside the magic circle of the game. The best games on social networks take advantage of this web of existing relationships as a substrate for play, imbuing the game with the value of friendships. The game becomes a facet of the relationship rather than the justification for it. Valentina Rao talks about the power of playful social games being in the "dramatic tale of actions instead of the actions themselves"[221] - In other words, when engaged in social activity, it isn't the catching of the fish that is important but the story of when we went fishing.

4.4 Measuring the Social Architecture

This chapter has explored how the social architecture of games are defined as a collection of their mechanics. Perhaps the most pressing question is then, "How can we design for specific social effects". Frustratingly, the answer is elusive. Because of the complex web of interrelated effects between game mechanics and the range of different social contexts, there is no existing model we can turn to, to explain how things work.

Social network games have become hugely profitable for their developers. By 2014 the market is forecast to be worth US$1.5bn [116]. With so much money at stake, there is a business need to be able to extract some useful information from the complex web of interactions within the social graph of the games. Traditional Web2.0 tools like web analytics are able to show broad statistics about who is playing and where they are from, in the form of MAUs (monthly active unique (users)), but are unable to see more complex social effects.

One important social effect of games is the “virality”: the way players pass on recommendations to games and invite friends to play follows some patterns of epidemiology. Games, like fads and fashion, spread through communities exactly like diseases. The *k-factor* [112] is a value that defines the contagiousness, and is calculated based on how many new people become “infected” by each carrier. A value greater than one means the number of players will continuously grow [165].

Virality, along with engagement (i.e. how long a user keeps playing a game/stays infected) form the most popular metrics about social games. From a business perspective, “monetisation” metrics such as ARPU (Average revenue per user) are equally important for the business to stay viable [165].

Importantly, since these metrics can all be calculated on-the-fly, they can be used to get swift feedback for changes in game mechanics. The complex effect of mechanics on the social architecture will be reflected at a high level [112]. Therefore, the developers can quickly determine which mechanics are beneficial, such as something that increases ARPU, or detrimental, such as those that reduces a daily k-factor. In this way, the game can be slowly changed to the benefit of the business.

4.4.1 MAU metrics, MAU problems

Metrics of play are extremely valuable tools for developers interested in intelligently modifying games based on indirect player feedback, in a process of metrics-driven social design. However, the focus is often on the interesting facts for the growth of the business: acquisition of new users (virality), retention of existing users and monetisation of the user-base [165]. The metrics are general enough that the actual system being studied does not even need to be a game, but could be used on any social system. The benefit to the users themselves (e.g. that the game might be fun) are only implied by the data collected. Fun is only of a secondary importance to profitability.

The major issue with metrics-driven social design is with scope. The metrics used are necessarily divorced from the nature of the social architecture itself because of the complexity of the interrelations between mechanics and context. As a result, the iterative improvement of mechanics to meet the demands of the metrics may lead designers into missing important innovations. Still, designers cling to the metrics as the only statistical feedback they can get from the complex system. Chris Hecker calls this “Metrics Fetishism”[117], and calls out a specific problem with a mathematical problem of *local maxima*. Iteratively modifying mechanics based on metrics means that evolution is through small changes rather than through seismic decisions. As a result, a point may be theoretically reached where future changes based on metrics lead to ever-reducing improvements. As such there is no guarantee that this strategy will lead to long term sustainable improvements. Although the idea of an “optimal game design” is somewhat farcical, without a careful understanding of the potential longer-term design space, it is argued that purely metrics-driven design approaches can favour homogenisation and oversimplification.

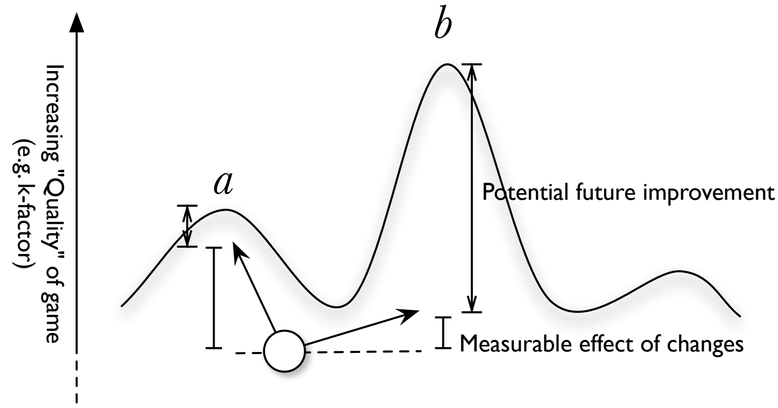


Figure 4.8: Reliance on hill-climbing designs based on metrics leads to local maxima problems - A more flexible approach to design is required.

Figure 4.8 shows an illustration of the problem Chris Hecker highlights. If we consider the social architecture of a game to be at the top of the bulge *a* according to the metrics, the metrics will show no further improvement to the mechanics are possible. However, a more flexible approach to game design may place the architecture in area *b* - although the metrics may initially show a smaller positive effect of the changes, longer term there may be greater space for improvements.

The key for metrics is use in context - although very powerful, they need to be used with consideration for the wider goals of the game. Is a wildly popular game always the most desirable outcome? What is the optimal community size for your game? Is it worth sacrificing a core mechanic to satisfy a greater number of players? Since the social architecture is defined by the complex relationships between these game mechanics, abstract metrics are an important way to be able to extract meaningful statistics, but must be used with caution.

4.5 Discussion

The social architecture is an abstract idea used to describe the social patterns of a system, as determined by the collection of mechanics in place within a social context. The effect of the social architecture is sometimes obvious, as particular choices in mechanics have direct effects on social behaviours, however it also has much more profound effects. The patterns of use are informed implicitly by the presentation and arrangement of the mechanics of any social system in combination with the activity of every other participant as the context [20].

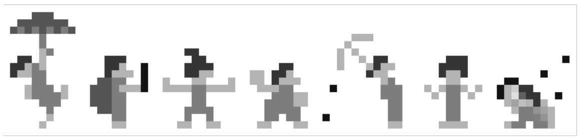
This chapter has introduced how the concept of social architecture can be used to describe the structures that are the foundations of social games. Combinations of game mechanics affect the larger social architecture in sometimes surprisingly complex ways, as does the social context of the game, especially where relationships are used in the game as part of the social graph.

Given the social architecture of games is such a complex web of interrelated mechanics, measurement of social effects becomes a major problem. When changing the way a single mechanic works in the game, we cannot isolate that single mechanic and draw judgement based on changes in its use. Just as the change in mechanic causes second-order effects in the optimal strategies of players, so does it affect the patterns of social interactions between the players.

Despite the complexity of the relationships between components of the social architecture, tools can be used to analyse the effects in quantitative terms. Commercial social network games have had great success with iterating design changes based on the comparison of high level social metrics such as virality and retention. In this way, social architectures of games are also susceptible to analyses using tools from other systems defined by social architectures, such as communication networks and information systems. With these tools, the abstract social architecture of games can be analysed in terms of social behaviours, at levels that include individuals, groups and communities. The following chapters build on this concept by using mathematical tools to probe the activities of players within social games under experimental conditions. By changing mechanics, effects on the social architecture are exposed in the patterns of interactions between the players.

5

Social Play-Styles



Lemmings (1991)

The social architecture of a game has a direct effect on the observed patterns of behaviour of the players within the system. By observing the patterns of interaction within a game, we can break down a social architecture in terms of mechanics in order to understand the effect of each on the game. However, on the individual level, social behaviour is the product of both the social architecture of the game and the idiosyncrasies of the players themselves. Who people know, their temperament, their taste in music and even what they had for breakfast contribute to their behaviour. The behaviour of the players is not only dependant on player preference but the social context and social history of play. There is no meaningful thing as the "average gamer"; as Richard Bartle says: "Players are all different, and they all behave differently."[16, p127]

This chapter explores the differences in social play between players as individuals. Starting from established theories on play styles, and common definitions of the difference between hardcore and casual play, experiments are conducted to highlight differences in individual behaviour. Several experimental games are introduced, and analysed based on the actual social behaviour of the players.

The analysis of data gathered from the experimental games provided here shows a profound difference in the volume of social interactions between different players. Robust findings show that, invariably, social interactions follow power-like distributions in social games. This follows established theories about differences between hardcore and casual approaches to social interactions by players. The "fitness" of players is explored as a predictive measure for the likelihood of a player becoming hardcore in the social network of games, and finally the importance of the hardcore players to the stability and structure of the social network created through social games is revealed. The differences between players are not only what make social games intriguing and exciting to play, but the social roles taken by players dramatically affect the growth and social ecosystem of games in surprising ways.

5.1 Play Styles

Game design literature presents a solid background in the importance of studying the players themselves (see [243] for a good review). Following the success of "user-centred design" in developing computer systems [105], game scholars argue for a *player-centred* game design process [210]. Rather than building a game based on the intuition and infallible wisdom of the game designer, the player-centred process looks at who the final player will be, and what kinds of things that *they* would like to see in the game.

The different types of player preference can be generalised in different ways. The most obvious method is through demographics, but demographics are crude tools when we consider designing for something as intellectual as play. History is littered with examples of failed games that were "designed especially for girls", as if gender directly determines taste in games.

> From the designer's point of view, demographics mean generalizations, generalizations mean stereotypes, and stereotypes mean problems

-Richard Bartle [16, p126]

For game designers, the generalisation of players is more successfully done through analysis of *play-styles*. Chris Bateman & Richard Boon [18], Richard Bartle [16], Marc LeBlanc [128] and Nicole Lazzaro [168] have all developed models that describe how people derive fun from different games. Typically the models are split into broad categories along the lines of achievement or mastery, the thrill of exploration and discovery, the pleasure of management/control and the fun of social play.

Crucially, all the models recognise that different people get different kinds of enjoyment out of the same games, and that individual preferences may change over time. Rather than being based on physical factors such as gender or age, they are better described as 'demographics of the mind'.

5.1.1 Models of Social Play

The social factor is universally recognised as an important part of fun for most players. While it certainly is rarely the *only* reason people play, and may not even be the most important one in many cases, it is undoubtedly a strong motivating factor for enjoying games [298].

In Richard Bartle's model of player enjoyment in online games [16, p167], he includes the desire for social play as an axis between "game-oriented" and "players-oriented", which reflects less or more interest in social interaction on the part of these players. The interest in social play is split into four types based on other types of interest. The axis of "Implict-Explicit" is based on how overt the form of play is, while "Interacting" is essentially behaving as a responsible social peer and "Acting" is forcing interactions upon people perhaps without consent.

These splits create four types of social play:

- Politicians are players who "act in an open fashion on other players", such as guild leaders and other decision makers in positions of social responsibility.

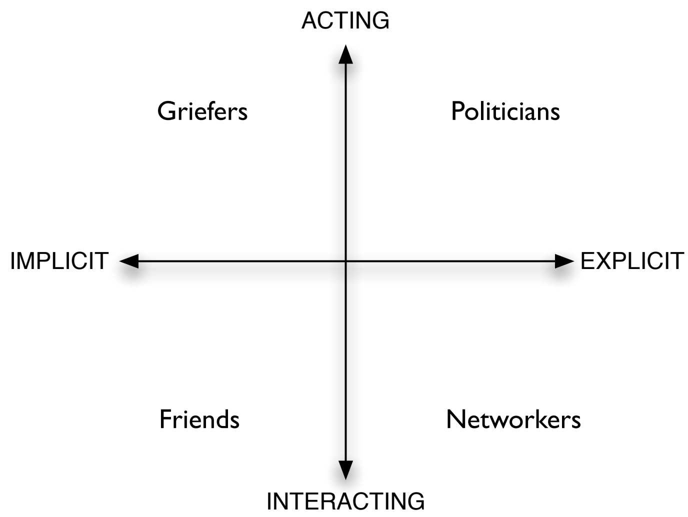


Figure 5.1: Richard Bartle's social play styles - This is one half of Richard Bartle's "Player Interest Graph" showing only types of *players-oriented* interests. Reproduced from [16, p167]

- Networkers are players who "interact openly with other players", such as highly social chatting type people, for whom status is not important.
- Friends interact "primarily with people they have known a long time", status is not as important as history.
- Griefers are "bullies prepared to use force or unpleasantness to get their way"

Importantly, a player is not defined by a single type at one time, but instead has a preferred social play-style that is a mixture of these types in different measures, that change over time. Amy-Jo Kim's popular "membership lifecycle" argues that social behaviour and social roles change the longer someone is part of a community [138], and Richard builds on this by asserting that the dominant social play-style also changes as a player matures and settles into a game community. The typical sequence being from abusive Griefer, through socialising Networker to responsible Politician and finally to Friend. Understanding and recognising these different attitudes to social play that are taken by players in a game is incredibly important. Katie Salen & Eric Zimmerman call these "external social roles"[229, p465], in that they aren't wholly implied by the game mechanics (or by extension, the social architecture) but brought to the game by the players as social beings. When considering social game design, it is therefore important to carefully consider these typologies in order to understand how different players will use the tools provided by the game design to create their preferred types of enjoyment.

5.1.2 Casually Hardcore

Independent to the discussion around individual player preference is the question of activity and style of approach. Some players dive into games head-first, devouring all parts of the narrative and game experience with surprising devotion. At the other end of the scale, many players prefer to dip in and out, playing for short periods from time to time with less commitment. This difference has become popularly known by players and academics as the "Hardcore/Casual split"[130]. This split has also lead to a distinction between types of games based on who they are presumed to be designed for. For example, a combat-oriented game like *Gears of War* may be called a "hardcore game" because there is the presumption that the game will only appeal to players who play a lot of games and would be willing to spend significant time overcoming the challenges of the game. Similarly, "Casual" games like *Bejeweled* are suited to shorter play-time so therefore are assumed to be suitable for players with less free time for gaming. These assumptions about player activity and game preference reinforces the stereotypes of what it means to be "hardcore"[36].

In his book, *A Casual Revolution*[137], Jesper Juul points out the differences between the stereotypes of casual and hardcore players when compared to the realities in a series of studies. For example, a common presumption is that casual gamers prefer easier games and have little knowledge of games in general ("game literacy"), however the results of his study show the opposite is true. Similarly, there is a stereotype that all hardcore players are male (they are not) and all hardcore players are into just complex games (anyone who has ever been to a *Bingo* hall will see through that). However, the distinction has a use in understanding the different play styles. We can ignore the cultural associations of the terms themselves, and concentrate on their definition based on actual behaviours. Hardcore-ness of games and hardcore-ness of the players are independent. For example, you can have a hardcore *Farmville* player just as easily as you can have a casual *Gears of War* player [137]. Hardcore games may have a sharp learning curve and punishing attitude [26] but they can still be Casual in terms of commitment required.

The following sections borrow the nomenclature of "hardcore" and "casual" in order to explain differences in social behaviour within games. Rather than based on attitudes (i.e. Barry Ip and Ernest Adams [130]) or self-identification and literacy (Jesper Juul [137]), the terms are used to differentiate between users based on patterns of activity. This extends discussions of what it means to be "hardcore", by adding colour to the spectrum of different ways we can understand game players.

5.2 Social Activity

Although theories of play styles and social activity are important in developing an understanding of social play, nothing beats cold, hard numbers. In these days of networked social play, the servers act as gatekeepers for social interaction, and keep detailed records of interactions between the players. Although *intent* is not stored in game servers along with records of interactions, patterns still emerge in interactions that give insight into player behaviour.

As established so far, social behaviour in games is very complicated. However, we can begin to understand patterns of behaviour based on metrics such as social activity. Analysing the difference between player activity forms the foundation of understanding how a player functions within the game society.

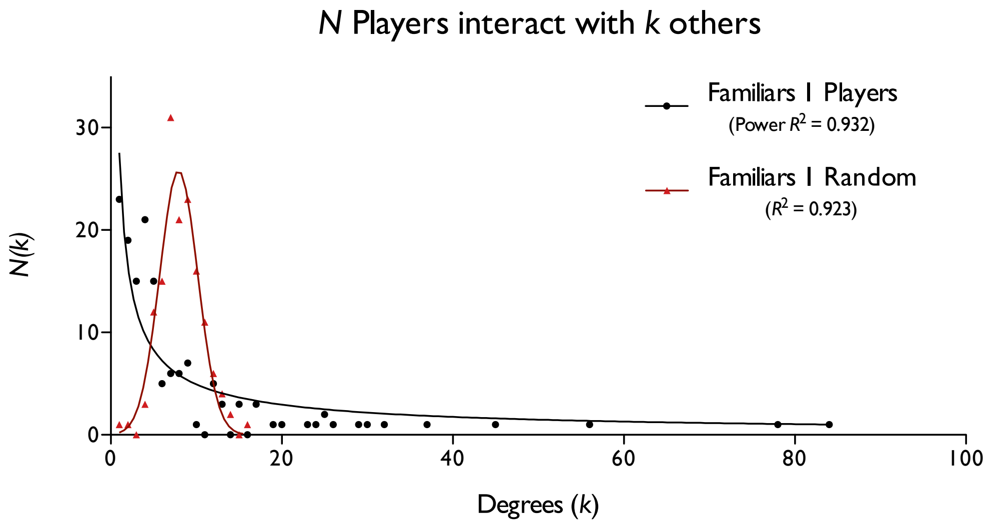


Figure 5.2: Player k vs k of random nodes in *Familiars 1* - Plot showing activity in social games decays with a heavy-tail (power law-like) distribution, compared with normal distribution for a random graph (on a linear scale)

Using social interaction data from the web game *Familiars 1* (see section A.2), Figure 5.2 plots the number of players that have engaged in social activity with k other players (i.e. $N(k)$) against increasing values of k for both the players of the game and a comparison graph. The comparison graph was created with the exactly the same parameters (603 social interactions between 157 players) except that the interactions were placed randomly between players following the Erdős-Rényi model [89]. Therefore, the difference between the two plots show the difference between a game where players interact randomly, and one where players interacting with intent.

Random network graphs, of the kind generated here, follow a Gaussian distribution for activity (least squares $R^2 = 0.923$). However, in social systems where connections are generated based on actor choice ("preferential attachment"[14]), for example the players of *Familiars 1* *choosing* who to interact with, the probability distribution has what the literature calls a "heavy tail"[200]. In other words, connections between the most highly active players are much more likely than we would expect based on random chance.

Indeed, this appears to be the case for *Familiars 1* (least squares $R^2 = 0.932$, F-test confirms curve difference with $p < 0.007$). The average (mean) value of k connections for *every* graph with the same parameters (random or not) is 8.204, so each player was involved with an average of just over 8 interactions; however this statistic is not as interesting as the distribution that is observed.

The results of the investigation into activity of players in *Familiars 1* immediately highlights one important (and perhaps obvious) fact - *players of social games don't randomly engage in social interactions!* However, is this just a quirk of *Familiars 1*, that somehow meant the players ended up with an odd distribution of interactions?

The same analysis was conducted for six data-sets gathered from the interaction data taken from the server-logs of several experimental and commercial games that involved social interactions [140, 142, 143, 146, 196]. In every single case, without exception, the same pattern was found. That social activity in games should reliably follow a heavy-tailed distribution should not be surprising, since it has been demonstrated that contributions to highly social Web2.0 sites such as *Wikipedia* and *Digg* also show these patterns [281]. However, this is strong evidence to support the fact that the communities of games specifically are built using similar social forces.

In Figure 5.3, the cumulative distribution function ($P(k)$) has been calculated for each value of k to allow for comparison between games - this plots the probability that a node v has a value of k greater than x, and makes it easier to compare the distribution of activity in different games on the same scale. The plots are shown on log-log scales for clarity.

The important factor about the emergence of the heavy-tailed graphs for social activity in online games is that the interactions are not evenly distributed. A lot of players make a few interactions, but a few players interact a lot. These few high-

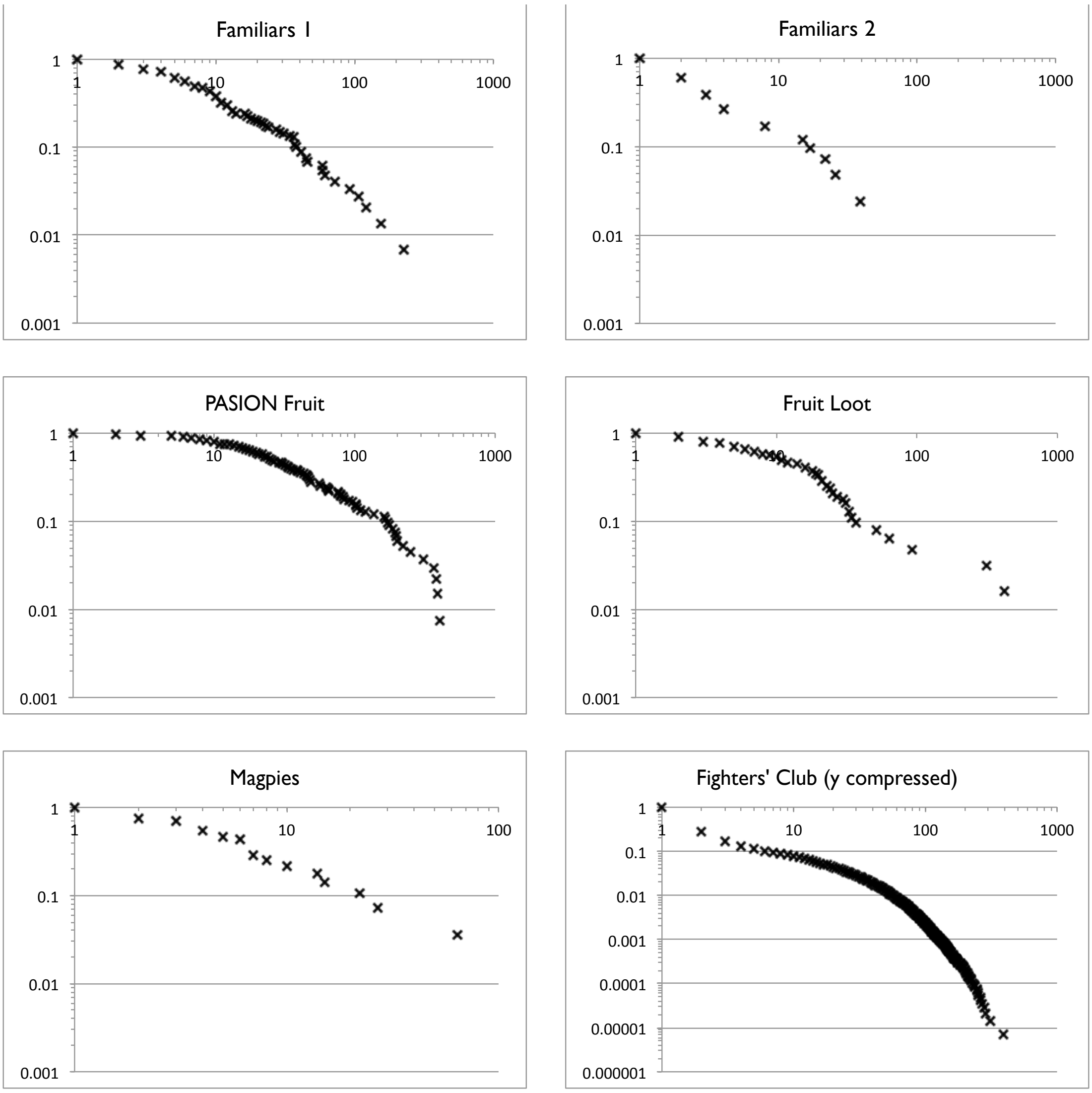


Figure 5.3: Cumulative Distribution P(k) for increasing values of k in several social games - Log-log plots of P(k) for several games shows that the probability distribution for activity is consistently "heavy-tailed" across social games

contributing players are responsible for a disproportionate amount of social activity in games. In other words, there are *hardcore* socialisers, who engage in disproportionate amount of social activity, while there is a large majority of *casual* socialisers, who engage in very little.

This pattern of hardcore/casual interactions occurs in many other social networks. A study of Swedish sexual behaviour [171] showed that patterns of sexual contact follow a power law. A small number of people engage in a *lot* more sexual activity than you might expect (several *thousand* partners) - there really are "hardcore" and "casual" sex fans, at least in Sweden. The parallel emergence of this split in game play should not be surprising, since even back in game studies pre-history (1992), F. Randall Farmer found hints that player activity is not normally distributed. In the BBS-based social chat environment *Habitat*, Randall noted that 75% of players fall into a category of "passive" players, that collectively were only responsible for 20% of play time in the game [94].

Compared with other types of social networks, it appears that generally, players of games are more indiscriminate in their social activity. For games that fit a power distribution ($P(k) \approx k^{-\alpha}$), the exponent for the games highlights the fact that people connect to more people than those in general social networks [191]. For example, the value of α for contribution activity in *Wikipedia* is 2.3 [281] compared to 1.97 for making suggestions in *Familiars 2*. In social systems, new users often do not realise the value of contribution - and the social rewards for being more active. For example, the initial activity levels of new Facebook users is a stronger predictor than the number of friends for who will become highly active in the future [43, 95]. In games where there is an established focus on community (for example, guild structures, formal grouping) the encouragement of social interaction, and low cost of interaction, could be part of the reason for the apparently high level of indiscriminate choice of interaction partner.

5.2.1 Power Laws and Models of Social Networks

When plotting heavy-tailed distributions of social activity as above, Michael Stumpf and Mason Porter warn that the apparent straight lines that emerge make it easy to jump to qualitative conclusions about the emergence of power laws in this data [251]. The power law is a very compelling pattern to find in such data, since it allows for a very simple description of patterns of behaviour at every scale. However, when investigated more thoroughly, in many cases the power law is not the best model, since many other distributions may also create straight lines on log-log scales.

For example, Atif Nazir and colleagues have completed an excellent study of several Facebook games [196], however they identify that the distribution of social activity in their game *Fighters' Club* as following a power law. When the cumulative distribution function of their data is plotted (see figure 5.3), the signature "straight line" is actually nowhere to be found. On further analysis, the log-normal distribution is a significantly more likely fit (based on comparing loglikelihood values calculated according to [57]). Atif's paper is still an excellent contribution, but the trap of misattribution of power laws is very common in many fields [56].

Based on the study of distribution of activity of the games described above, a heavy-tailed distribution is clearly evident in all games, however it is usually best described by the log-normal distribution. For each of the games in figure 5.3, the best fit distribution was calculated using the process described by Aaron Clauset et al. [57] using the maximum likelihood estimation, and goodness of fit to identify thresholds to the potential distributions (exponential, power-law, log-normal and truncated power-law). For power law candidates, a Monte Carlo simulation was run 2500 times (as suggested for p-values of 2 decimal places [57]) to generate random graphs that were compared to the candidate distribution using the Kolmogorov-Smirnov test. Based on the outcomes of the K-S tests for the simulated and real data, a p-value can be generated based on how more likely the real data is to follow the power distribution than the simulations. Aaron Clauset et al. [56, 57] recommend that a p-value > 0.1 is required to consider the possibility of a power distribution. Note that higher p-values are more desirable in this instance since we are showing similarity and not difference.

In all the games analysed this way, the only games for which a power distribution can be considered are for *Familiars 1* ($\alpha = 2.315, x_{min} = 4, p = 0.28$) , *Familiars 2* ($\alpha = 1.97, x_{min} = 2, p = 0.36$) and *Magpies* ($\alpha = 2.14, x_{min} = 5, p = 0.28$). For *Fighters' Club*, *PASION Fruit* and *Fruit Loot*[1] , the power distribution was ruled out ($p < 0.1$).

As Aaron Clauset and colleagues indicate [57], it is always possible to find a model with more parameters that has a better fit, however there is a trade-off between complexity and usefulness. In the case of social games, its value is in exposing broad patterns emergent through changes in the social architecture. The various mechanics and mechanisms that allow players to interact, appear to act in a way that supports players in interacting in somewhat predictable power-like distributions, where the "heavy tails" show that that some players interact at much greater levels than may be otherwise anticipated. Crucially, the generative mechanics through which players interact in games is generally very similar (i.e. the interaction patterns in two games are more similar to each other than they are to the way body shape scales in animals [280]), so it is a reasonable assumption that games should exhibit similar patterns at a macroscopic level. Differences in distributions and patterns of activity betray the effects of the fundamental socially generative mechanics.

5.2.2 Identifying the Hardcore Socialisers

Earlier in this chapter, a distinction was made between two classes of player: *Hardcore* players and *Casual* players. Hardcore players are defined by their high level of involvement in games, quantified by time spent in play and the scale of in-game achievements.

[1] *Fruit Loot* is a power law candidate but there are too few data points for effective analysis

In contrast, Casual players are characterised by shorter, less frequent play sessions and more passive involvement in the gaming experience.

Essentially, the Hardcore represent the pioneers of a game, and despite being a small minority of the total player-base, they help define the experience for their fellow players through their actions and behaviour. They are responsible for a disproportionately large number of interactions than the "long tail" of casual players.

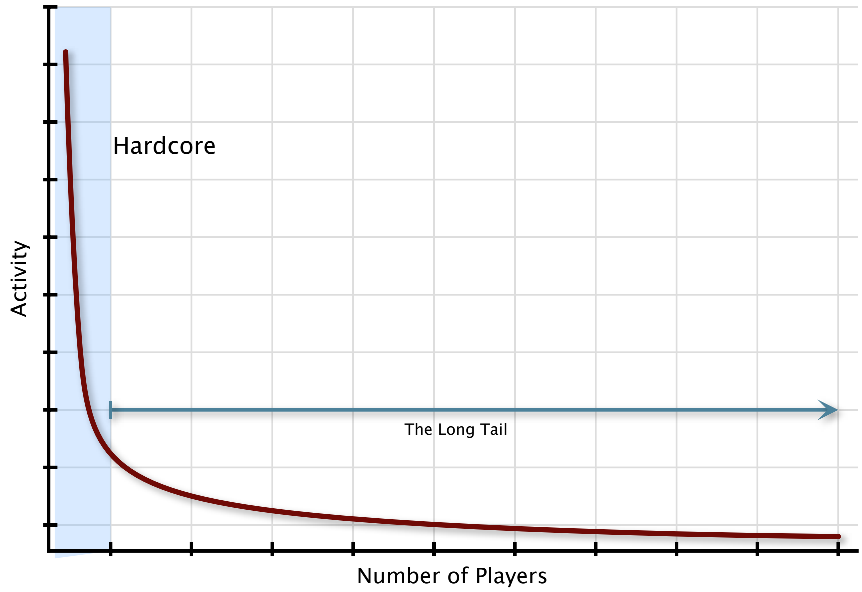


Figure 5.4: Hardcore players and the "Long Tail" of Casual players - Hardcore players are responsible for a disproportionate number of interactions in games

By identifying the hardcore players and analysing play patterns it is possible to see how the game is perceived amongst these influential players. This can give vital clues to areas where the game design needs improvement. Identifying the hardcore players is not a straightforward task. Studies of gamers in the past have identified them via self-report [18] or based on the time invested in play [83]. Analysis of interaction data from server logs means that the hardcore can be accurately identified directly based on activity.

The Long Tail

"The Long Tail" is a term coined by Chris Anderson [7] to describe how the power distribution is useful from an economic perspective, and is so named because of the shape of a power distribution has a large spike followed by a long decreasing tail. The phenomenon was identified first in sales patterns of online merchants like *Amazon*. In this example, a sharp spike in popularity shows that the few most popular items sell orders of magnitude more copies than any niche item in the long tail. However, the broad range of niche items that sell rarely on their own, in fact, make more money for the company in aggregate [8]. Therefore, *Amazon* is able to succeed and sell a few copies of many thousands of niche titles by extending their stock and taking advantage of the long tail. On the graph this difference can be visualised by comparing the area under the line that the top few items describes, which is smaller when compared with the area under the line of the long tail - which can also extend along the x-axis indefinitely.

The "Long Tailed" power distribution (or Zipf's Law [303]) also describes what is known colloquially as "The 80-20" rule that loosely states that "80% of X is attributable to 20% of Y" and is regularly found in social systems, whether they are mediated by technology or not. For example, the distribution of wealth in developed countries, the population size of American cities [199], sales figures for Japanese books [129], and even the frequency of words used in written language [303] all follow a form of this distribution.

The Long Tail of Play

Table 5.1 shows the percentages of players who were responsible for the majority of interactions in each game. For example, in *Familiars 1*, the most active 2.72% of players were responsible for 25% of the total interactions in the game. Although the games are different in terms of design, it is clear that in each, the top few hardcore players have a profound impact on the society within the game. Activity in social games

Table 5.1: Percentage of most active players that were cumulatively responsible for top $y\%$ of interactions in several social games

Int'ns	F1	F2	MP	PF	FL	FC
25%	2.72%	4.89%	3.57%	4.48%	1.59%	1.15%
50%	10.20%	9.76%	14.29%	11.19%	4.76%	4.20%
75%	25.85%	26.83%	42.86%	24.64%	25.39%	16.97%

has its own rough version of the "80-20 rule": about 9% of players are responsible for 50% of social activity in a social game.

Raph Koster talks about this same effect in *Ultima Online* [154, p98] with the social interaction of *murder*. The average number of murders committed by each player in the game is 2. In 2003, however, the top player had murdered over 14,000 other players, compared to a meagre 2,000 by the next best (or worst?). If that player had been playing UO since the day of the game's release in 1997, they would have committed on average more than 6 murders *every day*. This serves to underline the disproportionate amount of social interactions engaged in between players in the social systems of a game - the low mean of 2 highlights that the vast majority of players had not been nearly so murderous in their play-style.

5.3 Player "Age" and the Hardcore

So far, the examination of player activity has been through analysis of server logs. For each game, every interaction by every player was recorded and treated the same at the end of the trial in a summative evaluation. These evaluations yield patterns like the heavy-tailed power-like laws of activity for the players.

It must be noted that during the operational period of the games, players are not directly comparable - For each game, new players join the game at different stages. Some players are likely to be only briefly involved in the game during the period the server logs represent.

This fact raises the question that activity of the players will be affected by the time they have spent active in the game. A player who was only involved in a game for a few hours (i.e. long enough to make one interaction) appears in the analysis to be the same as a player who was involved for weeks but still showed the same activity.

Therefore, there is a reasonable hypothesis that hardcore players may only appear to be hardcore because they were involved in the game for a longer period of time, and as such, have had more opportunities to engage in interactions. In other words, social activity could be a function of time spent with the game.

To test for this, the player "age" is calculated based on the time elapsed between the first registration of a player in the game and the last occurrence of social activity. This can then be compared to the activity (as k) that the player engaged in during this period. If the hypothesis is true there should exist a positive correlation between the two variables.

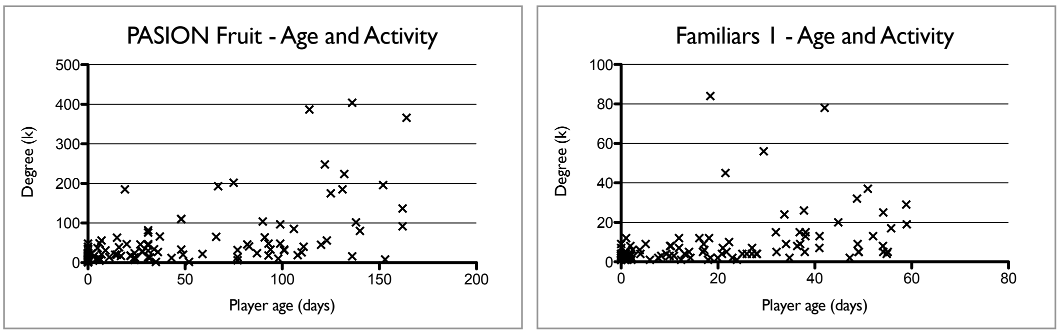


Figure 5.5: Player "Age" (days) compared with Activity in *Familiars 1* and *PASION Fruit* - Length of time playing a game is not an indicator of player activity

Figure 5.5 shows a plot of player activity against the length of the player game lifetime (age) in the two games where lifetime data was available. As can be seen, the age of a player is not a reliable indicator of the activity levels of that player - in other words a player who has been playing longer is not necessarily more active (PF $\rho = 0.61$, F1 $\rho = 0.60$).

The emergence of hardcore players in a game community is not just a measure of age but is informed by complex factors. Albert-László Barabási notes that emergence of highly popular web sites is similarly not only informed by age [13]. In the web, the "age" hypothesis would expect that the longest established sites would gather the most incoming links. Although this is partly true (as with game players), hugely popular sites like Google and Facebook show it is not the whole story. These sites are relatively young in the history of the web, but their popularity is not consistent with other sites created at around the same times. Albert-László proposes that the complex factors that make a web site more or less likely to be linked can be explained based on the abstract *fitness* of those nodes for the network.

5.4 Player Fitness - Who will become Hardcore?

Zipf's Law of the power distribution is a foundation principle that tells us that any social system, whether book purchasing habits, migration patterns or even the citation frequency of research papers [223], are profoundly affected by each individual within the system having a tendency to make choices based on *preferential attachment*. That is, the choice is never made in a vacuum, but is directly affected by previous choices made by other individuals before them. For example, when deciding to buy a music album on *iTunes*, an individual is likely to choose a highly popular album. This is not an indicator of absolute quality, as anyone who has ever despaired over the top 40 charts can attest, but a sum of social factors that led to the decision - exposure to the music through friends, radio, advertising, chart position and fashion may have all had an influence.

Many large social networks, such as the web, grow according to this preferential attachment [14]. That is, a new edge being added to the network is more likely to involve an already highly connected node. However, the existence of young, but rich nodes indicates that nodes are chosen not because they are already rich, but because each node has an innate affinity for gathering new connections. Ginestra Bianconi and Albert-László Barabási call this the *fitness* of the node [24] (as η). Over time, a node that is highly *fit* for a network will gather more connections based on how much more fit it is compared to the other nodes in the network.

Google as a search engine gained great popularity because it had a high fitness for the network of the web when compared to the competition. This fitness is based partly on the success of the revolutionary algorithms [209] used by the service, but also includes factors such as graphic design [177], timing, marketing and positive press coverage [167].

In the social networks of games, players have high fitness based on different factors: game skills such as competencies and amount of time they can invest; but also social factors such as availability and approachability. The Hardcore players are not just hardcore because they are competent at manipulating the game mechanically, but also because through their social behaviour they make themselves favourable targets for future interactions by others.

In section 5.2.2 it was found that it is easy to identify hardcore players based on activity, but the story is also of interest - the data for activity represents a snapshot of the complete life of the player, but what determines the fitness of any given player? Unfortunately the fitness of a player appears to be a complicated factor that can change over time based on any number of internal and external human factors. A player getting bored with a game and reducing their activity is effectively reducing their fitness in the network. Similarly, a player who joined the game during a busy time in their life and suddenly finds more time to play will increase their fitness in the network. Public holidays such as Christmas can effect the fitness of large numbers of nodes simultaneously, as can changes in the social architecture of the game (e.g. a new Facebook API limitation causing some players frustration).

In the theoretical treatment of fitness, Ginestra and Albert-László work on the assumption that the fitness for a given node (η) is constant [24] in order to avoid these complexities.

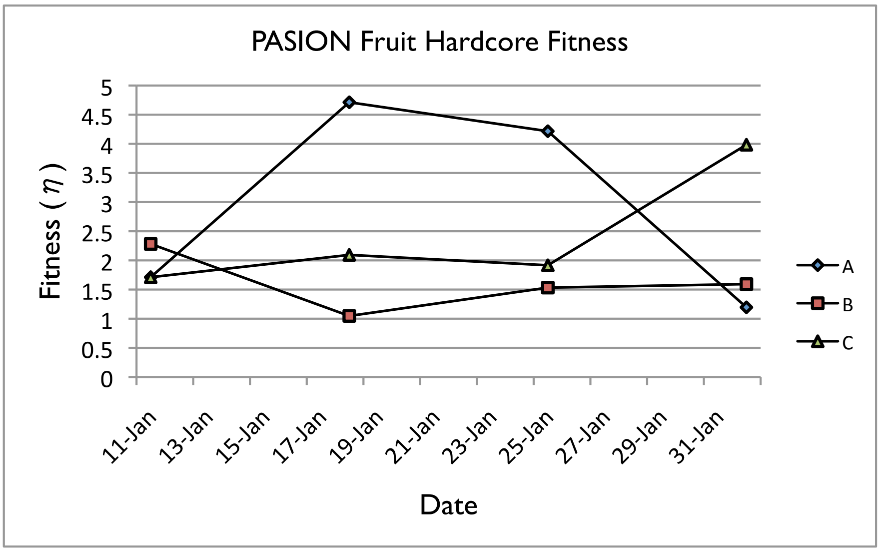


Figure 5.6: Changes in fitness for 3 random hardcore players of *PASION Fruit* - Network fitness η changes over time for each player based on complex social and personal factors

Figure 5.6 shows the change in fitness (η) for 3 randomly selected hardcore players (from top 10% by total k, marked A, B and C) of *PASION Fruit*. η is calculated based on the proportion of interactions that other players started with them compared with the total interactions that occurred during the game for each week (normalised to cope with new player registrations). This illustrative example shows that fitness changes quickly over even small time periods for each player. The reasons for changes in network fitness are complex and based on a combination of factors that could include changes in mood, status, availability, or even the weather. So, although fitness for the network can be calculated in hindsight, it appears to have little value as a predictor for future behaviour. In other words, given a selection of new players to a game, it appears that we cannot tell which one will become hardcore through network analysis alone.

5.5 Breakdown of the Community

In addition to being the most active nodes in the social graph of online games, hardcore players are also responsible for maintaining the structural fabric of the network. Their position within the lattice of interactions and players means that without them, the fabric of the community can fall apart [191].

There is a high probability that hardcore players will be the first contact that casual players have to the community within a game. Hardcore players reach out to less active players already a part of the game world, and provide the first social connections to the wider communities within games. As with board game "super-fans"[291, p154], the hardcore are frequently also the evangelists for the game, bringing in new players who may not have found the games interesting by themselves.

As such important nodes in the network, the hardcore players therefore act as a point of attack. As with similar social networks, the most effective way to disrupt a game is by simultaneously taking down the most important hubs [278]. Raph Koster highlights that these hardcore players are the most important members of game communities and as such should be treated with great care by game developers [157], he also points out that because of this, the best way to kill a competing game is to offer free accounts to the leaders of the biggest guilds [154]. Curiously, this is exactly the type of strategy used by counter-terrorism units, who try to identify and disrupt the operation of terrorist networks - the pilots of the planes in the *9/11* attacks in the US were effectively the hardcore members of the al-Qaeda terror network [162].

Figure 5.7 shows an example sub-graph in a larger social network of a game. The first diagram illustrates that the group of players form a "small world" in that each player can trace a path to every other player in the game through a chain of mutual

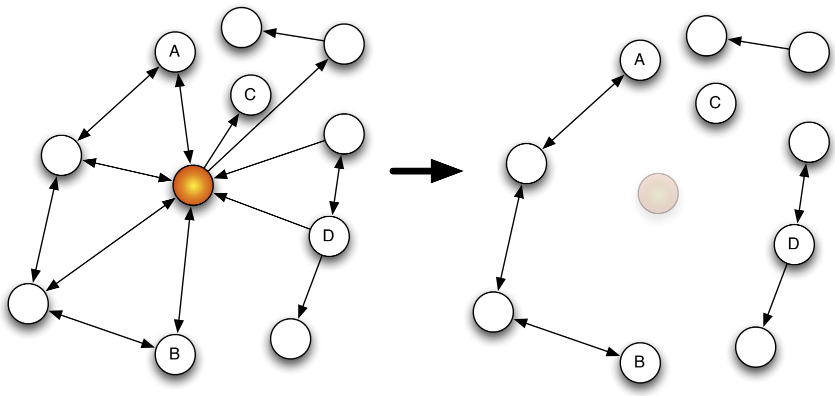


Figure 5.7: Hardcore as hubs in the social network - Removal of the hubs dramatically reduces the connectivity of a network

acquaintances. In a gifting game (such as *PASION Fruit*, see section A.5), player A may only receive some gift they need because the unknown player D had first sent it to the hardcore player. Despite not being in direct contact they both benefit from being a part of the widely connected social graph. The second diagram illustrates the same graph without activity involving the hardcore player - in this case, the network is no longer a small world, and breaks into three small graphs and an orphaned individual. Now A, C and D are separated from one another.

The hardcore player not only joins together otherwise disparate groups of players, but their activity creates *short-cut* connections around an already connected group. For example, A and B are both part of the same network even after the removal of the hardcore player, but now the path length L between the two players is longer. Regardless of *how* the central player became hardcore - whether they are a particularly active person in the community or simply perhaps have access to strategically important resources in the game, they are crucially important to the flow of social interactions around the network.

In social networking literature the hardcore are the equivalent of *connectors* [108] or *bridges* [13] that join together disparate communities. Although they may not be the

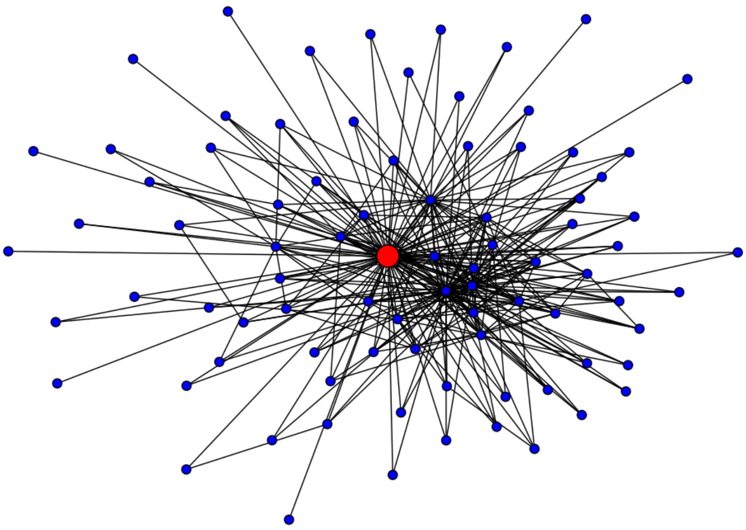


Figure 5.8: First order network around a hardcore player in *Familiars 1* - This hardcore node in *Familiars 1* acts as a connector for 10% of all nodes in the network. These nodes would become orphaned without the hub.

most knowledgeable members of the game community (i.e. Malcolm Gladwell's *mavens* [108]) they are the ones who are best situated to take advantage of that knowledge.

Figure 5.9 shows what happens to real game communities without the important hardcore network hubs. Players are removed from the network graph in order of their degree connectivity k (i.e. in descending order of hardcore-ness) along with the social connections they have made, and the size of the largest connected sub-graph is computed for the remaining network of players. While all three games have a connectivity of nearly 100% with the network intact (i.e. classic small-worlds), removing hardcore players has a dramatic effect on the structure of the network. The graphs of the social games quickly break up into collections of small networks and unconnected individuals. For *Magpies* and *Familiars 1*, by the time the top 20% of hardcore players are removed, less than 10% of the remaining community is connected in the remaining largest contiguous network. The network of *PASION Fruit* is more resilient, and the network remains largely connected until around 50% of the top players are removed.

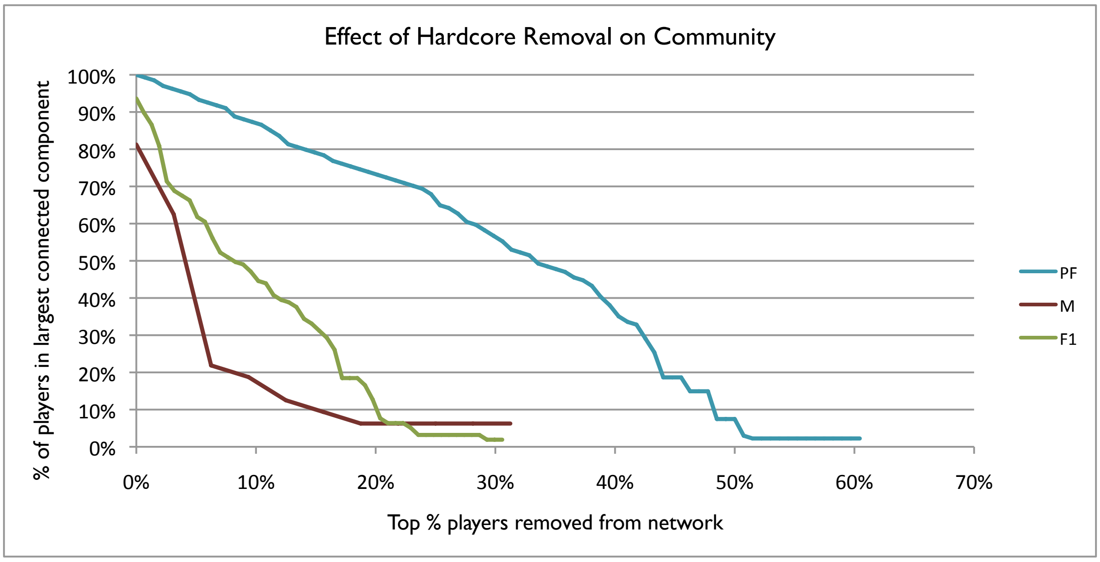


Figure 5.9: Effect of Hardcore Removal on Community - The reduction in connectivity of a social community is calculated for several games according to how many hardcore players are removed.

Despite the analysis above, there is an open question about what would happen to a game network without the set of hardcore players. This form of analysis can only show the effect on the network based on a historical viewpoint. It is based on the assumption that a player who chooses to interact with a hardcore player will choose not to interact with anyone if the possibility of choosing the hardcore player is removed. In reality, there is potential that the interaction would still occur but with a different partner. The choice of partner is based on the fitness of the partner in the network from the perspective of the player initiating the interaction (e.g. a real-life friend may have an inflated subjective value for fitness). Because of the highly subjective nature of fitness, and its unpredictable shifts as a variable, it is difficult to create an effective experimental condition that would allow a more effective study of networks with and without the presence of the hardcore.

5.6 Discussion

This chapter has introduced the importance of player differences in determining their social activity in online social games. Individual users have particular styles of play, based on a wide range of factors. One aspect of this play-style is the social activity - defined by how many social interactions a player is involved with through the course of play. This is an ambiguous concept since "social activity" can include anything from friendly messages and gifts to violence. However, despite this ambiguity, social interactions of all forms are what make social games social. By looking at social interaction as an abstract concept, we can discover the wider patterns of social play in the mechanical systems of games.

Theoretical models of social play are well established, however there is a lack of analysis of real data to support supposed differences in social behaviour between different players. To address this, experimental studies were performed with several social games in order to collect a large amount of data about real playful social interactions. Quantitative analysis of these data uncovers interesting patterns in the behaviour of players in game systems.

The single most consistent and reliable finding of this analysis is that social interactions in games follow *heavy-tailed* distributions. A small minority of players in every social game studied are responsible for a disproportionately large number of social interactions in the system. Although differences in the social architecture change the exact variables, a rule of thumb from the analysis presented in this chapter is that around 9% of social game players are responsible for 50% of social interactions in any given game (5.2.2).

This distribution of activity between a handful of highly active users and a large number of less active users supports game design theorists' proposal of a *Hardcore/Casual* split. Although existing literature talks about this split in terms of personality [130] or self-identification and literacy [137], this research finds evidence for measurable differences in social behaviour. Although there is no single point where this ‘split’ occurs, understanding the difference between these highly socially-active hardcore users and the casual users is important for game designers.

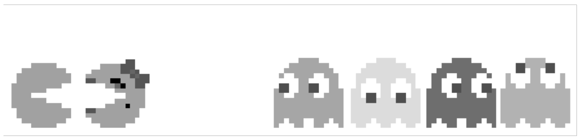
What makes a user hardcore is not based on how long they have been a player, but is determined based on their *fitness* for the social network of the game. This fitness is an abstract concept that includes everything that makes that player both an active initiator, and an attractive target with whom other players might start interactions. The importance of the hardcore players to the network of the game cannot be understated - without the core 10% or so players, the entire social structure of most games would collapse. The hardcore players are those that mediate trades, that create communities and that organise events like raids. Although communication exists outside their reach, the hardcore players are responsible for turning a game world of disparate unconnected individuals into a functioning community.

Although hardcore players are the foundations that tie game societies together, there is no centralisation in the social networks of games. In other words, it is foolish to believe that one top hardcore player oversees the society of the game, passing down edicts to their hardcore lieutenants for distribution amongst the casual peasants. Instead, although the hardcore players are inevitably connected together, an individual hardcore player may frequently interact more with casual players than other members of the hardcore class. The structure of the community in social games is such that observing the patterns of individual behaviour is not sufficient to explain the patterns that are observed in the social networks of play. Instead, players must be considered as part of sub-structures, or groups of players that have tighter links to one another rather than random users within the community of the game.

The complex web of social interactions that make up the communities of games are emergent from the behaviours of the individuals within that community. Although individual play-styles can be generalised to highlight politicians, socialisers, the hardcore and the casual, the most important axiom about play-styles is “Players are all different, and they all behave differently.”[16, p127]. This statement is so important that aspiring social game designers should seriously consider tattooing it on the inside of their eyelids.

6

Tribal Play



(Ms) Pac-Man (1981)

The wider communities of online social games can involve hundreds, or even millions, of players, but these are not always close-knit societies. Within the community of a large social game, the players tend split into smaller groups. These tribes can be defined formally by the game designers, or informally by the players; they can be long-lasting ventures involving hundreds of players and complicated internal politics, or they can be associations of convenience that exist for just a few hours. In any case, exploring the behaviours of players as they join together in groups is important in understanding social play.

This chapter explores the emergence of tribal patterns in social play. The drive to form community groups is not just a result of game design, but a fundamental part of the social nature of the species. Tribal effects, such as favouritism towards fellow group members, have been studied by social psychologists for decades (e.g. [108, 178, 261]). Based on this research, the implications for social game designers are discussed. Two specific experiments are presented, which explore specific factors relating to tribal behaviour in games. Firstly, the effect of feedback about players' implicit social activity on group cohesion in self-organised groups is examined; and secondly, the minimum social feedback required for group members to show in-group bias in randomised player groups is investigated empirically.

6.1 Us and Them

A great deal of attention in social psychological research has been given to investigating the behaviour of people in groups in terms of theories of social identity. One of the most robust, and replicated, findings in this field is that when a person identifies themselves as a member of a social group, this can lead to significant changes in their self-perception, as well as changes in their behaviour both towards other members of that social group as well as to people who are not associated with that group [262]. Specifically, people show favouritism for members of the same group (the in-group) ahead of non-members (the out-group).

> Even when there is no explicit or institutionalized conflict or competition between the groups, there is a tendency toward ingroup-favoring behavior. This is determined by the need to preserve or achieve a "positive group distinctiveness" which in turn serves to protect, enhance, preserve, or achieve a positive social identity for members of the group
>
> - Henri Tajfel[261]

Making a distinction between "us" and "them" within a larger community has a psychological effect that has defined large-scale social movements since the dawn of culture. Study of this group-favouring behaviour has a basis in the anthropological study of "Tribalism", where members of social groups feel a strong sense of cultural identity [254]. This form of social behaviour is not just historical - academics in sociology note that "Neo-Tribalism" is observed in modern contexts, such as in neighbourhood watch movements, youth subcultures and hobby clubs[178]. Joining such social groups has direct effects on self-perception for the individuals who identify with these groups.

In an online context, where identity is generally concealed, it is intuitive to believe that more complex effects of group identity aren't present - that somehow there is a blank slate where people act more rationally. However this is not the case. For example, new members joining online communities actively change their behaviour to better match the norms of their new tribe[166]. The SIDE model (social identity model of deindividuation effects [216]) argues that social identity plays an important part in determining behaviour, and it has been applied in experimental studies of numerous online contexts [79, 245, 246] with varying degrees of anonymity. The development of social identity based on groups appears to be one of the most fundamental human social traits, and can be observed in a large variety of contexts. It is not limited to developing cultures or direct face-to-face contexts, but appears wherever group members possess a strong feeling of identity and loyalty to their group. It is therefore not surprising that social identity and in-group bias is a common feature of social play.

6.1.1 Granfalloons

Tribalism and social identity comes with negative connotations; there is a long and bloody history of the abuse of social psychology, whether intentional or not, to create artificial divisions, generate feelings of hatred and even instigate violence between social groups. The most vivid examples are seen in nationalist [6] and right-wing extremist movements, that use powerful rhetoric to encourage in-group bias based on accidents of birth (i.e. which side of an imaginary border a person was born).

The worrying fact is that social identity is frequently irrational. Individuals show tribal drives based on random or arbitrary distinctions - their favoured football team, their skin colour, religion or gender. In *Cats Cradle*, Kurt Vonnegut [273] controversially asserted that most real-world examples of tribalism are based on these arbitrary and random distinctions. He termed these "Granfalloons", defined as a proud and meaningless association of human beings" [274], including examples like:

> the Communist Party, the Daughters of the American Revolution, the General Electric Company, the Independent Order of Odd Fellows and any nation, anytime, anywhere
>
> - Kurt Vonnegut [273]

Kurt's ideas were controversial enough to cause the book to be banned from several high schools in the USA [97], however his ideas are based on real social effects that are observable in strict experimental conditions.

6.1.2 We are having Fun; They are having Fun

Despite the history of tribalism being littered with dire warnings, it can also lead to positive effects. It has been experimentally demonstrated (e.g. [31]) that competition between groups, even when randomly selected, leads to better overall coordination and efficiency in tasks when compared with individual efforts. With restraint and a strong emphasis on perspective, tribalism can be even be a source of *fun*!

Many large-scale social games already use tribal metaphors to great success. *Dark Age of Camelot*, *Anarchy Online* and *World of Warcraft* all formally split the player-base into pre-determined competing factions as part of the wider narrative - Just like the athletes of different nationalities compete as part of the *FIFA World Cup. Eve Online*, *Shadowbane* and *Age of Conan* also have larger wars as part of their narratives, but the tribes are more informal - they are defined and organised by the players rather than the developers. These, too, have equivalent in sports in terms of amateur team competitions such as leagues and tournaments.

Tribalism brings people together- it can give feelings of identity and belonging; and makes 'friends' out of strangers. Within games, the psychological drives of tribalism create opportunities for exciting forms of play, and within a safe social environment.

6.2 Social Architectures for Motivating Tribalism

As discussed in chapter 4, the social architecture of a game is largely responsible for determining the social behaviours of the players within the community. This section will discuss how careful design of social mechanics can be used to encourage, or discourage, specific tribal behaviours.

At its simplest form, players can be encouraged to form groups by creating challenges that are unachievable, or extremely difficult, for individuals to manage alone. It is then natural for players to cooperate in small, temporary groups in order to meet the challenge (presuming the reward is suitable).

There are any number of ways which game mechanics can be implemented (even accidentally so) that encourage tribal forms. The most widely used and recognisable mechanic is that of player classes.

6.2.1 Example: Player Classes

Many *MMOG*s use asymmetrical class design to force players to group together. When starting to play, new characters must choose a *class* (e.g. Wizard, Monk, Cyber-Bureaucrat[1]) that determines the range of possible skills and abilities that the character has access to. Each class tends to have a weak area that means they will have difficulty meeting the challenges alone. Richard Bartle highlights the "classic triple"[16, p229] of class designs - The *Fighter* (or *Tank*) is able to absorb a significant amount of damage, but lacks the ability to heal; The *Cleric* can heal the fighter, but is weak and dies quickly if an enemy targets it; Finally, the *Magic User* (or DPS - Damage Per Second) character is able to use their abilities on an target to inflict damage from safety and increase the rate at which the target takes damage - generally this reduces the amount of time it takes to defeat the enemy before the cleric character runs out of resources (mana points, bandages, etc.). In this basic group, the characters are much more

[1] This isn't a joke - Sci-fi MMOG *Anarchy Online* has a *Bureaucrat* character class

efficient than they would be when tackling challenges alone, so there is an incentive built into the social architecture for players to form groups. This is equally applicable in both player versus player (PvP) and player versus environment (PvE) play.

Class systems have their roots in pen-and-paper role-playing games, and were first formalised in *Dungeons & Dragons*. They ensure that every player is involved in the game, and no one player can dominate. However, in this context, the group of players is usually very small - conflict and tribalism within such a small group is more likely to be based on politics and story than the innate social architecture of the game. Players are obliged to play together as a group because otherwise there is no point in playing at all - A player who chooses to play a character with no useful skills (e.g. an incompetent Elven secretary in a battle game) can barely participate in the *mechanical* aspect of the game and are simply "along for the ride" (which is perfectly fine, if they and their group are having fun!).

These "Rock-Paper-Scissors" type relationships between characters aren't found only in the social architecture of role-playing games. Online first-person shooter games such as *Team Fortress 2* and *Battlefield 2* also include different classes specifically designed for certain roles and synergies.

In large online games, these groupings are tribes at a basic level - frequently they are formed spontaneously as required by a particular situation. More complicated groups involving larger numbers of characters with a variety of more subtle roles may be needed to tackle more complicated challenges in a game. For example, raids with up to forty or more characters in *Everquest* or *World of Warcraft*. These larger events may have huge rewards in terms of game items or even simply for advancing the narrative (such as "Waking the Sleeper", a major part of the narrative arc in *Everquest*[66]).

6.2.2 Tribal Mechanics

Although tweaks to the central mechanisms of the game (e.g. murdering wildlife for experience points) can encourage group behaviours in games, for players to feel a part of a “tribe”, the architecture must support ways for players to organise at a larger scale. There needs to be a way for players to self-organise into “us”-es and “them”s. In designing online communities, Amy Jo Kim highlights the potential benefits of allowing users to form groups [138], but to flourish, social groups must be given spaces, tools and support from the architecture of the system beneath.

Figure 6.1: Characters in *World of Warcraft* are augmented with public social identity - Players can make their guild affiliation visible, and use titles awarded by the game for social achievements (e.g. “Knight”)

The established standard is in the support of team structures usually known as “guilds” or “clans”. Players don’t need to have formal architectures to support team play, for example FPS games have a long history of self-organised teams, leagues and tournaments, however, the architecture can be designed to reduce the effort needed by individuals to maintain such systems (creating websites, moderating IRC channels,...).

Formal in-game tribal mechanisms means the developers can include useful social features - “guild chat” allows players to talk to fellow guild members at any time regardless of distance. Guild property can give tribes a presence in the game world, and guild inventories allow tribes to own and share equipment. In their study of grouping behaviours in *World of Warcraft*, Nicolas Ducheneaut and colleagues find [82] that players using these social mechanics (i.e. being a member of an in-game guild) increase the amount of groups that they are involved with during play, the rate of advancement in the game and also increase the amount of time spent playing. Identification within groups such as guilds is an important source of social value within games [282].

Feelings of tribal identity are commonly further supported by allowing players to publicly display their affiliation. This might be by having a badge in the player profile, or even appending a guild abbreviation to names. In order to create a "them", systems of inter-tribe competition are created. These can be directly competitive such as in team PvP competitions and guild ranking systems, or indirectly competitive through social means - guilds acting as a social group, working together on the more difficult group challenges ahead of other tribes.

More complicated tribal systems can have more in common with governments than guilds. In *Eve Online*, a massively-multiplayer sci-fi space opera (essentially *Elite*: the MMOG), the meta-game structure for tribes is through complex "corporations". *Eve* supports player controlled craft up to the equivalent of naval capital ships. However, these craft are far too expensive for individuals to ever manufacture or purchase, so are essentially limited to corporation level play - purchased through the taxation of the players in that corporation. Corporations are engaged in elaborate webs of espionage and counter-espionage, also dabbling in intelligence and propaganda. The political system in *Eve* is so complex, the players have essentially formed some of the first functioning virtual nation-states, complete with the equivalent of dictators, armed forces and a repressed proletariat.

6.3 Socio-contextual Enhancement

In order for game design to support tribalism, it is important that the players have a feeling of social identity. The social architecture must therefore reinforce and enhance feelings of community, by specifically demonstrating to players that they are *in* a community.

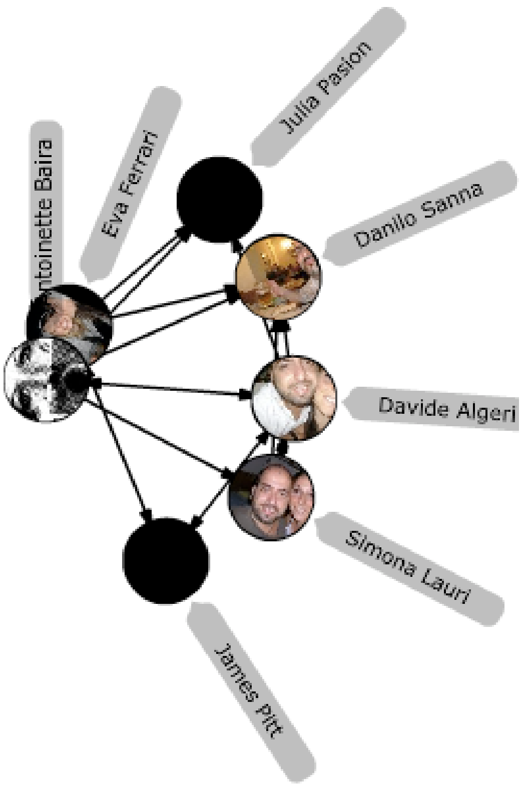


Figure 6.2: Implicit Social Connections are made Explicit in *Magpies* - This additional social information supports the ability of the group to work collaboratively[146]

The design of online social systems specifically has complications of *context*. For example, when studying face-to-face and online social interactions, Lillemor Adrianson and Erland Hjelmquist[3] found that typically face-to-face communication features more complex negotiation and diplomacy. However, when mediated by the Internet, it showed a greater reliance on extended information sharing and greater amounts of data exchange.

6.3.1 Making the Implicit, *Explicit*

The difference of context means that non-verbal aspects are often lacking in mediated communication. Efforts to increase the richness of communication online are generally based around making the *implicit* social factors in face-to-face communications more *explicit* in a virtual context.

Researchers in Computer-mediated communication (CMC) have conducted a great deal of work on replicating typical non-verbal aspects of face-to-face communication in computer mediated social environments and also introducing new non-verbal cues in a manner that is respectful of the context in which these interactions take place (e.g. [90]). One of the major strategies for increasing the richness of social presence has been by exposing the underlying social behaviours of group members, and making implicit factors in computer-mediated communication explicit. For instance, applications have been created that expose social network information [183] as "Socio-Contextual" information (data that makes hidden information about the social context of individuals more visible) to participants within group working scenarios [75, 139, 175].

By exposing these implicit relationships to the players, the game designer can trigger changes in their social behaviour. For example, in a controlled study of cooperation within a treasure hunting game, Francesco Martino and colleagues[182] found that displaying socio-contextual information in the form of Social Network Analysis (SNA) statistics to players had a positive effect on increasing group ability to cooperate and engage with the game objectives.

6.3.2 Feedback and Social Identity

Given that social feedback increases effectiveness at collaborative problem solving in games[182], and that structures that support feelings of social identity and belonging increase participation in games[82], it may be that exposing additional social context may also reinforce social identity in online games, even where there is no central problem-solving task.

To test this hypothesis, a social game called *Magpies* was created. *Magpies* (described more comprehensively in section A.3) is centred on the theme of collection; in many cultures, magpies are birds associated with the activity of collecting small shiny trinkets with which they decorate their nests. Players in the game work individually and create collections or stashes around a theme determined through free text entry. Other players are invited to contribute items that match the theme, in the form of text, images and/or locations. The stash then builds up over time as a list of curiosities that match this theme. Players can rate one another's stashes and compete to build the most popular collections. Players are also able to create and join arbitrary groups within the system. Groups are ranked against each other based on the status of the players within, to add a tribally competitive angle to an otherwise individually driven game.

Socio-Contextual Information in Magpies

In *Magpies*, as an addition to the central mechanics of the game, users were presented with a variety of statistics based on their social behaviours. These were split into group and individual indices. The Group Indices included Group Centralisation, Group Reciprocity and Group Density. The Individual Indices included Degree Centrality, In-Degree Centrality, Out-Degree Centrality and Reciprocity[276].

These measures were calculated regularly based on activity within the game, and presented to the user as values between zero and five "stars". The technical names for the indices were replaced in the interface by labels validated by focus groups as more meaningful to players (i.e. "Reciprocity" became "Equality") and supported with descriptions and examples within the game.

Additional visualisations allowed players to see activity in the form of network graphs. For example, it was possible to view the pattern of interactions between players within groups in the form of a network graph, where individuals were represented by nodes and connected by arrows. These arrows represent the act of one player contributing to the stash of another. Players could also visualise group membership by seeing a graph that represented each group as a node connected by edges indicating shared membership. This aided the players when choosing to join groups.

Figure 6.3: *Magpies* displays group connections and socio-contextual feedback to players in the game - *Beachcombers*, the control version of the application, does not show this information to the users

It must be emphasised that the enhanced social contextual information provided to players in the Magpies condition was provided as additional supporting information around the core mechanics of the game. There was no central task players were asked to perform with the aid of this information, and no problems that required solving through organised group collaboration.

Control Condition: Beachcombers

In order to conduct a controlled experiment, a second, almost exact duplicate of the *Magpies* game was created called *Beachcombers*, so-named from the activity of exploring beaches to discover trinkets and treasures washed ashore by the tides. This game was identical to *Magpies* apart from the branding and the fact that the socio-contextual feedback was hidden from view of the players.

Both games were released at the same time to a small group of volunteer participants selected by trial organisers and from then additional players were free to join the game

Table 6.1: Comparison of interactions between *Magpies* and *Beachcombers*

Game	Players (N)	Collections	Interactions
Magpies	102	67	297
Beachcombers	113	75	89

through natural "viral" spread. Each new player was asked to complete a release form for trial participation before beginning to play. All interactions with both versions of the system, including page access and usage of functionality, were recorded, along with the results of the social network indices, for post-trial analysis. Players were able to join either game freely. Despite this only one non-invited participant interacted with both games during the trial period.

Magpies, *Beachcombers* and the trial methodology are explained in more detail in section A.3.

6.3.3 Effect of Enhanced Social Context on Interactions

Over the course of the trial a total of 215 players played the two games. Between both conditions 166 collections were created, and these provoked a total of 364 response interactions (including a combination of text, images and locations) from other players. Both conditions had a similar number of players, who each created a similar number of collections. However, there is a striking difference in the number of interactions contributed by players in the augmented (Magpies) condition.

Both *Magpies* and *Beachcombers* experienced comparable patterns of growth, which indicates that the additional socio-contextual information in the augmented condition does not appear to be an interesting factor for attracting new players, or motivating existing players to actively engage in recruitment.

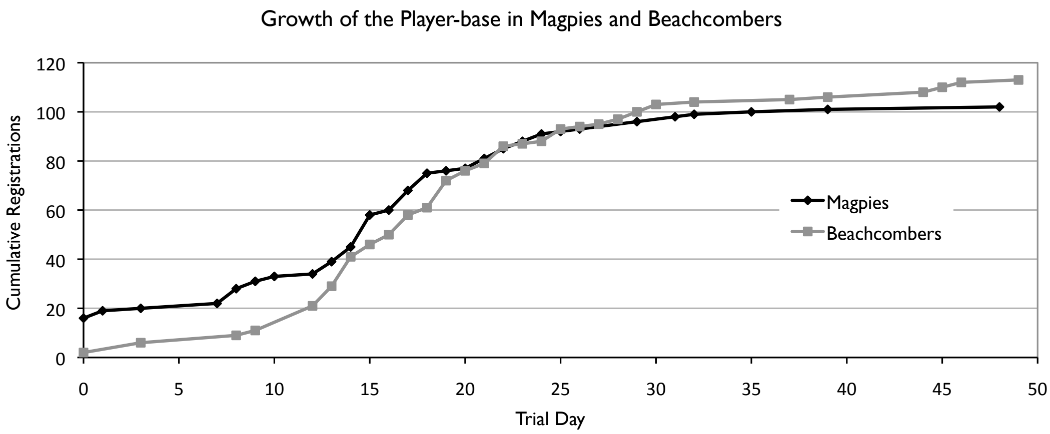


Figure 6.4: Growth of the player-base in *Magpies* and *Beachcombers* - Both games exhibited similar patterns of growth during the trial period

Interaction Patterns

In-game collections created in the socio-contextually augmented condition (Magpies) provoked many more response interactions from other players than those collections in the non-augmented condition.

Figure 6.5 shows the pattern of interactions (i.e. the act of a player making a contribution to another player's collection within the game) experienced in both conditions over time, compared with the growth of collection creation. As can be clearly observed, the pattern of interactions in the augmented condition appears to be highly accelerated when compared with the non-augmented condition, despite the patterns of collection creation and player-base growth being very similar. This indicates an increase in engagement with the game for the players in the augmented condition. An unpaired t-test confirms that daily interaction activity (across players) in the *Magpies* condition is significantly different than that in *Beachcombers* ($p < 0.002$).

In this controlled study involving over two hundred users, it was found that when players were exposed to this additional socio-contextual feedback, they were more likely to be involved in a higher number of social interactions with other game players com-

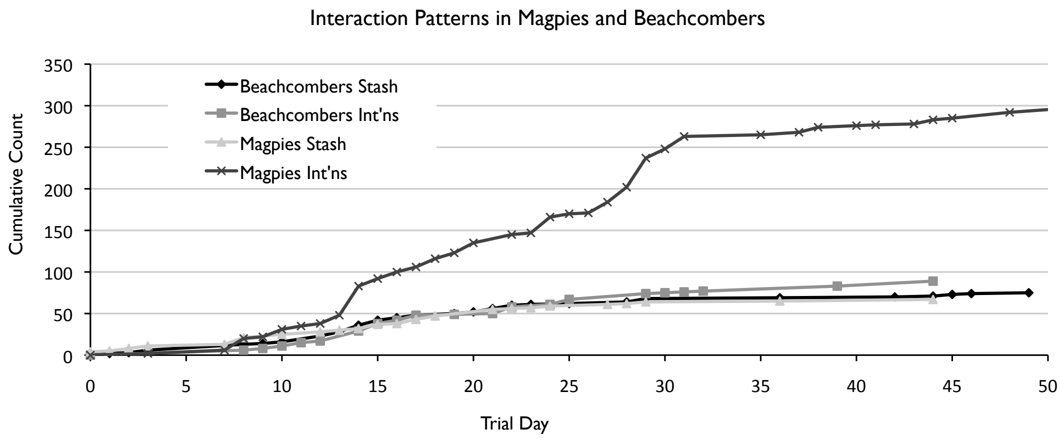


Figure 6.5: Interaction patterns in *Magpies* and *Beachcombers* - Magpies players were more socially active than players of *Beachcombers*

pared with a game that did not display this information.

These results corroborate findings in previous work by Francesco Martino *et al.* [182], in which players exposed to SNA information while playing games demonstrated increased activity and engagement, and extends this work further by showing that the observed increase in activity is not just limited to games centred around collaborative task completion or problem solving, but also applies to games such as *Magpies*, where the central objective is not as clearly defined and the additional social information is provided simply as context to the game play.

Both games were deployed on the social platform of *Facebook* and allowed to grow naturally through viral spread in the social graph. However, results show that the use of socio-contextual augmentation did not have any significant effect on the rate of growth of the player-base. Therefore, the increased engagement and increased social presence observed with active players does not appear to be a motivating factor for new users to join the game. However, since the socio-contextual enhancement in the game design did not give feedback or rewards for recruiting new players it may not have impacted on these viral behaviours.

It appears that presenting rich socio-contextual information to game players can enhance their general engagement with the game. However, it is not clear what specific contextual information is the most effective. In *Magpies*, players had a large selection of indices to browse, but the relative efficacy of each type of feedback is unknown.

6.4 Random Tribes and Minimal Player Groups

The result of the *Magpies* experiment suggests that giving groups of players feedback on their social behaviour is a useful way to increase social engagement between players in groups and with a game in general. However, in *Magpies*, the groups within the game were created and maintained by the players themselves. It is easy to imagine that many players only joined groups that had their friends in them already, and thus were predisposed to being highly social in the game. Any additional tribal patterns of in-group bias, therefore, may be due to external social factors. What if group membership were random?

6.4.1 Minimal Groups

In the 1960s and 1970s, experiments in social psychology showed repeatedly that people demonstrate a strong preference for members of their 'in-group' over members of an 'outgroup' even when groups were randomly determined. This finding was found to be consistent regardless of what characteristics were used to define those groups (e.g. [262]).

In a series of experiments, social psychologists tried to determine the nature of the "Minimal Group" - in other words, the minimal conditions required to generate bias from people towards in-group members. In a typical experiment [262], the participant was simply told that they were in group A and that their task was to give money to one of two other people; one who was also identified as a member of group A, and another who was a member of group B. Participants consistently favoured the other member of their own group, regardless of the fact that they had never met them, would never meet them in future, and that they knew nothing about them apart from their arbitrarily assigned group name. In experimental conditions, simply being told that you are a member of a group is enough to trigger these in-group biases [262]. Henri Tajfel & John Turner subsequently developed Social Identity Theory [263] in order to explain how membership of a group can affect cognitive processes and behaviour.

In these experimental conditions, the effect of social identity is profound, but in the complex social environment of a game, the effects may not be so easily measured. There are two main questions for game designers:

- Firstly, Do people show in-group bias when part of a group in an online gaming context, even when the membership is chosen totally randomly?
- Secondly, Is it enough that members of a group or tribe are members in name only (i.e. minimal groups), or does tribalism in games require the feelings of social identity be reinforced with social context and feedback?

6.4.2 Minimal *Player* Groups

In order to discover the nature of minimal player groups in online social games, a controlled study was devised where players were assigned randomly to groups within that game. The game, *PASION Fruit* (described in more detail in section A.5), organised players automatically into one of ten random groups as they joined the game.

The game itself was based on trading several varieties of fruit. Players could send one another gifts of fruit, and points were awarded based on the variety of fruit collected and reduced by the environmental impact of the transaction. Importantly, in the game design, although cooperation and negotiation were required for personal achievements (i.e. higher scores), this was explicitly separate from the mechanics of group membership. There was no in-game benefit for choosing to interact with a fellow group member ahead of any other player. Similarly, there was no restriction on the choice of possi-

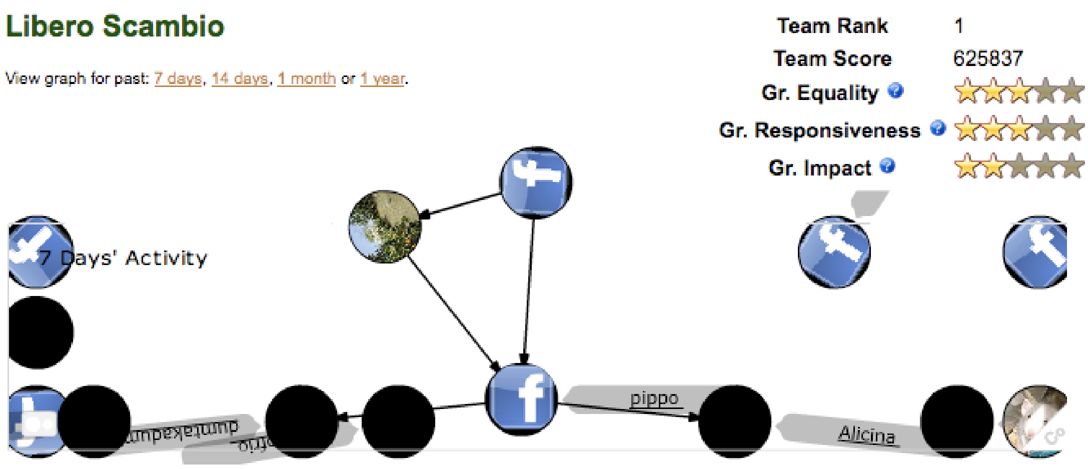


Figure 6.6: An augmented version of *PASION Fruit* showed additional social feedback to members of the randomised groups - The control version used randomised groups but without the augmentation

ble recipient. Players were able to give gifts to any member of the wider player-base, regardless of location or group membership.

In *PASION Fruit*, each group had a screen that showed members of the group as well as context information about the social behaviour of group members. This included social network indices and a social network visualisation (See A.5). Index labels were changed into more context-centred and intuitive ones (e.g. degree centralisation was changed into “Group Equality”) according to suggestions and choices coming from previous interviews with potential users.

A control version of the game was also implemented that was identical in every way to the original except for the name (*Fruit Loot* - A.5) and the lack of social context information for group members. In this condition, players were assigned groups randomly in the same fashion except the group information pages simply showed a list of fellow members. The point of the control was to be able to identify the difference that social feedback has on in-group favouring behaviours.

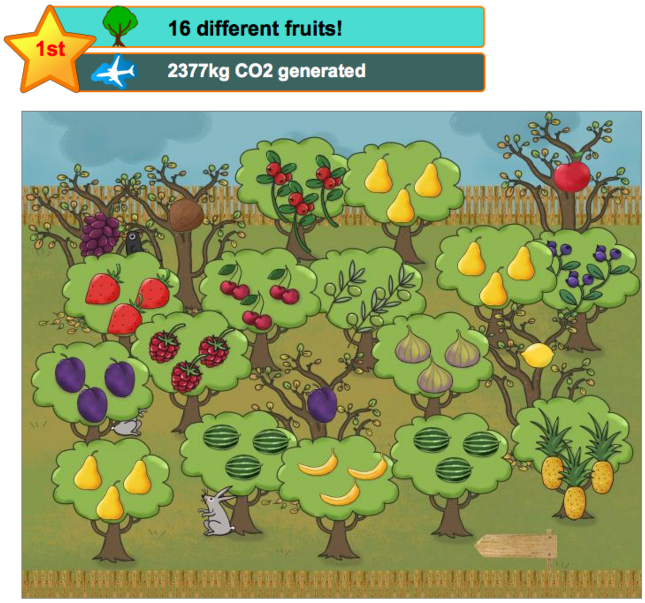
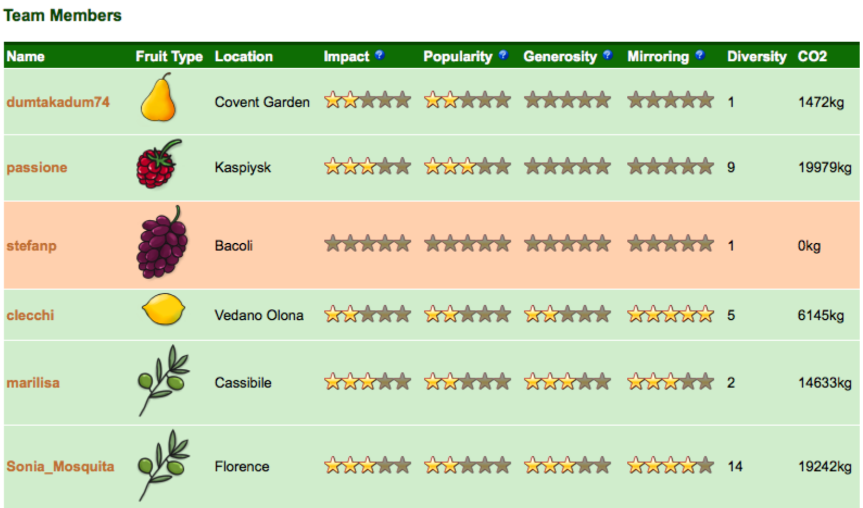


Figure 6.7: *PASION Fruit* is a game about fruit gardens - Players grow and exchange fruit, attempting to get diverse collections



Team Members

Name	Fruit Type	Location	Impact	Popularity	Generosity	Mirroring	Diversity	CO2
dumtakadum74		Covent Garden					1	1472kg
passione		Kaspiysk					9	19979kg
stefanp		Bacoli					1	0kg
clecchi		Vedano Olona					5	6145kg
marilisa		Cassibile					2	14633kg
Sonia_Mosquita		Florence					14	19242kg

Figure 6.8: *PASION Fruit* included socio-contextual feedback about other group members - The feedback is based on social network indices calculated based on player behaviour

Engagement in Minimal Player Groups

After a trial in experimental conditions (described in detail in A.5), data was gathered to evaluate the effect of minimal feedback on tribal behaviour in games. In this experiment, the mean number of events (fruit exchanged or received) by each participant was 13.4 in *PASION Fruit*, and 5.83 in the control condition. Means showed a larger activity (and therefore higher engagement) for participants involved in the social condition.

Analysis of the interactions in both conditions showed that the cumulative function of player activity between users in both conditions followed similar heavy-tailed distributions. The similarity in distribution shows that the macroscopic patterns of social interactions were close across both conditions. Players at similar levels of activity interacted with a similar number of co-players. Importantly, this confirms that the similarity of the social architecture between conditions. Despite having different players, the mechanics of both games resulted in similar patterns of social interactions. Any difference in the choice of co-player is therefore due to the experimental variables and has not been confounded by external factors.

In-Group Bias

By comparing the volume of social interactions between members of the same group, a picture of in-group bias emerges. In this experiment, presuming players chose recipients strictly randomly and the groups are of equivalent size, the expected in-group bias would tend towards 10% based on chance (since there are 10 groups in both conditions, of the same size). However, in the social condition, the mean value for bias across the user-base was 23.3% compared to the control condition with 5.97%.

Figure 6.9 shows a comparison of the two conditions based on the number of gifts a user sent to members of their own group (in-group) and other players (out-group). The lines show the expected split of in/out-group partnerships based on random player choice (i.e. 10% in-group), so points above that line represent players that favoured

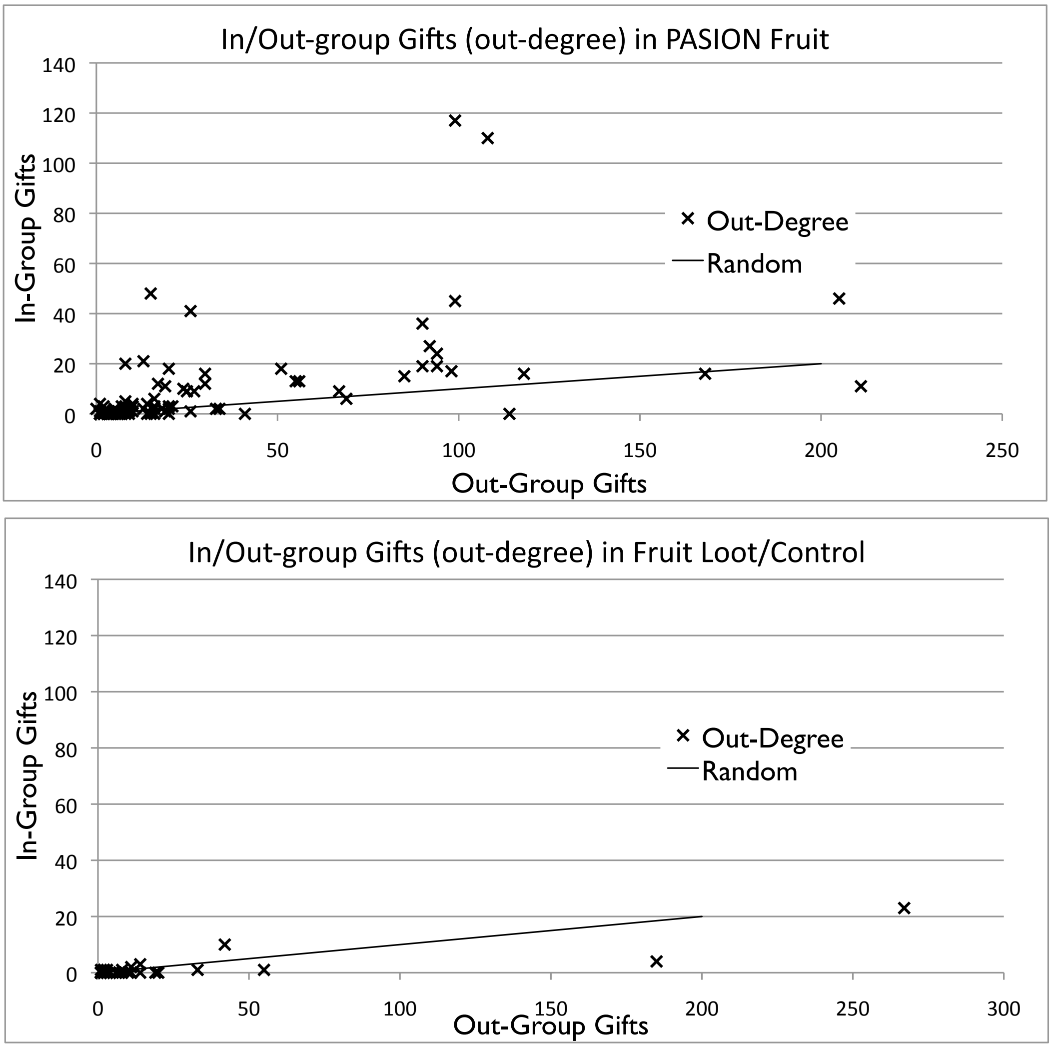


Figure 6.9: Comparison of in-group bias between randomised experimental conditions - In the socially augmented version, players showed greater engagement and favouritism towards members of their own group

group members disproportionately. As can be seen, many players in the social feedback condition favoured the in-group more than would be expected at random. Comparing the proportion of in-group bias using an unpaired t-test (presuming player bias, calculated as in-group interactions over *out-degree*, follows a Gaussian distribution), the condition with social feedback showed greater in-group favouritism with $p < 0.01$. Therefore, the data gathered about actual player behaviour gives strong support to the argument that showing players this level of socio-contextual feedback regarding group membership results in players showing disproportionate bias towards interacting with group members.

Social Identity

In a post-trial questionnaire, users in the social condition responded to questions about their membership of the groups. Players reported mixed opinions about group identity asked for their agreement with the statement "I felt a part of my group", 36.3% agreed or strongly agreed, and 39.3% disagreed or strongly disagreed; the rest being neutral.

In response to the statement "I was more likely to give gifts to members of my group", 57.6% of users stated they agreed or strongly agreed; compared to 27.3% who disagreed or strongly disagreed.

Players were asked to select how important various factors were in choosing whom to send a gift. In response to "Membership of your group", 54.5% of users thought it was somewhat, or very, important compared to 24.1% who thought it was somewhat or very unimportant.

The responses to the questions about group identity were mixed, however the analysis of server logs shows that when choosing a player to whom a gift will be sent, there was a higher probability to find that players would choose fellow group members in the social condition when compared to the control condition.

This reflects the non-intuitive aspect of the minimal group paradigm. Individuals may assume, looking back, that their choices of interaction partners were based on rational and measured decisions (e.g. interacting with the most suitable player for personal gain, regardless of group). However the reality of the activities as exposed by the quantitative data in the server logs highlights the cognitive bias at play in social systems that use tribal metaphors.

6.5 Discussion

Tools of Tribalism and social identity are frequently used for negative purposes: as dictators have known for centuries, creating divisions and artificial groups leads to measurably greater engagement and fervour for a cause. In other words, it is used because it works. This chapter explores the application of these techniques to discover if the same principles apply in the context of the design of mechanics that drive social games. Tribalism increase engagement both with the artificial social conflict, and wider engagement with the game itself.

Many social games already use tribal metaphors such as guilds, clans and factions to great success, and those mechanisms appear to directly convert into increased engagement of players with the game [82]. This evidence is often anecdotal - modern social games are so complicated in the social architecture it can be hard to extract the effect of particular mechanics on the behaviour of the players. A more scientific approach is required.

In experimental conditions, research has shown that *socio-contextual enhancements* that augment a game with explicit feedback about implicit social factors, directly support the ability of groups of players to collaborate on problem solving [183]. Two experiments with social game mechanics were presented in this chapter. The first was based around socio-contextual enhancements in a large game with no central problem-solving task. In *Magpies*, the players who were shown additional feedback about their social behaviour within the group showed greater engagement and increased levels of social activity within the game. This demonstrates that social mechanics do not always need to be explicitly designed to directly create social effects - simple reflective visualisations and feedback serve to reinforce social behaviour generally within games.

In addition, this chapter has shown that the formation of tribes is not necessarily down to an innate drive in players to socialise. If the social architecture makes tribalism beneficial, then tribes will form in the game. The second experiment built on the first to answer two specific questions:

- Whether people show in-group bias when part of a group in an online context, even when the membership is chosen totally randomly
- Whether it was enough that members of a group or tribe are members in name only (minimal groups), or if it requires reinforcement with social context and feedback.

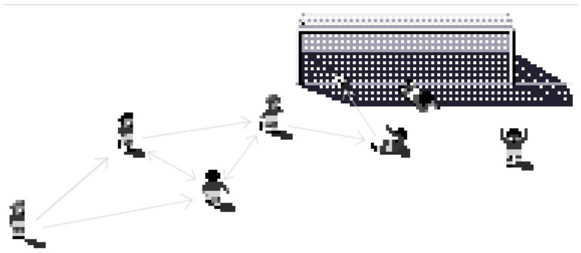
Through a controlled experiment, it has been demonstrated that splitting users into random groups in an online application directly leads to greater engagement and participation.

It must be noted that Henri Tajfel and John Turner [263] identified that prevailing context was one of several factors that contributed to the emergence of in-group favouritism. In the context of online social games, the key factor appears to be that group members require a minimum level of social feedback in order to trigger these feelings of social identity and to in-group bias in their actions. In other words, it is important to make it clear to the users that there is a meaningful distinction between the groups. Social gaming applications must carefully design the social experience with consideration to social feedback mechanisms. In order to encourage group behaviour, a minimum level of feedback is required - in this example, social network visualisations were used but other feedback mechanisms may also be effective. The emergence of in-group bias, in a system with enough social feedback, is directly measurable in the activities of the users, even if they do not strongly recognise this behaviour in self-reflection of their actions.

Even when tribe membership is determined completely randomly, with feedback, players show preferences for social play within their own tribes, and strong feelings of group membership and identity.

7

Networks of Play



Sensible Soccer (1992)

The previous chapters have highlighted how the holistic social architecture of games shape the interactions that emerge between their players. This complex relationship results in discernible patterns that uncover the social effect of particular design decisions, whether this is the impact on individual activity within a game, or the way clusters of players join together to form social groups. This information is extremely valuable to game designers. By understanding the complex effects of game mechanics, whether directly social or not, it enables the designer to engineer better social experiences based on the implicit expectations of the players themselves. A variety of tools can be used to try and better understand the players. Qualitative methods can give insight into the behaviours and motivations of individuals, but the behaviour of the community as a whole is harder to determine, and drawing conclusions based on individual experience does not give the complete view of the subtle social ecosystems at work. By treating the social interactions of players as a social network of nodes and edges, it becomes possible to investigate using the mathematical tools of Social Network Analysis (SNA)[276]. This chapter uses SNA to study the networks behind several social games to highlight the differences and similarities in the emergent social play.

The data gathered from server logs during the operation of online social games describes a complete social history of in-game interactions between the players. By examining this data using quantitative methods we can illuminate the structure of communities in-game from an objective, holistic perspective. Interestingly, taking this approach also allows different games to be directly compared based on the social structures that emerge from player activity.

7.1 Social Networks of Play

To analyse patterns of social activity, Social Network Analysis, as a branch of graph theory [234, 276], provides powerful tools for extracting meaning from the complicated tangle of social interactions that happen within a game.

SNA treats social systems as network graphs, composed of a multitude of edges connecting between a set of nodes. By mathematically studying the topology of this graph, SNA can uncover interesting features about the system from which the graph originates. In the context of social interaction in games, each player is considered to be a node in a graph, and each social interaction (gift, message, punch, etc.) between two players to be a directed line connecting to these nodes. Where server data is available, such a graph can be constructed for every player and every interaction within the social environment of a game. Studying the topology of this graph of playful connections can give insights into the nature of social interactions within the game communities.

The graphs of nodes and edges that are described by the data collected from play is dense and complicated. Figure 7.2 shows a visualisation of the interactions between players of *PASION Fruit*, and highlights the necessity of using mathematical tools to extract facts about the patterns and nature of play in such complex social systems.

SNA is an valuable tool for discovering meaning in networks like those formed in social play. A comparable example of this benefit is found in the analysis of the World Wide Web. Given that links between pages in the web reflect subjective quality, Jon

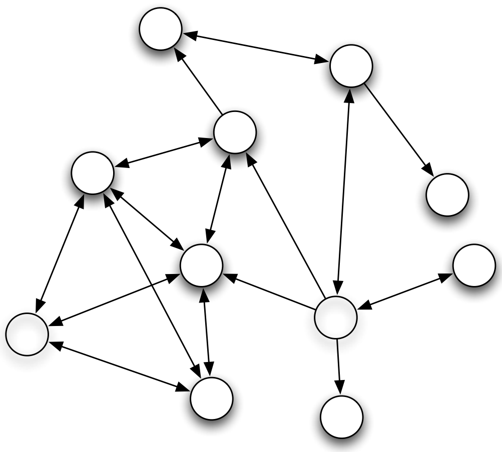


Figure 7.1: Graphing interactions in social games - Social games can be treated as network graphs made up of nodes (players) and directed edges (social interactions)

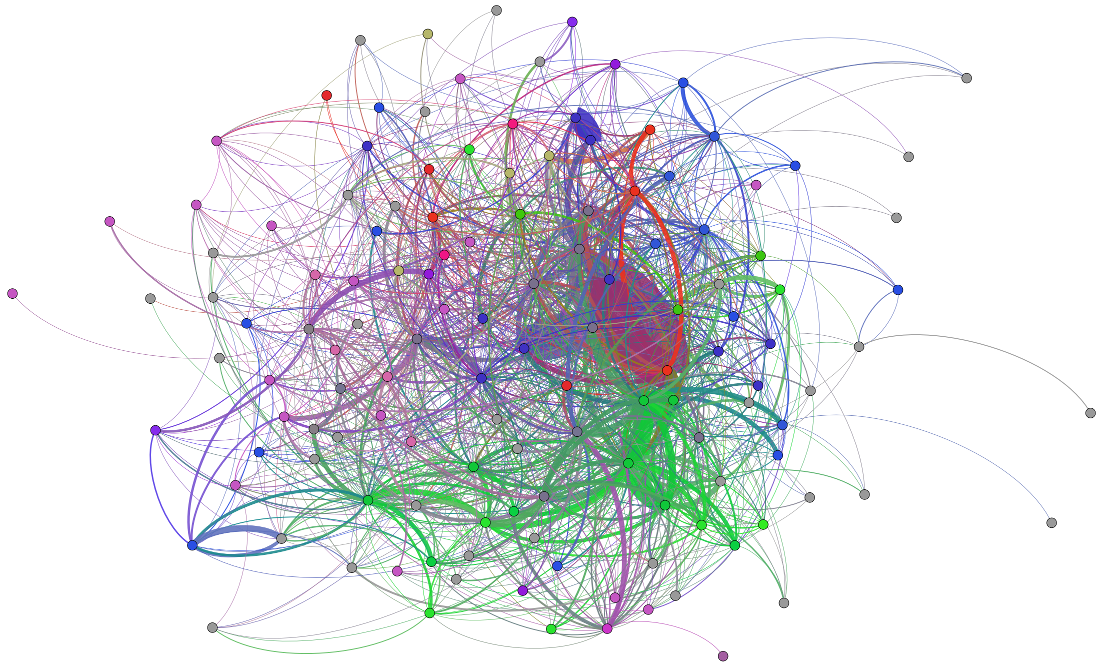


Figure 7.2: Network of interactions in *PASION Fruit* - The network graph of interactions in PASION Fruit highlights the highly complex patterns of social interactions in the game

Kleinberg described the authoritativeness of web pages by examining the social network of the web and the emergent structures found there [151]. The algorithm itself does not have to understand the semantics of the subject of the pages in the web, by presuming that the hyperlinks between pages are indicative of respect, the authoritativeness can be derived from the position in the network. Google's PageRank [209] algorithm matches this individual authority against the importance of a page's predecessors (those linking to it) and the textual content to build an effective search engine based on importance and relevance.

Just as PageRank is able to find useful patterns in the complex mess of the world wide web regardless of content, social network analysis can be used as a tool to highlight patterns in social interactions between players in social games, without the need to understand the specific context and content of each interaction in the network.

7.1.1 Scaling in Social Games

In Network Analysis, "Scaling" is characterised by the way that networks may exhibit *preferential connectivity* as they grow [14]. As new nodes join an existing network, they are more likely to connect to a highly connected node and therefore "the rich get richer"[13]. It is this preferential connectivity that results in a network activity following a power-like distribution, and makes some networks *scale free* at all levels of connectivity. In other words, the relative rarity of nodes with certain numbers of connections is predictable at any level. In terms of the social networks built in games, preferential connectivity means that with each interaction, a player is likely to choose to interact with one of the "Hardcore" players who are the most socially active players in the game.

The growth of social systems online has highlighted the effect of the power law due to the highly *scalable* nature of the web (although mathematically not scale free [284]). In a non-electronic context, physical limitations can prevent systems of preferential attachment from scaling indefinitely [14]. For example, a physical bookshop could never compete with the range of titles offered by *Amazon* simply because the physical size and logistics of such a store would be prohibitive. *Amazon* can scale much greater because the store-front is virtual, and the arrangement of warehousing and logistics is not constrained by high-street geography. Of course, since *Amazon* still deals mainly in physical items, they cannot scale indefinitely. This is a problem that does not affect purely virtual social systems such as online games in the same ways.

The growth of *Blogging* on the web is an example of such a highly scaling virtual social application. The NITLE census estimates there are over 2.8 million currently active blogs online [202]. This number is rising so rapidly [264] that this number is incorrect within minutes of writing it down. People have different motivations for creating and reading blogs [195], however, the patterns for subscription are a prime example of how "heavy tailed" distributions like the power law determine the popularity of any particular writer within this complex social system [238]. Basically, that readers are more likely to create new links in the network that point to more popular blogs than any other kind [158]. The distribution of links between blogs is more closely described by a log-normal distribution than a power law [235], but the emergence of this non-random heavy-tailed growth of the network is very important. Although they appear scale free, especially when compared to physically bound networks such as traffic networks, the networks of blogs and social games are both constrained in terms of their reliance on humans to form new connections within the network. In other words, humans, and human cognitive capability, is a finite resource that limits the scaling of these networks.

For example, social games generally exhibit patterns that hint at them being scale free, but on closer inspection scaling is only consistent within certain thresholds. Only within these thresholds, the value of the scaling exponent, α, is predictive for all values of k within that community. The probability of someone having more than k connections in a game is related to the same exponent α. In other words, based on the behaviour of existing users, we can reliably predict the number of users in the future who will have any given level of social activity. Social games cannot ever be truly scale free since there are barriers to the ability of players to interact - the cognitive and social physics of the network infrastructure are not reliable [284]. Since play is a cognitive process, there are limits to the capabilities of players to interact effectively, especially at higher levels of k. This threshold depends on the interface and cognitive load required to interact within any specific social game. For example, a game with very quick and simple interaction mechanics uses fewer cognitive resources, therefore should have the potential scale to a higher degree than a game whose interactions are more complicated and involved.

7.1.2 Scaling and the Social Architecture

The social architecture of a game directly affects the social activity of the players. If the game requires a lot of social interactions for a player to be successful, it is expected that the player activity will increase. Similarly, if the process of using the game interface to interact with another player is quick, players can be more socially active in a shorter period of time.

The effect of the social architecture on activity can be observed by the difference in the distribution of activity (see section 5.2 for more on the value of this analysis). For games whose communities show similar distributions, direct comparisons are possible by analysing the parameters of the distribution.

For example, several games appear to follow a power-like law for distribution of activity ($P(k) \approx k^{-\alpha}$), so we are able to compare by the difference in the scaling exponent (α, when fitted to a power distribution using a maximum likelihood method) between different games. If the exponent is high, and therefore the graph sharp, this shows that it is less common for players to be more socially active than in a similar game

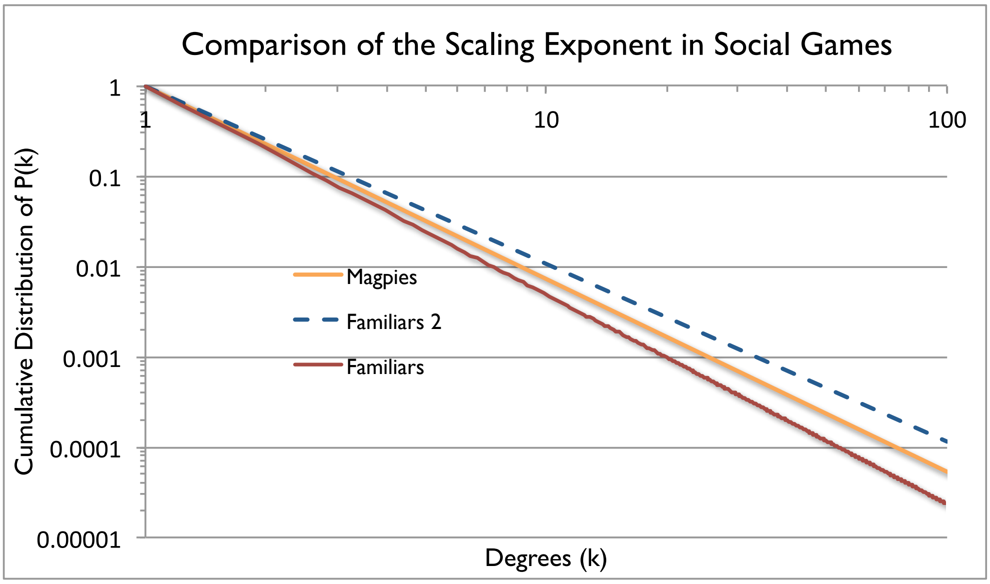


Figure 7.3: Comparison of the Scaling Exponent between games - The difference in best-fit (maximum likelihood estimated) scaling exponent (α) for a power-law decay of social activity highlights differences in the social architectures of games

with a lower scaling exponent. This is a result of the differences in social architecture between the games. Figure 7.3 plots the best-fit scaling exponent for applicable social games over typical ranges of k. This graph is abstract, since the real behaviours of the players will be distributed less cleanly around this line, but serves to illustrate the abstracted value of α as a single measure of social architecture. Based on this plot, it can be seen that, broadly speaking, the players of *Magpies* are much more socially active than the players of *Familiars 2*. This is not a value judgement, but highlights how differences in game design affect social activity.

The social architecture is complicated, since it is the result of a combination of game design, user interface and technical implementation factors. Comparing two or more games can be difficult since this social architecture must be considered from a holistic perspective. For example, Table 7.1 shows the games *Familiars 1* and *Magpies* have similar values for α. However, actual game design and implementation is different (see

Table 7.1: Scaling exponents (α) for the power-law decay of activity (k) in different social games

Game	best-fit α	x_{min}	p
Familiars 1	2.32	4	0.28
Familiars 2	1.97	2	0.36
Magpies	2.14	5	0.28

A.2 and A.3). This difference in design also means that the social architecture of these games is different, as the designs encourage social interaction in markedly different ways. The similarity of their scaling exponents illustrates instead that the holistic view of their social architectures results in a similar pattern of social activity.

A higher scaling exponent should not necessarily be considered a negative pattern by itself - it is dependent on the intentions of the game design. If higher activity levels (therefore a lower scaling exponent) were expected from players based on this design, then a high exponent may be an indicator that there is some issue with the implementation or user interface that is affecting the players' ability to interact.

This macroscopic view of social behaviour through analysis of social networks is agnostic to the mechanical idiosyncrasies of the games. Indeed, it can even be applied to non-game systems. Table 7.2 shows scaling exponents taken from social network analyses of several popular Web2.0 systems. Although of perhaps limited use, it enables us to compare systems. For example, the social architecture of *Twitter* encourages more social connections than the similar system in *Flickr*. When comparing the scaling of Web2.0 social activity to that of the social games in table 7.1, the game players appear dramatically more indiscriminate in their choice of interaction partners. Although this is not a thorough investigation, it does highlight the differences between communities based around games and those around other services.

Table 7.2: Scaling exponents (α) for the power-law decay of activity (k) in non-game social systems

Application	best-fit α
Wikipedia Edits [281]	1.96
Digg Votes [281]	1.35
Flickr Friends [164]	2.74
Twitter Follows [134]	2.41

7.1.3 Broad Scaling, Multi Scaling and Architecture Problems

For some games, activity is described by a power distribution, which is plotted as a straight line on a log-log graph as above. As such, it is apparently a fairly common pattern among social games. However, in some cases phenomena known as *multi-scaling* and *broad-scaling* are observed. Multi-scaling occurs where there is more than one scaling exponent at different levels of k in the same network, and Broad-scaling occurs where after a point, the tail of a single-scale network decays at an exponential or Gaussian rate [5] (i.e. $P(k) \approx k^{-\alpha}e^{-\lambda k}$). This means that the scaling exponent α has limited usefulness in making predictions for activity in the entire network, since different values for α may exist at different levels of activity.

Changes in scaling are a symptom of a hindrance in the process for preferential attachment [14] in a network. According to Luís Amaral *et al.* [5], this hindrance can be a result of two factors:

Aging of Vertices - if a node in the network "dies" they are longer available for connection in the network. For example, in the network of actors [225], if a popular actor (i.e. they have high *fitness* [13] for the network) dies during the most active part of their career (e.g. River Phoenix, Heath Ledger), they will not be available to expand

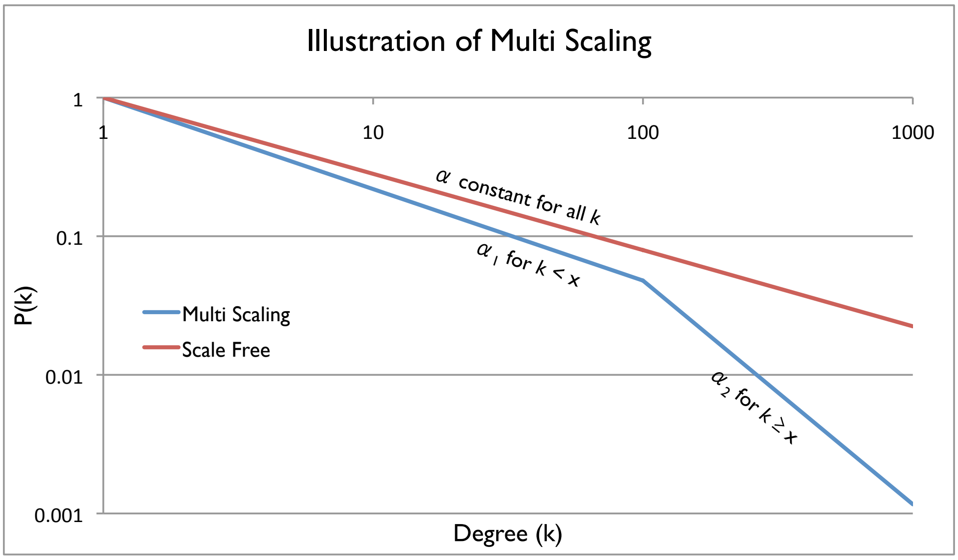


Figure 7.4: Illustration of Multi Scaling in comparison to Scale Free network activity - Exponent α is constant in scale-free networks, but changes in multi- or broad scaled networks based on thresholds of k

the network further. If this happens regularly it can lead to broad scaling effects.

Limited Capacity or Increased Cost of Attachment - if a node has a hard limit to the number of connections they can maintain. For example, the distribution of flight routes to different airports follows the power distribution. However it is broad scaling because above a certain limit, airports are challenged to physically expand any further to cope with new routes.

These hindrances also affect the social networks in social games. If the network of a social game shows multi-scaling, it is an indicator of an anomaly within some part of the social architecture of the game.

In the Facebook game *Hugged*, the cumulative distribution of player activity shows multi-scaling. Figure 7.5 shows the cumulative distribution function of k (degrees). The social graph shows multi-scaling, with the range $k \leq 15$ having scaling exponent

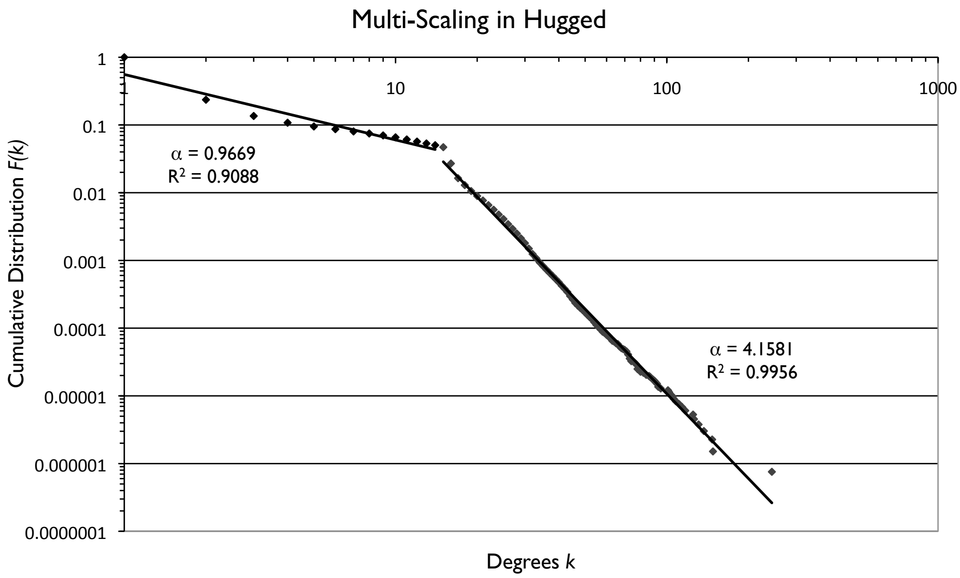


Figure 7.5: Multi-scaling in *Hugged* - The multi-scaling in the cumulative distribution of degree-connectivity(k) in Hugged highlights anomalies in the social architecture of the game

$\alpha = 0.9669$ and at $k > 15$ having a sharp phase change with $\alpha = 4.1581$.

The cause of this sharp multi-scaling can be traced back to an issue in the social architecture of the application interface. *Hugged* allows users to select one of a range of "Hugs" (e.g. Friendly hugs, Birthday hugs, Sexy hugs, etc.) and send them to a choice of their Facebook friends [196]. However, a player may only select a small subset of friends to hug at once, and the Facebook API used by *Hugged* limits the number of application notifications a user may make to friends within a 24 hour period[1]. A single hug request to up to 15 players once a week would place that player in the first scale of users. To appear in the second scale (i.e. interact with more than 15 other players) would require the player to re-visit the game after the 24 hour enforced wait. The emergence of multi-scaling shows that players are unlikely to revisit in order to interact with more than 15 friends at a time.

[1]This number has changed several times. As of July 2010 this is 12

This anomaly is an issue within the social architecture - the API-imposed limits are an example of an *increased cost of attachment* in the form of an enforced wait between interactions, that prevents all but the most determined users from interacting with their network as much as they would like. In order to correct it, the developers of *Hugged* (i.e. Nazir er al; [196]) would need to find a way around the API restriction to allow players to send hugs to as many people as they want. Without this restriction that is a part of the social architecture of the game, it is reasonable to assume that the social network of Hugged would become more broadly scaled.

7.1.4 Scaling Threshold

Theoretically, it is impossible for social games to be classed as purely scale free (or *scale invariant*) networks [13] because games are affected indirectly by physical limitations. As an extreme example, if a game had 7 billion players, there would be no way for the game community to grow further. However, it may be that there is a lower threshold, above which the scaling starts to decay at an exponential rate (i.e. broad-scaling). This would be observed as a dipping tail in the plot of the cumulative distribution function. Once the value of k is above a certain value, the decay will no longer be determined by a power law.

Figure 7.6 illustrates a possible example of this phenomenon, where players who engage in social activity above a certain threshold appear to become exponentially more rare. Part of the reason for this is due to difficulties caused by the social architecture as explained in the previous section, but the main reason could be biological:

Social systems such as the World Wide Web [13, 124] have been shown to be largely scale-free, because there is almost no practical limit to the number of links that can exist to, or from a web page (although physical reliance on network infrastructure halts it eventually [284]). However, when dealing with social relationships, it may be different. The evolutionary anthropologist Robin Dunbar theorises there is a limit to

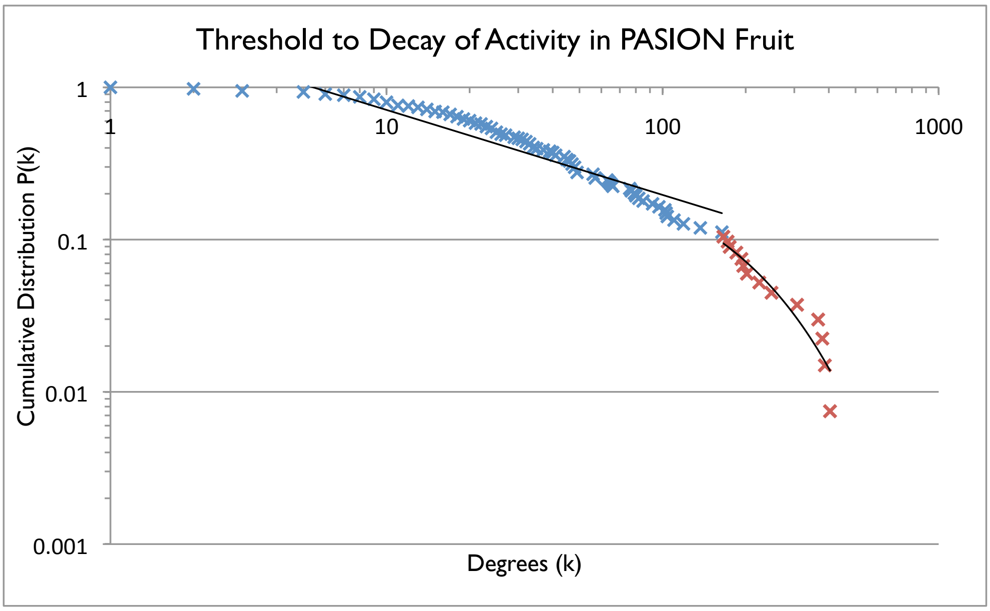


Figure 7.6: Decay of activity above a threshold in *PASION Fruit* may be caused by biological factors - At $k > 160$ activity shows an exponential cutoff. This threshold coincides with Robin Dunbar's social brain theories

the capabilities of primates to maintain relationships related to the size of the neo-cortex [84]. *Dunbar's Number* is "about 150" and represents the average number of simultaneous strong relationships humans have the capability to maintain. Above this number the importance of the relationships diminishes - so although many people have over five hundred Facebook friends, only a third of these are likely to be considered "close" in real terms.

This theory of "the Social Brain" has compelling evidence, and the effects can readily be observed in real human social behaviour. 150 is about the size of Hutterite and Amish communities [85], the size of military Company level units, and even related to the number of Christmas cards people send and receive each year [120]. Raph Koster points out that sizes of player guilds in *Ultima Online* has a "knee" at around 150 - this size of guild is disproportionately popular in massively multiplayer games. [154, p30]

Dunbar's number also coincides with the threshold that appears in the networks of interactions in social games, and in online social networks generally (For example, the mean number of connections from each user in social networks Orkut [4] and Facebook [92]). Although relationships in social games may be very different from those we have in the "real" world, the theory of the "social brain" raises the likely possibility of affecting the volume of social interactions a player may be willing to create.

This means that although we can reasonably expect a website to have large numbers of links across the web, for a human being engaging in interactions over the medium, there is an upper limit to the cognitive and practical abilities of any individual. So where the web is largely scale-free because there is no immediate limit to the potential for preferential attachment (i.e. we won't run out of links for a while), for a person there is an unknown biological limit that will affect a human social network's ability to grow to similarly high scales.

7.2 Small Worlds

> [Small worlds are] tightly woven, full of unexpected strands linking individuals seemingly far removed from one another in physical or social space
>
> - Jeffrey Travers & Stanley Milgram [267]

Small World networks are a peculiar kind of network graph where almost every node can trace a path to every other node in the network [277]. They are named for the famous "Small World" experiments carried out by Travers and Milgram in the late 1960's [267], which attempted to prove that everyone can trace a social connection to any random person on earth through a chain of mutual acquaintances. The most popularly known example of a small world network is the "Kevin Bacon Graph" that shows every movie actor is linked to every other movie actor through a chain of mutual film appearances. *Six Degrees of Kevin Bacon* is a popular parlour game based on this concept where players challenge each other to name an actor that cannot be linked to Kevin Bacon in less than six steps [225] - For example, the relatively obscure actor Jay Tavare, who played "Vega" in classic videogame tie-in *Streetfighter: The Movie*, has a "Bacon Number" of 2 because he can be linked to Kevin Bacon in just two moves: Jay Tavare was in *Executive Decision* with Oliver Platt who was in *Flatliners* with Kevin Bacon.

Based on the collection of film appearances recorded by the Internet Movie Database (IMDb) an extensive study was carried out into the nature of the network that is formed around this principle [278]. The findings showed that the "Kevin Bacon Graph" (KBG) was indeed a Small World in that all nodes can trace a path to one another. In fact, the average Bacon Number for the whole network is just 2.946, with the highest being 8 and the smallest being 0 (for Kevin himself). However, Kevin Bacon is not the centre of the movie universe - that honour lies with Rod Steiger for whom the average path length (or Steiger Number) is 2.679.

In Network Analysis terms, small world networks are defined as having high average *clustering coefficient* and a low average *path length*.

Average Path Length (L) represents the average length of every path from each user to each other user in the network. The higher the value of L, the more spread out the graph is, and as L decreases, it indicates how previously distant nodes have become closer via a bridging connection between nearby nodes. This is equivalent to the average "Bacon Number" (or Steiger Number, or Tavare number, etc.) between every single actor in the movie network.

The Clustering Coefficient shows the average number of connections each node has within its local graph neighbourhood. For example, for every actor u that is adjacent to the set of nodes V, γ is equal to the proportion of neighbours of each node v (from within V) that are also adjacent to u. The clustering coefficient is the average value of γ for every node in the graph. The value of γ is in the range 0..1, where values

Table 7.3: Small Worlds of Social Games

Game	Average Path Length (L)	Average Clustering Coeff. (γ)
PASION Fruit	2.025	0.418
Magpies	1.303	0.279
Familiars 1	2.314	0.471
Random (F1)	2.584	0.059
KBG	3.65	0.79

approaching 0 indicate a highly connected graph structure (see Section 7.4).

Social games can also be classified as Small Worlds - the larger community of players are linked through play to one another in a large contiguous social graph. The Rod Steigers and Kevin Bacons of a game are represented by the hardcore players - where Steiger and Bacon frequently act alongside relatively unknown actors and therefore bring them into the Small World of acting, our Hardcore social gamers interact frequently with our Casual players and therefore bring them into the Small World of the game.

Table 7.3 shows the relevant small-world statistics for a few of the social games when compared with a random graph generated based on the properties of the *Familiars 1* network. The statistics of the KBG [278] are included for illustration - despite the act of socially interacting in a game and acting in a movie being different, the small world networks share similar network properties when compared to random equivalent graphs.

7.3 Balance and Reciprocity

The community of game players is tied together through the complicated patterns of social interactions that occur as part of the game. At the basic level, each interaction (e.g. a gift, a message) is *dyadic* and will always have an initiator and a recipient. From this simple block, more complicated social interactions can be built. Broadcast messages can be considered as a collection of interactions that simply share the same initiator and content. Trade agreements can be described as a pair of symmetrical interactions between two players. More complicated trade arrangements with multiple players consist of a group of interactions that form a loop, each participant responsible for initiating and receiving one interaction.

It is not enough for an analysis of such social interactions to treat the sender and recipient as equals in the activity. The active role of creating and engaging in an interactive event is different from the passive act of being the recipient of the same event. In other words, interactions in social games and elsewhere, have *direction*. The network of the web is also directional, as one site links to another and is not necessarily reciprocated - the most popular blogs have thousands of incoming links but may only have a handful outgoing [158]. This results in the directed network graph of the web resembling a bow-tie shaped set of “continents”[13, 39] - the core continent contains the search engines and directory sites that are signposts for content, there is a continent of personal pages that link bigger, more popular sites, but receive very few links in return; there is a continent of corporate websites that receive lots of links but rarely link out; finally there are peninsulas and islands which are self contained (e.g. Intranets, niche interest sites).

For social communities online, such as those on social networking sites *Orkut* and *MySpace*, the connections are based on real social relationships [4]. Alan Mislove and colleagues [191] found that there was strong correlation between in-and-out-degree, which is very different from the web. Where the hubs in the web are different from the *authorities* (for example, *Yahoo!* is a hub, but *GamaSutra* is an authority), in networks of relationships the hubs and authorities are frequently the same person. In social games, the interactions are directly between people rather than information, so there is a strong aspect of psychology that becomes important. Social games have communities, along with all the unspoken rules that implies - a social hierarchy, social rules and mores. The game, even though it takes place in a magic circle away from real life, still has a social contract.

Reciprocity is an important part of the social contract that has been said to form "the essence of what makes us human"[169]. The effect is that when someone gives you something for free, you are socially indebted to that person until you re-pay them in kind [113]. This psychological effect has successfully been used by charities who send out thousands of free pens and stickers in the hope that some people will feel compelled to make a donation in return [55]. In the social network of Twitter, there is a rule of etiquette around reciprocity. When receiving a new follower, you are socially obliged to follow their updates in return [185]. Games on social networks such as *FarmVille* that encourage players to send out gifts to friends have also been said to take advantage of social pressure of reciprocity to recruit new players [176]. In several studies, Yvette Wohn and colleagues find that mechanics that support reciprocal behaviour (such as gifting) increases engagement [286], the development of social capital [285] and also acts as a predictor for the expenditure of real money on virtual items [287].

The reciprocal effects can be split into two functional types in terms of game mechanics - general reciprocity, where as a response to an interaction the player creates a new interaction regardless of recipient; and specific reciprocity, where that response is specifically back to the player who initiated the incoming interaction.

7.3.1 General Reciprocity

General reciprocal effects are worth investigating because it can be used as an indicator of engagement with the game, especially for less active users. Incoming interactions may act as a prompt to less active players to become more engaged with the social aspect of a game generally. An example of this would be receiving a free gift from a charitable organisation that reminds and prompts you to make a charitable donation to any organisation, not necessarily the one that sent you the gift.

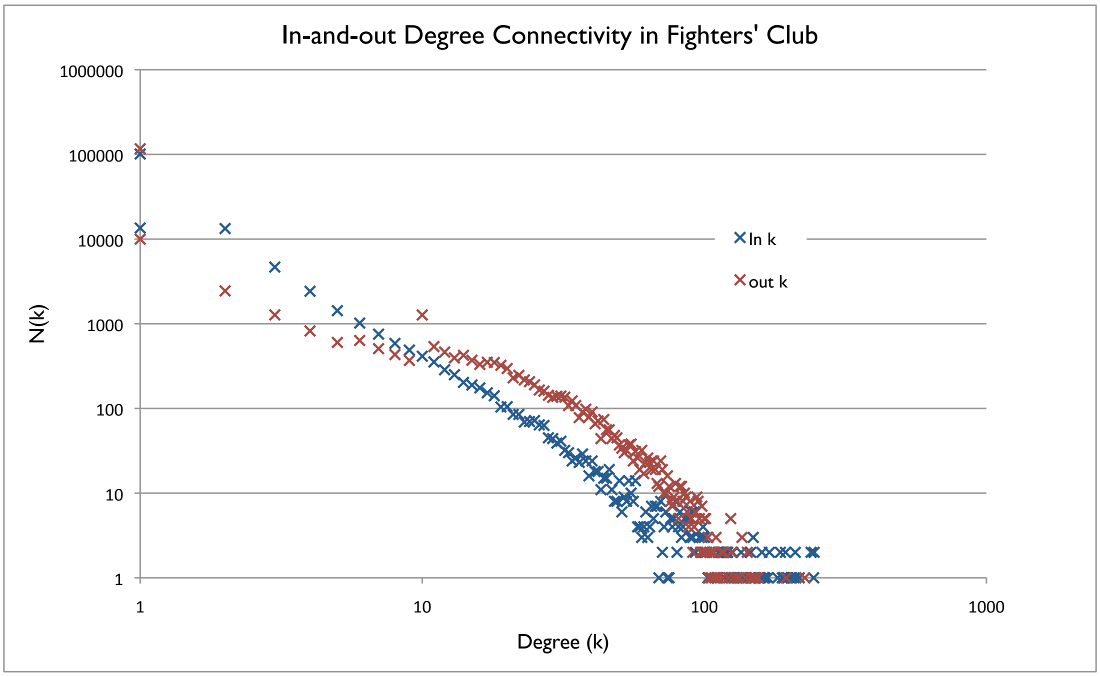


Figure 7.7: In-and-out degree connectivity in *Fighters' Club* - In-Degree connectivity follows a single scale, but out-degree appears to show multi-scaling effects

General reciprocal effects can be seen in figure 7.7, which shows that in *Fighters' Club*, where the central social interaction was "Fight", players engaged in similar behaviours generally both inwards and outwards (i.e. they started roughly half of the fights they were involved with). However, for outward interactions, the distribution shows multi-scaling as the lines intersect at around $k > 10$. This indicates that players below a certain activity level generally received more interactions than they started.

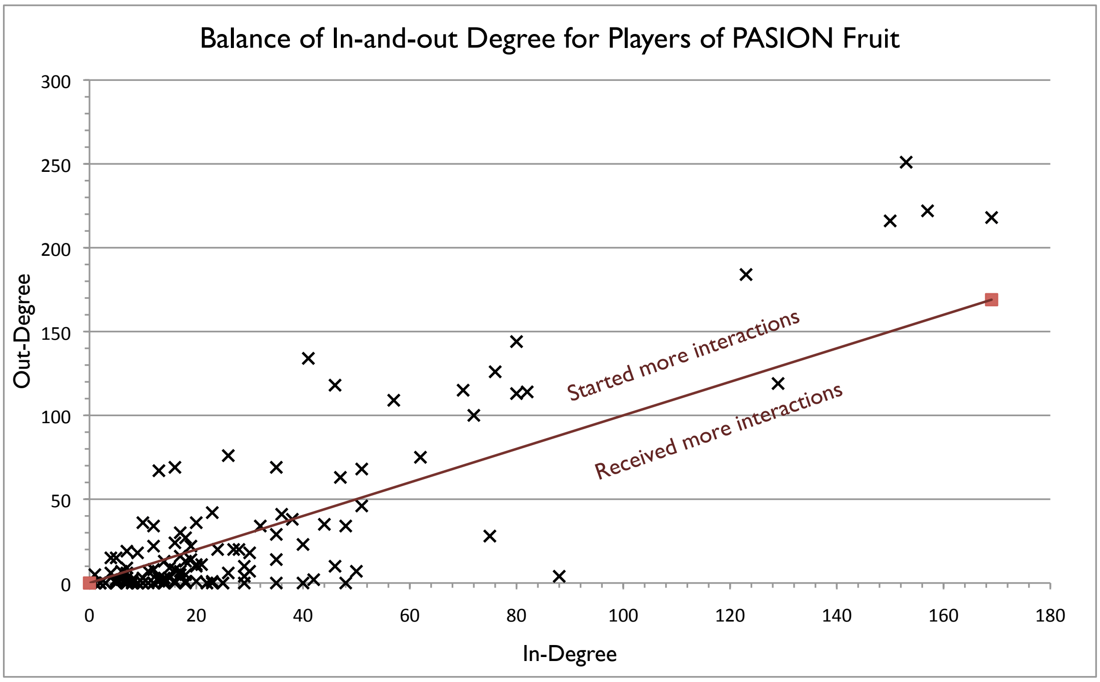


Figure 7.8: Balance of in-and-out-degree for individual players in *PASION Fruit* - More active PASION fruit players tended to send more gifts than they received

Figure 7.8 shows each player of *PASION Fruit* plotted based on their personal values for general inward-and-outward k. There is a line plotted on $x = y$ for illustrative purposes - since every interaction involves both a sender and a recipient, the area above $x = y$ contains the same number of players as below the line. Like in *Fighters' Club*, players had generally balanced general inward and outward behaviour (i.e. players are clustered around $x = y$), however players with high activity skewed towards creating more interactions, and less active players tended to receive more.

Generally, therefore, social activity of players in social games are "balanced" between creation and receipt. For each interaction a user receives, they are likely to reciprocate that act and start a new interaction with another player. However, this may not necessarily be the same person who initiated the original interaction.

7.3.2 Specific Reciprocity

Specific reciprocity is where, after receiving an interaction, the player creates a responding interaction that specifically targets the sender of the first interaction. Specific reciprocity allows us to see that players are aware of their responsibilities according to the social contract and treat other players, who they may never have met, as fellow humans. The act of returning an interaction is an implicit acceptance of their social debt to their other player that must be repaid. General reciprocal effects can be considered reminders from the game as a system that involves players, but specific reciprocity indicates players consider in-game social ties as having value within the community.

For several social games, specific reciprocity has been calculated for a player based on the appearance of symmetrical links in the network graph. For each player, v and their network neighbours (u in the set U), specific reciprocity for v is the proportion of the set of incoming directed edges $U \rightarrow v$ for which a corresponding symmetrical edge exists in $V \rightarrow u$.

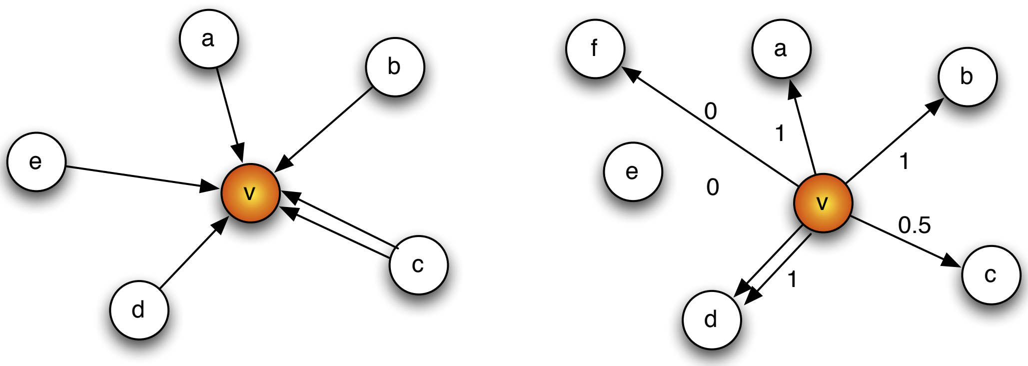


Figure 7.9: Calculation of Specific Reciprocity - SR is calculated as a proportion of incoming links that are symmetrical

Consider the sub-graphs in Figure 7.9, the first graph showing the incoming links for node v and the second showing just the outgoing links from v to the set of neighbours

U who sent an interaction. The specific reciprocity is the number of symmetrical links in the second graph over the number of links in the first. Importantly, multiple interactions from the same user in the first graph (i.e. parallel) must be individually reciprocated in the second. Therefore the overall specific reciprocity for edge $c \leftrightarrow v$ is 0.5 because only one edge exists for $v \rightarrow c$ against two for $c \rightarrow v$. However the reverse is not true - since there is only one edge $d \rightarrow v$, the maximum symmetry (1) exists because there is at least one link in $v \rightarrow d$, the extra link is not considered (Of course, the calculation for specific reciprocity for the node d would take this link into account). Similarly, links to other nodes in the graph from v which did not appear in the first graph, such as $v \rightarrow f$ are not included. Therefore the specific reciprocity of node v is the sum of individual reciprocal values divided by the number of nodes in U (i.e. $SR(v) = 3.5/5 = 0.7$).

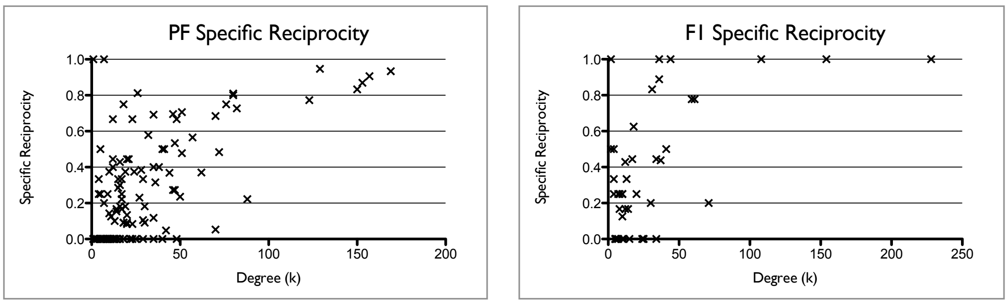


Figure 7.10: Specific Reciprocity for individuals in *Familiars 1* and *PASION Fruit* - SR is individually calculated for each player and plotted against in-degree (i.e. popularity of the player)

Figure 7.10 shows the distribution of specific reciprocity against the in-degree of every player in the games *Familiars 1* and *PASION Fruit*. As one might expect, the majority of players are unpredictable in their reciprocal behaviour in the network. However, above a certain point in both games, the most popular players (i.e. high fitness in the network) have high values for reciprocity. It appears that the more interactions a player is sent, the more likely they are to specifically reciprocate each time. For players of both games where $k > 50$, there is a positive correlation of $\rho = 0.77$ (PF) and $\rho = 0.74$ (F1).

7.3.3 Anomalies in Balance and Engagement

The balance of incoming and outgoing interactions that a player is involved with indicates their engagement with the social aspect of the game. Based on the analysis of the social games, each player should be expected to have roughly equal outgoing and incoming activity, edging towards receiving more interactions if their overall activity is low. Differences in balance for individuals and groups of players indicates anomalies possibly caused by the social architecture of the game.

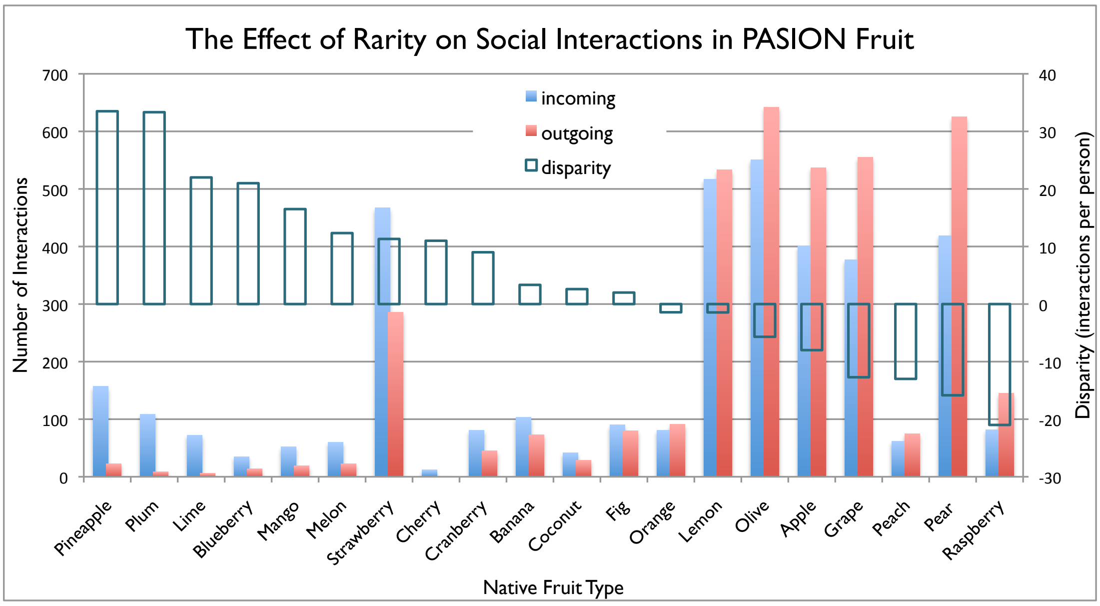


Figure 7.11: Imbalance in gifts received based on fruit type in *PASION Fruit* - Some types of fruit were more rare in *PASION Fruit*, causing social anomalies when players attempted to arrange trades.

PASION Fruit had such a social anomaly. In this game, players had a "native fruit" type based on their physical location that was more easily available. Since the locations of players were not evenly distributed, this led to certain fruits being more abundant in the game community than others (e.g. Pears and Apples for players in the UK). Since scores are partly based on diversity, there was a mechanical reason to actively seek out rarer fruit. This led to players who held rare fruit being the target of many more interactions (gifts - perhaps as a good will gesture in hope of a reciprocal rare fruit in return) than expected based on their active behaviour (i.e. gifts sent). Figure 7.11 shows, for each native fruit, how many interactions were started and received by players who held them. The disparity value shows the difference in the number of gifts received and sent. This value has been normalised for the number of players and shown on the second axis - positive values show on average, these players received x more fruit than they sent. Negative values show that players with those fruit tended to send more gifts than they received in return. This highlights that the players with the common fruit (and negative disparity) may have been at an unfair disadvantage due to the way native fruits are issued by the game mechanics. However, the social behaviour of the players is based partly on other factors so the relative differences for activity and disparity can not be assumed to be entirely attributable to this mechanic.

7.4 Clustering

Social interactions in games directly involve two players, however the context of the interaction in the larger network is also interesting. The neighbourhood of each node and the patterns of interactions around the neighbourhood can give insights into the social patterns such as community engagement.

The clustering coefficient can be calculated for each user based on how likely their co-players are to interact with one another. For a node, the coefficient (γ) is the proportion of their first-degree neighbours (i.e. people they have directly interacted with) that have interacted with one another. In the illustration Figure 7.12, the value of γ for the central node is the proportion of the dotted edges that exist.

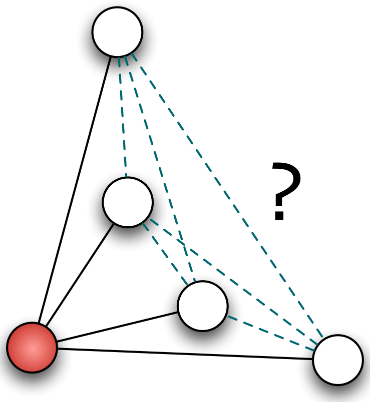


Figure 7.12: Clustering among nodes in social games - The clustering coefficient is calculated as the proportion of triangles that exist in the first-degree network.

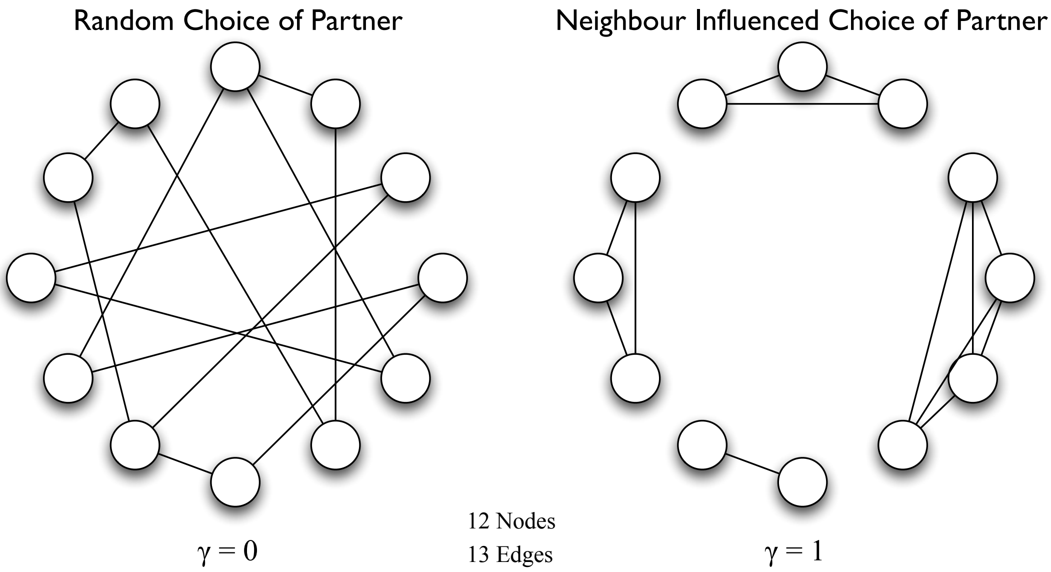


Figure 7.13: The Clustering Coefficient for a network increases as players consider neighbour connections when initiating interactions - The emergence of clustering shows awareness of the local social network rather than arbitrary association

The clustering coefficient for a network ranges from 0 to 1, where values approaching 0 indicate that players choose targets randomly across the network (Watts's *Solarian* world [278]). Values closer to 1 indicate that players intelligently choose interaction targets based on who their existing neighbours know - this leads to highly disparate networks composed of tightly linked clusters that are rarely linked (A *caveman* world [278]). Figure 7.13 shows illustrative examples of how the graph shape changes based on these choices.

Section 7.2 described how clustering determines the small world nature of the social game worlds, but the clustering coefficient for individuals within the system can describe individual behaviours. However, the choice is profoundly affected by the social architecture in the game. In *Fighters' Club* and *Familiars 1*, there is no in-game motivation for players to choose players based on their neighbours' interaction patterns. Other games that implement guilds or grouping systems add motivating factors that can increase the likelihood a player will engage with neighbours and therefore exhibit higher clustering.

The emergence of clustering patterns suggests the potential for distinct communities of play within social game spaces, however the complex web of interactions makes these communities challenging to identify. In all of the social games studied, players interact fairly indiscriminately across the player-base. Even when showing in-group bias (see section 6.4), a large proportion of interactions still involve a wider group of players. In a brief analysis of data gathered, distinct clusters were attempted to be identified using techniques such as k-clique community calculations [211], however, consistently analysis showed that players formed single cohesive communities. This sort of result is due to the social architectures of the games studied resulting in relatively low average clustering coefficient for these networks (see Figure 7.3). Identifying communities may be possible based on analysis of frequency of interactions in given time periods but this is out of scope here, where we seek to understand clustering community-wide.

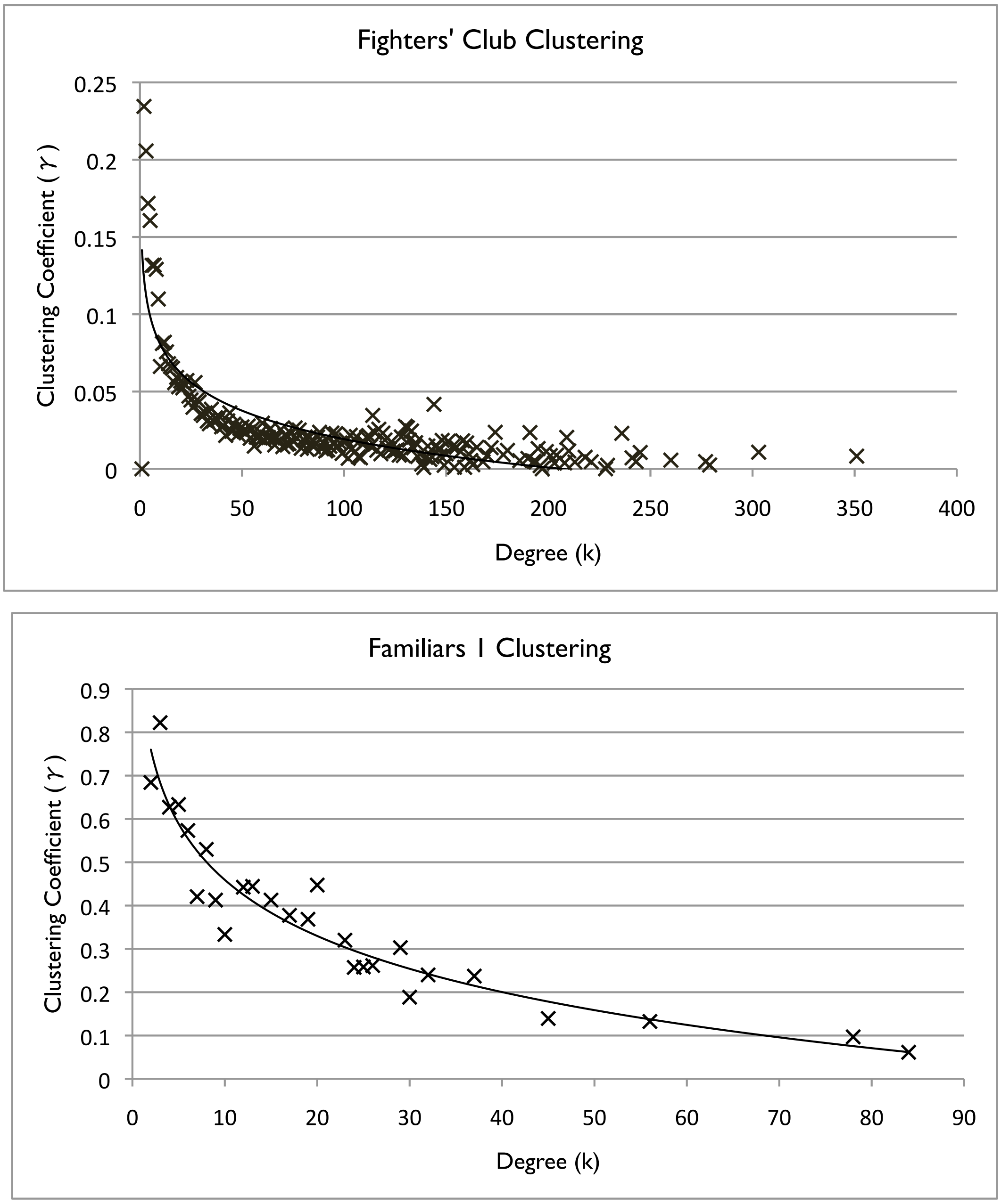


Figure 7.14: Clustering of individuals by degree in *Fighters' Club* and *Familiars 1* - Both games show that high clustering is much more rare for hardcore players.

Figure 7.14 shows that individual clustering is negatively related to activity in both *Fighters' Club* and *Familiars 1*. The more people play, the more their choices of partner appear to be random. Of course, in reality their choices of partner are not random but determined based on complicated personal motivations. However, the set of co-players extends to include a larger proportion of the player-base than for less-active players.

At the other end of the scale, players with lower activity exhibit higher clustering. Although it might appear that this is simply a symptom of the low activity, the activity of one player is not a predictor for the activity levels of their first-degree neighbours. The low clustering could be explained in some cases by external relationships having an effect on the choice of interaction partner. For example, a new player might feel more comfortable initiating interactions with existing friends rather than strangers, even if their friend has been playing the game for a longer time (and therefore be more indiscriminate in choice of partner). This seems especially likely on SNS-based games such as those on *Facebook* - the new player is first exposed to the game through news stories about the activity of their friends within the game world, therefore there exists a strong bond between the friends as players of a game, and the game itself.

7.5 Discussion

This chapter has focussed on using the tools of Social Network Analysis (SNA) to explore the complicated network of interactions that are formed during the play of social games. Data from several social games has been collected and analysed to uncover the hidden social patterns present in these networks of play.

Specifically, the analysis concentrated on identifying the patterns of social games with respect to three particular metrics:

- The properties of *scaling* in social games and the ability to predict behaviour based on a constant for each game

- Behaviours around reciprocity in social games, in order to identify both general patterns of reciprocity and how certain sub-sections of game communities reciprocate differently.

- The emergence of clustering behaviour in social games, to find if players show a preference towards interacting with other players they are already close to.

Based on this analysis, several key findings are apparent. Social networks of play appear to be *small-world* networks, where each player is able to trace a path to every other player in the game through a path of interactions.

The distribution of activity within social games is determined by the social architecture of the game. Even with different players, two games with similar architectures will create comparable patterns in social play. This is so reliable across games that anomalies in distributions such as broad- and multi-scaling can be used to identify problems with the mechanical design and functional implementation.

Hardcore players of social games have particular patterns of reciprocal and clustering behaviour - the more interactions a user receives, the more likely they are to reciprocate those interactions. Similarly, casual players are much more likely to interact within close knit clusters. The more active a player becomes in social games, the wider their choice of interaction partner.

While traditional methods of evaluating user experience, such as retention metrics, focus groups and questionnaires are still effective tools for analysing games as interfaces, social games in particular have exciting new possibilities for designers. Since the interactions between players form a network graph, the records of interactions are capable of being explored using tools from network analysis. The results of these analyses can provide insight into the behaviour of players as a community, and are able to highlight complex social patterns that are not immediately intuitively visible in the spaghetti-like tangle of player interactions.

8

Conclusions

Puerto Rico (2002)

In this dissertation, the word ‘social’ is used 1544 times. It has become something of an unfortunate buzzword, bringing to mind self-appointed ‘thought-leaders’ who develop ‘social media strategies’[1] for faceless corporations.

However, the trend of socialisation of services is based on a real socio-technological revolution. In the last decade, the web has shifted from being a way of connecting information to a way of connecting people. Games, as technology innovators, have been at the forefront of these seismic changes. Examples include the growth of success of MMOGs like *World of Warcraft*, consoles like the *Wii* that are designed explicitly to create social occasions, social match-making services like *Steam* and *XBox Live*, to the explosion in popularity of games built on social networks. Even face-to-face social play with boardgames is seeing a renaissance [86] as an activity that is made more engaging through its social context.

Game studies, as a field of inquiry, has long recognised the importance of the social aspect of play, and this is reflected in the models and definitions that form the

[1]e.g. “Utilise social currency to amplify experiences and drive conversations ” - Helpfully generated by http://whatthefuckismysocialmediastrategy.com/

foundations of the field. This dissertation builds on, and complements, game studies literature by exploring games from a social perspective. It is based on the fundamental argument that *all games are social* in some capacity.

Given the importance of social experience within the play of games, the approach of this dissertation is to attempt to clarify the relationship between game mechanics, context and the patterns of social play. The central research question of this work is to find if the mechanical features of games meaningfully describe the social effects of those games during play.

Rules and Contexts

To begin to address this, the first chapter framed games in terms of socially negotiated sets of rules. In order to explore the social effects of play, games are split into three separate conceptual layers of rules with varying social impact. The *physical rules* are core-most and represent the rules imposed by the environment - including rules like gravity in *Jenga* and the latency of network communications in *Counter-Strike*. The middle layer is that of the written *game rules* - the rules that the designer lays down, and the players follow, in order for the game to operate correctly. This includes calculating the correct rent in *Monopoly* and the amount of hit-points a Kobold has in *Dungeons & Dragons* (both online *and* off). Finally the purely *social rules* are the implicit rules that dictate appropriate behaviour in the social situation of play - whether it is appropriate to gloat about your victory in *Halo* or distract other players when they are trying to concentrate on their next move in *Buckaroo*.

These rules are tempered by *social context* - they are negotiated based on the relationships between the players and the various social and societal mores. Each layer of rules is negotiable as appropriate. The game of *Cricket* may have the hard leather ball replaced by a softer tennis ball, the game may not have the regulation eleven players per side, and the adults may bowl more softly to the children. Each modification is at

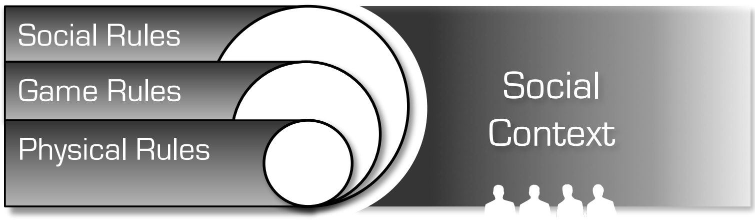


Figure 8.1: Chapter 1 defined games in terms of layers of rules, tempered by social context - The model is agnostic to genre and formats

a different layer of rules (physical, game and social), and made for the benefit of the players given the current social context of the game.

Breaking and Changing the Rules

The second chapter challenged the model presented in the first by examining what happens when the players break the negotiated rules at each level. From refusing to participate in the game as a fair enterprise by cheaters and spoilsports, through to the more nuanced issue of mischief. As games are governed by a fuzzy social contract of play, this chapter explored what happens at the edge, between the appropriate and inappropriate. This includes performative mischievous acts by players bending the social rules of play, and the serendipitous acts of players leaving unusual surprises for other players to stumble upon inside the virtual worlds of games. The chapter also discussed the issues of emergent social play, where players use the environment of one game as the physical substrate in which to play another - for example, racing jeeps in *Halo* or the creation the game of *Bagball* in *Ultima Online*.

This chapter, and the previous, served to establish the boundaries within which games exist as social activities. This general understanding provides a foundation on which specific social effects are investigated.

The Social Architecture

The fourth chapter build on this foundation by uncovering the mechanisms that connect design to social effects through the metaphor of the *social architecture* of play. This architecture describes how game mechanics can be defined based on their effect on the social behaviour of the players. These effects are not only limited to those mechanics that directly stimulate interaction, instead seemingly irrelevant mechanics can have surprising second-order effects on the social structure of games. For example, the types of items monsters drop in online role-playing games has complex effects on the social nature of the game, by adding the need for negotiation and diplomacy between players. The second half of the chapter dealt with the social graph, and the exposure of real world relationships to game systems. With the massive growth of games built on social network sites, it is important to understand how the context of the social graph affects the patterns of interactions created by game mechanics.

The remaining three chapters built on the concept of the social architecture of games in order to explore real patterns of play with quantitative methodologies. Using data from experimental and commercial social games, these chapters examined social play from the individual, group and network perspectives respectively.

Playful Graphs

It is perhaps an obvious statement that all players are different, and play the same games in different ways. However, the results of several experiments show that, across radically different games, the broader patterns of social interactions of a play community are predictable. Multiple experiments confirm that the distribution of social activity in games reliably follow heavy-tailed distributions (power and log-normal). In every game studied, there were a socially *hardcore* group of players who were responsible for a disproportionate amount of social activity, followed by a "long tail" of *casual* players. The qualities of these distributions also mean that social activity can be directly compared between games with very different mechanics since the shape of the distributions serve as a useful indicator of how indiscriminate the social strategies of the players are within any given game. Player age and fitness were explored as possible indicators for being able to predict hardcore players without success - player fitness varies greatly over time based on personal (external) circumstances, and players who have been a member of the community the longest are not significantly more likely to be a hardcore player than a brand new member. The nature of the hardcore players was explored in more depth in terms of the social network built during play. The findings show that the most socially active $\approx 9\%$ of players are responsible for $\approx 50\%$ of social interactions in the games studied, and that the removal of the hardcore players would cause the entire community of the game to collapse. These players truly knit game communities together.

Chapter six explores patterns that emerge within the communities of games in terms of tribalism, and the effect of "socio-contextual enhancements" on group identity and game engagement. Based on controlled experiments, this chapter shows that giving players feedback about their social status within a game community has a reliably positive effect on game engagement. In other words, by demonstrating to the players that they are members of communities, those players will engage in more social interactions within the game than they would otherwise. In addition, by examining the concept of "minimal groups" in games, findings show that with a little feedback, players will quickly follow tribal tendencies. Even when placed in random groups with strangers, players will interact more often with group members than anyone else. These tribal effects echo observed social effects in the real world, and demonstrates the "fuzzy boundaries"[136] between activity in games and the real world.

The final chapter brings the tools of Social Network Analysis to bear on the social interactions of play. By analysing the web of interactions between players as a graph, the patterns of social play can be explored mathematically. Clustering and reciprocal behaviours in social games is uncovered, and social games are shown to be forms of *small-world* networks, sharing features with networks like the connections between film actors and the citation patterns of scientific papers. A key finding is that for the same game, played in a similar context but by different players, the patterns of interactions between game communities are nearly indistinguishable. This lends support the idea of the social architecture having a reliable and predictable effect on the social behaviour of the players. Based on the strength of these findings, it is even possible to highlight problems with user interface or mechanical design of the game, by analysing anomalies in the web of interactions. Although not a panacea for better mechanics through a proceduralist understanding of play patterns (game design is still a delicate craft)[239], the ability to uncover the social architecture of games can be profoundly powerful as a game design tool.

Future Directions

This dissertation has taken a broad approach to understanding games as fundamentally social activities. By taking this approach, it has been necessary to frame games based on their social effects. This exposes the game design as an architectural foundation of social experiences, whether these are directly competitive or passively shared. This viewpoint creates the opportunity for game designs to be examined using tools of social systems from other fields, such as social network analysis.

The central contribution is the demonstration that through the analysis of the larger patterns of play created by players as communities, we can connect measurable behaviours to game mechanics and contexts. The experiments presented here provide evidence to support this by exposing the effect of subtle changes in design on these societies of play. However, these experiments are by no means exhaustive, and as chapters 2 and 3 highlight, the impact of social forces on games as “social fictions” is extremely complex. Not only is social behaviour impacted by changes in mechanics and contexts in sometimes subtle and unexpected ways, the effects of different mechanics shift and change based on their context within the rest of the game as a system. Despite this seemingly insurmountably complicated relationship between players and games, with careful use of quantitative tools, we can begin to slowly unweave this web and understand more about how to make measurably better games and playful experiences.

Closing Remarks

As far back as 1938, Johan Huizinga's "Homo Ludens" described the pervasiveness of social play - from the rough play between lion cubs, through to colleagues playing hangman in boring meetings, social play is ubiquitous [126, p12, p192]. In the context of contemporary games this is still just as true - games are innately social activities. The magic circle of play is a "porous membrane"[48] that means players cannot help but bring social and emotional baggage with them into a game. This baggage brings social patterns of tribalism, preference and levels of social activity, that all follow patterns first observed in non-game social systems. However, this is a profound strength. By understanding the relationship between the mechanics of system and the social effects, games can evolve with our understanding of the same. The recent success of social network games that use formalised inter-personal relationships as a platform demonstrates how game designs can benefit from developments in social technology. Social play is bound up with the complexities of the relationships between players. Relationships of different sorts add genuine *value* - not just to the experience, but even to services and tools around the game - and this social value permeates play completely.

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Ludography

This section lists game titles mentioned in the text, sorted alphabetically by title. It is intentional that the games are not distinguished by platform, so the list mixes board games, video games and web games. Where there are several editions of a game, the date and publisher of the first edition is used except where the relevant feature or mechanic only appeared in subsequent editions, in which case the first relevant edition is referenced. Designers are included where known.

1000 Blank White Cards (1990) Public Domain, Designers: Riff Conner and Nathan McQuillan

1830: The Game of Railroads and Robber Barons (1986) Avalon Hill, Designer: Francis Tresham

1832 (2006) Deep Thought Games, Designer: Bill Dixon

1856 (1995) Mayfair Games, Designer: Bill Dixon

Advanced Dungeons & Dragons (1977) Tactical Studies Rules (TSR), Designers: Dave Arneson, Eric Holmes and Gary Gygax

Age of Conan (2008) Funcom

Ambush! (1983) Victory Games, Designers: John H. Butterfield and Eric Lee Smith

Anarchy Online (2001) Funcom

Asheron's Call (1999) Microsoft Game Studios, Developer: Turbine, Inc.

Battlefield 2 (2005) Electronic Arts, Developer: Digital Illusions CE

Battlestar Galactica (2008) Fantasy Flight Games, Designer: Corey Konieczka

Bausack (1987) Zoch Verlag, Designer: Klaus Zoch

Bejeweled (2001) PopCap Games

(Modern) Bingo (1929) E.S. Lowe Company, Designer: Edwin Lowe (Adaption of traditional game)

Black & White (2001) Electronic Arts, Developer: Lionhead Studios

Bohnanza (1997) Amigo Spiel, Designer: Uwe Rosenberg

(Contract) Bridge (1925) Public Domain, Designer: Harold Vanderbilt

Buckaroo (1970) Milton Bradley, Designer: Julius Cooper

The Campaign for North Africa (1979) SPI, Designer: Richard H. Berg

Carcassonne (XBox Live Arcade) (2007) Sierra Online, based on *Carcassonne* by designer: Klaus-Jürgen Wrede

Carcassonne: The Princess & the Dragon (2005) Hans im Glück, Designer: Klaus-Jürgen Wrede (Expands *Carcassonne*)

City of Heroes/Villains (2005) NCSoft, Developer: Cryptic Studios

Civilization V (2010) 2K Games, Developer: Firaxis Games

Club Penguin (2005) Disney Online Studios, Developer: New Horizon Interactive

Container (2007) Valley Games, Designer: Franz-Benno Delonge and Thomas Ewert

COUNTER-STRIKE (2000) Valve Software, Designers: Minh Le and Jess Cliffe

COW CLICKER (2010) Ian Bogost, (Online: http://apps.facebook.com/cowclicker/)

D20 SYSTEM (2000) First implemented in *Dungeons & Dragons (3rd Edition)*, Wizards of the Coast

DARK AGE OF CAMELOT (2001) Mythic Entertainment

DIPLOMACY (1959) Avalon Hill, Designer: Allan B. Calhamer

DONKEY KONGA (2003) Nintendo, Developer: Namco Bandai Games Inc.

ELITE (1984) Acornsoft, Developers: David Braben and Ian Bell

EVE ONLINE (2003) CCP Games

EVERQUEST (1999) Sony Online Entertainment

FARM TOWN (2009) Slashkey (Online: http://apps.facebook.com/farmtown)

FARMVILLE (2009) Zynga (Online: http://www.farmville.com/)

FLUXX (1997) Looney Labs, Designers: Andrew Looney and Kristen Looney

FRIENDS FOR SALE (2007) Serious Business

GALAXY TRUCKER (2007) Czech Games Edition, Designer: Vlaada Chvátil

GAME OF LIFE (AKA CONWAY'S LIFE) (1970) Published in [103], Designer: John Horton Conway

GEARS OF WAR (2006) Microsoft Game Studios, Developer: Epic Games

GOLDEN AXE (1989) Sega Corporation

GRAND THEFT AUTO (1997) BMG Interactive, Developer: DMA Design

GUITAR HERO (2005) Activision, Developer: Harmonix

GURPS (GENERIC UNIVERSAL ROLEPLAYING SYSTEM) (1986) Steve Jackson Games, Designer: Steve Jackson

HABBO HOTEL (2000) Sulake Corporation

HALF-LIFE (1998) Sierra Entertainment, Developer: Valve

HALO: COMBAT EVOLVED (2001) Microsoft Game Studios, Developer: Bungie

HEARTS (ca. 1850) Public Domain

ILLUMINATI (1983) Steve Jackson Games, Designer: Steve Jackson

INTRIGUE (1994) Amigo Spiele, Designer: Stefan Dorra

JENGA (1983) Milton Bradley, Designer: Leslie Scott

JOHANN SEBASTIAN JOUST (2011) Die Gute Fabrik, Designer: Douglas Wilson

KER PLUNK (1967) Ideal Toy Company, Designers: A. Eddie Goldfarb and René Soriano

LEMMINGS (1991) Psygnosis, Developer: DMA Design

LINEAGE (1998) NCSoft, Designer: Jake Song

LITTLEBIGPLANET (2008) Sony Computer Entertainment, Developer: Media Molecule

LORD OF THE RINGS (2000) Kosmos, Designer: Reiner Knizia

MACHIAVELLI (1977) Avalon Hill, Designers: S. Craig Taylor and James B. Wood

MAFIA WARS (2009) Zynga

MASTERS OF COMMERCE (2011) Grouper Games, Designer: Britton Roney

MAGIC: THE GATHERING (1993) Wizards of the Coast, Designer: Richard Garfield

MAO (1961) Public Domain, Designer: Unknowable

MARIO KART 64 (1996) Nintendo

MARIO KART WII (2008) Nintendo

MINECRAFT (2009) Mojang Specifications, Designer: Markus Persson

MONOPOLY (1933) Hasbro, Designer: Charles Darrow, based on *The Landlord's Game* by Elizabeth J. Magie

MORTAL KOMBAT (1993) Acclaim Entertainment, Developers: Midway Games and Sculptured Software

MORNINGTON CRESCENT (1978) *I'm Sorry I Haven't a Clue* (BBC Radio 4), Designers: Unknowable

MS PAC-MAN (1981) Namco, Developer: Midway

NETHACK (1987) Open Source Development and Design

NEVERWINTER NIGHTS (2002) Infogrames Entertainment, Developer: BioWare

NOMIC (1982) Public Domain, Designer: Peter Suber

ON THE UNDERGROUND (2006) JKLM Games, Designer: Sebastian Bleasdale

PAC-MAN (1980) Namco

PANDEMIC (2008) Z-Man Games, Designer: Matt Leacock

PARKING WARS (2007) area/code, (Online: http://apps.facebook.com/parkingwars/)

POKER (ca. 1810) Public Domain

PONG (1972) Atari, Inc., Designer: Allan Alcorn

PROGRESS WARS (2009) Substance Lab, Designer: Jakob Skjerning, (Online: http://progresswars.com/)

PUERTO RICO (2002) Ravensburger/Alea, Designer: Andreas Seyfarth

RESTAURANT CITY (2009) Playfish

QUAKE (1996) id Software

QWOP (2004) Foddy.net, Designer: Bennett Foddy. (Online: http://www.foddy.net/Athletics.html)

RACE FOR THE GALAXY (2007) Abacus Spiele, Designer: Thomas Lehmann

RACE FOR THE GALAXY: THE GATHERING STORM (2008) (Expansion to *Race for the Galaxy*) Abacus Spiele, Designer: Thomas Lehmann

ROCK BAND (2007) Electronic Arts, Developer: Harmonix

SCRABBLE (1948) Spear's Games, Designer: Alfred Mosher Butts

SCRABULOUS (2006) RJ Software, Re-implementation of *Scrabble* by designer: Alfred Mosher Butts

SECOND LIFE (2003) Linden Lab

SENSIBLE SOCCER (1992) Sensible Software

THE SETTLERS OF CATAN (1995) Kosmos, Designer: Klaus Teuber

SHADOWBANE (2003) Ubisoft, Developer: Wolfpack Studios

SHADOWS OVER CAMELOT (2005) Days of Wonder, Designers: Bruno Cathala and Serge Laget

SIMCITY (1989) Broderbund, Developer: Maxis

THE SIMS (2000) Electronic Arts, Developer: Maxis

Slaves to Armok II: Dwarf Fortress (2006) Bay 12 Games, Designers: Tarn Adams and Zach Adams

Snakes & Ladders (Traditional) Public Domain

Social Heroes (2008) Designer: Adam Simon (Online: http://www.socialheroes.net/)

Split/Second (2010) Disney Interactive, Developer: Black Rock Studio

Spore (2008) Electronic Arts, Developer: Maxis

Star Wars Galaxies (2003) Sony Online Entertainment

Superlatives (2007) Social Gaming Network, (Online: http://www.facebook.com/superlatives)

Talisman (1983) Games Workshop, Designer: Bob Harris

Tamagotchi (1996) Bandai, Designers: Akihiro Yokoi and Aki Maita

Team Fortress 2 (2007) Valve Corporation

Thurn und Taxis (2006) Hans im Glück, Designers: Andreas Seyfarth and Karen Seyfarth

Ultima Online (1997) Electronic Arts, Developer: Origin Systems

Ultima Online: Mondain's Legacy (2005) Electronic Arts (expands *Ultima Online*)

Ultima Online: Renaissance (2000) Electronic Arts, Developer: Origin Systems (expands *Ultima Online*)

Unreal Tournament (1999) Infogrames Entertainment, Developer: Epic Games

Villa Paletti (2001) Zoch Verlag, Designer: Bill Payne

Warhammer 40,000 (1993) Games Workshop, Designers: Andy Chambers, Jervis Johnson, Rick Priestley and Gavin Thorpe

Werewolf (AKA Mafia) (1986) Designers: Dimitry Davidoff and Andrew Plotkin

Die Werwölfe von Düsterwald (2001) (Reimplementation of *Werewolf*) Lui-Même/Pro Ludo, Designers: Dimitry Davidoff, Philippe des Pallières and Hervé Marly

West Wars (2010) Innogames Gmbh (Online: http://apps.facebook.com/westwarsgame)

The World Cup Game (2006) Games for the World, Designer: Shaun Derrick

World of Warcraft (2004) Blizzard Entertainment

A

Experiments in Social Games

Half-Life (1998)

In order to study patterns of online social play, data were gathered from a range of social games and applications. A range of games were developed, with different social mechanics, that connected to the existing social graph in various ways. Each game or application was trialled for several weeks by the public “in the wild”. These trials consisted of tens of thousands of social interactions by thousands of individual users, and data collected about these interactions forms the basis of the research presented in this dissertation.

This appendix serves as a reference for the experimental aspect of the dissertation. The games are used throughout the dissertation as reference points and sources of data for quantitative analysis. However, since there is a variety of different games, including the background information on design and development in the text made the analyses and findings unclear. Rather than interrupt the discussion of the results with information about the finer idiosyncracies of the games in the main text, those features are described here for reference.

A.1 Project Background - PASION

A significant amount of work upon which this dissertation is built was carried out within the PASION project. PASION (Psychologically Augmented Social Interactions Over Networks [41]) was a major EU-funded integrated project operated by a consortium of 18 academic and industry partners from across Europe. The project itself ran from January 2006 through to December 2009, and was funded under the Presence II Initiative in the Future Emerging Technologies within the European Framework VI Programme.

One thread of this project was the potential value of "social augmentation" in the application area of social gaming [150]. This thread was coordinated by Duncan Rowland (2006-2008) and Shaun Lawson (2008-2009) of the Lincoln Social Computing Research Centre at the University of Lincoln.

The main aspect of this work package was the development and operation of a series of social games that would use services provided by other technical partners in order to test social augmentations in a series of trials. This development work was carried out in the main by Ben Kirman and was split into three distinct cycles. The first cycle lead to the development of *Familiars 1*, the second cycle *Familiars 2* and *Magpies*, finally the third cycle *PASION Fruit*.

Each cycle of game development and experimentation involved similar processes, which are presented in the following sections.

A.1.1 Language

Every game was released in both English and Italian language, with Italian translations being supplied by partners at Istituto Auxologico Italiano in Milan and Telecom Italia in Rome and Naples.

Although the interface was in two languages, the players of each game formed a single community of play. In the analysis and text presented in this dissertation, the players are not distinguished at all based on language. One related analysis on the different patterns of play between English and Italian players of *Familiars 1* was presented in a paper at Mindtrek 2009, however showed no evidence for difference in both individual play types nor choice of co-player [145].

A.1.2 Formative Evaluations

Every game went through a series of formative evaluations during the development process. During the design process and prototyping of the game, all interested partners were involved in design workshops, where design concepts were presented, and comments were gathered ahead of development. Once development was under way, prototype versions of the software were subject to expert review in terms of usability, which were conducted by Goldsmiths College in London, the findings of which led to design and interface changes where appropriate.

Focus groups were organised by Istituto Auxologico Italiano in Milan, and by Goldsmiths College in London, in order to test prototypes with real users. These groups were recruited by partners from the same sample of users who would eventually form the "seed" player groups for each game. Feedback from these evaluations were used to further fine tune and otherwise improve the games ahead of release.

A.1.3 Summative Evaluation

Once the development cycles were complete, each game was released to the public in a "summative evaluation", where data were gathered about player activity in the wild.

Recruitment

These trials were managed and operated by Istituto Auxologico Italiano in Italy, and Goldsmiths College in the UK. The chosen recruitment methodology was through recruiting initial players through advertising and mailing lists, then following a snowball sampling methodology to fill out the player-base. Snowball sampling is where tools are provided to players to invite potential contacts of interest into playing the game (e.g. through Facebook sharing systems, or email templates). In this way, the player community of the game builds quickly based on viral-type spread of game registrations.

Snowball sampling as a methodology has some dangers of introducing bias in the sample [200, p59], since participants were only likely to recommend the game to other contacts they thought would appreciate the game, and in every case is affected by a process of self-selection based on personal desires to become involved with that game (i.e. the player must want to play).

In the case of the PASION experiments, these biases were recognised and thought to be acceptable. The purpose of the experiments was to test the effect of various social augmentation features between measures, so presuming both samples are comparable (since they are both susceptible to the same biases), any effect would not interfere with experimental results. In addition, the purpose of the experiments was to test game function among players, and not among a representative sample of people in general, therefore the self-selection bias of users being motivated players when signing up for the game was not an issue. We can presume that all players of games do so willingly, and that any experimental participants are representative of this sample of voluntary game players.

Data

The summative evaluations were centred around collecting behavioural data from the use of the games by the players. This was done through logging interactions on the game server. Each action or decision by each player was logged for later analysis.

In this dissertation, the only data used for analysis was from social interactions in each game. The exact form of those interactions varies between the games (gifts, messages, item contributions, etc.) and are discussed in each section, but all follow the general structure of {*Sender, Recipient, Timestamp*}, which describes a specific directional interaction. In aggregate, this data allows the description of a timed interaction graph. All other data gathered, apart from user registration date, was not considered in this analysis (although may have been used by other partners).

In addition, post-evaluation, colleagues at Istituto Auxologico Italiano collected additional data from participants through questionnaires. These data were not used as part of the analyses presented here.

Although every game followed very similar summative evaluation processes, each game had some unique aspects that are discussed in the appropriate sections below.

A.2 Familiars 1

Familiars 1 was the first social gaming application developed as part of the EU PASION Project[41]. It is a highly social, locative game that can be played online and via cellular phones, against friends and strangers across the world. This section outlines how the game plays and the main features of the various interfaces, including appropriate details about implementation.

A.2.1 Concept

Familiars are virtual creatures that inhabit the real world. They can be though of as a virtual companion (like a witch's cat), pet, or dæmon. A familiar has a life independent of its owner and are free to travel around the world, collecting photos and information that they document in their blog. When registering, a player gets to adopt and customise their own familiar. They then manually define a task for the familiar to complete (See A.4) and release it in a location of their choice. Once released, other players can interact with familiars and contribute items to their blog, by using the web or mobile client.

As the player and their familiar explore the world meeting others, a social network is built to show who they have met and interacted with in the game. Players can compare their network with other people and see how they rank in the social high scores. Depending on the shape and size of each player's local social network, they are assigned a score. In order to rise in the rankings players must learn how to create tasks for their familiar that are attractive to other players, and maintain existing relationships

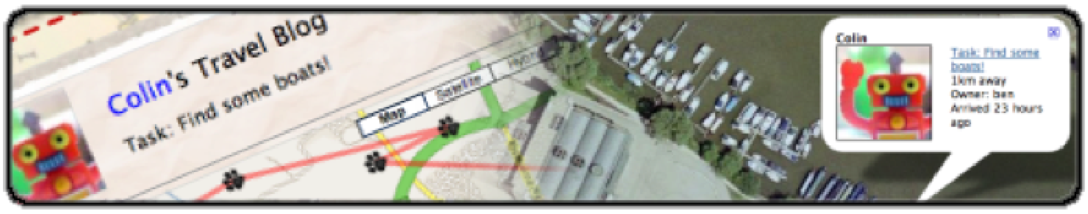

Figure A.1: Concept illustration of *Familiars 1* - Familiars are creatures that travel and maintain blogs

through continued interaction. The scores are weighted so that players with medium sized social networks with relationships that are well maintained will score higher than players with large networks of remote friends with whom they rarely interact.

A.2.2 Development

Familiars 1 was developed from initial design in February 2007 through to release in May 2008. The development included cycles of prototyping, design consultation and user tests. As part of a large European project there was a lot of collaboration during this process. The initial design was created by Ben Kirman and Duncan Rowland, based on the design of *Gophers* by Sean Casey [47]. The design was iterated based on feedback from all PASION partners during regular meetings. The development of the game server and clients (web and mobile) used in release was done by Ben Kirman. A proof of concept of the mobile client was created by Cash Garman and Martin Fowler in early 2007. User focus groups were performed by PASION partners Istituto Auxologico Italiano in Milan, and Goldsmiths College in London, during September and December 2007.

The game software is made up of 3 main components: the game server cluster, the web client interface and the mobile (cell phone) interface. Game rules and game state are managed by the game server while the client interfaces are simply used to effect player actions in the game.

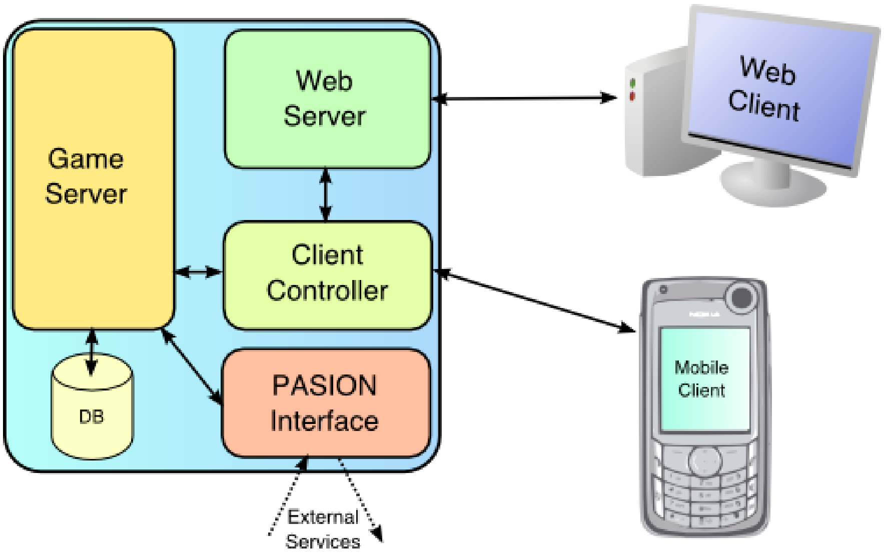

Figure A.2: Components of *Familiars 1* - The architecture of *Familiars1* was built of three main components

Mobile Client & Location

The mobile client takes the form of a distributable package suitable for installation on mobile phones. The application is written in Java for J2ME and uses as basic and generic functionalities as possible in order to have a high level of compatibility. Players must have registered to play the game in advance on the website in order to have a valid user and password pair as is required by the application. Once logged in on the client application, the game uses the data transfer capabilities of the handset in order to exchange information with the game server cluster. There are three main features of the mobile client. The user can view the recent activity of their own familiar, view their current local social network and search for familiars nearby. Familiars can be picked up and given photos or text in order to help with their task. The familiar is finally dropped at the players current location. All interactions are communicated to the server and stored in the game database. Changes appear immediately on the travel blog maintained by the familiar.

Figure A.3: *Familiars 1* Mobile Client - Playable on many J2ME devices

Importantly, all of the features of the mobile client are replicated on the web - there is no requirement to use the mobile version. In fact, the mobile client was only used in a small minority of interactions.

Location is a feature in *Familiars 1* - familiars travel around real world locations to collect data from the players. However, all location is provided as self-report. There is no attempt to validate or determine a player's true location. This is a result of initial trials with focus groups that found players preferred to play in places they were bored (e.g. at work) and often wanted to add contributions from locations they had visited in the past.

In other words, in *Familiars 1*, location is not a context for the interaction, but a context for the contribution itself.

Web Interface

The web clients are managed by a web server component that interfaces to the client controller using web specific features not available on mobile, such as maps and AJAX enabled interface elements. The web interface is primarily an orchestration interface for players that allows them to observe and manage their familiar, generating new tasks and exploring the social network built up through normal game play. Players can also

Figure A.4: A Familiar's blog in *Familiars 1* - In *Familiars 1*, familiars would keep automated travel blogs about their experiences use the web interface to interact with familiars, providing photos and text comments in the same way as on the mobile client. This functionality was added as a result of the formative evaluations; in which testers found it frustrating they could not interact with familiars directly from this interface.

Figure A.5: *Familiars 1* had an extensive tutorial for new users - Players were guided through each part of the game by their own familiar

External Interfaces

The game system also exposes interfaces to second and third party systems. The main connection here is between centralised services provided by other partners in the PASION Project[41] such as user management and social networking algorithm services.

All familiar blogs have a read only service available using RSS (Really Simple Syndication). This is a standard XML based format that is widely used by news reading software. This adds the possibility for users to subscribe to a familiars blog using the same system as they do for subscribing to other blogs and content providers as normal.

A Facebook application has been built and deployed using the blog feed provided by the RSS service. This allows users of the popular Facebook online social network to display a small image in their profile that shows recent activity by their familiar. The Facebook application has also been retrofitted to be usable on any website by simply copy-pasting a line of HTML code. This enables users to embed the blog snippet on any website, for example a blog or MySpace profile page.

Game Server

The game server cluster is itself made up of several sub components that allow the delegation of server tasks appropriately. The game server component itself is the most important subsystem within the game. It handles and maintains the game state that the players affect via interactions using client applications. Game data is stored in a private game database system that only the game server component has direct access to. All client interaction with the game is conducted via the client controller layer. This is device agnostic and features all the functionality and error checking regarding user input into the system. Since the component is built in a generic manner, it is possible to add new interfaces for new platforms very simply using this existing functionality as a gateway to the game server itself. Both the mobile and web clients interact with the game via the client controller layer. Since the interface appearance and interaction flow for the mobile clients is handled on the device itself, the mobile clients connect directly to the client controller, using a thin verification layer to ensure compatibility.

The server architecture is very much based on a traditional web application structure. The heart of the system is the Familiars Server Application itself, which is built using Python and the Pylons framework. The application is a singleton in that there is only ever one instance that manages everything to do with the game. It is persistent in that it is separate from the web request structure and can handle many requests simultaneously. All game related activity passes through the server application, and the underlying data structure used in the database is never exposed to other parts of the system.

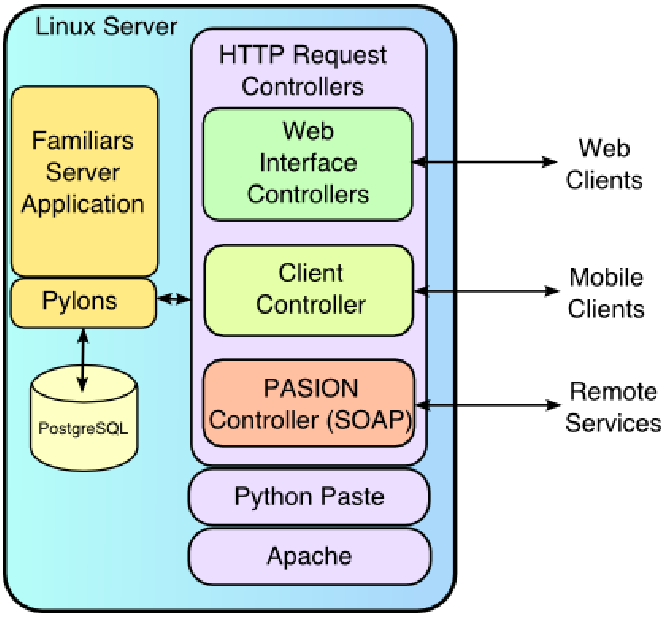

Figure A.6: *Familiars 1* is supported by the Pylons MVC platform on a standard Linux stack

All externally triggered game events, such as those created by players on either mobile or web clients or PASION services, are received as HTTP requests via port 80 on the server. These requests are handled by the standard Apache HTTP daemon on the server. For game based requests, Apache instantiates a Paste Request object. Paste is a Python based threaded web server application that is able to take the Request object and pass the details on to the appropriate controller objects. The controller object deals with the request and passes data to and from the Familiars Application Server. Depending on the controller and type of request, a view may be created from a suitable template. These templates may be HTML for web clients; JSON for mobile clients or SOAP for PASION based requests. Using this design pattern, the data and game state is protected from direct requests via the controller layer. Based on behaviours defined in the controller, one of several different views may need to be populated with data (e.g. Success view or Failure view on login). These views are defined in template files written in the "Kid" XML based template language. Familiars uses PostgreSQL to handle database functionality. The data is exposed only to the Familiars server via the SQLAlchemy Object Relational Mapping (ORM) system. The model layer in the Familiars application deals with non data related database tasks such as data formatting, stored procedures equivalents for frequent queries and triggers for game events affected by data.

A.2.3 Social Networks as Scores

The key research question of *Familiars 1* was to test the potential of exposing players to basic information about their social activity. Through normal play, data was collected on the patterns of interactions players were involved with, and simple statistics were presented back to players about their social activity (as shown in Figure A.7) in the context of the game community.

Rank (out of 233)	Player	Familiar	Task	Popularity	Friendship level
25	erika	Gigi	Your favourite animals!	Very Popular	Low
26	Hercules	Hercules	Help me to find the tries of "The Twelve Labours"!	Quiet	High
26	Mitch	Kiwi	Who is the cutest familiar?	Very Popular	Very Low
28	jonchalk	Frank	Delta	Popular	Very Low
29	seanas	Ayu	Ayu wants to travel the world	Very Popular	Very Low
30	ben	Colin	Lincolnshire is famous for sausages, what region is your favourite sausage from?	Popular	Very Low
31	boris	Boris	Quale è il tuo film preferito? Tell me what is your favourite movie	Popular	Very Low
32	gioflo	Puppy	trovare foto delle spiagge più belle	Very Popular	Very Low
32	PEPPAG	Cucciolo	Matrimoni da favola!!!!!!!!!	Very Popular	Very Low
34	shaun	Nangster	I'm wet and cold - take me somehwere to warm up and dry off!	Quiet	Low
See the full high score table					

Figure A.7: Players of *Familiars 1* are ranked based on the state of their social network - The score is calculated based on social network indices generated from social activity in the game

The rank of the player and socially close players are shown along with the social network analysis of the reciprocity and centrality in the network. The scores, and therefore ranks, are calculated based on a combination of these values and the recent intensity of player activity. Centrality (1-degree) is calculated based on the number of other players that have interacted with a user in the past week. Reciprocity is based on the ratio of reciprocal relationships the user has been involved with. These values are referred to as “Popularity” and “Friendship” respectively in order to not confuse users with technical social network analysis (SNA) terms (a concern highlighted during focus groups).

A.2.4 Trial Methodology

The summative evaluation of *Familiars 1* was organised following the standard PASION experimental procedure outlined in section A.1.3.

The trial began in May 2008 and lasted 8 weeks. This trial was open to the public, but was seeded with players recruited by trial organisers - 100 Italian players were invited via email to start playing in May. This was followed by an invitation to 50 British users to join the ongoing game in June. The invitations were open and players are free to extend the invitation to their friends and family, as they feel appropriate. Upon registration, and after trial completion, trial participants were contacted via email to complete a short questionnaire administered by the trial managers (the questionnaire data is not explored in this dissertation). In addition to the questionnaire responses, data was collected through normal usage of the game in order to study social behaviour in the game. Data collected included every interaction (time, participants and content) in the game, each registration and new familiar task created. All participants played the same game, and there were no changes in interface during the trial period (i.e. all players had socio-contextual feedback). The game was made available in both English and Italian language versions.

At the conclusion of the trial, the game had registered 157 active users and recorded 1546 distinct interactions between players. An interaction is defined as one player contributing data to the task that has been assigned to a familiar by a second player. This graph of interactions and users forms the basis of study into play styles and general patterns of social interaction, the results of which are discussed in chapters 5 and 7.

In addition to the results described within this dissertation, analyses of data from *Familiars 1* have been reported in several publications around bilingual activity in social games[145], the emergence of hardcore in social games[143], design of user-generated and locative games [141, 147] and the impact of the social graph on scaling in social games[144].

A.3 Magpies (& Beachcombers)

Magpies was the second game created as part of the PASION project [41]. In contrast to *Familiars 1*, *Magpies* was built and deployed on the *Facebook* platform. The platform exposes large amounts of information about the social graph to application developers through an API to allow the creation of socially rich games and tools.

A.3.1 Concept

Magpies, like *Familiars 1*, is centred on the theme of collection; in many cultures, Magpies are birds associated with the activity of collecting small shiny trinkets with which they decorate their nests. Players in the game work individually and create collections or stashes around a theme determined through free text entry. Other players are invited to contribute items that match the theme, in the form of text, images and/or locations. The stash then builds up over time as a list of curiosities that match this theme. Players can rate one another's stashes and compete to build the most popular collections. Players are also able to create and join arbitrary groups within the system. Groups are ranked against each other based on the status of the players within, to add a socially competitive angle to an otherwise individually driven game. *Magpies* was tested internally through a series of usability evaluations and focus groups in order to fine tune the game design and interface, before being released officially on the Facebook platform and being made open to the public.

A.3.2 Development

Magpies was developed between June 2008 and April 2009. As with other PASION applications, the design and implementation were an iterative process, involving substantial collaboration between various partners. In the case of *Magpies*, the design was based on *Familiars 1* by Ben Kirman and Duncan Rowland, adjusted based on user feedback gathered by trial organisers Auxologico Italiano and Goldsmiths Col-

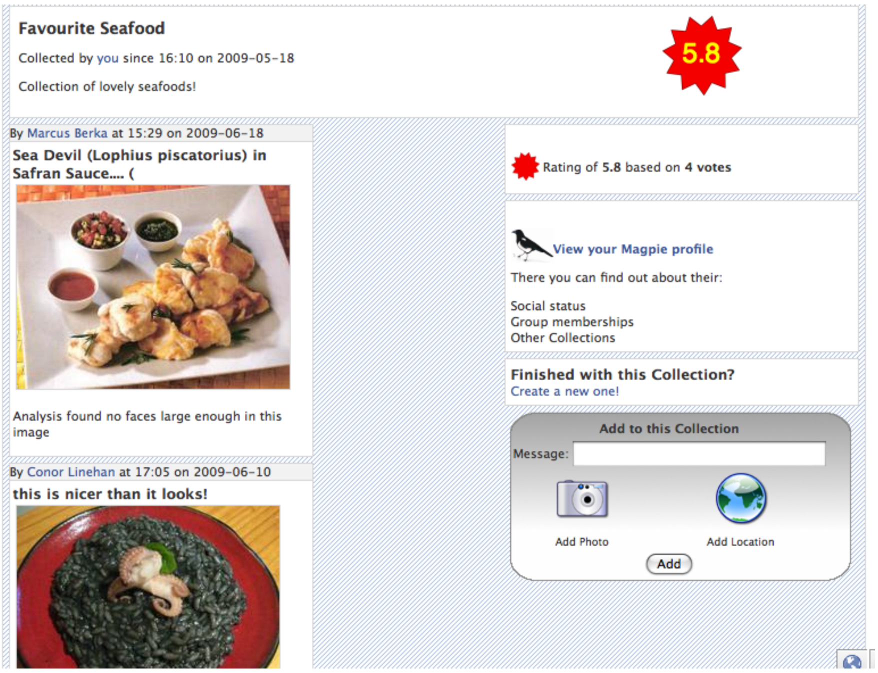

Figure A.8: ***Magpies* and *Beachcombers* feature collections that are contributed to by other players -** Both applications are served via Facebook lege. Both the *Magpies* and *Beachcombers* clients and servers were developed by Ben Kirman. External services, such as the SNA calculation service, were developed by PASION partners Telecom Italia and Radiolabs (Italy). The graphic design and artwork was contributed by local Lincoln digital artist Aga Kowalska[1].

Figure A.9 describes how the game architecture links PASION, the applications and the Facebook interfaces. *Magpies* was the first application to use this structure, and it was re-used by both *Beachcombers* and *Familiars 2*. This architecture was designed and developed by Ben Kirman and is application agnostic. It has been designed to work with both game concepts but can also be expanded to work with other applications. All parts of the application are generic apart from the Application Engine, which must be re-implemented for each purpose as required.

The server was implemented on the same Linux/Apache/PostgreSQL/Pylons (Python) stack used by *Familiars 1*, and is described in section A.6. The application engine section contains the specific parts of the game that cannot be kept as abstract parts of the architecture itself.

Facebook Integration

In *Magpies*, *Beachcombers* and *Familiars 2*, the Facebook integration is abstracted as a "Facebook display engine". Facebook offers integration services to external applications via the "Facebook API" and this is how the Social Game applications integrate so completely into the Facebook service. Following the example in figure A.10, all user requests to the application are filtered through Facebook, which creates new requests to the application server on behalf of the user. Using data from the FB-API service and the application core itself, the application provides data to be returned to the user. This data is parsed by Facebook and presented within the Facebook application environment. From the user's perspective, they are interacting only with Facebook.

[1]http://www.agakowalska.net/

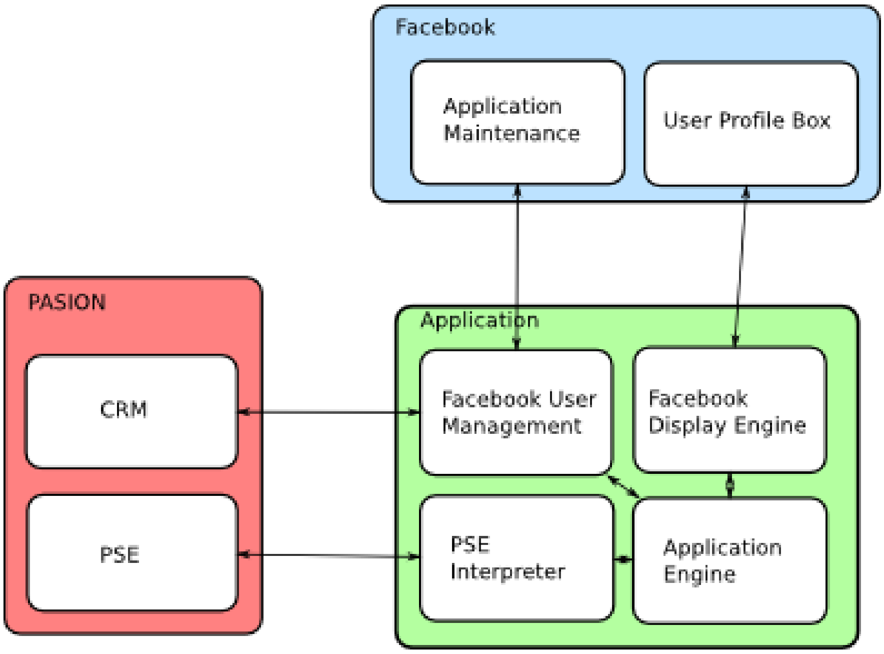

Figure A.9: *Magpies* was built integrating Facebook and the PASION metrics server

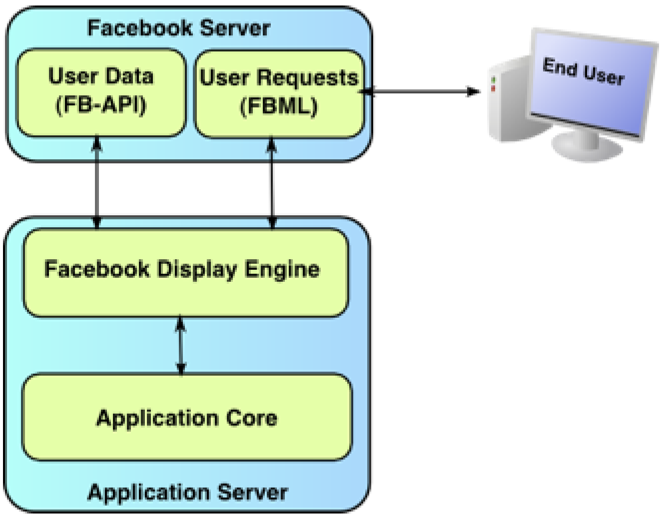

Figure A.10: *Facebook* integration with the applications

Facebook itself is the one that makes requests to the application on behalf of the user and verifies the output is well formatted and sane before passing it back to the user.

A.3.3 Socio-contextual Enhancement

In *Magpies*, as an addition to the main game, users were exposed to a variety of measures based on a selection of standard Social Network Analysis (SNA) indices. These were split into group and individual indices. The Group Indices included Group Centralisation, Group Reciprocity and Group Density. The Individual Indices included Degree Centrality, In-Degree Centrality, Out-Degree Centrality and Reciprocity.

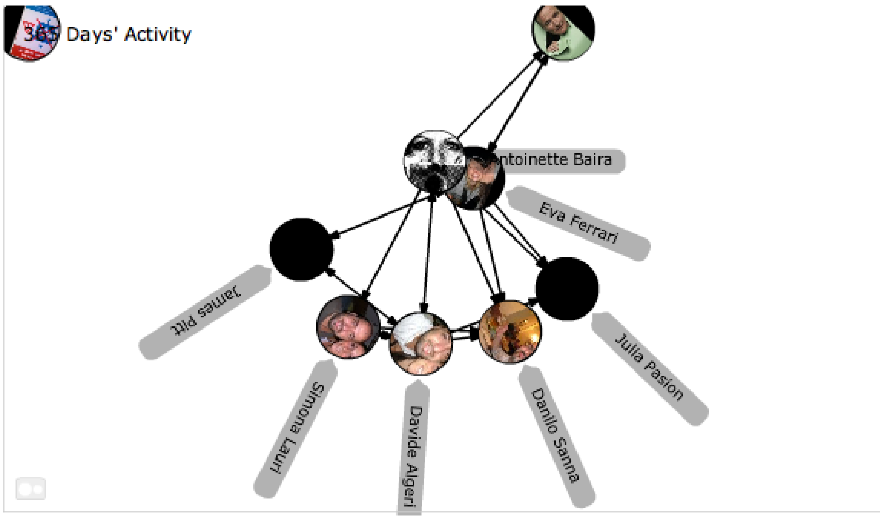

Figure A.11: *Magpies* exposes the social network of the game to the player

These measures were calculated regularly based on activity within the game, and presented to the user as values between zero and five "stars" . The technical names for the indices were replaced in the interface by labels validated by focus groups as more meaningful to players (i.e. "Reciprocity" became "Equality") and supported with descriptions and examples within the game. Additional visualisations allowed players to see activity in the form of network graphs. For example, it was possible to view the pattern of interactions between players within groups in the form of a network graph, where individuals were represented by nodes and connected by arrows. These arrows represent the act of one player contributing to the stash of another. Players could also visualise group membership by seeing a graph that represented each group as a node connected by edges indicating shared membership. This aided the players when choosing to join groups.

Figure A.12: *Magpies* displays group connections and socio-contextual feedback to players in the game - *Beachcombers*, the control version of the application, does not show this information to the users

It must be emphasised that the enhanced social contextual information provided to players in the Magpies condition was provided as additional supporting information around the core mechanics of the game. There was no central task players were asked to perform with the aid of this information, and no problems that required solving through organised group collaboration.

A.3.4 Trial Methodology

The summative evaluation of *Magpies* was organised following the standard PASION experimental procedure outlined in section A.1.3.*Magpies* was evaluated in a 50-day public trial starting in April 2009.

There were two versions of the game in a parallel trial. *Magpies* contained socio-contextual feedback as described above, and a clone, *Beachcombers* was exactly the same application except without this feedback.

Beachcombers had to be a retitled version of *Magpies* because *Facebook* disallows applications sharing the same name (as would be ideal in a controlled trial situation). In addition, the trial organisers were concerned over confusion between the applications by trial participants. For example, by typing “Magpies” in the Facebook search system, participants may have become confused by the apparent duplicate. To avoid this potential cross-contamination between participants in the different versions of the trial, the decision was made to separate the applications by name. In the actual trial data, no single participant was recorded in both conditions (i.e. by tracking Facebook ids, we are able to confirm that the participant groups were distinct).

Both games were released at the same time to a small group of volunteer participants selected by trial organisers (Auxologico Italiano and Goldsmiths College) and from then additional players were free to join the game through natural snowball sampling methodology.

Each new player was asked to complete a release form for trial participation before beginning to play. All interactions with both versions of the system, including page access and usage of functionality, were recorded by the system, along with the results of the social network indices, for post-trial analysis. Players were able to join either game freely.

The concurrent trials for both games lasted for 50 days starting at the end of April 2009. At the end of the trial period questionnaires were distributed to all participants in order to gather additional non-procedural information about the trial.

Over the course of the trial a total of 215 players played the two games. Between both conditions 166 collections were created, and these provoked a total of 364 response interactions (including a combination of text, images and locations) from other players. In terms of network analysis, the graph is formed purely of response interactions as edges and players as nodes (where the receiving node is the creator of the collection).

The results of analyses of data collected during the *Magpies* and *Beachcombers* trials are referenced at several points in the dissertation, in relation to understanding effects of socio-contextual information and group behaviour (see chapters 5, 6 and 7), in addition to being discussed in a formal publication about the effect of socio-contextual feedback on group behaviour in social games[146].

A.4 Familiars 2

Familiars 2 was developed as part of the PASION project [41], in parallel to the development of *Magpies* between June 2008 and April 2009.

A.4.1 Concept

Familiars 2 is based around the concept of each player owning a companion animal - a virtual sprite or creature similar in concept to Pullmans dæmons [219] - which take an animal form that represents the personality of the owner. The pattern of a players interactions and behaviour in the social network of the game and *Facebook* itself is used to directly decide what animal form a player's familiar should take. For example, a player who has many friends and is very active in the social environment of *Facebook*, the familiar may choose to take the form of a highly social animal (e.g. a rabbit) to reflect this aspect of their personality. Similarly a relatively less socially active player's familiar may choose to be a solitary creature such as a Bear.

Figure A.13: *Familiars 2* changed its form based on user activity -

In terms of Sharabi's classifications [236] (Discussed in 4.3.3), Familiars can be considered a self-presentation tool. The key difference is that the player has very little direct impact on the form the familiar will choose, since analysing the actual behaviour of the owner makes this decision. For example, allowed to define their own identity, players may choose to represent themselves as highly social. However, in *Familiars 2*, by analysing the observed social activity of the player, this may not prove to be an accurate representation. The application was developed on the “Facebook Developers Platform” and made available to all *Facebook* users to install on their profile. By agreeing to install the application, a small box would appear on their profile page showing the current animal form of the familiar and a link to show more details. Within the application itself, users can see the current familiar (and the reasons why it has chosen this form), the social status of any groups the player is a part of, and may also suggest the familiar runs facial expression recognition on specific photographs in order to learn more about their owner.

A.4.2 Development

The implementation of *Familiars 2* uses the same architecture and stack as *Magpies* and *Beachcombers*. For more details see section A.3.2. The main difference is in the application engine, which deals with functionality specific to this game.

Familiars 2 was developed between June 2008 and April 2009. It was designed by Ben Kirman and Shaun Lawson, in order to explore how data can be gathered from Facebook activity to create passively playful experiences. The application itself was built by Ben Kirman, using external services provided by PASION partners - specifically SNA metric calculation services and facial expression recognition. The graphic design and artwork was contributed by local Lincoln digital artist Aga Kowalska[1].

A.4.3 Autonomous Behaviour Analysis: The In-*fur*-ence Engine

[1]http://www.agakowalska.net/

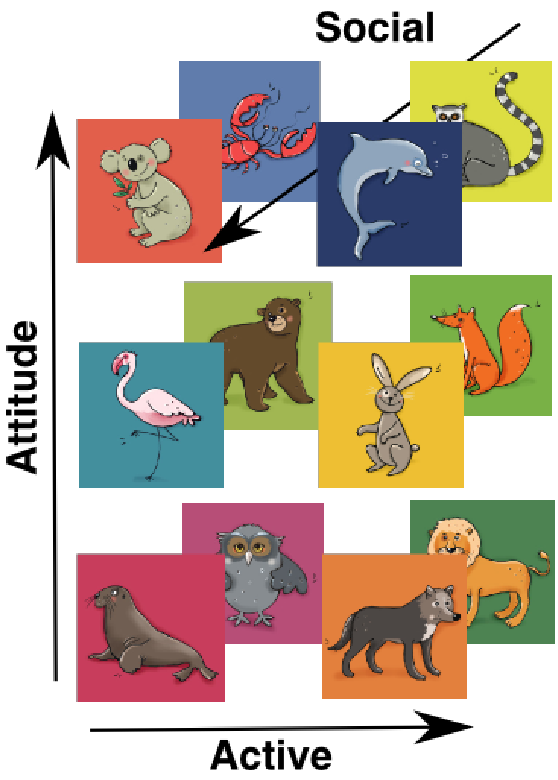

Figure A.14: *Familiars 2* animals were distributed around the 3-axes of behaviour -

The primary method a familiar uses to determine an appropriate form to take is through a process of automated behaviour analysis based on data provided by the Facebook Developers API. When a *Facebook* user installs an application, they must accept an agreement that permits *Facebook* to pass on details about personal behaviour and status to the application. It is through this process that *Familiars 2* collects behaviour data for analysis.

Behaviour is classified based on three dimensions: Sociability, Attitude and Activity. The data is collected from all these sources and combined in order to determine the type of animal the familiar should be. The association of animals and behaviours (e.g. koalas are less active than lions) was based on a cross-cultural study conducted as part of the PASION project, which is explained in detail in the published paper[142].

Sociability is based on the social activity of the player within their peer group and the application itself. *Familiars 2* accesses data on the number of friends a player has, and whether they themselves are users of the application. Group membership data is analysed in terms of the number of groups the user is a member of, the shared group membership with friends and the changes in this data over time. The value for sociability is normalised across the user community in order to provide a wider range of values.

Attitude is a value that represents the current temperament of the owner and is calculated through analysis of the facial expressions of the user's photographs.

Facebook gives application developers access to image data for every photograph that has been tagged with an application user. This provides a powerful capability so that any photograph containing that person can be accessed by the system so long as they have been tagged as appearing in the photograph. The photograph data is analysed using a remote Facial Expression Recognition (FER) engine (provided by PASION partners at Siemens and ITI CERTH [41]) that is able to extract the facial features found in the picture. Based on the measurements between the various facial features, the engine is capable of associating an expression and a value for confidence. This in turn is distilled into a positive or negative value for "valence" or temperament, which is used to adjust the value for attitude for the Familiar.

Activity is calculated based on the recent activity of a player within the application and to an extent within *Facebook* itself. Any page view within the application and each action taken within the game is recorded as part of the player activity. The activity dimension is time-based so only activity that occurred within the past 7 days is considered.

Voting

The application is capable of analysing personality in a completely autonomous manner. However, a facility for voting is provided so that players are able to adjust the form an animal takes manually if they don't feel it is appropriate.

An owner of a familiar, or a friend of an owner, may suggest that a familiar changes form to a different animal. This suggestion is given by simply clicking the animal form they think it should take. At the point of voting, a player is able to see the various attributes for Sociability, Attitude and Activity in order to make an informed choice about the most suitable animal that should be picked.

When a vote is received by the game, the appropriate adjustment is calculated based on the current profile of the owner, the suggested form and the number of suggestions a player has made. A vector is calculated between the current emotional profile of the player as understood by the game and the suggested form. The current emotional profile is adjusted based on the angle of this vector and weighted by the number of recent interactions. The weighting prevents people from “spamming” the system by repeatedly making a suggestion in order to force the familiar to change form.

Players are permitted to suggest their own familiar changes form, although the weighting for this change is very low to ensure that their friends always have the biggest input into the type of animal that the familiar chooses.

Voting as an additional input to the system adds a level of user power into the mix while the familiar is for the most part autonomous, players still have the ability to use the voting system to “nudge” the decision in a different direction. This also allows for the familiar to take into account more nebulous feelings from friends that cannot be captured automatically. For instance social activity outside *Facebook* is invisible to the familiar, so having this data provided in a coarse way by friends through voting helps smooth over this limitation.

A.4.4 Trial Methodology

The summative evaluation of *Familiars 2* was organised following the standard PASION experimental procedure outlined in section A.1.3. *Familiars 2* was trialled in an 8 week study between April and June 2009. The game was made open to the public on *Facebook* and added to the *Facebook* application directory so it would appear as any other application does within the site. Invitations were sent out to acquaintances and colleagues both in the UK and in Italy, with the expectation that there would be some natural viral growth.

Over the course of the trial, 260 players installed the application and were given a familiar as generated automatically by the system (with daily automatic updates). The additional voting mechanism allowed users to "nudge" a familiar's form. 202 votes were recorded during the trial period. Trial organisers at Goldsmiths college distributed questionnaires to users to investigate attitudes and opinions regarding the game after the trial was complete. In addition, user activity within the game was recorded (i.e. votes, page views, calculations, etc.) to help explore the usage patterns of the game by the users.

The results of the analysis of trial data are presented in the dissertation in the context of social identity (chapter 3), and patterns of social behaviour in online games (chapters 5 and 7). In addition, a peer-reviewed paper was published based on these results and the effect of passive emotional judgement on game activity [142].

A.5 PASION Fruit (& Fruit Loot)

PASION Fruit was the final game developed as part of the social gaming strand of the PASION project [41]. At its heart, *PASION Fruit* is a game about environmental sustainability. Gameplay is centred around growing and maintaining a virtual garden of a variety of fruit trees. The goal of the game is to create the richest possible collection at the lowest possible environmental cost. The name is a pun based on the acronym of the project funding the development (PASION)[41].

A.5.1 Concept

PASION Fruit is a game about virtual fruit gardens. Each player, upon registering to play the game, is asked to choose a real location for his or her garden, which will be important when it comes to paying for transport costs to send fruit to other players.

The game is centred upon the concept of gifting. The objective of players is to collect a diverse variety of fruit, and the only way to gain new fruit is through gifts from fellow players. When registering to play the game, players are assigned one "native" type of fruit based on their home location. The types of fruit available differ based on country, so, for in-stance, while players in the UK may grow Apples, Pears and Strawberries, players in Italy will be capable of growing Lemons, Grapes and Olives. Over time, all fruit trees will generate fruit that can be sent to other players as gifts. When sending a fruit, a player must pay a negative cost in terms of CO2 emissions that are calculated as a function of distance it costs more points to send a fruit great distance than to local co-players. E.g. it will cost considerably more to send an exotic fruit to somewhere far away than it will to send a fruit to someone in a nearby location.

The formal goal of the game is to gain points based on the diversity of fruit types within your garden, however this is balanced against the environmental cost of transporting fruits long distances. Since each country only grows a certain subset of fruits natively, in order to be successful players are forced to transport more exotic fruit from

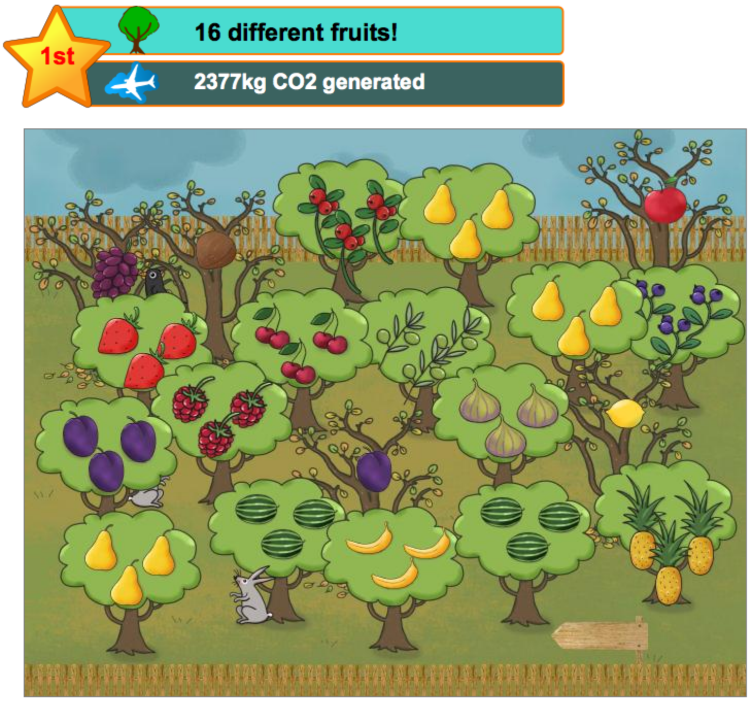

Figure A.15: Fruit gifts from other players are planted in *PASION Fruit* gardens, to grow and breed more fruit - The challenge for the players is to maintain diversity distant locations and pay an environmental cost represented by CO2 expenditure. A

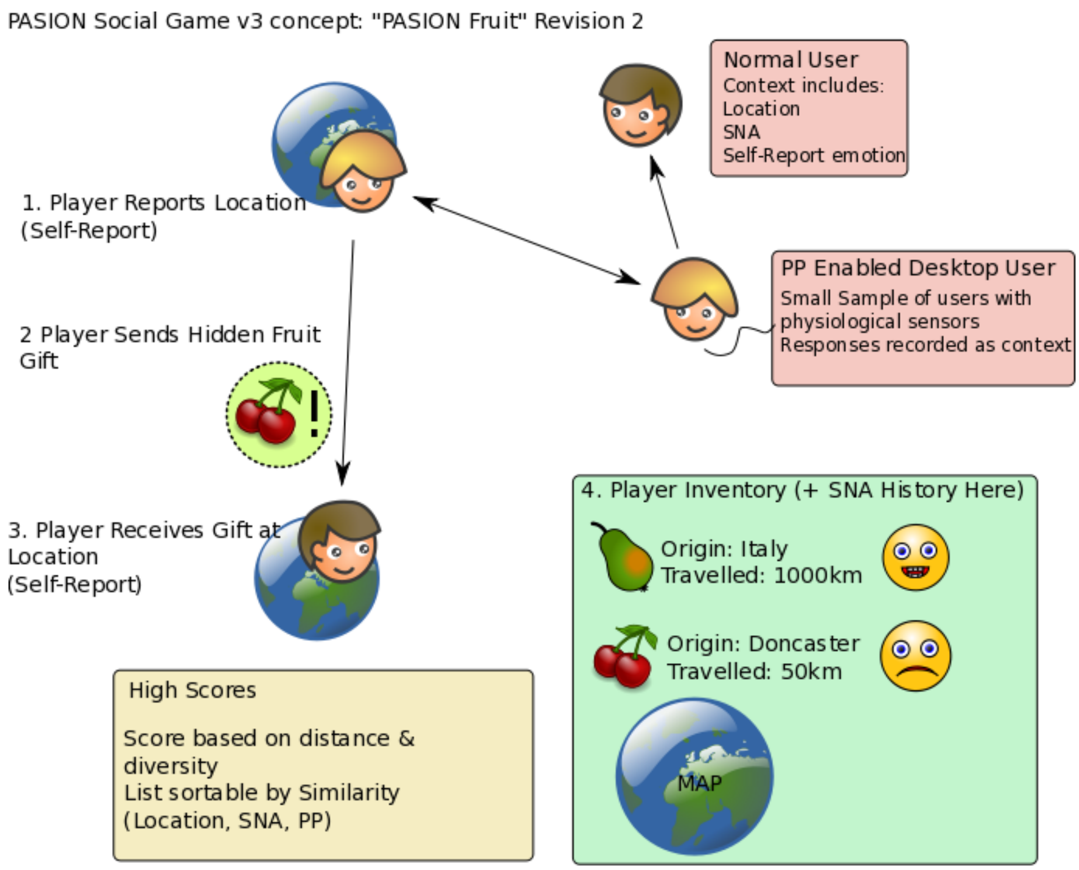

Figure A.16: *PASION Fruit* High Concept

main feature of the design is that players dont get to choose what fruit they plant in their garden they can only receive gifts of fruit trees from other players. They can request types of fruit using the comments/messaging system within the game, but whether the other player will send the desired fruit or not is unknown. Secondly, the player sending the gift bears the entire cost of CO2 emissions generated by sending the fruit the distance between the two gardens. Therefore, when sending a gift of one of your valuable fruit trees to another player, you not only lose the tree itself, but you lose the points it contributed towards your own gardens diversity, you pay the environmental cost (and therefore cost in score) to send it however far it must travel, and get no direct benefit from your act.

Since sending gifts involves cost, players need to be careful about choosing a gift recipient. The context of previous interactions is a powerful tool that allows players to make informed choices about gift recipients. For example, a player that was happy to receive an apple last month, may be happy to receive an alternative fruit such as a pear. Or a player located in the UK would be happy to receive a lemon which is a type of fruit not natively available to them. In addition to context on a per-event basis, the average values are calculated for each player and presented in addition to the rich Social Network Analysis indices that are built during normal play. For example giving a gift to a player with high reciprocity might mean an increased chance of receiving a good gift in return!

PASION Fruit provides a wealth of social history tools for players to be able to see the past behaviour of other players, to help them make informed decisions about who to send gifts to do they need this kind of fruit? Are they likely to return a gift? Do they have a type of fruit I need? Will they be willing to lose it? An abstract score is generated in real-time for each player based on the diversity of their garden, and the amount of CO2 emissions they have generated as a result of gifts they have sent. This score is then ranked against others in a high score table so players can see how they are performing.

A.5.2 Development

The implementation of *PASION Fruit* uses the same architecture and stack as *Magpies* and *Familiars 2*. For more details see section A.3.2. The main difference is in the application engine, which deals with functionality specific to this game.

The game was designed to be distinct from previous games developed as part of PASION, so rather than relying on the mission mechanic, a new game was devised by Ben Kirman and Shaun Lawson. It was developed between April 2009 and January

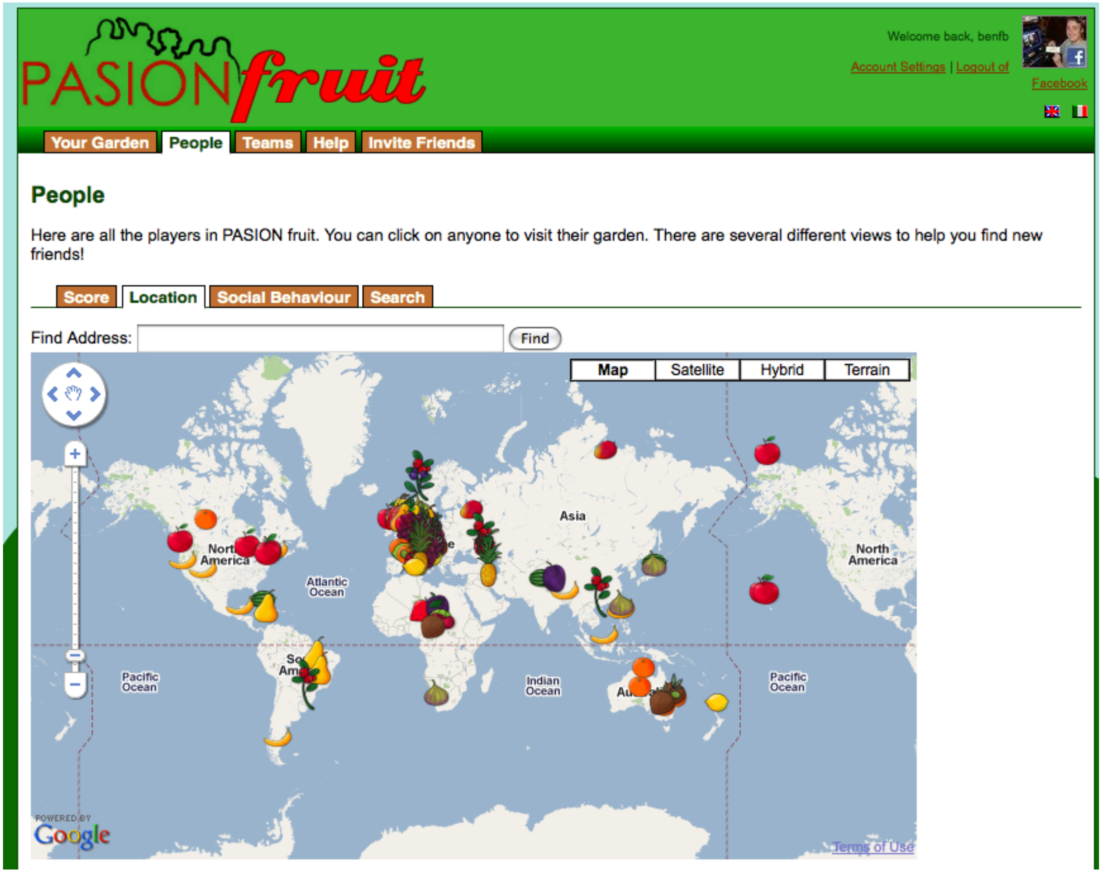

Figure A.17: In *PASION Fruit*, certain kinds of fruit only grow natively in certain countries - To maintain a local source of exotic fruit requires collaboration between players.

2010, again in collaboration with other PASION partners. As previously, the game was developed by Ben Kirman, with the support of artwork created by Aga Kowalska.

PASION Fruit diverged from the server stack used in previous games, still being Python but instead being developed on the Django framework served via Apache on Linux.

Physiological Input

As part of the game, after receiving gifts, users are asked to self-report their emotional response using a “valence-arousal” matrix defined by PASION partners at the Universität zu Köln. This metric is shown as context to the gift in the player history. These partners also recruited a handful of players to provide physiological input using hand-mounted galvanic skin response and infra-red measurement devices. In order to use this in *PASION Fruit*, Ben Kirman developed a client application in Python to read physiological measures and store them in the remote game database.

A.5.3 Trial Methodology

The summative evaluation of *PASION Fruit* was organised following the standard PASION experimental procedure outlined in section A.1.3. As with *Magpies* and *Beachcombers*, *PASION Fruit* was released simultaneously with a control version of the game - *Fruit Loot*. *Fruit Loot* is identical in every way, except for the name, and the fact that *Fruit Loot* lacks any feedback on the social networks built during play, or the emotional feedback provided by other players when receiving a gift, which act as the variable between game conditions.

Both *PASION Fruit* and *Fruit Loot* were opened simultaneously to the public in a trial lasting 11 weeks, starting in mid-February 2010.

Since registration was publicly open, and the game integrated with the social network *Facebook*, the player-base was permitted to grow as a natural viral or snowballing effect as would be experienced by a typical social game on the site. By the end of the trial, the *PASION Fruit* server recorded the 99 active users (users who sent at least one gift) who had between them generated 3922 gifts of fruit between one another. The control version, *Fruit Loot*, amassed a total of 81 players and 824 gifts. There was no overlap between users of the two games (based on comparing registered email addresses), so each user only experienced one condition.

Based on the analysis of gift interactions between users in the different conditions, any difference can be explained by the presence (or lack) of the socio-contextual and emotional feedback, the findings of which were explored in chapter 6. The games also contribute to the understanding of patterns of social behaviour and the effect on the social architecture as discussed in chapter 7.

A.6 Externally Developed Applications

To support the research into social applications, additional sources of data were investigated. Of course, usage data of games and social applications have commercial value and are generally closely guarded secrets. However, Atif Nazir, a researcher in network measurement at the University of California in Davis had made a significant data source open to the public. Atif had developed a handful of applications to test the Facebook platform when it was released in mid-2007, and those applications found great success. He collected data from millions of users making tens of millions of social interactions using his applications. Once the results of the studies were published [196, 197], Atif and his co-researchers anonymised a snapshot of the data and kindly posted it online[1] for others to use.

Atif's social applications saw volumes of interactions that are orders of magnitude greater than was observed in any of the other applications described here. This makes the data extremely valuable in addressing concerns of scale in the research. If patterns of social interaction hold true at both the small and large scale, it can be used to validate any findings.

Obviously since the design and development was external (described fully in [196]), it was not possible to adjust the designs or methodology - specifically that there is no control conditions for the large trials (this was un-necessary in Atif's study). However the data is still very useful, in particular for studying the network effects present in social games.

A.6.1 Fighters' Club

Fighter's Club is a simple application where players start *fights* with other *Facebook* users. Players choose opponents from the whole set of Fighters' Club players and challenge them to a fight. There then follows a fixed time in which players may hit one

[1] http://www.ece.ucdavis.edu/rubinet/data.html (Accessed January 2009)

another, and recruit the assistance of "supporters" to aid in their cause. After the time period is over, the winner is determined based on hits, supporters and the status of the players involved. The winner of a fight and their supporters gain points and prestige in the form of money and "Street Credit" which will make them more powerful in future conflicts.

In *Fighters' Club*, the main social interaction is therefore either *fight*, or *support*.

An important aspect to note is that players can pick fights with anyone within the social network of the game, not just those who are officially friends in Facebook. Players may also create and join formal groups with other Fighters' club players that compete in high scores based on the success of the individual members of the group.

A.6.2 Hugged

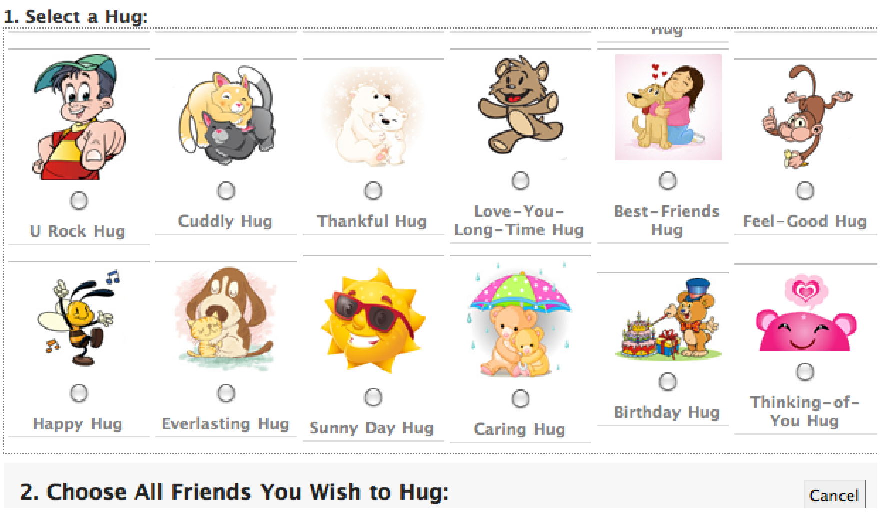

Figure A.18: *Hugged* on Facebook - An example of a Facebook application of phatic communication

Hugged is an example of a *phatic* communication application on *Facebook*. Social interactions are not part of a game but genuine social acts between the users. In this application, people simply choose a person and a type of hug to send (e.g. Fuzzy Hug, Friendly Hug, Naughty Hug, etc.). The recipient receives this hug as a message along with an associated picture (often a bear, cat or other cute creature). Interactions are simply one time directed communication events that have no time constraints associated with them. Importantly, a user is only able to send a hug to other *Facebook* users who are already in their list of friends on the service. It is also possible to send one hug to multiple recipients in one action.

A.7 Design Summary

The broad design for each application and game has been presented; however, there are idiosyncrasies, similarities and relationships between the designs that should be mentioned.

A.7.1 Familiar Familiars

During the development and trials, both *Familiars 1* and *Familiars 2* were both simply known as *Familiars*. However, both games had different mechanics and there was no direct lineage between the designs (we just liked the name!). For clarity, in the rest of the dissertation the names *Familiars 1* and *Familiars 2* are used to refer to the first and second games, respectively.

A.7.2 Task-Contribution Provenance

Familiars 1, *Magpies* and *Beachcombers* all share a central mechanic of tasks and contributions. The players create tasks or collections based around themes, then the other players contribute to these lists by adding text and images. This mechanic has lineage through several research games, including Sean Casey's *Gophers*[47], *Hitchers* from Adam Drozd *et al.*[81] and *MobiMissions* by Lyndsay Grant *et al.* [115]

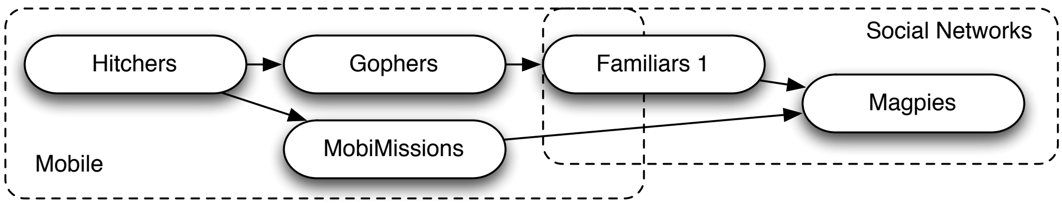

Figure A.19: Lineage of the Task-Contribution mechanic - Showing the relationships between the games in terms of the development of the mechanic, from the earliest use in *Hitchers*

A.7.3 Identity and the Social Graph

Each application treats the issues of *identity* and *accessibility* differently. Figure A.20 shows an illustration to highlight these differences.

Identity is either hidden - in which case the users are essentially anonymous to one another; known to friends - where application users are anonymous but their identity is visible to established friends (i.e. PASION Fruit users can know fellow players because of the links to *Facebook*); or public, in which case the user's real identity is attached to each of their interactions within the systems.

Accessibility refers to how "visible" the activities of the user are to the world at large. *Familiars 1* and *Hugged* are both limited explicitly to established friends (i.e. first-order connections on the social graph). Games *On the Graph* are those where the position of the user on a formal social graph (i.e. *Facebook*) is visible to other users, so people may play with friends-of-friends, or even strangers within the context of the social network. Finally *Familiars* is completely separate from a formal social graph, so the non-game relationships between players are hidden and there is essentially a level social playing-field supporting activity in the game.

PASION Fruit (and *Fruit Loot*) is a special exception because the game is formally off the social graph, however since players may log in and access the game via their social graph (and the games post updates to network), it is a mix of players who are situated both on-and-off the social graph.

A.7.4 Social Mechanics

Despite the differences in approach to identity and accessibility, each of the games and applications studied rely on direct, active social interactions. This means that in order to be successful at the game (or get value out of the non-game application), users have to explicitly engage in social interactions. This implies that diplomacy, cooperation and negotiation are all important within the social architecture of these games. The

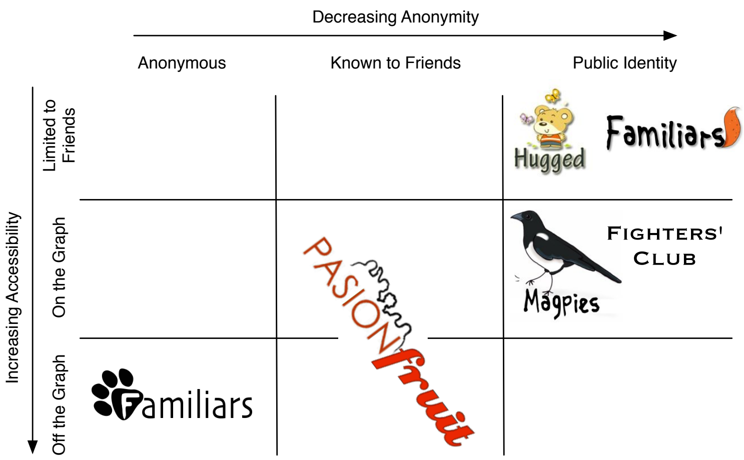

Figure A.20: Comparison of approaches to Identity and Accessibility in the Social Games - Note that it is *Familiars 2* that has the logo with a tail

applications are truly social and cannot be effectively used without social interactions - as opposed to games such as *Mafia Wars* which are primarily only passively social.

Table A.1: Broad Comparison of Trial Data. Applications are grouped by concurrency of trials.

Game	Players (N)	Interactions	Trial Length (days)
Familiars 1 (F1)	157	1546	56
Magpies (MP)	102	297	50
Beachcombers (BC)	113	89	50
Familiars 2 (F2)	260	202	50
PASION Fruit (PF)	99	3922	77
Fruit Loot (FL)	81	824	77
Fighters' Club (FC)	143020	263112	21[1]
Hugged (HG)	1322631	1555597	21

A.8 Trial Summary

This appendix has summarised a range of social games and social applications of a variety of types and forms. Each one has been tested in the wild with real users. Studying the patterns and forms of social interaction in these applications allows us to test theories surrounding social play. The applications are referred to directly by name in the text. In order to not cause confusion, the descriptions of the games and applications are here for reference, to save diversions during the discussion of the results.

Table A.1 shows a summary of the trials and data collected for each game. Total interactions includes all social interactions for each application (e.g. both *fight* and *support* actions in *Fighters' Club*, and the trial length is the period over which data was collected for analysis.